MINISTRY OF WORKS AND DEVELOPMENT
WATER AND SOILS DIVISION

MANUHERIKIA IRRIGATION
SOCIAL AND ECONOMIC IMPACT STUDY

FINAL REPORT

SHEPPARD AND ROUT
ARCHITECTS AND PLANNERS

IN ASSOCIATION WITH

BROWN COPELAND AND CO LTD
CONSULTING ECONOMISTS

AND

DR G W KEARSLEY
RESOURCE DEVELOPMENT CENTRE
UNIVERSITY OF OTAGO

1985

ACKNOWLEDGEMENTS

During the course of this study, Sheppard and Rout, Brown Copeland and Co. Ltd and Dr G W Kearsley have been generously assisted by many people and interested parties. This is now acknowledged with appreciation.

Otago United Council

Federated Farmers, Irrigation Sub-Committee
Manuherikia Valley

Ministry of Agriculture and Fisheries

District Office, Ministry of Works and Development

Residency Office, Ministry of Works and Development, Alexandra

All individuals and orgaisations in the study area
who contributed to this study.

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PREAMBLE

The Study Context

There has been a long history of irrigation in Central Otago, nowhere more so than in the Manuherikia Valley, a part of the Clutha river system.

After gold-mining races were turned to agricultural purposes, the system was developed and formalised through the construction of two major systems, the Omakau and Manuherikia schemes. Served by the ageing Falls Dam, the whole irrigation structure is in need of major repairs. Indeed, since this study was commissioned a major failure of the Manuherikia scheme has occurred.

The Ministry of Works in association with the Irrigation Committee (a sub-committee of the Federated Farmers Local Branch) has been working towards adopting a definitive plan for future development of irrigation in the valley. If the valley were still dryland (non-irrigated) the chances that extensive or whole valley irrigation would be introduced would be remote due to the very high capital investment involved and the extensive geographic area of the valley.

In fact, though, a large portion of the valley has been irrigated for an extended period and irrigation must be considered an integral part of the land use pattern now established in the area. Given that the existing schemes are in a chronic state of disrepair there is a need to investigate seriously a range of schemes for future development, because not only land use patterns, but farm size, farming practices, community size and service provision all relate to the productivity of irrigated land.

A recent concept, to upgrade the existing irrigation scheme, involved expansion to a whole valley system. Preliminary analysis of this in 1979, using provisional cost estimates, indicated that such a proposal could be economic but subsequent increases in capital costs for this scheme made it less viable and meant that alternatives needed to be considered.

In early 1983, the Ministry, in consultation with the Irrigation Committee, commissioned the study reported herein. The purpose of this study has been to consider a range of irrigation alternatives and to estimate the likely economic and social effects of each. This approach, it is believed, will put present and future irrigation in the valley in a better perspective and help in the choice of direction to be adopted.

I. INTRODUCTION

The Manuherikia Valley has experienced the benefits of irrigation on a modest scale over the last fifty or so years. The schemes which provided this are now in need of major repair and are likely to fail within 5-10 years unless such action is taken. The cost of repair could be considerable and serious study of the future of irrigation in the valley is essential.

While a number of previous studies and investigations have been carried out, this study looks at a range of irrigation alternatives and attempts to identify the main social and economic implications and impacts that may arise from each. Because the costs of improved irrigation are expected to

be high it is essential that these impacts, beneficial and adverse, be considered before any plan is adopted. Included among these is an alternative which assumes a return to a non-irrigated situation by allowing the present schemes to run down. This is included as a baseline for purposes of comparison only, and the effective baseline is the "continuation" of the present scheme involving investment sufficient to overcome present operating problems.

It is outside the scope of this study to establish the preferred irrigation alternative or the optimum future land use for the valley. The study simply identifies the likely impacts of the alternatives drawn up by the Ministry of Works & Development as a first step towards formulating the preferred scheme for the valley.

The range of irrigation alternatives that could be considered for the Manuherikia is potentially very wide, and any number of specific plans could be investigated. However, as this study is focused on identifying the types and scales of social and economic impacts likely to arise, alternatives from the broadest possible spectrum have been selected for investigation, even though none may be exactly the scheme that is finally chosen.

Alternatives extend from a dryland (non-irrigated) future through several kinds of irrigation schemes serving various mixes of pastoral and horticultural developments to a "full valley" irrigation scheme. The range of options considered thus makes it possible to assess the costs and benefits and the beneficial and adverse impacts that are associated with the widest range of possible developments.

II. STUDY OBJECTIVES

In order to carry out the broad aims listed above, the detailed objectives of the study were stated as follows in the study brief:

1. To assess the social and economic impacts of the various alternatives for the proposed irrigation scheme on the study area, taking into account the existing characteristics of and likely trends in the study area without the irrigation scheme.

2. To assess the social and economic impacts of the irrigation scheme alternatives on the wider region, especially those arising from agricultural production in the valley.

3. To examine the planning issues arising from the irrigation scheme alternatives.

This set of objectives recognises that the benefits of irrigation, or any other development, are not simply economic ones. A worthwhile scheme provides the basis for a community to develop, based primarily upon those who derive their livelihood from the scheme itself. They and their families require many services, both local and far away. There include the transport operators, banks, stock and station agents and contractors who, among others make farming possible. They also include the teachers, doctors, shop and hotel keepers who provide for the daily and occasional needs of the primary community.

The produce of a region has consequences outside the local area; products, such as fruit or stock provide further jobs as they are handled and processed. The demands of rural people for further education, entertainment and professional services help to sustain regional centres and cities well outside their local area. The land, town and country are all linked in complex systems of interdependence that extend far beyond the farm gate and far beyond the profitability measured by an Internal Rate of Return.

This study aims to assess those impacts for the range of irrigation scheme alternatives that have been developed by the Ministry of Works & Development. As stated in the introduction to this report, these cover a wide range of possibilities and can be considered to span a spectrum from a future without irrigation through a number of alternative schemes to a scheme that provides irrigation for an extensive area of the valley. While those at the extremes of the spectrum may be considered unlikely to eventuate they were included for study purposes to give the likely limits and allow the identification of significant impacts.

III. APPROACH TO THE STUDY

In order to carry out the study objectives and thus to satisfactorily evaluate the implications of the various alternatives, the following approach to the work was adopted:

1. Formulation of a picture of the present situation in the Manuherikia and its immediate region in terms of present farming practices, the present local economy, the community and its perceptions and beliefs.

2. Formulation of the trends in the valley which would be likely to occur in the absence of irrigation.

3. Assessment of the likely social and economic pacts of the several irrigation alternatives on the present valley economy and community.

Through earlier studies, the work of Government Departments and through other documentary sources, some data exist which refer to some aspects of farming and life in general in the Manuherikia Valley. These are inadequate for the purposes of this study, so that additional data were required and had to be specifically collected.

The additional data required were obtained by way of a survey of businesses and farm households in the study area, discussions with local and Government agencies and a review of comparable information on other rural areas served by irrigation. These are further detailed below.

The report that follows describes briefly the historical development of irrigation and farming in the Manuherikia, the present situation (task 1), the trends perceived (task 2), the irrigation alternatives and associated costs and the likely economic and social impacts of these on the local economy and community (task 3). General conclusions regarding the future in the valley with and without irrigation are also drawn.

Detailed information from the field surveys is held by the Resource Development Centre at Otago University.

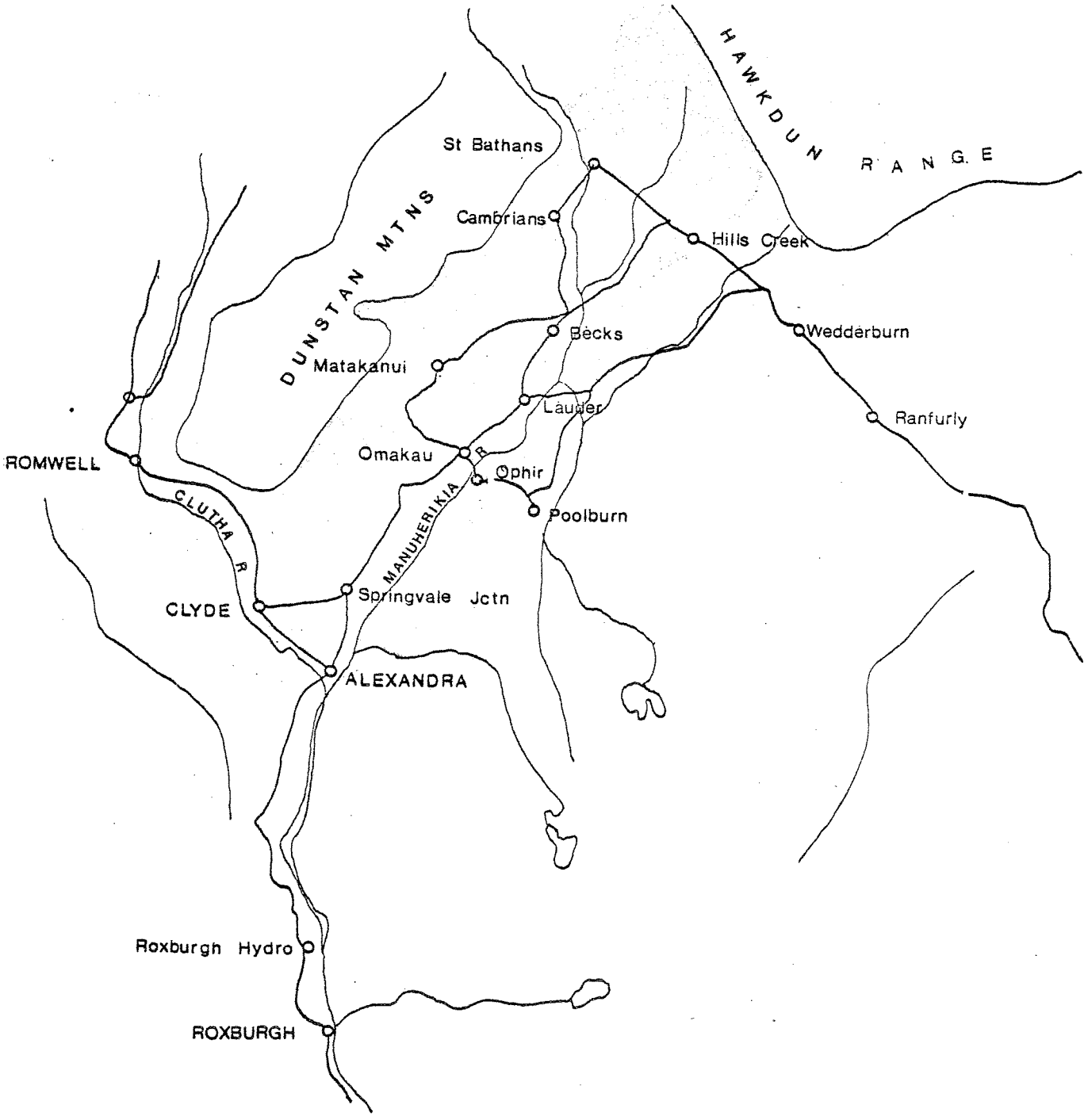

FIG. 1 OUTLINE OF STUDY AREA (SHADED)

Household Questionnaire

The study area for the farm household survey was delimited as follows:

West : the Clutha River between Clyde and Alexandra

East : the headwaters of the Manuherikia catchment at the Falls Dam; this represented the furthest upstream limit of any irrigation proposal as well as the limit of settlement

North : the break of slope of the Dunstan Ranges, or the head of roads that penetrate them

South : the break of slope of the Raggedy Range and Blackstone Hill, which represents the hill country block separating the Manuherikia and Ida Valleys

The study area thus defined, Figure 1, covers all of the land that could possibly be irrigated under any Manuherikia irrigation proposal, or pumped scheme from Lake Dunstan.

The aim was to contact all full or part time farmers in the area delimited, even if they had very small holdings.

The survey was conducted by senior students from Otago University over a period of 3 weeks during May/June 1983. The questionnaire was left at each farm household for residents to complete and then collect at an agreed date. A total of 187 households were sampled, in the first instance. Of these, three refused to comply immediately, and two of these gave as a reason for not participating the belief that they could not be involved in any possible irrigation scheme.

Of the 184 questionnaires that were returned, six were eventually discarded as being substantially incomplete. One respondent was a very recent arrival, on a small holding; another owned less than one acre, as it transpired, and the bulk of the questionnaire was thus irrelevant. Of the remaining four, three were owners of ten acre blocks near to Alexandra, and only one had a holding of more than this. No reasons for non-completion were given, although the small holdings were essentially undeveloped. Since these appear to have been good reasons for non-compliance in some cases, even though these were not made explicit, the overall response rate was considered to be excellent. At worst a 95% return was obtained, and if the suspected or declared reasons for non-compliance are considered, then a return rate of 98% was experienced.

The pattern of responses represents the pattern of land-holding, and thus cluster in the Lower Valley area around Alexandra and Clyde, whereas a minority of pastoral farmers command the largest land area. In some cases farms had been amalgamated within one family, or were managed as single composite units. These were treated as one response, but, as in the case of the larger stations, they are very large units especially when compared with small holdings.

Within the body of the questionnaire, variable rates of response were obtained for some questions, especially when simple frequencies are considered. In general this is attributed to one of the following:

- lack of interest in a particular topic
- question not seen as relevant by respondent
- question considered too personal
- respondent had not considered issue in sufficient depth to answer to his own satisfaction

Thus, if one considers the section on Future Irrigation Intentions, it might appear that almost a third of respondents had failed to comply. In fact, specific, and valid, reasons for apparent non-response include the following:

- some irrigators had small properties and were not thinking of future developments as such
- some irrigators felt that they were pretty well developed as is
- some respondents had no definite plans or had not thought through what they might do
- some were not presently irrigating and the section did not apply to them

In such cases, cross-tabulation against other relevant data reveal such reasons, and where an apparently high non-response has been acquired this is done.

The questionnaire itself is reproduced in Appendix A, and was relatively lengthy, covering the following range of topics:

- mobility
- patterns of daily life
- land tenure and land use
- specific crops
- stock
- present irrigation
- farm employment
- land capability
- regional effects of farming
- future irrigation
- non irrigators
- social consequences of future irrigation

Data on household composition were also collected, for purposes of cross-tabulation where appropriate. Aggregate data were available on a Mesh Block basis from the 1981 census.

A draft of the questionnaire was considered by members of the United Council and local and Head Office staff of the Ministry of Works & Development, and amendments made to produce the final version used in the survey.

The data collected were coded and stored as a series of computer files

which are held by the Resource Development Centre, Otago University. Data were processed in frequency and cross-tabulation forms using the Geography Department's FREQUENCY and XTAB computer programmes, and the SPSS 'CROSSTAB' facility.

Business Survey

After preliminary returns from the Household Survey became available, a survey of business establishments that seemed likely to be affected was conducted in the Manuherikia Valley and the wider regions.

Representatives of 28 business enterprises in Alexandra, Omakau, Lauder, Becks, Oturehua, Wedderburn and Ranfurly were interviewed during June 1983. Two thirds of the sample was from Omakau and Alexandra while the remaining businesses were distributed among the other centres.

All companies that had been mentioned by householders were contacted, and a sample of others was included.

A copy of the survey form is included in Appendix B. The results of the survey provided information on length of ownership, employment, value of trade, and impact of changes in irrigation. A complete response was achieved.

PART 1 STUDY AREA DESCRIPTION

In this section the key natural, economic and population characteristics of the region and study area are outlined. The landscape and climate are first discussed as they provide the setting for the study area and are major influences on the region's economy and land use patterns. These are followed by a brief history of the development of the region in particular of the irrigation history. The regional economy and regional population profile are also discussed, as are the patterns of daily life and community structure, based upon service usage and evaluation, as well as perceptions of service adequacy.

1.1 Landscape

The Manuherikia Valley is a north-east south-westerly tending valley drained by the Manuherikia River, which rises in the Hawkdun Range and flows along the south-east margin of the valley to join the Clutha River at Alexandra. The valley was formed over 12 million years ago when this area underwent a period of folding and subsequent faulting. These processes lifted and tilted the landscape, forming the present basin range topography characteristic of Central Otago. Erosion, following the mountain building period partially filled the valleys with upper Tertiary and Pleistocene deposits which in turn have been cut, by tributary streams and the river, into terraces and residual hills. Alluvial fans are numerous in the valley where streams emerge from the mountains onto the plains and from higher terraces onto lower ones.

Along the north-west side, the valley is contained by the Dunstan Mountains, a faulted schist block rising to approximately 1520m. Along the south-east side the valley is bounded by another schist block divided by the Poolburn into Blackstone Hill (980m) in the north-east and the Raggedy Range to the south-east. The Hawkdun Range of greywacke forms the north-east

boundary.

The valley extends for about 64km north west of Alexandra and rises steadily as it approaches the Hawkdun Ranges from an elevation of 141m at Alexandra through 300m at Omakau to 540m at St Bathans. The valley begins as a series of terraces at the confluence of the Clutha and Manuherikia Rivers. After rising over these terraces the basin develops into an open plain which gradually changes to a gently rolling landscape south of Omakau. Numerous rocky outcrops are a common feature throughout this section of the valley.

Approaching Omakau there is a noticeable rise onto a higher plain with more open pasture which again develops into rolling countryside towards Gidding Downs and Blackstone Hill in the northern reaches of the study area.

1.2 Climate[1]

New Zealand's climate is controlled by a disturbed westerly airstream which brings frequent anticyclones, cold fronts and depressions across the country. Central Otago and therein the Manuherikia Valley are generally sheltered by the Southern Alps from these rain bearing winds. As a result the area has a dry climate with a relatively high level of sunshine. As an inland region Central Otago also experiences extremes of temperature with high levels of warmth in summer, very cold temperatures in winter and relatively large diurnal ranges in all seasons.

Detailed climatic data for the Manuherikia Valley are available from ten rainfall stations distributed the length of the valley from Alexandra to St Bathans and two climate stations, one at Alexandra and one at Ophir. Climatic data from the Naseby Station is also cited as indicative of the climate at the head of the valley. Geographically Naseby is not strictly within the valley; however it has an elevation and aspect similar to St Bathans, and is included to give an impression of that particular area.

A noticeable feature of precipitation in the area is the sharp gradient of increasing precipitation as one moves up the valley. Alexandra averages 339mm annually compared with Ophir's 420mm and St Bathans' 790mm. The wettest months are October through to March with winter being the "dry" season, although no season is particularly wet by New Zealand standards, especially in the lower valley.

Variability is also a characteristic of Central Otago rainfall both annually and during any single year. For example in Ophir the normal annual rainfall averages 420mm with a recorded annual maximum of 560mm and a minimum of 281mm. Similarly the normal monthly rainfall during January is 53mm with a recorded maximum of 107mm and a minimum of 12mm.

With increasing altitude snow provides an increasingly important contribution to precipitation. The Dunstan Mountains are often snow covered for up to six months of the year and in some shady hollows for even longer. Through the winter there is on average more snow in the upper valley with Alexandra averaging 4.4 days of snow annually compared with 6.1 at Ophir

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(1) Climate data discussed in this section are from the New Zealand Meteorological Service, 1973 : Summaries of Climatological Observations to 1970. Miscellaneous Publication No.143.

and 16.4 at Naseby.

Temperatures in Central Otago and the Manuherikia Valley are extreme with a highly variable daily range. The mean annual temperature range for Alexandra is 40°C, for Ophir 42°C and for Naseby 40°C. The further up the valley the colder the climate. The mean annual minimum temperature reported for Alexandra is -7.7°C compared with -10.7°C at Ophir and Naseby. The extreme heat of summer is moderated with increasing altitude so that mean annual maximum temperatures decrease with increasing altitude. The mean annual maximum temperature at Alexandra is 32°C compared with 31.5°C at Ophir and 29.3°C at Naseby.

The variable daily range in temperatures is shown in Table 1.2.1 below:

Table 1.2.1

MEAN DAILY TEMPERATURE RANGE (0c)

Location	January	July
Alexandra	12.4	9.4
Ophir	14.0	10.5
Naseby	14.0	9.7

Climate stations in Central Otago have recorded some of the highest temperature ranges in New Zealand, while Ophir has the distinction of having recorded the lowest, for any settled area, at least.

The length of the growing season is defined as the period when the mean monthly temperature exceeds 10°C.(1) On this basis the length of the growing season decreases towards the head of the valley as shown in Table 1.2.2.

Table 1.2.2

APPROXIMATE DURATION OF THE GROWING SEASON

Location	Months
Alexandra	7
Ophir	6
Naseby	5

Soil temperature is as important to agricultural production as air temperature. Ground frosts and screen frosts affect the length of the

(1) Centre for Resource Management, University of Canterbury and Lincoln College, Resource Use Options for the Upper Manuherikia Valley, Lincoln Papers No.9 1982.

growing season. Ground frosts may occur in the valley at any time throughout the year except at Alexandra which is free of screen frost from December through to March. The frostiest months are May to September.

Both Alexandra and Ophir climate stations record an annual soil water deficit. This is caused by high summer temperatures and a concentration of rainfall in spring and summer with the result that evaporation rates are high. The small amount of soil moisture built up over winter and early spring is generally depleted by October or November and a soil moisture deficit continues until May or June of the following year. Above 800m there is generally no soil moisture deficit due to the weather and cooler climate at higher altitudes.(1)

The valley enjoys a high proportion of sunny calm days. Only Blenheim and Nelson in the South Island exceed the level of sunshine experienced in this area, but strong gusty north westerlies are sometimes channelled down the valley. Dry winds in general and the north westerlies in particular contribute to the soil moisture depletion and cause erosion of light soils where there is insufficient cover.

1.3 Soils

Most soils in the valley are derived from the schist base rock with a few soil groups derived from greywacke material.(2) There are three main soil groups in the study area -

Brown-grey earths
Yellow-grey earths
Yellow-brown earths and related alpine and steepland soils

Brown-grey earths are found in the driest parts of Central Otago in association with shallow steepland and salty soils. They predominate in the study area from Clyde/Alexandra along the valley to Lauder. Brown-grey earths are mainly fertile soils. They are well supplied with plant nutrients but because of their structure such nutrients can be readily exhausted. Soils of this type are particularly suited to stone fruit production although they are also used for intensive fat lamb rearing. Irrigation is necessary for both the above uses and for this the deep soils on the fans and terraces are most suitable. Shallow tracts of brown-grey earths on the terraces as well as hilly and steepland soils are used for dry land sheep grazing in conjunction with irrigated land. Salty soils can only be used for rough grazing.

Brown-grey earths have a weak structure which is easily broken down by excessive cultivation especially with rotary cultivators. The result is a fine dusty soil very susceptible to wind erosion and removal by irrigation water. However, contour or border dyke irrigation practises minimize the loss of topsoil by reducing the strength of the water stream.

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(1) ibid

(2) J.D. McCraw Soils and Conservation, in a special publication of the New Zealand Geographical Society Miscellaneous Series No.5, Christchurch, 1965

There is a gradual transition to yellow-grey earths in the upper reaches of the valley and on the adjacent hills. They are of medium fertility and are suited to semi-intensive sheep grazing, small seed cropping and pip fruit growing. Irrigation is essential for full production. Nevertheless they are easily eroded if the humus content is exhausted through heavy and regular cropping.

Yellow-brown earths and related alpine and steepland soils predominate in the uplands and are the most extensive soils in Central Otago. They are of low fertility but respond to applications of appropriate fertilizer. These soils provide useful pasture for extensive sheep grazing.

1.4 History of Settlement

European occupancy of the Manuherikia Valley began with its selection as pastoral runs, six such being taken up in September 1858 to embrace the entire district. The population remained sparse until the influx of miners and others upon the discovery of gold in the Dunstan Gorge in August 1862 and subsequently in the valley of the Manuherikia itself. Around the perimeter of the valley mining settlements were established - at St Bathans, Cambrians, Drybread, Matakanui, Devonshire, and Waikerikeri Creek - where gold bearing Tertiary sands, grits and conglomerates had been drawn up along the Dunstan Mountains. Becks was established as a staging post on the coach route from the coast to Dunstan (Clyde) and Alexandra. The latter grew as an administrative and service centre, although not without considerable competition from Clyde. The mining industry underwent significant structural changes after 1870, the individual miner and small informal partnership giving way to the private and public company employing outside capital, new technology, and wage labour to develop extensive mines at St Bathans, Tinkers (Matakanui) and elsewhere. Much of the capital and management were supplied locally, by the business communities of the main settlements. The same interests later advocated the subdivision of the runs and closer settlement and the construction of irrigation schemes, as a means of establishing long term businesses after the gold had been removed.

Agricultural settlement and development, partly to supply the miners, followed closely upon the discovery of gold. Apart from the commonages established near Clyde and Alexandra, 20,000 acres of the Valley were reserved under *The Gold fields Act 1866* for disposal as small holdings. By June 1877, 17,112 acres had been disposed of under the agricultural lease provisions of that Act, 1,367 acres under the deferred payment of *The Otago Waste Lands Act 1872*, while the Spottis Hundred of 5,300 acres had been declared in 1874. With the leases of the runs expiring in September 1882, the runs were subdivided and the leases auctioned while further areas were reserved for small farm settlement. In order to prevent conflict between miners and farmers mining, tailings, and sludge channel reserves were made while the Tinkers Sludge Channel was maintained as an outlet for the Matakanui mining area. Agricultural settlement and development were encouraged after 1900 by rising product prices, the release of water by the mining industry for irrigation purposes, and the completion of the railway line to Omakau in 1904 and Alexandra in 1907. The decline in mining, however, meant a gradual withdrawal of population from the basin-margin settlements. Matakanui, Cambrians and St Bathans are now virtually deserted with only one or two old buildings remaining as an indication of a more populous past. Alexandra during this period received a boost from the rapid expansion of the gold dredging industry after 1895. That stretch of the Clutha River between Alexandra and Clyde was one of the three major areas of experi-

mentation in dredging beginning with the spoon dredge in the 1860s and progressing through the current-wheeler, suction dredge and steam powered bucket and ladder dredge. The success of several companies working the river between Alexandra and Cromwell and beyond on the Kawarau River stimulated the major dredging boom of 1899-1900. Alexandra's population grew rapidly between 1891 and 1901, especially between 1896 and 1901, as industries - foundries, engineering workshops, blacksmiths, transport and construction firms - were established and coal mines opened to service and supply the industry. The gradual contraction of the industry after 1901 was reflected in an accelerating loss of people from both Alexandra and Vincent County. That decline was accompanied by growing demands that more land be made available for settlement and irrigation schemes constructed, demands in turn supported by the completion of the Central Otago railway line to Alexandra to provide cheaper, bulk access to the coastal urban markets and ports.

The main settlements in the Valley are now concentrated along Highway 85, Alexandra to Palmerston. The high and difficult plateau country to the east of Central Otago has precluded the construction of a high standard road direct to Dunedin.(1) The latter is reached via Lawrence and Milton, via the Maniototo Plains and Palmerston, or via Middlemarch and Mosgiel. Such difficulties of access have reinforced a long-established sense of separateness felt by the communities of Central Otago and a desire to fashion and direct their own development and future. The Manuherikia Valley itself is well serviced by a network of secondary roads.

The settlement pattern is now one of closely settled orchard lands and rural residential units near Alexandra changing to irrigated pastureland and a more open settlement around Omakau. Along the western perimeter of the valley just under the hills are widely spaced sheep stations with ready access to range country as well as maintaining some cultivated paddocks for winter feed in the valley. In the Manuherikia Valley itself, Lauder and Becks are minor service centres with a primary school and hotel in each community. Lauder also has a general store and service station while Becks has only petrol pumps. There is an agricultural contractor at Becks and a D.S.I.R. satellite tracking station with associated staff housing near Lauder. St Bathans is another minor service centre with petrol pumps and a hotel. It has also been recognised by the local council as an historic area of special merit and has an historic designation on it to preserve the old buildings remaining from the gold rush days. The main centre within the Valley is Omakau (population 210 in 1981) which provides a limited range of wholesale and retail services, a primary school, and police, fire and automatic telephone services.

Alexandra with a population of 4348 is a sub-regional service centre for the eastern half of Central Otago including the Manuherikia Valley. It offers a wide choice of retail goods, business and social services, farm supplies and services. Alexandra is located on a main tourist route to Queenstown and this has led to increasing development in the restaurant and hotel trade. Further, it is an increasingly important retirement centre.

Regional linkages beyond the valley are few and well defined. Stock is processed at Dunedin or Oamaru. Fresh produce is transported to Dunedin

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(1) This notion remains very much the goal of regional promoters today, with access to the horticultural areas one of the main justifications.

and air freighted from there to market or shipped by sea (e.g. apples). Specialist health services and tertiary education involve travelling to a regional centre.

The Manuherikia Valley is essentially a pastoral valley with its social and economic linkages mainly directed towards Alexandra. It is part of a wider hinterland which contributes to the growth and prosperity of that community.

1.5 History of Irrigation

The Manuherikia Valley was the scene of some of the earliest irrigation experiments in New Zealand. Central Otago is a region of hot dry summers and cold dry winters. Certain attributes of the rainfall, in particular, require the operation of an irrigation system. As noted in Section 1.2. The rainfall regime is characterised by a late spring - early summer maximum so that a large proportion occurs when temperatures, insolation and evaporation are all high. The average annual rainfall is not only low but also highly variable. At Alexandra between 1928 and 1960, the mean monthly variation of rainfall was 49 per cent from the normal 1921-1950 rainfall. For the month of February, over the period 1928-1960, three months had less than 25 per cent of the average rainfall and eight others between 25 and 49 per cent, so that in 11 out of 33 years Alexandra received less than half its average rainfall.

Low annual rainfall totals with marked variability and seasonal distribution mean that many valley and basin areas seldom receive sufficient rainfall to maintain pasture growth. Many areas thus experience prolonged (up to nine months) and critical periods of soil moisture deficit. The problems posed by a low and variable rainfall are compounded by the fact in most of Central Otago's catchments the greater part of the runoff - from snow melt in the ranges - occurs in spring and is lost to agriculture, so that river levels are at their lowest when water is most required in the summer months. For the limited supply of available water there has always been intense competition.

The development of irrigation farming in the Manuherikia Valley involved a protracted, occasionally bitter, conflict and struggle between miners and farmers for control of the water resource (beginning in the 1860's with J.D. Feraud's efforts to secure water for his Waikerikeri Valley market garden) and prolonged efforts to secure direct State participation and financing. Until 1872 water could be diverted for mining purposes only, and by that date the industry had secured most of the available supply. Such irrigation rights as were granted were inferior rights, while the miners took care to ensure that their interests were at all times protected and conserved.

As mining declined towards and after the turn of the century and the value of water for alternative purposes rose the resource was reallocated. That process, however, was by no means smooth. A proposal in 1912 to convert prior mining water rights out of Dunstan Creek into irrigation rights and to use the water for an irrigation scheme to service the Lauder area foundered on miner opposition.

Considerable conflict existed among the settlers themselves over the distribution and use of the available water. Thus the efforts, in 1921, of a small group of settlers to secure exclusive control of water rights held by the failing undaunted Tinkers Gold Mining Company Ltd. created con-

siderable controversy. The outcome in that instance was a conference among the Departments of Lands and Public Works, the Vincent County Council, and the settlers. A scheme of distribution was agreed upon, the County managing the Matakanui Irrigation Scheme until it was incorporated in 1935-1936 into the larger Omakau Irrigation Scheme.

Pressure for State involvement to finance storage and distribution schemes and to ensure equitable distribution resulted in a number of schemes being constructed and generated from 1917 onwards, many incorporating former mining races. In the Manuherikia Valley, the Manuherikia Irrigation Scheme commenced supplying 4900 acres in 1922. The total capital cost of the scheme was 266,736 or 54.4 per acre, the highest of all schemes constructed in Central Otago up to 1936. The Omakau Irrigation Scheme was one of two mooted in 1931, this particular scheme to supply 15,000 acres then held by 52 individuals and drawing water from the Upper Manuherikia River. Supply commenced in 1936, the total capital cost being 317,080, or 21.1 per acre. The other scheme proposed was the 'Becks-Clyde', also to draw water from the Upper Manuherikia and to serve 28,000 acres at an estimated cost of 680,000.

Ingenious and extensive, the schemes have served largely in their original form for some 50 years. They are continuously maintained although certain sections of the systems are close to the end of their useful life. Each year the Ministry of Works expects to replace portions of the systems. In the late 1960's a review of the schemes indicated that the Omakau and Manuherikia Schemes were in danger of total collapse by failure of key sections. A ten year life was placed on the Omakau Scheme and a five year life on the Manuherikia Scheme. These predictions were made nearly fifteen years ago now and minor "surgery" and preventative work (clearing of river-beds in the vicinity of the major syphons) are keeping the scheme operative, although annual costs are high. In addition, deferred maintenance is accumulating and failure, particularly in many of the system structures, is becoming a high probability.

With further hydro-electric development in the Clutha Valley since that time and the imminent closure of numerous horticultural holdings as part of the Clyde Dam project, there has been some interest in new horticultural development in the Alexandra/Dunstan Flat area and in the lower Manuherikia Valley. Together with the Earnscleugh area the horticultural potential of the region is significant and adds a further dimension to irrigation investigations. In the Manuherikia these must become studies not just of the effects on pastoral production and maintenance of the present situation but of the contribution to future horticultural production in the region.

1.6 Population

1.6.1 The Regional Population

As in many parts of the rural South Island both Vincent County and Maniototo County have experienced population decline in the past, but, in both cases, this has been halted in the last inter-censal period, as shown in Table 1.6.1.

In Vincent County, a 6% decline between 1971 and 1976 was reversed in the following five years so that the 1981 population was only marginally less than that of 1971. In the Maniototo, however, an 8% decline was experienced between 1971 and 1976, and, although this was halted in the 1976-81 period, only very minor gains were recorded, so that the population

Table 1.6.1

POPULATION OF THE COUNTIES
(excluding boroughs)

	1971	1976	1981
Maniototo County Administrative Area	2628	2423	2430
Vincent County Administrative Area	4188	3917	4170

Source: Department of Statistics, New Zealand Census of Population and Dwellings 1971, 1976, 1981

remained essentially static. Possible reasons for this pattern are discussed below with reference to the particular study area.

The two main urban centres near the valley are Alexandra and Clyde. Alexandra with a population of 4348 is much larger than Clyde (population 769) and is clearly the dominant urban centre in the area.

Alexandra has experienced a remarkable pattern of growth increasing from 1945 to 1961 by 123% to 2404. The rate of growth has slowed steadily over the last twenty years as shown in the Table below.

Table 1.6.2

POPULATION OF ALEXANDRA AND CLYDE

						% Change			
	1961	1966	1971	1976	1981	1961-1966	1966-1971	1971-1976	1976-1981
Alexandra Borough	2404	3031	3615	4137	4348	+26	+19	+14	+ 5
Clyde Township	-	-	585	673	769	-	-	+15	+14

Source: Department of Statistics, New Zealand Census of Population and Dwellings 1961, 1966, 1971, 1976, 1981

Alexandra has experienced very rapid growth throughout the 1960s and the earlier half of the 1970s, and is still growing, although at a much slower rate. In the past, this was mainly due to the increasing importance of Alexandra as a tourist, retirement and holiday centre and the intensification of farming in the hinterland. These factors still contribute to the growth of both Alexandra and Clyde, and will probably continue to do so in the future.

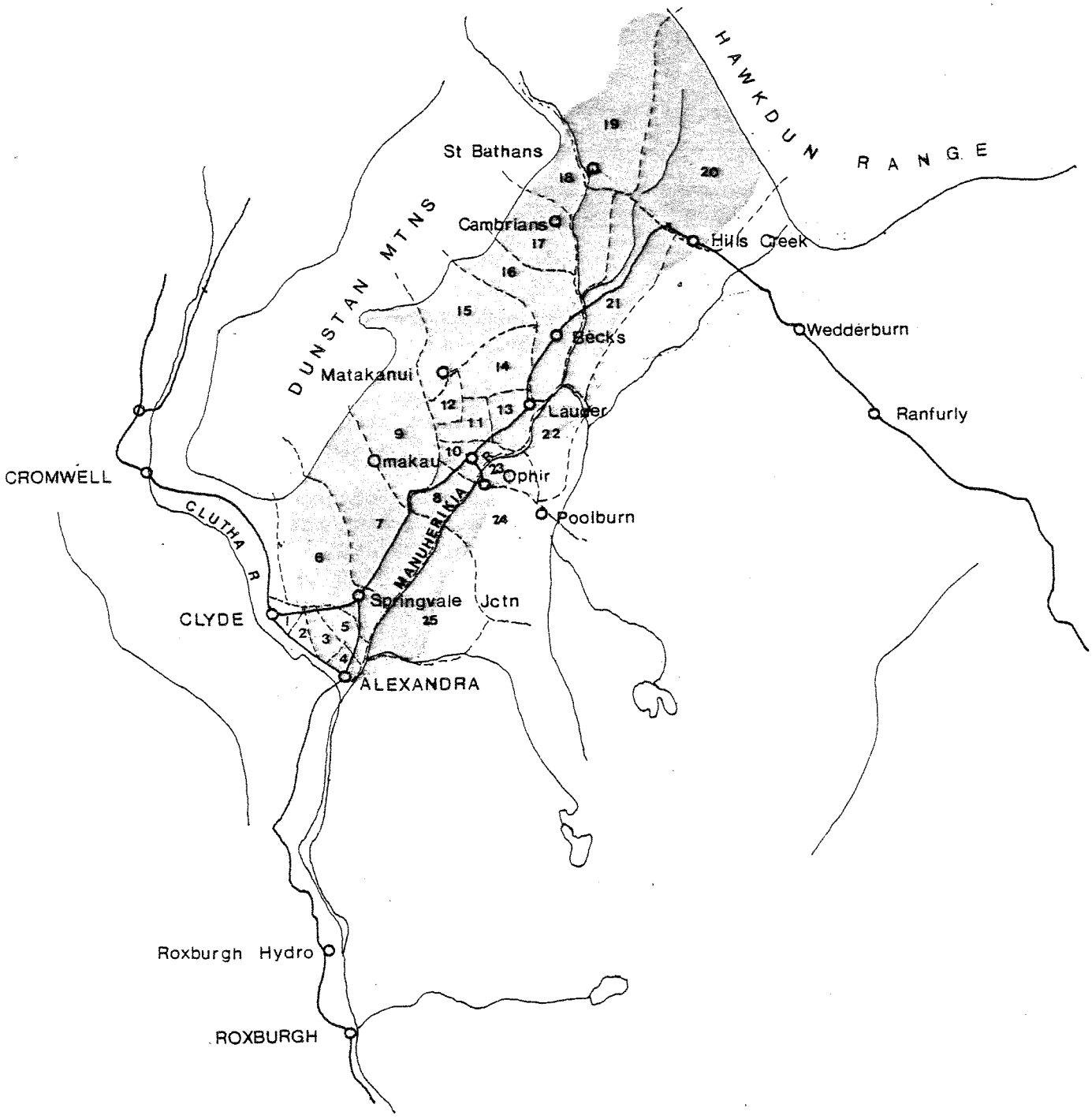

FIG. 2. MESH BLOCKS COVERING STUDY AREA

In particular the Earnscleugh Irrigation Scheme across the river from Alexandra has recently been approved. There are currently 400 hectares of land in horticultural production in this area and the scheme is expected to increase this amount by 300ha over seven years. In addition there is provision for a further 300 hectares of horticultural development in the longer term (7 - 15 years). Over the next seven years the result in the Earnscleugh area will be an increase in population in the order of 400 persons,(1) and there will also be a related increased in off farm employment. This increase in employment will be concentrated mainly in the urban centre and will mean an increase of approximately 150 people.(2)

Alexandra can therefore be expected to maintain a modest rate of growth to 1990, and has a planned population capacity of 4500 associated with the current provision of underground services. It is likely to reach this limit over the next decade, so that an expansion of the sewage treatment system will then be required.

Clyde has also been growing steadily over the last ten years or so. Upper Clutha hydro electric developments, especially the Clyde dam, have, since 1976, been another contributing factor to the growth of both centres. When construction at Clyde is completed in a few years time it is expected that some of the workforce are likely to stay in the area permanently through retirement or finding alternative employment although there will be an overall decline in job opportunities at Clyde with the ultimate completion of construction. The induced employment generated from increased horticultural production in the Earnscleugh area is likely to be concentrated in Alexandra with its dominance of trade and services in the area so that Clyde's rate of growth is likely to decrease.

1.6.2 Population of the Manuherikia Valley Study Area

The Manuherikia Valley population figures are derived from an aggregation of mesh blocks which approximate the study area as shown in Figure 2. The rural hinterland between Clyde and Alexandra and including Dunstan Flats is considered part of the "valley" for the purposes of demographic and social analysis. Although the mesh blocks do not coincide exactly with the study area boundaries the population in the high country areas is so sparse that it is assumed that the mesh block data provides a reasonable estimate of population and demographic trends. There are a total of 25 mesh blocks in the study area.

As a whole, the Manuherikia Valley has experienced a slowing rate of decline from -4% between 1971 to 1976 to -2% between 1976 to 1981, as is indicated in Table 1.6.3.

The 1971-76 decline that affected both Vincent and Maniototo Counties is clearly to be seen, as might be expected, given that the study area is mainly located within the former.

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(1) Based on an average resident on farm employment demand of .4 persons/ha for horticultural development and multiplied by the average household size in Vincent County (excluding Boroughs) 1981 of 3.3.

(2) Based on an induced employment multiplier of .4 for every full time on farm job multiplied by the average household size in Alexandra 1981 of 3.0.

Table 1.6.3

POPULATION OF THE MANUHERIKIA VALLEY STUDY AREA

	1971	1976	1981
Manuherikia Valley	1465	1409	1383

Source: Department of Statistics, New Zealand Census of Population and Dwellings 1971, 1976, 1981

The decreasing population from 1971 to 1976 can be explained partially by the combination of an ageing population and a decrease in the number of school age children in the population.

Between 1971 to 1976 the population of residents aged 65+ increased from 5% to 7% and the population of school age children (5-14 years) declined from 24% to 20% (New Zealand Census 1971, 1976).

Another factor contributing to a decrease in population is the decline in farm employment experienced in both Maniototo and Vincent County as described more completely in the section describing the regional economy. In the 1983 survey undertaken for this study, 46% of the households surveyed indicated that family members and/or friends had moved from the area. Although no specific explanation was offered for a few of the moves, 25% of the moves away from the area had been for employment. The explanation of a further 12% of the moves is equally divided between retirement, purchase of a farm elsewhere, education and marriage.

A parallel development was the decrease in average household size in the valley from 4.0 in 1971 to 3.7 in 1976 to 3.3 in 1981.

The 1976-1981 recovery in numbers that is to be seen in Vincent County as a whole was not reflected in the study area; although the rate of decline was halved, it nevertheless constituted a further fall of 2%. Reasons for this apparent disparity must therefore be sought in smaller area statistics.

An initial evaluation of mesh block figures resulted in the identification of 3 sub-areas within the study area each exhibiting different demographic patterns.

The sub-areas are comprised of the following mesh block locations:

Lower Valley	1, 2, 3, 4, 5, 6, 25
Mid Valley	7, 8, 9, 10, 11, 12, 13, 14, 22, 23, 24
Upper Valley	15, 16, 17, 18, 19, 20, 21

A change in rounding procedure was adopted in the 1981 census so that the total population at census in a sub-area is not necessarily the sum of the component age groups.

That there has been considerable variation in valley population by sub-areas is shown in Table 1.6.4.

Table 1.6.4

POPULATION OF THE MANUHERIKIA VALLEY

	Total Population at Census			% Change		
Locality	1971	1976	1981	1971-76	1976-81	1971-81
Lower Valley	506	504	594	*	+18	+18
Mid Valley	702	656	572	-7	-13	-19
Upper Valley	257	249	285	-3	+14	+11
Total	1465	1409	1383	-4	-2	-6

* less than 1% change

Source: Department of Statistics, New Zealand Census, Mesh Block Data 1971, 1976, 1981

In order that the reasons for there differences might be ascertained each sub-area is described in more detail below, and each area is subdivided into its constituent parts in Table 1.6.5.

LOWER VALLEY

This area includes the vicinity of Clyde, Dunstan, Letts Gully, Strathmore, Springvale and Galloway. The population remained relatively stable in the sub-area between 1971 to 1976 but then increased by 18% between 1976 to 1981. The increase occurred primarily in the vicinity of Clyde due to the hydro construction and to a lesser extent in the Springvale area and around Strathmore, which are close to both Clyde and Alexandra.

Census data for 1971, 1976 and 1981 indicate a stable age structure and therefore the main factor influencing the population in this area since that period appears to be the influx of hydro workers and their families, rather than a structure change in population composition. This is illustrated in Table 1.6.6.

The increase in the number of households resulting from what is presumed to be the effect of hydro construction caused only a moderate increase in population and a smaller average household size as shown in Table 1.6.7. This was, therefore, coupled with an increase in the number of occupied dwellings, many of which were new constructions.

In the absence of substantial changes in agricultural practices, the population in this area is likely to remain relatively stable with a minor increase possible as a flow on effect of the continued growth of Alexandra. An intensification of horticultural production and consequent subdivision would, however, raise the prospect of a substantial population increase.

Table 1.6.5

MANUHERIKIA VALLEY STUDY AREA

Total Population At Census

LOCALITY	1971	1976	1981
LOWER VALLEY			
Clyde Vicinity	30	12	68
Dunstan	175	198	200
Letts Gully	169	156	141
Strathmore	47	45	75
Galloway	85	93	110
Sub Total	506	504	594
MID VALLEY			
Moutere and Matakanui Uplands	124	95	103
Omakau Vicinity	403	390	362
Omakau	175	171	107
Sub Total	702	656	572
UPPER VALLEY			
Drybread Uplands	58	52	54
Becks	115	106	125
Blackstone	41	51	53
Downs	43	40	53
Sub Total	257	249	258
VALLEY TOTAL	1465	1409	1451

Source: New Zealand Census, Unpublished Mesh Block Data 1971, 1976, 1981

Table 1.6.6

POPULATION OF LOWER VALLEY BY AGE GROUPS

		0-4	5-14	15-19	20-59	60-64	65+	Total
1971	Number	50	130	42	237	17	30	506
	%	10	26	8	47	3	6	100%
1976	Number	54	135	47	222	12	24	504
	%	11	27	11	44	2	5	100%
1981	Number	45	156	54	285	15	30	585
	%	8	27	9	49	2	5	100%

Source: New Zealand Census, Unpublished Mesh Block Data 1971, 1976, 1981

Table 1.6.7

OCCUPIED DWELLINGS AND HOUSEHOLD SIZE IN IN THE LOWER VALLEY

	1971	1976	1981
Number of Occupied Dwellings	115	113	162
Average Household Size	4.4	4.5	3.2

Source: Department of Statistics, New Zealand Census, Mesh Block Data 1971, 1976, 1981

MID VALLEY

This sub-area incorporates the Moutere and Matakanui Uplands, Omakau and the valley floor in the vicinity of Omakau. Pastoral farming including some irrigated land is the predominant land use in this area with the emphasis on fat lamb production on the valley floor.

This sub-area has experienced a decline in population (-19%) since 1971 and this largely accounts for the general trend of population decline in the valley.

The decline in population can be attributed primarily to an ageing population and a decline in the number of children. Between 1971 and 1976, census data, set out in Table 1.6.8 show an increase in the proportion of those 65 years and older from 4% to 8%. The proportion of school age children (5-14 years) during the same period decreased from 25% to 19% while the proportion of pre-schoolers remained stable at 12-13%.

Between 1976 and 1981, the proportion of pre-schoolers had dropped to 10%, while the proportion of school age children had remained only slightly different at 18%. Clearly, in the absence of any as yet unperceived in-migration of young families, the present trends seem bound to continue.

Table 1.6.8

POPULATION OF MID VALLEY BY AGE GROUPS

		0-4	5-14	15-19	20-59	60-64	65+	Total
1971	Number	83	173	52	344	21	29	702
	%	12	25	7	49	3	4	100%
1976	Number	86	126	51	327	12	54	656
	%	13	19	8	50	2	8	100%
1981	Number	75	99	39	303	15	45	558
	%	10	18	7	53	3	8	99%

Source: Department of Statistics New Zealand Census, Mesh Block Data 1971, 1976, 1981

There has been some consolidation of pastoral holdings in the valley with a decrease in the number of farms from 100 in 1971 to 80 in 1982 (Ashworth-Morrison Cooper 1981). Similarly since 1976 there has been a consolidation of several businesses in Omakau and a reduction in banking services to agency level staffed from Alexandra. Local residents report that houses vacated by young families in Omakau are generally taken over by retired farmers. The school roll has declined from an average of 100 students in the early 1970's to an average of 83 students in the early 1980's. The only other school in this area is at Lauder. It is a sole charge school which has had an average roll of 12 students during this period.

The number of occupied dwellings in this sub-area has remained

relatively stable but the average household size has decreased to 3.1. Table 1.6.9.

Table 1.6.9

OCCUPIED DWELLINGS & HOUSEHOLD SIZE IN THE MID VALLEY

	1971	1976	1981
Number of Occupied Dwellings	186	192	187
Average Household Size	3.7	3.4	3.1

Source: Department of Statistics, New Zealand Census, Mesh Block Data 1971, 1976, 1981

It is expected that the population will only stabilize in this area over the next decade if the ageing population is renewed by younger families with children.

UPPER VALLEY

This sub-area includes Drybread Uplands, Becks, Blackstone and Downs. This is the most sparsely populated sub-area. It showed a population decline from 1971 to 1976 of -3% and then an increase of +14% from 1976 to 1981. These changes can be explained in terms of an ageing population during the first intercensal period, being replaced by a younger population with more children since 1976, as is demonstrated in Table 1.6.10.

Table 1.6.10

POPULATION OF UPPER VALLEY BY AGE GROUPS

		0-4	5-14	15-19	20-59	60-69	65+	Total
1971	Number	27	47	17	145	8	13	257
	%	11	18	7	56	3	5	100%
1976	Number	33	27	9	150	12	18	249
	%	13	11	4	60	5	7	100
1981	Number	33	63	18	144	6	15	279
	%	12	22	6	52	2	5	99%

Source: New Zealand Census Mesh Block Data 1971, 1976, 1981

Between 1971 and 1976 the proportion of the population 60 years and older increased from 8% to 12% while the proportion of school aged children

declined from 18% to 11%. However, while the proportion of pre-schoolers held steady at 12% in 1981, there was a big jump in real numbers of school age children, as well as a doubling of their proportional representation, up to 22%. This is clearly reflected in Otago Education Board figures which show that since 1975 the school roll at Becks has increased steadily, Table 1.6.11.

Table 1.6.11

THE SCHOOL ROLL AT BECKS

	1973	1975	1977	1979	1981	1983
Becks	28	24	40	56	61	65

Source: Otago Education Board

The average household size declined a little between 1971 to 1976 but by 1981 had recovered to 1971 levels, largely as a consequence of the increased numbers of children, as seen in Table 1.6.12.

Table 1.6.12

OCCUPIED DWELLINGS & HOUSEHOLD SIZE IN THE UPPER VALLEY

	1971	1976	1981
Number of Occupied Dwellings	67	73	76
Average Household Size	3.8	3.4	3.8

Source: Department of Statistics, New Zealand Census, Mesh Block Data 1971, 1976, 1981

There has also been a minor increase in the number of occupied dwellings. Given the relatively large household size now characteristic of the area it can be expected that the population will be relatively stable over the next ten years as young families mature, unless unforeseen migration processes intervene.

1.7 The Regional Economy

Agriculture and its servicing dominate the study area. The Manuherikia Valley lies predominantly within Vincent County, although north of Lauder, the top end of the valley is in the Maniototo. Distinctive trends in economic activity have taken place in both counties over the past decade, and these are first reviewed by way of introduction.

Farm numbers have remained virtually static in Maniototo since 1970/71, but have shown a slight increase in Vincent County, particularly reflecting subdivision around Clyde. The predominant land use is pastoral, with the area in grassland and lucerne remaining stable in Maniototo but nearly doubling in Vincent County over the decade, the majority of the increase being over the past two years, (probably as a result of the LDEL).(1) In both counties there has been a steady and uninterrupted growth in the number of breeding ewes: 2.6%/annum in Maniototo, 3.1% in Vincent. Lambing percentages have also risen between 7-14 points during the period. Beef cattle represent approximately 3% of the total stock and 12% of stock units. Numbers increased in Maniototo up to 1979/80 but have declined since then. Likewise, in Vincent, cattle numbers rose in the early half of the decade, but have subsequently declined.

While irrigation is in place in the Manuherikia, albeit somewhat precariously, such is not the case in the Maniototo.

Schemes for the irrigation of the Maniototo Basin date from at least 1911 when the then Minister of Public Works announced that a scheme to irrigate 26316 hectares was under consideration. His prediction that it would be operating by 1916 occasioned no little surprise. Most proposals advanced over the following 60 years were based on the creation of a reservoir in the Styx Basin to contain sufficient water to irrigate up to 25000 hectares. The scheme approved in 1975 was based on the run of the Taieri River during the irrigation season supplemented from storage in the Great Moss Swamp. It was designed to command 25000 hectares on both sides of the Maniototo Basin and to irrigate 9300 hectares at a total cost of $5-9 million or $635 per hectare. A water charge of $14-56 per hectare was envisaged.

Additions and modifications to the schemes and generally escalating costs induced Government in December 1983 to announce a major reassessment of the project. Since the total estimated cost had risen to $43.9 million or $4720 per hectare a decision was made to complete the west race only as far as Eden Creek. The east race was not to be constructed at all so that all the area on the west side of the Taieri River from Eden River to Waipiata and that on the east side of the river were not to be irrigated. The number of farms to be served was reduced from 72 to some 20, the area from the original 9300 hectares to 3853 hectares, and the charge per hectare set at $50.

In terms of actual farm employment, both Maniototo and Vincent counties have experienced a decline in the farm labour force (excluding working owners, leaseholders, and unpaid family workers) since 1975/76, as shown in Table 1.7.1. The net loss has been 70 positions in full time, part-time or casual employees over the past five years in Maniototo (from 198 to 128) and 105 employees in Vincent County (from 344 to 239), relative declines of 35% and 31% respectively. This loss is more rapid than the national average, and has mostly occurred during the last three years.

In 1978/79 there were five manufacturing enterprises in both the Maniototo and Vincent counties and twelve in Alexandra, with total employment of 50, 22 and 89 respectively. There has been a marginal increase in activity over the decade with three additional establishments starting in Alexandra and two in Maniototo County.

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(1) Land Development Encouragement Loan Scheme

Table 1.7.1

EMPLOYMENT IN AGRICULTURE

	Maniototo			Vincent County		
	1975-76	1980-81	Change	1975-76	1980-81	Change
	No's	No's	%	No's	No's	%
Number of Working Owners Leaseholders, Sharemilkers						
30 hr/week or more	240	257	+ 7.1	420	416	- 1.0
less than 30 hr/week	59	37	-37.3	166	155	- 6.6
	299	294		586	571	
Paid permanent full time employees	115	88	-23.5	216	130	-39.8
Paid permanent part time employees	43	23	-46.5	46	45	- 2.2
Paid casual employees	40	17	-57.5	82	64	-22.0
	198	128		344	239	

Source: Department of Statistics, Agriculture Statistics various issues

At the last census of distribution, 1977/78, Ranfurly had 5 wholesale and 14 retail trade establishments, compared with 15 and 75 respectively in Alexandra. Detailed data are shown in Table 1.7.2. Data on the retail trade sector over the past decade suggest that distribution sector activity is declining in Ranfurly but expanding in Alexandra. In aggregate, however, total employment provided in the retail sector in the two locations has risen by 35% over the ten year period (from 302 to 408) due to the dominant influence of the growth of Alexandra.

In aggregate then, it appears as if overall economic activity, as measured by an employment indicator, is declining in Maniototo and increasing in Vincent County. While both areas are experiencing an exodus of labour from agriculture, this decline has been offset by an expansion in the manufacturing and distribution sectors in Vincent County, a trend which has not been duplicated in the Maniototo. Agriculture employs approximately two-thirds of the workforce in the Maniototo, but in Vincent County (including Alexandra), the proportion falls to around 40%.

As previously noted, Alexandra has grown rapidly in the past, aided by its excellent climate which has promoted tourism, retirement living and horticulture. The Upper Clutha power scheme has lent impetus to this trend, so that Alexandra has now become a regional centre of some significance. Table 1.7.3 reflects these changes with big increases recorded in the borough for male employment in manufacture, building, transport, finance and, especially, community and personal services. Female employment has also mushroomed in this last sector and in the retail/hospitality industries.

Table 1.7.2

DISTRIBUTION SECTOR STATISTICS, 1977-78

	Ranfurly	Alexandra
Wholesale Trade		
No. of establishments	5	15
Persons engaged	20	113
Sales ($M)	1.6	24.5
Retail Trade		
No. of establishments	14	75
Persons engaged	66	342
Sales ($M)	2.6	18.1
Restaurants & Hotels		
No. of establishments	3	24
Persons engaged	27	165
Sales ($M)	..	2.8
Personal & Household Services		
No. of establishments	3	8
Persons engaged	5	27
Sales ($M)	..	0.4

Source: Department of Statistics 1981 New Zealand Census of Distribution 1977-78.

With the exception of construction work on the Maniototo irrigation project, and some growth in forestry and tourism, notably at Naseby and St Bathans, the area served by Ranfurly has not had the benefit of the advantages enjoyed by Alexandra. Nevertheless, one significant factor that may change this in the future is the presence of substantial lignite deposits at Hawkdun and Home Hills. The Liquid Fuels Trust Board has recently announced that the Hawkdun and Home Hills lignite fields together constitute one of its two preferred reserves for development. The Home Hills field with 284 million tonnes indicated reserves and the Hawkdun field with 700 million tonnes inferred reserves comprise some 21 per cent of Otago and Southland's total lignite resource. Only the Mataura (at 1277 million tonnes) and the Ashers-Waituna (at 968 million tonnes) exceed in size the Hawkdun reserve. Development of these deposits inevitably will have a profound impact - environmental, demographic, social, and economic - upon both the Maniototo Basin and the Manuherikia Valley.

1.8 Community Structure & Patterns of Daily Life

The communities of interest within a region are associated with the patterns of daily life that can be recognised everywhere. These include shopping, the use of services such as banks, post offices and professional offices. Health services and education are important, too; altogether they form the basis for the continuance of the minor service centres of the

Table 1.7.3

ALEXANDRA BOROUGH : PERCENT CHANGE IN LABOUR FORCE PARTICIPATION BY SEX AND INDUSTRIAL DIVISION BETWEEN 1971 and 1981

Participation	Agriculture Hunting Fishing Forestry	Mining & Quarrying	Manufacturing	Electricity Gas Water	Building Construction	Wholesale Retail Restaurant Hotels	Transport Storage Communication	Finance Insurance Property	Community Social Personal	Inadequately Defined	TOTAL
Female											
1971	12	-	20	5	6	143	18	31	88	-	326
1981	36	-	27	6	9	192	36	45	126	15	498
% change 1971 to 1981	*		*	*	*	+35%	*	*	+43%	*	+53%
Male											
1971	85	2	75	73	212	207	85	51	126	-	925
1981	87	3	117	60	237	213	111	72	210	-	1128
% change 1971 to 1981	+2%	*	+56%	-18%	+12%	+2%	+31%	+41%	+67%	-	+22%

Source: New Zealand Census 1971, 1981

* Meaningless due to low participation rates of less than 50

region, while the patterns of local use provide the basis of an assessment of regional and local affiliations. In a similar manner, sports clubs and social groups of a broader kind provide a further indication of regional linkages outside the purely business world.

Table 1.8.1 sets out the patterns of patronage of various shops and services reported by farming households in the main survey.

Table 1.8.1

PURCHASING CENTRES OF RESIDENTS OF MANUHERIKIA VALLEY

Items	Major Purchasing Centres (% responses)
Household Supplies	
Food	Alexandra(66%) Omakau(14%) Lauder(12%) (1)
Household supplies & services	Alexandra(83%) Omakau(10%)
Tabacco & alcohol	Alexandra(48%) Omakau*, Becks*, Clyde*, Lauder*
Clothing & footwear	Alexandra(90%)
Household furnishings	Alexandra(82%) Dunedin(11%)
Household equipment & appliances	Alexandra(89%) Dunedin(4%)
Services	
Garage	Alexandra(48%) Omakau(26%) Lauder(11%) Clyde(10%)
Stock & Station agent	Alexandra(52%) Omakau(35%)
Post Office	Alexandra(55%) Omakau(34%) Clyde(10%)
Lawyer/Accountant	Alexandra(68%) Dunedin(21%)
Bank	Alexandra(83%) Omakau(11%)
Health Services	
Doctor	Alexandra(90%) Ranfurly(4%) Clyde(2%)
Chemist	Alexandra(96%)
Dentist	Alexandra(85%) Ranfurly(5%) Cromwell(2%)
Farm Goods	
Inwards Transport	Alexandra(20%) Omakau(17%) Oturehua(15%)
Outwards Transport	Omakau(20%) Alexandra(18%) Oturehua(17%)
Fertilizers, sprays	Alexandra(57%) Dunedin(13%) Omakau(7%)
Implements	Alexandra(42%) Ranfurly(5%) Omakau(3%)
	n = 178

Source: Analysis of survey responses

* less than 5% response

(1) more than one place could be listed, total may therefore sum to more than 100%

A hierarchy of shopping affiliations was established by asking respondents to nominate the centre in which they purchased a range of goods and services. With respect to food three centres dominated - Alexandra (66%) Omakau (14%) and Lauder (12%). Purchases of tobacco and alcohol exhibited a more dispersed pattern consistent with the location of hotels, while some evidence emerged of bulk buying outside the region. With respect to household supplies and services, clothing, furnishings and household equipment and appliances, the dominance of Alexandra as a regional shopping centre was clearly apparent. In so far as higher order goods were concerned, however, that is clothing, household equipment and appliances, but particularly furnishings - Dunedin began to exert an increasing attraction. In general most shopping needs appear to be met within the region, primarily by Alexandra and, to a much lesser extent, Omakau.

Respondents were also asked to nominate the centre in which they sought five services - garage, stock and station, post office, lawyer - accountant, and bank. The pattern with respect to garage services was comparatively dispersed, although Alexandra and Omakau remained clearly dominant. Conversely Alexandra and Omakau provided practically all the stock and station services required within the region. Post office and banking services were also supplied chiefly by those two centres. Only for the higher order services of lawyers and accountants did the influence of the metropolitan centres, Dunedin and to a much lesser extent, Invercargill, become apparent. With respect to those services and banking facilities Ranfurly also exerted a minor attraction. Alexandra dominated in the provision of medical, dental, and chemist services, although Ranfurly supplied a small proportion, 4%, 5% and 2% respectively.

In general most lower and middle order goods and services appear to be provided, and satisfactorily so within the region with Alexandra clearly dominating as the supplier for the valley as a whole. Omakau provides some middle order but mostly lower order requirements, the otherwise dispersed pattern for daily purchases, and purchases of alcohol and tobacco and garage services reflecting the distribution of hotels, stores, and garages. Dunedin is the major centre outside the region from which goods and services are purchased, its importance being particularly apparent with respect to higher order services.

With reference to educational facilities, ninety-one percent of the respondents stated that they did not have any children in a playcentre or kindergarten. Eight percent said that they had one child in a playcentre or kindergarten and 1% said they had two children involved in one of the two groups. Most children who attended, went to a playcentre or kindergarten in Alexandra or Becks.

Half the farmers stated that they had children in primary school. Eighteen percent had one child in school; 22% had 2 children in school, 9% had three children in school and 1% had four children in school. Most children were sent to primary school in Alexandra (21%), but significant numbers were sent to schools in Omakau (9%), Becks (9%) and Clyde (9%).

Twenty-nine percent of the farmers had children in secondary school. Nineteen percent had one child in school, 9% had two children in school and 1% had three children in school. Most of the secondary school children attended in Alexandra (18%) and Dunstan (4%), and a very few boarded in Dunedin.

Eighty-two percent of the farmers said that at least one member of their

household belonged to a sports club or social group. The most frequently mentioned clubs were golf, rugby, squash, hockey, Lions and Lionesses and tennis. Most of the clubs were located in Alexandra, Omakau, Becks or Clyde. The majority of the farm families (66%) also belonged to a second club or group and a significant portion belonged to a third and fourth club (45% and 28% of total responses, respectively).

Manuherikia Valley respondents were asked to rate the main categories of services in their area as very good, good, satisfactory, poor or very poor. Overall they expressed considerable satisfaction with the retail services available in respect of household supplies/food and, though much less so, of furniture and appliances. Education and recreation services were both rated highly. Some small degree of dissatisfaction is apparent though with respect to health and professional services.

Respondents also nominated a wide range of additional facilities and services they would like to see provided. They fell into a number of groups: hospital and medical; banking and postal - particularly in Omakau; shopping; young persons' recreation; and entertainment. That 59% did not nominate any such additional facilities suggests a comparatively high level of satisfaction with those already provided. Further, 72% did not nominate any centre at which additional services could be provided, which suggests satisfaction with the existing distribution of their provision. Those who did nominate a centre selected Alexandra and Omakau.

1.8.1 Mobility

Community stability is often reflected in the pattern of population movements into, out of and within an area. The reasons for such moves shed considerable light on regional social and economic issues, for the decision to move over more than a small distance is a major life-cycle decision, and not one to be undertaken lightly.

When lengths of residence in the area was considered, only 35% of the total sample had lived at the same address for fewer than 5 years, while a similar proportion - 32% - had done so for over 20 years. The results reveal a community comprising a stable core of long-term residents balanced by a similar number of more recent arrivals to their present house.

As might be expected, perhaps, there was a tendency for newer households to be clustered at the Alexandra/Clyde end of the valley, but there was no strong association between mobility and age, reflecting the propensity to move of both young people and the retired or retiring, both of whom are well represented in the area.

The pattern of responses to the question "Where else have you lived ...?" suggests that there have been three main movements: (a) within the Manuherikia Valley, 18% giving Alexandra and 13% giving elsewhere in the valley as their last place of residence; (b) from elsewhere in Central Otago into the valley (11%); and (c) from elsewhere in Otago and Southland, including Dunedin and Invercargill (22%). Of those responding, therefore, 90% gave a place either within the Manuherikia Valley, Central Otago, or elsewhere in Otago and Southland as their last place of residence.

When those who had moved into the area were asked why they had done so, economic opportunities - purchase of a farm or orchard (18%), work prospects (13%), and establishment and purchase of a business (6%), accounted largely

for movement into the valley. Climate also rated highly (10%) and was no doubt associated with those citing health, lifestyle, and retirement as reasons. Marriage was given in relatively few instances. In general the Manuherikia Valley appears to be perceived as a region of considerable economic opportunities and, to a much lesser extent, than say Alexandra, as a place for retirement.

In the light of this, it is not surprising that some 68% of those responding to the question "Would you like to stay here or move away to somewhere else?" replied that they would 'definitely like to stay'; indicating a high level of commitment to the district. Only 5% indicated a wish to move away. The reasons cited for remaining in the region suggest a comparatively high level of satisfaction with the 'quality of life' offered by the region in terms of both physical character (mainly climate) of the district, economic and employment opportunities and prospects, and of community and family ties. The fact that only 20% did not give a reason, and only 5% expressed a wish to move away from the district, indicates a high degree of affirmative satisfaction. Those wishing to move cited the desire to purchase a farm, probably elsewhere, as a main reason.

In spite of these perceptions and preferences, however, 46% of the sample indicated that family members and/or friends had moved. The major reason was believed to be employment (25%), although retirement (4%), farm purchase elsewhere (4%), and education (2%) and marriage (2%) were also cited as reasons.

In sum, therefore, the Manuherikia Valley community comprises a stable core of long-term residents and a similarly sized component of relatively recent arrivals from within the Otago-Southland region attracted largely by the possibilities for the purchase of farms or orchards and the economic and employment opportunities generally. For these reasons and others generally associated with the concept of 'quality of life' residents indicated a strong positive attachment and commitment to the region.

PART 2 FARMING & IRRIGATION IN THE VALLEY TODAY

2.1 Introduction

In general terms, pastoral farming systems dominate the Manuherikia Valley. The Ashworth-Morrison Cooper report identified 81 farms covering 87,000 ha. in the area in 1981, and the main survey associated with this report identified valid returns from 178 farms and smallholdings, with an aggregate area reported by the farmers as just over 88,000 ha., although 10 (6%) declined to give an areal extent. There are 37 units engaged in horticulture, to a greater or lesser extent, covering some 160 ha., but the majority of systems are based on sheep - Half Breds on the hill country and Cross Breds on the Downs. Approximately half (94) of the survey respondents were full time farmers, but there is a large group of part time farmers on small blocks at the lower end of the valley and in the fringe areas around Alexandra and Clyde.

The gross value of agricultural output at the farm gate from the valley is estimated at just under $10 million annually with just over half or $5.3 million derived from irrigated agriculture and $1.1 million or 11% from horticulture. Details are shown in Table 2.1.1.

Table 2.1.1

ESTIMATED GROSS FARM OUTPUT (VALUED AT FARM GATE)

Description		Area	S.U.	Gross Income
		ha	no	$M
Scheme Command				
Irrigated Pasture		12,780	156,160	5.3
Horticulture		200	-	1.1
Dryland		6,600	26,300	0.8
	Sub-total	19,580	182,460	7.2
Outside Scheme Command				
Downland		15,657	48,060	1.5
Hill		52,438	65,550	1.0
	Sub-total	68,085	112,610	2.5
TOTAL		87,675	296,070	9.7

Source: Study estimates

2.2 Land Tenure

Because of the number of small units considered in the main survey, only 52% of survey respondents described themselves as full-time farmers, while 44% were part-time or hobby farmers. Four percent declined to respond; these were all on very small units, and, as will be seen, these people did not see themselves as farmers at all. The distribution of full-time farmers was geared especially to the Middle and Upper Valley,while almost all of the part-time farmers were to be found in the Lower Valley clustering especially around Clyde and Alexandra. The distribution is set out in Table 2.2.1.

Table 2.2.1

FULL-TIME AND PART-TIME FARMERS BY SUB-REGION

	Upper Valley		Middle Valley		Lower Valley	
Full-time	20	95%	40	92%	32	28%
Part-time	1	5%	1	3%	75	66%
Not appropriate/n.r.	-	-	2	5%	7	6%
					n = 178	

Source: Study Survey

Of the 77 part-time farmers, all had other employment of one kind or another. There were 53 different jobs cited, with no particular job being represented in significant numbers, although seven builders were listed. Professional people, contractors and a variety of skilled and unskilled manual workers were identified, illustrating the broad range of people attracted to semi-rural living, especially at the urban periphery. The fact that farming, and perhaps even profitability is not of paramount interest will have profound implications for development and investment decisions.

Although 91% of respondents claimed that they owned their own farms, with the rest leasing or managing or acting in a partnership, this is not an accurate reflection of the pattern of land tenure as such, especially in areal terms. Thus, 89 percent of the farmers interviewed responded that they owned some or all of their farm land under a freehold tenure. The responses ranged from one to 4430 hectares and were heavily skewed towards the smaller properties, with 45% of all farmers interviewed having as freehold property under 10 hectares, representing 50% of all freeholders.

Private lease is relatively unimportant. Although one unit contains a block of 3600 hectares of private leasehold, only 2% of holdings had any such land, mostly in small amounts.

Crown lease, mainly of relatively unproductive hill land is present in large blocks. Nineteen percent of the respondents stated that they held their land under Crown lease. Land areas ranged from less than ten to over 5,000 hectares or even greater, with only 5% of the farmers leasing properties under 100 hectares in this manner.

Small amounts of land were also held under special conditions, such as railway lease, but these were an insignificant element in the tenure system.

In general, while private freehold is the major form of land tenure in the study area, many farms supplement this with extensive blocks of Crown lease. Much of this can only be used if supplemented by winter pasturing on the irrigated land in the valley.

Table 2.2.2 summarises the distribution of farm sizes, by all modes of tenure, for the whole study area. This table demonstrates the bi-modal distribution of farm sizes. On the one hand, the small-holdings of under ten hectares comprise some 47% of holdings whose size was declared, whereas they cover only a small fraction (one percent) of the study area. Between 10 and 100 hectares, there are few farms, only ten percent of the total, but at the upper end of size classes, 43% of holdings are larger than 100 hectares, representing only a fraction less than 100 percent of the land area, and ten percent of farms are over 1000 ha., which, because of their size, cover 73% of the study area.

Table 2.2.3 lists farm sizes for the various sub-regions of the study area, demonstrating the very marked contrasts that exist. This table confirms again the preponderance of small units at the lower end of the valley, and the very large units on the peripheral terraces and at the head of the study area in the easternmost portion of the valley.

As well as recording the size of holding, lengths of tenure and farming experience were also collected. Land has been held for a long time in some cases, whereas other properties have only recently been taken up, as was intimated in the earlier section on mobility. The length of time

Table 2.2.2

DISTRIBUTION OF FARM SIZES BY ALL MODES OF TENURE : STUDY AREA

Size Category	Number of Holdings	Percentage of Total Holdings	Total Area	Percentage of Total Area
0-1	3	2	2	*
1-5	52	30	192	*
5-10	24	14	180	*
10-20	9	5	131	*
20-50	6	4	147	*
50-100	1	1	91	*
100-250	12	7	2,307	3
250-500	31	18	11,220	13
500-1000	14	8	9,713	11
1000 +	16	10	64,483	73
No response	10	-	-	-
Totals	168		88,466	

* less than 0.5%

n = 178

Source: Study Survey

Table 2.2.3

FARM SIZES BY SUB-REGIONAL DIVISION

Size (ha.)	Upper Valley		Middle Valley		Lower Valley		Total
	No.	% of all holdings	No.	% of all holdings	No.	% of all holdings	
0-1	-	-	-	-	3	2	3
1-5	-	-	2	1	50	30	52
5-10	-	-	-	-	24	14	24
10-20	1	*	-	-	8	5	9
20-50	-	-	1	*	5	3	6
50-100	-	-	-	-	1	*	1
100-250	-	-	7	4	5	3	12
250-500	6	4	18	11	7	4	31
500-1000	5	3	7	4	2	1	14
1000 +	7	4	8	5	1	*	16
nr.	(1)	-	(1)	-	(8)	-	(10)
Total	20		44		144		178

* less than 1%

n = 178

Source: Study Survey

for which land has been held in the owner's family is set out in Table 2.2.4.

Table 2.2.4

LENGTH OF TIME LAND HAS BEEN HELD IN PRESENT OWNER'S FAMILY

5 years or less	35%
6 - 10 years	17%
11 - 20 years	11%
21 - 50 years	15%
51 - 99 years	15%
100 years and more	5%
No response	2%
	n = 178

Source: Study Survey

It is sometimes argued that land that has been held for several generations is well-known and even loved. In the secure knowledge that it will continue to be handed on, farmers will seek to develop it to its optimum. An alternative viewpoint suggests that, in a sense, familiarity breeds, if not contempt, then at least indifference. Similarly, it can be argued that new blood is either not attached to the land or that a new broom sweeps clean. In the event, both perspectives can be supported when attitudinal material is considered in subsequent sections. Regional variation at each extreme is set out in Table 2.2.5.

Table 2.2.5

LENGTH OF TIME LAND HAS BEEN IN OWNER'S FAMILY

	Upper Valley		Middle Valley		Lower Valley	
Less than 5 years	3	14%	5	11%	51	46%
More than 20 years	12	57%	29	66%	29	25%

n = 178

Source: Study Survey

While high proportions of the Lower Valley's units have only recently been acquired, the reverse is true for the other two sub-regions, reflecting again the essential differences between the Alexandra/Clyde district and the rest of the valley.

Years as a farmer are also of significance, in terms of experience and likely future intentions. In the study area, a range of responses was again encountered, and, while these are naturally geared, in part, to a person's age, some interesting results obtained. Of these, perhaps the most interesting is that some 16% felt that this was actually a question that did not apply to them, for they were not farmers. Clearly, these are part-time or hobby farmers on small blocks, who regard their other job as their primary one, and their farming, which, it has to be admitted, is often quite desultory, is really only a recreation.

The responses of those who considered themselves to be farmers are set out in Table 2.2.6.

The distribution is somewhat bi-modal, since more than 40 percent had more than twenty years of experience, almost as many as who had less than ten. Regional variations are set out in Table 2.2.7.

As before, the contrast is greatest between the Lower Valley and the remainder. Almost all the 'non-farmers' are to be found there, and the proportion who have had more than 20 years experience is substantially lower. Half of the Middle Valley farmers are in this position and a clear majority of Upper Valley farmers also fall into this category.

Table 2.2.6

YEARS OF FARMING EXPERIENCE

	No	Percent	
less than 5	25	17	
6-10	28	19	
11-15	13	9	
16-20	16	11	
21-25	20	14	
26-30	14	9	
31-40	19	13	
41-50	5	3	
'all my life'	8	5	n = 148
'not a farmer'	(28)	(16)	n = 178
No response	2	-	

Source: Study Survey

Table 2.2.7

VARIATION IN YEARS OF FARMING EXPERIENCE

	Upper Valley		Middle Valley		Lower Valley	
Less than 5 years	1	5%	4	9%	20	18%
More than 20 years	14	67%	23	52%	35	31%
'Not a farmer'	-		2	5%	27	24%
					n = 178	

Source: Study Survey

2.3 Farm Products

By most measures, the current predominant farm product is the consequence of pastoral farming. Over the whole study area, out of the 178 valid returns obtained, 83 (47%) listed pastoral production as their sole pursuit, while 116 (65%) responded that over half of their production was pastoral. By contrast, 57 (32%) listed no pastoral production at all. Included among these were horticulturalists, nurserymen, stud farmers and a proportion of folk whose land was simply idle, and no more than a large garden or pony paddock.

Another significant area of production is in horticulture, for, although 142 (80%) of the 178 questioned said that they had no horticultural production at all, 36 clearly did. Of these, a half, or 10 percent of the overall total were wholly horticulturalists, and 25 (15%) had at least half their production in horticulture.

Cash crops, as a general category, include cereals, hay and lucerne, among others. Although 31 (17%) specified these as part of their farm production, 18, well over half the total, ascribed ten percent or less of their production to them. Indeed, 60% of production was the maximum, and was the only instance to exceed 40%.

Only two (2%) listed 'other' products as their sole output. These were a nursery and a stud; in fact only ten (5%) listed them at all, and, in the form of various 'sidelines' they were never more than a very minor part of the farm economy.

The only major regional division is the restriction of horticulture to the Clyde/Alexandra vicinity in the Lower Valley. Pasture and a few cash crops are the main, and indeed, essentially the sole products elsewhere.

2.4 Specific Crops and Land Uses

As well as indicating the primary products of their farm, in terms of economic benefit, respondents were also asked to indicate the percentages of their total land farmed in various categories as at December 1982. Table 2.4.1 shows the percentage of respondents by proportion of farm area in specific crops.

These figures confirm the pastoral - horticultural split, and the relative simplicity of land-use systems. Details of crop yields and income derived were only reluctantly revealed. In many cases this information was regarded as a business confidence, or as too personal to divulge; it is equally possible that in some cases farm records were too poor to make such information available. Part-time farmers, in particular, were poor respondents in this context.

Since cash crops were only listed by 31 farmers, large returns could not be expected, in any case, even though 64 reported lucern production and 24 mentioned cereal crops. Fodder crops, in general, were listed by a further 22. Such returns as were collected have been reported in Table 2.4.2, primarily for illustrative purposes.

Table 2.4.1

TOTAL FARM AREA THAT IS FARMED IN THE FOLLOWING CATEGORIES : PERCENTAGE RESPONSE

	Proportion of Total Farm Area				
Crop/Land Use	Nil	less than ¼ total area	¼ to ½ total area	½ to ¾ total area	¾ to all of farm
Native Pasture	62	15	7	5	10
Improved Pasture	52	9	16	8	15
Cultivated Pasture	70	20	2	1	7
Lucerne	65	32	3		
Cereals	87	13			
Seeds	99				
Other Cash Crops	97				
Fodder	88	10			
Woodlots	87	11*			
Horticultural Crops	79	10	2	2	7**
Idle	82	10	3		***
Other Uses	95				
No response	=	=	=	=	=
				n = 178	

Source: Study Survey

* 11% of respondents had 10% or less of their farm area in trees or woodlot

** 5% of respondents had 100% of their farm area in horticultural production

*** 4% of respondents whose land is idle

Table 2.4.2

REPORTED CROP YIELDS AND RETURNS

Wheat:	1.5 - 2.75	tonnes per ha., at $150 - $210 per tonne, mostly circa $200 per tonne.
Oats:	2 - 2.5	tonnes per ha., at $140 - $200 per tonne, mostly circa $145 per tonne.
Barley:	2 - 2.5	tonnes per ha., at $145 - $160 per tonne, mostly circa $150 per tonne.
(Intensively irrigated : 4 tonnes per hectare)		
Ryecorn:	1.5	tonnes per ha., at $280 - $290 per tonne.
Lucerne (Irrigated):	150 - 250	bales per ha.

Source: Study Survey

There was considerable variation in the quality and price of both fruit and general market garden products. Details of yields were generally sparse and to an extent obscure. However Table 2.4.3 sets out some typical yields and prices, again more for illustrative than substantive purposes.

Table 2.4.3

ILLUSTRATIVE YIELDS AND PRICES FOR HORTICULTURAL PRODUCTS

Fruit	Yield per holding	Price
Apricots	8,000 9kg cases (5.8 ha.)	$5 per case
	6,000 cases	$8 per case
	10,000 kg	$0.80 per kg
	2.5 tonnes	$5.82 per case
Apples	625 kg	16c per kg
	4,000 kg	40c per kg
	6.4 tonnes	40c per kg
Pears	25,704 kg	22c per kg
	10,000 kg	30c per kg
Peaches	1,200 cases	$6 per case
	9 tonnes	$5 per case
Nectarines	500 cases	$8 per case
	700 kgs	80c per kg
	8.75 tonnes	$4.57 per case
Cherries	22,500 kg	$3.50 per kg
	5,000 kg	$2.00 per kg
Market Gardening		
Tomatoes	20,000 kg	$1 per kg
	2,000 kg	$1.70 per kg
Potatoes	28 tonnes	$300 per tonne
Sweet Corn	10,000 cobs	15c per cob
Blackberries	1 tonne	$1000 per tonne
Onions	5.5 tonnes	$200 per tonne

Source: Study Survey

Substantial amounts of fruit and produce are sold at the farm gate through fruit stalls and the area is noted for this. Fruit wines are also produced.

2.4.1 Horticulture in detail

Given the importance of horticulture, a separate analysis was made of the 36 respondents who engaged either entirely or in part in horticultural activities on their units. They are divided almost equally between full-time (54%) and part-time (46%), with the part-timers all having other jobs. Over 90% owned all of their land by freehold and exactly half had farmed it for ten years or less which was also the length of time that it had been in their families. Some 40% had only been horticulturalists for 10 years or less in total, both in the area and elsewhere.

Half produced nothing but horticultural products, a further 14% produced such crops from ¾ or more of their land. Six percent devoted half to ¾, and 8% ¼ to ½ of their land to horticulture and 22% less than ¼.

Twelve percent of horticulturalists do not irrigate and 44% irrigate 10 hectares or less. "Wild flooding" is the most frequently used technique (39%) and a further 12% of the respondents use sprinklers. Forty-six percent of respondents have been irrigating for 10 years or less.

Sixty-three percent of the horticulturalists said that they did not always receive their water quota. Respondents were asked to assess the reliability of the water supply, and while 50% of the horticulturalists said that the supply is reliable or very reliable, 47% of the horticulturalists describe the supply as not very reliable to very unreliable.

2.5 Stock

As already stated, pastoral farming in the region is based primarily on sheep; nearly three quarters of all units had carried sheep in the previous winter. They are supplemented by beef cattle, carried by some 33% of farmers. Miscellaneous numbers of horses, deer, pigs, opossums and goats were also declared, although they are never particularly significant except to the occasional small unit.

Popular sheep breeds include the Romney, found on 28% of all farms, the Coopworth (11%), and the somewhat loosely defined '½ breed' (19%). Merinos, Borderdales, Perendales, Border Leicesters, Southdowns and Corriedales, together with a range of specific crosses are also to be found.

Cattle breeds are dominated by Herefords, and their crosses (17%) and supplemented by Angus, Shorthorn and Red Poll herds.

The size of flocks is set out in Table 2.5.1 and size of herds in Table 2.5.2.

In total, there are over a quarter of a million sheep in the study area, in flocks that range from the small groups of ten to twenty for domestic slaughter and handicraft wool, to vast mobs of 11,000 or so. The biggest flocks are in the Upper Valley, but the largest numbers are in the Middle region, which has well over half of the study area's sheep in flocks which typically range from 2,000 - 4,000. The small size of units in the Lower Valley is reflected in the large number of small flocks, with modal size below 50 sheep. Indeed, only a third of flocks could reasonably be considered sufficient for economic viability, of themselves. Excluding those that are very small, modal flock size overall is centred on the 2,000 - 3,000 size.

Table 2.5.1

SIZE OF FLOCKS, BY REGION

Size Category	Upper Valley		Middle Valley		Lower Valley		Total	
	Flocks	Sheep	Flocks	Sheep	Flocks	Sheep	Flocks	Sheep
1-50			2	52	35	829	37	881
51-100					7	534	7	534
101-250	1	140	1	225	5	884	7	1249
251-500					1	350	1	350
501-1000					1	730	1	730
1001-2000	1	1840	5	7449	4	6125	10	15414
2001-3000	5	13750	15	38929	6	15800	26	68479
3001-4000	3	11170	12	42672			15	53842
4001-5000	3	14403	3	12837			6	27240
5001-6000	1	5500	2	11099			3	16599
6001-7000	1	6660					1	6660
7001-8000	1	7700	3	22584			4	30284
8001-9000	1	8700	1	8014			2	16714
9001-10000	1	9600					1	9600
10001-11000	1	11000					1	11000
11001-12000								
12001-13000			1	12500			1	12500
Totals	19	90463	45	156361	59	25252	123	272076

n = 178

Source: Study Survey

Table 2.5.2

SIZE OF HERDS, BY REGION

Size Category	Upper Valley Herds	Upper Valley Cattle	Middle Valley Herds	Middle Valley Cattle	Lower Valley Herds	Lower Valley Cattle	Total Herds	Total Cattle
1-50	2	48	13	366	13	82	28	496
51-100	4	345	9	718			13	1063
101-250	4	596	10	1826			14	2422
251-500	4	1590	1	500			5	2090
501-1000			1	800			1	800
Totals	14	2579	34	4210	13	82	61	6871

n = 178

Source: Study Survey

Cattle numbers are far less, with about 6,900 to be found in 61 herds. Both numbers and maximum herd size are to be found in the Middle Valley, with two-thirds of the animals and the largest herd, 800 head. As with sheep, herd sizes are trivial and total numbers are quite insignificant.

The dichotomy in farm systems is revealed in the number of farms who rely wholly on stock for their farm income, and the number who do not do so at all.

Forty-four percent of farms depended wholly on stock and thirty-nine percent did not do so at all (Table 2.5.3) with the remainder falling between the two extremes.

Table 2.5.3

PERCENT OF FARM INCOME DERIVED FROM STOCK

0%	72	39%
1-25%	2	1%
26-50%	2	1%
51-75%	5	3%
76-99%	20	11%
100%	77	44%

n = 178

Source: Study Survey

Among those who specified 'none' are an undeterminable number who gained no formal income from their land, other than trivial amounts whereas the polarisation of those that did so at the farther end of the scale shows the dominance of pastoral and stock farming on those units that practised it. The dominance of the Middle Valley as a pastoral region is also emphasised.

The carrying capacity of land varies enormously, from 0.7 to 25 stock units per hectare. These represent the extremes of unirrigated hill land to intensive small unit stocking on intensively irrigated and supplemented land. Four to eight units per hectare are much more usual, and in fact, 50% of responses fell between 4 and 10 s.u. per ha. Farm by farm variation is so great, however, that regional figures would be misleadingly generalised.

The performance of stock was also quite variable, with the most complete information being for sheep and lambs.

Lambing percentages are set out in Table 2.5.4, the proportion sold in Table 2.5.5, and meat and wool weights in Tables 2.5.6 and 2.5.7 respectively.

Table 2.5.4

LAMBING PERCENTAGES

Percentage recorded	Response	Percent responses
<80	4	4
80-89	16	6
90-99	16	17
100-109	30	32
110-119	13	14
120-129	12	13
130-139	4	4
140-149	2	2
>150	6	6
no response	2	2
		n = 93

Source: Study Survey

The modal response was 100, occurring in 15 (16%) of cases, while the range 90-120 contained 64 (68%) of cases. Very high values tended to be on small properties or on special units, such as stud farms, all do not reflect the pastoral farm experience which rarely deviates from the range 95-110%.

Table 2.5.5

PERCENTAGE OF LAMBS THAT ARE SOLD

Percent Sold	Response	Percent responses
0	10	11
1-50	1	1
50-59	6	6
60-69	6	6
70-79	12	13
80-89	7	8
90-99	13	14
100	37	40
		n = 93

Source: Study Survey

As can be seen, all or most lambs are sold. The cases where none were are small units, rearing sheep for coloured fleeces or home consumption. On the larger units, the bulk of lambs are sold, and they represent one of the major sources of farm income.

Table 2.5.6

MEAT WEIGHT PER LAMB (kg)

Weight (kg)	Response	Percent Response
< 13	8	10
13 - 13.9	25	32
14 - 14.9	26	34
15 - 15.9	11	14
> 16	7	9
		n = 77

Source: Study Survey

Modal values in this table are at 13 kg (21%) and 14 kg (22%) with a subordinate peak at 15 kg (11%). Intermediate values are sometimes specified, but a high proportion of answers were rounded to the nearest kilogram.

Table 2.5.7

WOOL WEIGHT (kg)

Weight (kg)	Response	Percent Response
< 3	2	2
3	21	25
4	39	46
5	18	21
> 5	5	6
		n = 85

Source: Study Survey

Wool weights did not vary greatly, with almost all being in the 3 - 5 kg categories, as, perhaps, might have been expected, with nearly half recording values of 4 kg.

Cattle performances were rarely recorded. Only 27 farms were able to record a sale weight, which was from 250 - 300 kg in half of the cases recorded, but which ranged from below 250 kg to over 350 kg. Calving percentages were recorded in only 18 cases, with a dominant modal value of 90-95%. The low level of information listed reflects the relative unimportance of cattle numbers per farm, and the dominance of sheep in the stocking programme.

2.6 Present Irrigation

To a greater or lesser extent, almost all of the landholders in the study area practice irrigation, for the simple reason that their holdings would be non-viable without it. There is a great diversity of extent and method, however, and irrigation can mean a large acreage under careful border-dyking; it can mean intensive use of water for tree crops and frost fighting, using overhead sprinklers. In many cases it is no more than wild flooding from a breach in a subsidiary race or the occasional application of water to a semi idle paddock. For the full-time farmers, irrigation is critical, for few farmers would be as productive without it, nor could many exist as economic units.

The present area of farm land irrigated varies from less than a hectare to over 500 ha., with a skew being exhibited in the lower portion of the range. Forty-three percent of the farmers irrigated between 1 and 10 ha., with the modal response being 2 ha. (12%). On the other hand, 31% irrigated more than 100 ha., as is seen in Table 2.6.1.

Methods of irrigation were quite divergent. Nineteen separate methods and combinations of methods were cited by farmers, with the single most popular system being wild flooding, listed by 38% of farmers. The major types and combinations are listed in Table 2.6.2.

Table 2.6.1

AREA PRESENTLY IRRIGATED : WHOLE STUDY AREA

less than 1 ha.	15	8%
1-5 ha.	61	37%
6-10 ha.	15	8%
11-20 ha.	6	3%
21-50 ha.	6	3%
51-100 ha.	13	7%
101-150 ha.	22	11%
151-200 ha.	11	6%
201-300 ha.	15	8%
301-400 ha.	5	3%
more than 400 ha.	3	2%
non-irrigated	6	3%
no response	-	-

n = 178

Source: Study Survey

Table 2.6.2

METHODS OF IRRIGATION

Wild flooding	67	38%
Sprinkler systems	33	19%
Border-dyking systems	35	19%
Bore	4	2%
Controlled flooding	7	4%
Overhead sprinkler	6	3%
Other (trickle, flush, microjet etc)	17	9%
No response	3	2%
Not applicable	6	3%

n = 178

Source: Study Survey

Some combinations are quite specific. Sprinkler systems involved sprinklers used in combination with flooding, with piped irrigation and with gravity feed. Similarly, border dyking is utilised in a number of combinations. Application by wild flood is not the most efficient use of water, but, as subsequent sections demonstrate, perceptions of water reliability, and other issues, have blunted the imperative towards development that might otherwise have occurred.

Water was drawn from a number of schemes. As the Manuherikia and Omakau schemes are easily the largest, it was to be expected that these would be most frequently cited, by 49% and 13% respectively. Twelve percent had private water rights or schemes, while a number of minor schemes were also listed. These are detailed in Table 2.6.3.

Table 2.6.3

SCHEME FROM WHICH WATER IS DRAWN

Manuherikia	88	49%
Omakau	23	13%
Private	21	12%
Dunstan	9	5%
Minor schemes*	18	10%
No response	13	7%
Not applicable	6	3%
		n = 178

Source: Study Survey

* e.g. Matakanui, Devenshire, Downs, St Bathans etc.

The demand for water is, of course, a highly seasonal one. Indeed, water is so plentiful in the winter season, that some parts of the valley are considered to be flood-prone, and this point emphasises the fact that the critical problem in the Manuherikia is the storage and distribution of water rather than its gross annual availability.

In dry years the demand for water commences in the Spring and ends in the Autumn, as in Table 2.6.4.

Irrigation clearly commences in September and October and ceases primarily in April. Table 2.6.5 sets out similar data for wet years.

In this case, not only is the season slower to start, even though October remains the modal month, but it ends sooner, with April, nonetheless, remaining modal, also. Even more important, however, is the observation by 14% of respondents that irrigation is either minimal, sporadic or not required at all.

Table 2.6.4

IRRIGATION SEASON IN DRY YEARS

	Month of commencement		Month of cessation	
August	8	4%		
September	56	31%		
October	53	30%		
November	25	14%		
December	6	3%	3	2%
January	1	*	1	*
February			6	3%
March			33	19%
April			93	52%
May			13	7%
No response/not applicable	29	(16%)		n = 178

Source: Study Survey

* less than 1%

Table 2.6.5

IRRIGATION SEASON IN WET YEARS

	Month of commencement		Month of cessation	
August	4	2%		
September	37	21%		
October	45	25%		
November	19	11%		
December	12	7%	4	2%
January	5	2%	1	*
February			13	7%
March			44	28%
April			56	31%
May			4	2%
Not required	26	14%		
Not applicable/no response	29	(16%)		n = 178

Source: Study Survey

* less than 1%

Since there was a wide range of farming experience, it was only to be expected that there would be a wide range of experience with irrigation. In fact, a high proportion, notably new farmers around Alexandra, had only a few years of irrigation, whereas the long established irrigators of the Upper and Middle Valley regions frequently cited spans of thirty, forty, and even more, years. Results of this question are detailed in Table 2.6.6.

Table 2.6.6

YEARS OF EXPERIENCE IN IRRIGATION

Less than 5 yrs	51	29%
5-10 yrs	38	21%
11-20 yrs	19	11%
21-30 yrs	19	11%
31-40 yrs	19	11%
41-50 yrs	7	4%
more than 50 yrs	6	3%
'all my life'	10	6%
not applicable	6	3%
no response	9	5%

n = 178

Source: Study Survey

When asked about the reliability of the water supply, farmers were first asked whether or not they received their full quota. One hundred and sixteen, or 65%, claimed that they did not, and only 28% (49) said that they did. Seven did not respond (4%) and the question was not applicable to 6 (3%). Although two-thirds is a high proportion not receiving water in full quotas, it should be noted that the present complexities of the current system of allocation are such that many could hardly expect to receive what they perceived as their quota, in any case, and a clearer picture emerges when reliability is considered specifically, as in Table 2.6.7.

Table 2.6.7

PERCEPTIONS OF IRRIGATION WATER SUPPLY RELIABILITY

Very reliable	18	10%
Usually reliable	74	42%
Not very reliable	46	26%
Unreliable	19	11%
Very unreliable	11	6%
Not applicable	6	3%
No response	4	2%

n = 178

Source: Study Survey

In Table 2.6.7 it is clear that the majority regard their supply as usually reliable, a perception that may well have changed following the late 1983 failure of the Manuherikia main race at a critical time. Equally 43%, almost as many, regarded the system as unreliable to an extent. An even clearer picture emerges when these answers are disaggregated by region and scheme used.

Table 2.6.8

PERCEPTIONS OF RELIABILITY BY SCHEME RELIABILITY

	1	2	3	4	5	n.r.
Manuherikia	7	37	26	12	6	
Omakau	-	12	8	1	2	
Private	5	7	4	2	1	2
Dunstan	-	6	3	-	-	
Minor Schemes	5	5	1	2	2	2

No response 13 (7%) Not applicable 6 (3%)

n = 178

1 = Very reliable
2 = Usually reliable
3 = Not very reliable
4 = Unreliable
5 = Very unreliable

Opinions on the Manuherikia scheme were exactly split with precisely half seeing it as reliable, and the other half seeing it as unreliable to a varying extent. Similarly opinion was almost evenly split with reference to the Omakau scheme, but with the additional belief expressed that it was never very reliable. Private schemes were seen most favourably, but even here, a fair proportion thought their system was unreliable. Finally, the minor schemes varied considerably; it was especially notable that the Matakanui scheme was exceptionally unreliable in the eyes of its users.

On a regional basis, there are few significant differences in perceptions of reliability, save those that relate to the location of the various schemes. Thus, there is a slight tendency for Upper Valley farmers to be more satisfied than those in the Lower Valley, but there are no really profound differences other than those.

As in previous sections, farmers were somewhat reluctant to give details of specific land uses, with a 'no response' rate of 41 (23%). However, of those who did respond, by far the majority specified grazing and pasture as primary uses of irrigated land. Table 2.6.10 sets out the crops cited.

While grazing predominates, and makes possible the greater utilisation of hill lands around the study area, a total of 30 farmers (17%) listed horticulture or orcharding on their irrigated land, and this is an important

Table 2.6.9

RELIABILITY BY REGION

	Upper Valley		Middle Valley		Lower Valley	
1*	2	10%	4	9%	12	11%
2	10	50%	20	45%	45	39%
3	3	15%	10	23%	33	29%
4	1	5%	6	14%	12	11%
5	1	5%	3	7%	7	6%
n.a./n.r.	3	15%	1	2%	5	4%
					n = 178	

Source: Study Survey

* Key as for Table 2.6.8

Table 2.6.10

MAJOR CROPS AND USES OF IRRIGATED LAND

	No.of responses	Percent[1]
Pasture and grazing	104	58
Fruit trees and orcharding	13	7
Nursery production	3	2
Lucerne	13	7
Horticulture	14	7
Cropping	12	7
Fodder	8	5
Not applicable	6	3
No response	41	23
	n = 178	

Source: Study Survey

[1] May sum to more than 100%, as more than one crop is cited

present land use in the Lower Valley.

Specific answers to crop acreages were insufficiently complete for an entire census of irrigated land use, but returns were sufficient for a clear indication to be gained, especially as non-returns were almost entirely from part-time farmers operating very small units.

Table 2.6.11

LAND USES BY REGION AND AREAL EXTENT (hectares)

	Upper Valley	Middle Valley	Lower Valley
Pasture & grazing	1462	4714	1256
Lucerne	50	208	49
Crops	85	33	-
Hay	71	28	28
Fruit *	-	-	65
Nursery	-	-	4
Horticulture *	-	-	67
Total	1668	4983	1441
No response	-	8	18
			n = 172

Source: Study Survey

* 'Fruit' and 'Horticulture' are to an extent interchangeable

Reference to areas irrigated in total demonstrate that there is a substantial difference between acreages that are specified as 'under irrigation' and acreages devoted to specific crops. This is in part due to development currently going on prior to production being achieved, but it is also due to a reluctance to disclose specific crop acreages that runs throughout this survey. The 'no response' declared in the cases of the Middle and Lower Valley areas refers to the difference between the numbers who, on the one hand, listed an area of irrigated land, but, on the other, did not specify any particular crops.

At best, therefore, only a comparative picture can be drawn, which again demonstrates the essential difference between the pastoral and horticultural regions of the study area. However, detailed inspection of individual returns for the Lower Valley, which is at once the most critical area and that which returned the highest failure to respond rate reveals a number of significant trends. These include a number of properties, under 10 ha. in extent where horticulture is being developed but is not yet returning a yield and 20 ha. were identified as being in this category. This is associated with recency of purchase, recent subdivision and a high rate of turnover. Indeed, 100 ha. of fruit and horticulture are to be found on

units of less than 10 ha., with plots of between 2-7 ha. being most common, and with 3 and 7 ha. as the modal values.

Information about recent changes in the use of water, or in irrigation systems was also sought. Forty of the sample of 178 listed changes, representing 22% of those surveyed, 118 (66%) said that they had made no changes, and 14 (7%) did not answer, and one may presume that they, too, have probably made no changes. The question did not apply to 6 (3%). Regionally, the positive responses were clustered in the Lower Valley, where 27 were to be found, although this is exactly in proportion to the population there. On a proportional basis, positive responses are particularly met in the Upper Valley, where six people reflect 30% of the responses there. However, no strong regional pattern is to be found, except that the Middle Valley is most static with only 16% (7) of its responses being positive.

Recent changes that were listed involved the bringing in of a total of 934 hectares in 25 separate developments, ranging in size from 1 to 168 hectares, with the bulk of them under 5 hectares. The uses were accordant with existing uses, concentrating on pastoral extension or lucerne production, and horticultural development in the Lower Valley. Table 2.6.12 sets these out by regional subdivision, as well as listing the rate of introduction of new irrigation systems.

Table 2.6.12

RECENT IRRIGATION DEVELOPMENTS, BY REGIONS

	Upper Valley		Middle Valley		Lower Valley	
Response						
Positive	6	30%	7	16%	27	24%
Negative	11	55%	33	75%	75	65%
No response	3	15%	4	9%	13	11%
Total Area	394 ha.		421 ha.		119 ha.	
Main products	Pasture, Lucerne		Pasture, Lucerne		Pasture, Orchard, Nursery, Lucerne, Horticulture, Fodder	
System	Flood	5%	Wild	3%	Overhead	5%
	Spray	25%	Spray	7%	Sprinkler	9%
	Nr.	70%	Nr.	89%	Border dyke	4%
					Nr.	82%
					n = 172	

Source: Study Survey

In the Upper Valley about a third had recently made changes, bringing in nearly 400 ha., mainly in large blocks, ranging from 40 - 170 ha. These were exclusively for pasture and lucerne. In the Middle Valley, only 7 farmers had made such changes, bringing some 421 ha. again, exclusively for

pasture and lucerne. Block size ranged from 1 to 140 ha., with the main concentration being around 100 ha. However, as in the case of the Upper Valley, few farmers were at all involved, and here, especially, this would be because many farms were already fully developed.

Twenty-seven farmers had extended their irrigation in the Lower Valley, but had only developed around 120 ha. in all. However, work had centred on small scale (less than 10 ha.) developments for orcharding, horticulture and nursery crops, and a 40 ha. fodder development. Some 14 farmers had recently initiated or extended irrigated fruit and market garden schemes in this area which had the greatest value, but smallest area of development in recent years.

2.7 Land Capability

In attempting to assess land capability and potential for development, farmers were asked whether or not they were using their land to its fullest capacity. Their responses are listed in Table 2.7.1.

Table 2.7.1

PERCEIVED LEVELS OF UTILISATION BY REGION

	Total Region		Upper Valley		Middle Valley		Lower Valley	
Definitely	20	11%	3	14%	8	18%	9	8%
Probably	30	17%	6	17%	11	24%	13	11%
Unsure	3	2%	-		2	4%	1	1%
Probably not	45	25%	7	32%	13	29%	25	22%
Definitely not	72	40%	4	18%	7	16%	61	53%
No response	5	3%	-		2	4%	3	3%
Not applicable	6	3%	2	10%	2	4%	2	2%

n = 178

Source: Study Survey

A major point of interest is the overall belief by two-thirds of those sampled that their land is not at capacity at present. A majority believe this in the Upper Valley, and almost half do so in the Middle, and even there, less than half, again, believe that their land is so developed. In the Lower Valley, a massive three-quarters doubt that their land is fully developed, and less than a fifth believe that it is. This is undoubtedly a perception of horticultural possibilities among those who have not yet entered orcharding, as well as an acknowledgement of partial development only by hobby farmers.

Clearly there is a major tendency to believe that land is not yet at capacity throughout the study area, and that it would be possible to do considerably more than at present. Comments on water reliability, already

mentioned, will, of course, greatly inform this point of view, but it is possible that other factors are also at work. These are listed in Table 2.7.2.

Table 2.7.2

MAIN FACTORS PREVENTING FULL USE OF LAND

	Total		Upper Valley		Middle Valley		Lower Valley	
Lack of finance	83	47%	12	55%	15	33%	54	46%
Weeds	10	6%	-	-	6	13%	4	3%
Animal Pests	9	5%	1	5%	4	9%	4	3%
Insufficient water	88	49%	10	50%	24	53%	52	44%
Inadequate pines	36	20%	11	55%	14	31%	9	8%
Lack of markets	14	8%	4	20%	6	13%	1	3%
Other	38	21%	3	15%	4	9%	31	16%

n = 178

Source: Study Survey

In general, lack of finance and of water are seen as major constraints to development. Inadequate prices and lack of markets, to a lesser extent are also significant. All of these are important in the Upper and Middle Valley, although in the latter case constraint levels are generally lower, because of the belief that land is developed to capacity which is more strongly held there. Only finance and water are seen as Lower Valley constraints; market conditions are not a problem, a reflection of the buoyant state and general optimism of the horticultural industry.

As earlier stated the Manuherikia Valley is predominantly pastoral agriculture but certain areas of the Lower Valley are particularly suited to horticulture. There is a strong indication from the survey responses that lack of an assured and adequate water supply is restricting both agricultural and horticultural development in the region. Half of the respondents indicated that they found the present system of irrigation unreliable, and "insufficient water" was given as the major reason for not using the land to its fullest capacity.

The entire study by Ashworth-Morrison Cooper found that insufficient water, an unreliable supply and the doubtful future of the irrigation scheme was having an adverse effect on horticulture and pastoral productivity. Decisions to improve productivity in horticulture by replacing ageing trees, introducing new varieties and adopting more intensive production were not in evidence. Frost damage was causing low yields as the increase in fuel prices has made smokepots an uneconomic method of frost control, Bascand (1980).

Stocking levels were found to be conservative on pastoral units because of a limited and unreliable water supply. A dry year or very dry year reduced livestock performance for an extended period. A reduction in wool

weights and lambing percentages was still apparent the following year. Therefore farmers tended to stock at a level that they could sustain with minimal economic loss during dry periods when water supplies were limited.

Provision of an improved irrigation supply system would increase farmer confidence and enable development decisions to be made with some guarantee that irrigated pasture production could be maintained in drought seasons.

The trend in the valley in terms of population is a slowing rate of decline to stability over the next decade with some cyclical variation arising from age structures and family size. Land use trends are to sustain a low level of horticultural and pastoral productivity relative to the land use potential assuming an adequate and reliable water supply.

The factor most likely to alter this stability would be the sudden collapse of one or both of the irrigation schemes in the valley. The impact of a sudden cessation of water supply in terms of overall population would be a further decline at least comparable to that which occurred between 1971 to 1981. The personal cost to individuals directly affected would be considerable. Pastoralists would be faced with suddenly having to learn and adopt dryland farming techniques. There would be a number of farms too small to be economically viable dryland units. Families on these farms would be forced to acquire more land or sell and move elsewhere.

2.8 On-farm Employment

On-farm employment was restricted, in the main to family members, principally wives of farmers, or their sons. Most farms were reliant solely on the farmer himself, and only the larger units employed non-family permanent staff full-time. Rather more employed part-time workers.

2.8.1 Family

Some eighty-one farmers mentioned their family as helpers, of whom 58 were wives, and almost all others were sons or daughters. Thirty-three farms had two helpers, and sixteen had three or more. In total 132 people were listed as employed on the various farms, and since 74 were at least potentially free to leave, since they were not spouses, substantial employment is provided, much of it concealed.

Duties were rarely listed specifically, and phrases such as 'farm work', 'labouring' and 'general' were usually used. Most farms were too small and unspecialised to need specific skills, and this is revealed in the answers given, although 'packing' of fruit, was commonly mentioned in the Lower Valley.

2.8.2 Full-time Staff

Twenty-two farms employed full-time workers, of which nine employed two, or more. A total of forty-three permanent jobs were listed; most of the workers had been employed for around 10-12 years, performing such duties as stock tending and general farm work.

2.8.3 Part-time Staff

Around fifty part-time jobs were listed, mainly in the Lower

Valley area. Eighteen farmers listed this type of employment, although it is probable that some casual work was not listed. Similarly, family members pressed into action during the fruit season or hay-making might not have been listed here. Apart from fruit-picking, fencing is the only other listed activity. Most workers lived in Alexandra, but a few were accommodated on the farm.

2.8.4 Total employment

Altogether, 132 family members, 43 hired staff and 50+ part-time jobs are provided in the region. Family members are mainly accommodated on the farm, as are permanent workers; few came from the small townships in the region, apart from shearers and other contractors.

Apart from the jobs listed, it is probable that family members make a greater contribution than actually specified, while casual pickers and packers may also be more numerous.

2.9 Regional Linkages of Farming

There is a minimal level of service sector activity in towns within the valley, with the exception of Omakau. A service listing is given in Table 2.9.1 and demonstrates that most of the local towns offer only two or three services, usually a tavern and petrol sales. In contrast Omakau offers a much wider range of services, but mainly geared to farm supplies and goods handling rather than consumer purchases.

Table 2.9.1

SERVICES WITHIN THE PROJECT AREA(1)

Oturehua(2)	Tavern	Omakau	Implement sales & service
	Hardware		Stock & Station agents(2)
	Service Station(2)		Hotel
	Transport company		Tavern
			Wool & Skin Buyer
St Bathans	Tavern		Transport company
	Petrol Services		Builder
			Service Station(2)
Becks	Agricultural Contractor		Takeaway
			Bank
	Tavern		Accountant
	Petrol Services		Hardware
			Retail Grocery
Ophir	Tavern		Concrete Products Manuf.
	Canvas Projects Manuf.		Agricultural Contractor(2)
			Construction company
Chatto Creek	Tavern	Lauder	Tavern
			General Store
			Service Station

Source: Field Observation 1983

(1) Not an exhausive listing (2) Not strictly within the Study Area

2.9.1 Transport

The majority of the farmers used only one transport company for delivering supplies to the farm. Of the farmers who responded, 24% used Holgate and Anderson, 16% used Alexandra Transport, 15% used Beckers Transport and 6% used their own transport. The most frequently cited transport company locations were Alexandra with 20% of the responses, Omakau with 17% and Oturehua with 15%.

The majority of the farmers used only one transport company to collect farm product. Of the farmers who responded, 26% used Holgate and Anderson, 18% used Beckers Transport, 12% used Alexandra Transport and 4% provided their own transport. The most frequently cited transport locations were Omakau with 20%, Alexandra with 18% and Oturehua with 17%.

2.9.2 Purchase Location of Farm Supplies

Breeding stock were purchased from a variety of locations, the most prevalent being Omakau with 10% of the total responses. Eight percent of the farmers obtained breeding stock from their own property, 7% purchased stock in Alexandra and 3% purchased in Lauder.

The most frequently cited location for purchasing of stock other than breeding stock was Omakau which was cited by 15% of the respondents. Alexandra was the second most popular location with 7% and Cromwell was third with 2%.

Thirty percent of the farmers bought their seeds from Alexandra, 16% from Dunedin, 8% from Omakau and 8% from Cromwell.

Most fertilizers, sprays, etc were purchased in Alexandra, which was cited by 57% of the farmers, Dunedin was mentioned by 13% of the farmers, Omakau by 7% and Invercargill by 2%.

Forty-two percent of the farmers bought farm implements in Alexandra, 5% in Ranfurly and 3% in Omakau.

2.9.3 Off-farm Facilities

There was a low response to the question regarding a more convenient location for off-farm facilities. Location of seed dressing facilities received the largest response at 4% of the total.

Location of the meat processing works was cited the second most frequently at 3% of the total. Railways was cited by 2% and fertilizer and sales yards were both cited by 1% of the farmers. The locations which were thought to be the most convenient for off-farm facilities by the farmers who responded were Oturehua, Lauder and Alexandra.

Eleven percent of the farmers thought that cheaper cartage could be provided as an improved off-farm facility.

Meat processing works were also cited by 5% of the farmers as a potential candidate for improvement. Seven percent of the farmers thought that the improved off-farm facilities should be located in Alexandra.

In general, however, it was clear that there was, if not satisfaction,

then at least acceptance of the services provided.

As with the patterns of purchase and community association, most linkages were within the study area, focussed upon Alexandra, but with minor leakage to Oturehua and Ranfurly. The regional significance of Dunedin, and to a minor extent Invercargill, was also underlined.

PART 3 IRRIGATION ALTERNATIVES

In Sections 1 and 2 the present situation has been described. In this section irrigation alternatives and their implications are set out. These form the basis for the estimation of social and economic impacts.

3.1 Irrigation Scheme Alternatives

There are some 16,085 hectares of land irrigated presently in the valley. Eighty percent of this area is commanded by the Manuherikia and Omakau Irrigation Schemes while the remaining 20% of the irrigated land is commanded by four ancillary schemes on the terraces. Repairs and maintenance of the ancillary schemes are primarily the responsibility of individual farmers and can continue indefinitely; however the future of the Manuherikia and Omakau schemes is uncertain.

The present situation in the valley is therefore rather particular. In contrast to most established farming areas in the country the Manuherikia situation is presently one of living to a large extent on borrowed time. Its present irrigation water resources could virtually cease at any moment. Thus, two key future irrigation states can be considered. The first is acceptance of the termination of the two major irrigation schemes and a return to a dryland state in the areas presently irrigated under these; the second is continuation of the major irrigation schemes by further investment. Since the cost of capital works on the Manuherikia and Omakau Schemes is likely to be high, then various alternatives involving varying investment and serving more or less land should be investigated.

In consultation with the study team, the Ministry of Works formulated several alternatives for examination. These encompass a spectrum extending from the essentially dryland (non-irrigated) future through "continuation" to full valley (extended) irrigation. Some six alternatives are assessed; variations on these are of course possible. The Ministry did not expect any one alternative necessarily to be selected as preferred but formulated them to enable representative economic and social implications to be drafted. Further study and detailed development of one or more of the alternatives will be a task that is subsequent to this analysis.

A description of the alternatives studied is set out in Table 3.1.1 and illustrated in Figure 3.1.

These schemes would not be able to meet full demands for irrigation water across all the commanded area in each season. The irrigation status of each is summarised in Table 3.1.2, which reflects full supply, limited supply (some disruption and shortfall as in the current situation) and occasional supply (delivery in wet years only), which, of course, is when the water is less urgently needed.

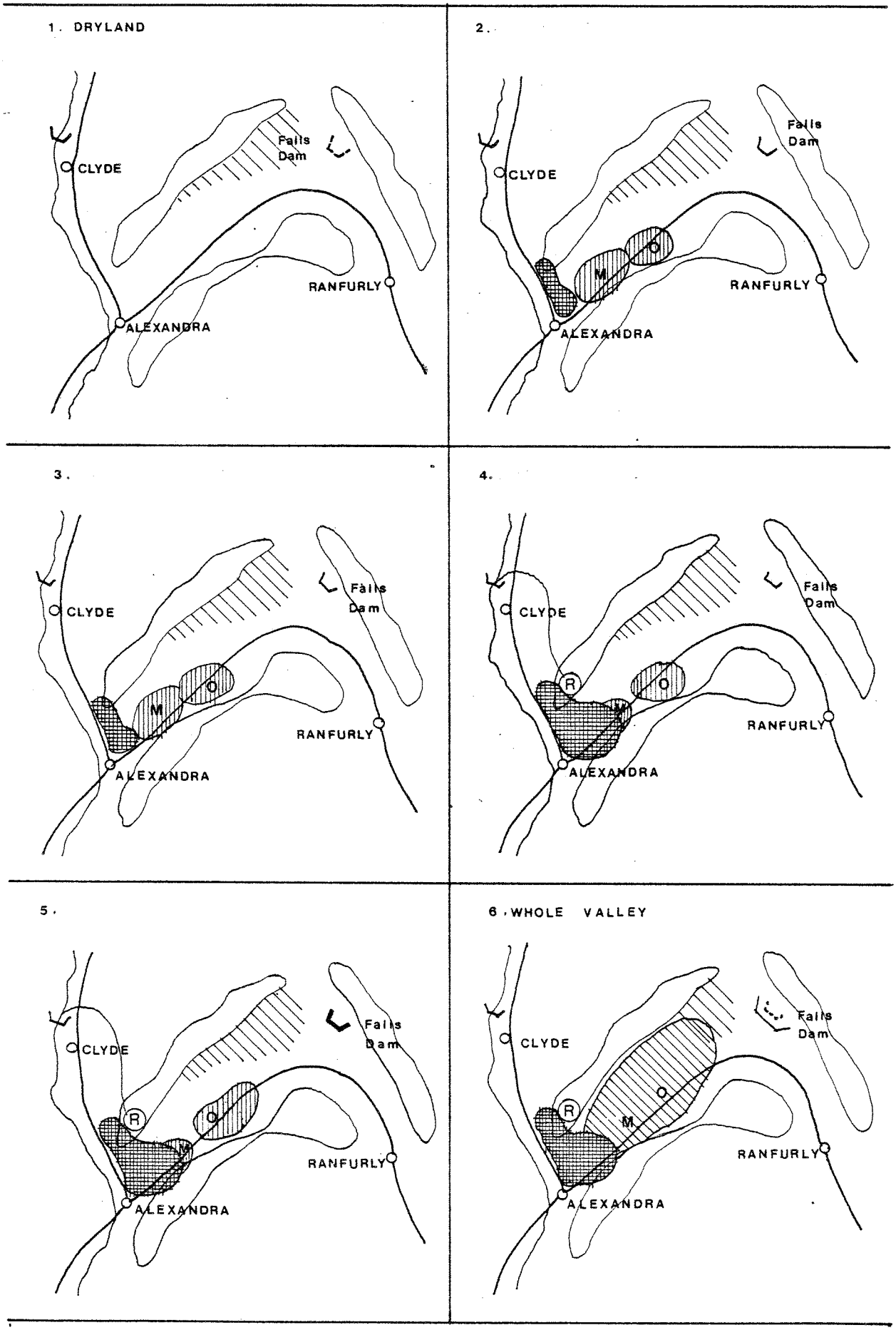
Table 3.1.1

IRRIGATION ALTERNATIVES*

Alternative		Description	Area Commanded (hectares) Horti-culture	Pastoral	Description	Area Commanded (hectares)
1	Dryland	Transition to dryland farming	nil	nil	Transition to dryland farming	nil
2	Status Quo	Maintenance at current level until structural failure (predicted within 5 years)	200	2610	Maintenance at current level until structural failure (predicted within 10 years)	10,170
3	Assured Supply 'A'	Assured supply to present irrigators with increased storage capacity (in race storage) for frost fighting capability to horticulturalists	200	2610	Assured supply to present irrigators	10,170
4	Assured Supply 'B'	Increased storage and redistribution to enable conversion of an additional 1000 hectares to horticulture associated with decline in pastoral irrigation	1200	nil	Assured supply to present irrigators	10,170
5	Increased Supply in both schemes and redistribution for horticulture	As in 4 above	1200	nil	Increased supply and expand area commanded	14,570
6	A modified whole valley scheme	As in 4 above plus some pastoral irrigation	1200	600	Increased supply and expand area commanded	16,070

* These are described verbally in Appendix C, and set out diagrammatically in Fig 3.1, over

FIG.3.1 IRRIGATION ALTERNATIVES STUDIED (1-6)



KEY

Smaller races

Omakau (pastoral)

Manuherikia (pastoral)

Horticultural

Table 3.1.2

IRRIGATION STATUS OF AREA COMMANDED

Alternative	1 (Dryland)	2/3	4	5	6
Area Irrigated (ha) (1)					
Full	-	4,400	7,600	10,900	14,600
Limited	2,300	5,070	900	900	200
Occasional	805	3,510	2,870	3,970	3,070
Dryland	16,475	6,600	8,210	3,810	1,710
Total (2)	19,580	19,580	19,580	19,580	19,580
Land Use					
Pastoral	19,580	19,380	18,380	18,380	18,380
Horticultural	-	200	1,200	1,200	1,200
Stock Carried (su)	99,440	182,460	169,835	214,215	246,175

Source: Analysis of Data from Ministry of Works & Development, Dunedin

(1) Areas provisional and accurate to ±20%

(2) Reflects the aggregate of the actual areas commanded by any of the alternatives, 2 - 6. The 1710 ha. dryland under alternative 6 represents 700 ha. of land in Becks which is commanded under alternative 5, but not under alternative 6, and 1010 ha. in Strathmore, Springvale and Dunstan which is commanded under alternative 2, but not under alternative 6.

The implications of each development alternative for each district are summarised in Table 3.1.3. Briefly, Alternatives 3 to 6 maintain or increase the areas commanded in the Upper Valley, but involve a redistribution of supply in the Lower Valley away from pastoral use toward meeting the demand from horticulture. Whereas, presently, some 2610 ha. of land is supplied for pastoral use in Strathmore, Springvale and Dunstan, this water is re-allocated together with additional supplies from Lake Dunstan to meet the demand from an additional 1000 ha. of horticultural development in the Springvale and Dunstan areas under Alternatives 4 and 5. Only in Alternative 6, the modified whole valley scheme, is there adequate water remaining in the system to again meet the demands of pastoral irrigation in the Lower Valley after satisfying the demands of horticulture.

If the Manuherikia and Omakau Schemes were to cease, some 3105 ha. in the command area only would continue to be irrigated from the Dunstan, Lauder, Matakanui and Devenshire systems. The distribution of this irrigated land, by district, and the irrigation status, are summarised in Table 3.1.4.

Table 3.1.3

IRRIGATED AREAS BY DISTRICT

Area	Alternative 2/3	4	5	6 (1)
Omakau Scheme				
Pastoral Use:				
Downs	900	900	900	1,300
Blackstone	1,000	1,000	1,000	1,000
Becks	1,900	1,900	4,200	3,500
Drybread	3,700	3,700	4,700	6,000
Matakanui	2,400	2,400	3,500	4,000
Moutere	270	270	270	270
Sub Total	10,170	10,170	14,570	16,070
Horticultural Use	..	..	..	..
Manuherikia Scheme				
Pastoral Use:				
Strathmore	160	..	..	..
Springvale	1,600	..	..	600
Dunstan	850	..	..	..
Sub Total	2,610			600
Horticultural Use:				
Springvale) Dunstan)	200	1,200	1,200	1,200
Total	12,980	11,370	15,770	17,870

(1) While the Omakau (Upper Valley) and Manuherikia (Lower Valley) Schemes are independent under Alternatives 2 to 5, Alternative 6 involves a redevelopment of this total area.

Table 3.1.4

IRRIGATION STATUS UNDER CLOSURE OF MANUHERIKIA AND OMAKAU SCHEMES (1)

District	Annual Irrigation	Occasional Irrigation	Dryland
Downs	600	210	1,240
Blackstone	530	186	640
Becks	320	112	3,730
Drybread	300	105	7,515
Matakanui	250	88	5,160
Moutere	300	105	5,017
Strathmore	-	-	5,460
Springvale	-	-	2,164
Dunstan	-	-	1,000
Various Horticulture	-	-	200
	2,300	805	32,130

Source: Ashworth-Morrison Cooper, Manuherikia Valley Irrigation Scheme, Revised Economic Report, 1983 Appendix, p.4

(1) In addition there is 52,438 ha. of hill country unaffected by the irrigation schemes.

3.2 Options and Problems

3.2.1 Cost Estimates and Major Existing Problems

This section includes cost estimates provided by Ministry of Works and Development, Dunedin. The figures are to a prefeasibility standard ±25%.

The approximate capital costs for each of the farm options under consideration were as follows:

Option 1	Nil
Option 2	$30 m
Option 3	$55 m
Option 4	$80 m

The cost of Option 1 is the annual operation and maintenance costs for the two schemes with no provision for major repairs/capital works. Therefore the capital costs for this option are nil.

Option 2 includes capital costs to enable the long term operation of the Omakau Scheme at present levels of total supply; and repair of the Manuherikia Scheme and the establishment of a new Clutha River supply to allow large scale transition from pastoral farming to horticulture in the Lower Valley.

For Option 3 and 4, only outline estimates as noted above were provided.

Finally there is included a detailed cost estimate entitled Option 2A. This provides capital cost estimates for repairing the Omakau and Manuherikia Schemes to a standard which would assure long term operation of both schemes at present levels of total supply.

3.2.2 Option 1 - Operation and Maintenance

Ministry of Works and Development, Alexandra, was requested to prepare a brief statement covering the annual operation and maintenance cost of present facilities including identification of problem areas.

In order to answer these aspects in some degree of detail these matters will be treated as:

(i) Financial aspects as they relate to operations and maintenance in total.

(ii) Problem areas in the existing Omakau Irrigation Scheme.

(iii) Problem areas in the existing Manuherikia Irrigation Scheme Re-assessments.

(i) FINANCE FOR OPERATIONS AND MAINTENANCE

The level of funding for many years has been adequate to cope with the essential maintenance of minor structures and some minor reconstruction.

Any major reconstruction/emergency works have been done by diverting funds which would otherwise have been used on minor maintenance.

Within the Combined Omakau and Mauherikia Irrigation Schemes there are sections which require a significant amount of maintenance/replacement work on minor structures. If it were possible to neglect the major works then over a period of say 10 years the current level of funding would suffice for this minor work.

During the last few years, operations and minor maintenance expenditure has been in the order of $390,000 per year (at MWD CCI 2000). This figure is made up from the following costs:

Salaries, wages vehicles	$260,000
Machine cleaning	50,000
Weed Sprays	10,000
Stores - Equipment	10,000
Renewal/Repair	55,000
Mechanical and Electrical	5,000
	$390,000

This sum does not allow for the costs of any major repairs/replacements. In the last three years such works as sealing Falls Dam, Marslin Point major repair and Marslin Point Bypass Cutting accounted for approximately $125,000.

It has been recognised for some time that deterioration of the major structures has reached the stage that something will have to be done. However there has been a reluctance to squarely address the problem. This has largely arisen because financial and scheme reconstruction considerations have to some extent overshadowed the immediate maintenance needs.

It is considered that in order to overcome the maintenance backlog there would be an immediate need to increase the funding level by say 15% - 20% to cope with minor works (for approximately 10 years) together with a special allocation to repair major works on a fixed timetable basis.

(ii) PROBLEM AREAS IN THE EXISTING OMAKAU IRRIGATION SCHEME

a. The Falls Dam and Spillway

The lining of the spillway has deteriorated markedly and is in urgent need of repairs. This item has been the subject of an Engineering Report. The concrete facing on the dam has deteriorated within the joints and the present repairs are essentially temporary in nature.

b. The Main Race Intake on the Manuherikia River (Structure No.1)

The true right bank is continually eroding and requires at this stage minor annual maintenance to reconstruct the abutments. In the longer term it will be necessary to place a permanent wingwall in the location if this structure is to be retained for long term future use. The minor problems of scour on the weir itself and downstream apron are considered to be normal wear and tear to be coped with annually as required.

c. Pipeline from Intake (Structure No.2)

This 2000' x 54" diameter pipeline is showing signs of its age. Within ten years it will need to be replaced either by a new pipeline or open race.

d. The Primary Measuring Weir (Structure No.20)

This whole structure needs to be replaced. At present the concrete is badly eroded and much of the steelwork needs replacement. In all probability it would have a maximum life of ten years even if patched. The bywash facilities have caused a considerable number of problems over the years.

e. The Lauder Syphon (Structures Nos. 69-73)

This must be considered as the most critical structure in terms of its condition in the whole of the scheme. It is 5340' long and is composed of steel and concrete pipes. Over the last three years there has been work required in each of those years. There are concrete blocks on many of the concrete pipe joints on the upstream end of the syphon (installed to seal cracked pipes; these in turn have resulted in further stress cracks) and almost all of the steel section needs replacement.

When originally installed this syphon was well above the high flood level of the Lauder Creek; this is no longer the case. It would be impractical to consider replacing the existing pipeline along its current alignment. It would probably be necessary to realign the whole race and install a new crossing at a less critical point on the Lauder Creek. It would be possible to do this work while keeping the current unsatisfactory structure in service.

Failure of this syphon would result in approximately 90% of the total Main Race supply being lost.

f. Huddleston Syphon (Structure Nos. 231-233)

The whole 3777' pipeline requires replacement. Loss of approximately 15% of the total Main Race Supply would result through failure of this syphon.

g. The Dunstan Intake Weir

The sheet piling weir has buckled and while it will probably continue to be usable for many years replacement should be considered.

h. General

Many of the pipe intake and outlet structures have been constructed without wingwalls. This has resulted in subsequent erosion behind them. Within the existing capabilities of the Irrigation Section repairs can be effected.

In the Lauder, Dunstan and Matakanui sections, there is a large backlog of work required in replacing measuring boxes and access crossings. An increase in the level of funding of in the order of say 20% would allow for rapid replacement of these.

The race system itself is generally in reasonable condition there being approximately 80% currently capable of being machine cleaned. A continuing programme of reconstruction works would probably see all races capable of machine cleaning based on a say ten year programme at little above existing funding levels.

(iii) PROBLEM AREAS IN THE MANUHERIKIA IRRIGATION SCHEME

a. No.1 Tunnel and De-Silter

The invert lining in the tunnel is now non-existent. The tunnel itself appears sound but this impression would probably need some qualified confirmation. The de-silter is in need of repairs; it would probably have an effective life of another ten years. It is anticipated this period could be extended by extensive maintenance works which are within the capabilities of the existing maintenance resource.

b. Gorge Race Section

This length of race has been the subject of many years of scrutiny and numerous reports. It is an area which has annually required constant patching. The major problems are of either slow ground movement cracking the race and buckling the walls or of large boulders dropping into the race causing damage. To overcome these problems the race would need to be reconstructed at major cost.

c. No.2 Tunnel

This tunnel is in better condition than the No.1 tunnel but would require some maintenance works in the invert area.

d. Chinky Gully Flume

At most this structure has ten years of life because of the state of the steel flume; the timber is quite sound and would last much longer. This total structure could hardly be considered appropriate within a modern irrigation scheme.

e. Chatto Creek Syphon

This entire structure is in need of repoacement by a buried pipeline which could be constructed in parallel with the existing structure.

f. General

Of the above items, the Gorge Race, Chinky Gully flume and Chatto Creek syphon are the most vulnerable. The loss of any one would result in almost total loss of supply to the existing Manuherikia Supply area.

The race system between the end of Chatto Creek Syphon and Alexandra is generally in very good condition. While there are some crossings and measure boxes which would need to be replaced these present no difficulties at the current level of funding.

The only portions of race now giving any reason for concern are the CDE, the Borough Race from Bruce's Hill to Alexandra and AG race.

The current lack of bywash facilities in Alexandra/Clyde area in general has caused some concern. Also in the same area the use of the races to provide domestic water supplies has been a continuing nuisance.

3.3 Capital Costs of Irrigation Alternatives

The off-farm capital cost of the alternatives are given in Table 3.3.1. It is estimated that for headworks, main race systems and secondary distribution works to farm gate, these will total $13.2 million for alternative 3, $26.6 million for alternative 4, $55 million for alternative 5 and $80 million for alternative 6. Also shown in Table 3.3.1 is the full service equivalent area (FSE) for the Upper Valley section of each alternative, which takes account of the relative benefits in each alternative from full service, as compared with limited or occasional service. The average off-farm capital costs vary between $1000/FSE for alternative 3 and $4500/FSE for alternative 6. The costs for alternatives 4, 5 and 6 are high compared with $850 - $1000/ha for current pastoral developments in Canterbury and $1350/ha for the Lower Waitaki Scheme in North Otago. Furthermore, if the incremental costs are calculated - i.e. the additional off-farm capital costs associated with service to further Upper Valley pastoral areas in Alternatives 4, 5 and 6 compared with Alternative 3 the unit costs increase to over $7000/FSE, which casts serious doubt on the economics of expansion of irrigation services to pastoral areas. Consideration of the Upper Valley and Lower Valley developments together in one "scheme" may allow an element of cross subsidization from the higher valued horticultural develop-

ments in the Lower Valley. However, the magnitude of these unit capital costs for pastoral service suggest that this approach is unlikely to sufficiently improve the overall economics of these alternatives.

Table 3.3.2

OFF-FARM CAPITAL COSTS OF DEVELOPMENT ALTERNATIVES

Alternative	2	3	4	5	6
Capital Cost ($M)					
Lower Valley[1]	..	5.3	12.2	12.2	..
Upper Valley	..	7.9	16.4	42.8	..
Total		13.2	28.6	55.0	80.0[2]
Area Serviced (ha)					
Lower Valley	3,080	3,080	1,470	1,470	2,070
Upper Valley	9,900	9,900	9,900	14,300	15,800
Total	12,980	12,980	11,370	15,770	17,870
Land Use (ha)					
Lower Valley Pastoral	2,880	2,880	270	270	870
Lower Valley Horticultural	200	200	1,200	1,200	1,200
Upper Valley Pastoral	9,900	9,900	9,900	14,300	15,800
Full Service Area Equivalents (FSE)[3] (ha)	7,875	7,875	8,675	12,635	14,600
Capital Cost of Service to Upper Valley					
$/FSE	..	1,000	1,900	3,400	4,500[4]
$/FSE above the cost of Alternative 3			10,600	7,300	8,200[4]

(1) Represents the costs to repair or upgrade the Manuherikia Scheme plus developing a new supply from the Clutha for the Dunstan Flats (Alternatives 4 - 6).

(2) It is difficult to apportion the modified whole valley scheme costs between the upper and lower sections, although the "opportunity cost" of services to 1470 ha in the lower section is $12.2 million.

(3) As an indicative guide, based on comparative stock rates and gross margins, 1 ha of full supply is assumed equivalent to 0.85 ha under limited supply and 0.60 ha under occasional supply.

(4) Includes allowance of 600 ha of full supply to Springvale and assumes the opportunity cost of supply to the remaining 2070 ha in the Lower Valley is $8.4 million (see footnote (2)).

Note: These cost estimates are provisional only and subject to revision.

No detailed estimates have yet been derived for the on-farm capital costs associated with each alternative. In the Ashworth-Morrison Cooper evaluation of the original Whole Valley Scheme, on-farm costs (excluding livestock) represented 81% of off-farm costs, and are therefore very significant in the total cost structure. Bordering is estimated to cost around $1250/ha for farm headwork, land development, structures, cultivation, fencing and pasture establishment and contour ditching around $710/ha. Orchard reticulation with dams, mains and orchard sprinklers will cost around $8300/ha. In addition costs are incurred in buildings, sheds, plant and equipment and in the case of the Manuherikia Valley, the cost of establishing a rural water supply system ($135/ha).

3.4 Horticultural Development in the Valley

The Ashworth-Morrison Cooper report estimated the area of horticulture in 30 lots at 118 ha, which would increase by 55 ha with the Whole Valley Scheme to a total planted area of 173 ha. It was assumed without the scheme that horticulture would cease in the valley. The survey conducted with this study tended to confirm these estimates - 37 holdings were identified with an aggregate area of 160 ha of crop. Aggregate land use proposed under the development alternatives is summarised in Table 3.4.1. Whereas the "with project" horticultural land use was estimated at 200 ha under the original "Whole Valley" scheme, the more recent proposed development alternatives include an allowance for service to 1200 ha of horticulture in the Lower Valley. While this extent of planting may well be technically feasible, it appears both from discussions in the district and analysis of the survey responses that such an increase may be optimistic.

Responses to the survey are presented in Table 3.3.1. Nineteen respondents indicated that they would expand their area in horticulture if water supply sere assured, and the aggregate area of new planting was estimated at 175 ha. While this may be a lower estimate - given the demonstrative impact of increased horticulture on farmers intentions - it is indicative of the probable scale of development. Most new planting in the immediate area is being undertaken in association with the adjacent Earnscleugh Irrigation Scheme, and local opinion suggests that while adequate water will see a revitalisation of horticulture in the Lower Manuherikia Valley, a six-fold increase over the next twenty years is probably unlikely, under foreseeable circumstances.

It has also been assumed to date that phasing out of the Manuherikia Valley Irrigation Scheme would eliminate horticulture from the land use alternatives for the Lower Valley. It is possible, however, that groundwater or river pumping systems would emerge, alternatives that need to be further investigated with the Otago Catchment Board and the local county councils. It will be seen from the above description of the alternatives that the range of future possibilities for the valley is extensive. Adoption of one of these must be arrived at by a balance of total cost and social and economic effect. Some of the alternatives could be built in stages and this approach can sometimes improve the overall cost and economics of a scheme development.

For instance, with specific reference to horticulture in the Lower Valley, it may well be economically attractive to upgrade the existing Manuherikia Scheme to adequately service existing users (alternative 3) and then construct the Dairy Creek supply (as in alternative 4) once sufficient interest has been demonstrated in further expansion of horticulture

Table 3.4.1

IF WATER IS ASSURED FOR THE LONG TERM AT RATES COMPARABLE TO THOSE AT PRESENT

1. What specific on-farm developments, if any, would you plan to make?

	Responses	%
Irrigate more land) Improve irrigation methods)	34	18
Horticulture	19	10
Increase Stock	11	6
Nursery Extension) Plant More Trees)	12	7
Cropping	6	3
No Response	80	44

2. What crops and areas would you expect from these developments?

	Area (ha)	Responses %
Lucerne)		5
Berries)	520	2
Cropping)		2
Asparagus) Horticulture	175	3
No Response		80
		n = 178

Source: Study Team Survey

on the Dunstan Flats. The timing of costs and benefits is then balanced, without creation of a large block of surplus or unused capacity in the irrigation water supply system.(1)

PART 4 FUTURE IRRIGATION

The future of irrigation in the Manuherikia Valley, and the choice of an appropriate option is intimately bound up with the present use of water, which has been described, and with future intentions for water use. As has been shown, less than half of the farmers in the region believe that their land is fully developed and more than half believe that it is not, some stating so emphatically. This is particularly true in the Lower Valley where perceptions of the likely value of horticulture clearly colour attitudes towards the potential for development.

(1) The Alexandra office of the Ministry of Agriculture & Fisheries is currently undertaking a technical assessment of the potential for horticultural development in the lower Manuherikia. The results of this study should be available in early September 1983.

4.1 Perceptions and Attitudes

Beliefs about the reliability of water are also important, and strong reservations about reliability were widespread, and were not confined to any particular scheme. As has been noted, events following the conduction of the Study Survey, notably a failure of the Manuherikia Race at the head of the Lower Valley region, have not only confirmed the validity of the doubts expressed, but they can only have added to concerns for security in the future. When farmers were asked about the constraints that were holding their land back from full development, they were able to identify finance and water as the dominant, and sometimes the only, real constraining issues.

Allied with these concerns is a perception of the role of water in farm management. As has been clear throughout preceding discussion, and as will be emphasised in subsequent sections, irrigation is unlikely to be justifiable in the future in economic terms unless greater aggregate returns can be achieved, given the present costs of construction works. It is therefore imperative that water be used as an integrated part of a development plan for management of the farm at a higher level of efficiency, notably through the production of new commodities, and not simply as dry weather insurance for present practices. Clearly, the opportunities for development vary throughout the valley, both in terms of perception and of physical limitations, but it is equally clear that rational and attainable objectives for future water use must be held if major capital investment is to go ahead. If such objectives have not yet been thought through, then it is essential that the likelihood of their development and implementation should be assessed.

Thus, the Study Survey asked for information relating to attitudes towards the role of water, details of specific development places and perceptions of the consequences of various future courses of action with reference to water availability and price and with respect to the social and economic environments.

Attitudes towards the future use of water were tested initially by asking farmers to indicate the statement which they thought expressed the best use of water. Four statements were offered in the questionnaire, which covered a range of possible water uses, and which were related to various levels of development. They were:

.. As a safeguard against drought.

This perception fitted the belief that water was simply there in case of need.

.. As a means of increasing yields in present land uses.

This is a more positive and development oriented proposition which sees reliable water as a means of increasing farm productivity.

.. As a means of increasing the carrying capacity of hill country.

Here, it is recognised that a major constraint to increasing upland productivity is the bottleneck imposed by availability of lowland fodder acreages and winter grazing areas. This, of course, only applies to some units.

.. As a means of diversifying the farm into new land uses.

This is the most forward looking statement, and it is one that is associated with the best hope for future irrigation viability, given the present condition of pastoral product markets, and the perceived opportunities in diversification. The views expressed are set out in

Table 4.1.1.

Table 4.1.1

THE BEST USE OF WATER

Statement	Total*		Upper Valley		Middle Valley		Lower Valley	
1	50	28%	6	27%	24	53%	20	16%
2	70	39%	11	50%	18	40%	39	33%
3	9	5%	3	14%	3	7%	2	2%
4	44	25%	5	22%	12	27%	27	23%
na/nr	28	15%	-	-	2	4%	26	23%
							n = 178	

Source: Study Survey

Key: 1 : As a safeguard against drought
2 : As a means of increasing yields in present land uses
3 : As a means of increasing the carrying capacity of hill country
4 : As a means of diversifying the farm into new land uses

* May sum to more than 100%

As can be seen from the above Table, increasing existing yields is perceived as the primary best use of water. Drought insurance and diversification are effectively second equal, and hill country expansion is, only a minor aim. There was a 12% 'no response' rate, while the section was not applicable to 3%, who answered a separate set of questions geared towards non-irrigators. The no response fraction clusters in the Lower Valley, and inspection of returns shows that there were small holders who were not, perhaps, as committed to development, mainly because farming was secondary to their main employment. However, since these also cluster in the major area of orcharding potential, their relative disinterest becomes an important planning issue.

In the Upper Valley yield increases were seen as the main aim, but drought insurance and diversification were close to overall values, while hill country development was relatively important, and was probably seen as a consequence of other statements in any case. Drought insurance, coupled with yield increase was the primary pattern in the Middle Valley, but diversification was important too. This pattern very much reflects the perception that this region is very well developed in any case. In the Lower Valley, drought insurance was very much a minor concern and hill country issues almost non-existent. Among those who responded, increasing yields, especially for horticulturalists, and diversifying, for those who were pastoralists, were seen as major issues. In sum, therefore, it may be suggested that extensions of existing farm systems are important in the Upper Valley, maintenance of what are perceived as already efficient units predominates in the middle region, and emphatic imperatives towards development contrast with an apparent apathy in the horticultural area. This is a pattern that closely reflects perceptions of levels of development.

4.2 Planned Developments

Present irrigators and those who might become irrigators in the future were asked for specific details of their future plans. These range from carefully worked out and budgetted development plans to quite cursory intentions, or even none at all. Since completed returns were collected from non-irrigators, the total of irrigators could be no more than 172, out of the sample of 178 valid returns.

However, 'irrigator' is an expression that covers many levels of development on many sizes of unit. As has already been noted there are a number of Lower Valley residents who purport to practice irrigation on quite small holdings. This may well include 'watering the garden' to all intents and purposes, or digging a hole in the dyke or inserting a canvas dam and wild-flooding a small area. If these small units were to be found in districts where pastoral uses were the only feasible ones, then their returns would be inconsequential. If, however, as is the case, their land is initial to a development strategy in this case enhanced horticulture, then their plans and attitudes, or lack of them, become a vital part of decision-making concerns. It is for this reason that such units are considered in this study, and may ultimately have to be the subject of a further specific analysis.

A total of 54 farmers had no plans for future development that they were prepared to reveal, while a further 16 had plans of the most rudimentary kind. The pattern of their distribution is set out in Table 4.2.1.

Table 4.2.1

REGIONAL DISTRIBUTION OF PLANNED DEVELOPMENTS

	Upper Valley		Middle Valley		Lower Valley		Total	
No plans	3	15%	12	27%	39	34%	54	30%
Rudimentary plans	1	5%	5	11%	10	7%	16	9%
Developed plans	13	65%	26	59%	63	55%	102	57%
Non-irrigators	3	15%	1	2%	2	2%	6	4%
						n = 178		

Source: Study Survey

Thirty percent of farmers who were presently irrigators had no plans, or were prepared to offer none, and 9% had virtually none. Plans were well developed in the Upper Valley; only four respondents failed to detail theirs. In the Middle Valley, 17 (38%) of respondents had none or few and only 59% had them. In the Lower Valley the rate of non-response is even greater; 49 (41%) were unprepared, and only 63 (55%) were. Clearly, this is a situation that cannot be allowed to stand without analysis and explanation.

Given the earlier material discussed, it seems possible that some units are too small to warrant a careful development plan, especially if farming is a minor pastime. To see if there is an association in this context,

Table 4.2.2 compares plan deficiency with unit size for each region.

Table 4.2.2

DEFICIENCY OF PLANS BY SIZE OF HOLDING

	Total	No. with < 1 ha irrigated	No. with < 5 ha (< 10)
Upper Valley			
No plans	3	0	0 (1)
Few plans	1	0	0 (0)
Middle Valley			
No plans	12	0	0 (1)
Few plans	5	0	0 (0)
Lower Valley			
No plans	39	10 (26%)	24 62% (34 87%)
Few plans	10	9 (90%)	10 100% (10 100%)
			n = 70

Source: Study Survey

This table clearly demonstrates that, while there is a strong association between small units and lack of plans, all of the units that specified minimal irrigation were categorised by lack of plan, also. This however is only where small units proliferate, and thus applies only to the Lower Valley, where 44 of the 49 plan-less units were less than 10 ha., and 34 were less than 5 ha. Elsewhere, there is no association at all, and some other solution must be found. In the Middle Valley, especially, economic full-time units characterise those who did not respond.

Possible explanations lie with the belief that a farm is already fully developed, or with satisficer behaviour, which suggests that when some farmers have done enough to be satisfied with results they will not seek to optimise but will be content with what they have.

Analysis of individual returns revealed that there were certain similarities among this group, and these are set out in Table 4.2.3.

Table 4.2.3

CHARACTER OF LARGER UNITS WITH NO OR FEW PLANS

Farm Type		Irrigation		Reliability		Capacity	
Pastoral/Supp. feed	13	100%	4	Reliable	13	Def	7
Pastoral	4	>75%	8	Unreliable	6	Prob.	4
		>50%	13			Prob. not	5
						Def. not	3
						n = 19	

Source: Study Survey

Almost all of these units are in the Middle Valley, most are simply freehold properties, but one is solely Crown Lease with only 1% of its area irrigated. Sizes vary from 138 ha to nearly 4,000 ha., but most are either around 200 ha. or 700 ha. All are pastoral and most have supplementary feed, and, as well, the majority have most of their land already under irrigation. It seems probable that no further irrigation is realistically possible on many of these farms. Two-thirds find their water supply at least usually reliable and nearly as many regard their land as probably developed. There was a tendency for those with a relatively low level of irrigation to regard their land as not developed to capacity, and these seem to be a critical group.

While fully developed farms, 11 in all, could not reasonably be expected to have established development plans, those that were not, some 8 altogether, might have developed them and some further explanation has to be sought. On a questionnaire by questionnaire basis, it was found that one was quite elderly and had allowed his farm to depart a little from a high optimum position, and he had agreed that every possible constraint was inhibiting him from attaining full capacity. Another farm was an all Crown Leasehold unit referred to above, and a third was wholly privately leased. In neither case could formal development plans reasonably be expected. In the other cases doubts about economic viability were usually written in and finance and markets were indicated, emphatically in one case, as constraints. Two of these also commented that they were not prepared to offer plans without a specific scheme to relate to.

In summary, it can be seen that non-respondents fall into three categories:

- Those with very small, part-time units.
- Those that are already fully developed.
- A small group who either leased their land, had grave doubts about the economics of development, or who had reservations about revealing firm plans in a generalised context.

Thus while an initial appearance suggests that there is a very high no-response rate, this is quite explicable, and, in the circumstances it is reasonable that 'no response' should be read as a logical 'none', as, indeed was written in in a few cases. Given the somewhat tense and disturbed circumstances of the time at which the survey was undertaken, the response is, in fact, eminently satisfactory.

Specific on-farm developments, in terms of crops and facilities are set out for the whole study area in Table 4.2.4.

At least one development strategy was mentioned by 110 (64%), a second option was listed by 28 (16%) and a third by 7 (4%). While a range of options, sixteen in all, were listed, 45 were associated specifically with horticulture representing 41% of plans and 31 were specifically pastoral, 28% of plans. Other options, such as 'extend and improve' related to horticultural units in a ratio of one to two, thus emphasising the role of horticulture.

As this is so, there is clearly a regional component to the pattern and this is set out in Table 4.2.5.

Table 4.2.4

SPECIFIC ON-FARM DEVELOPMENTS: STUDY AREA

		%
Horticulture	25	15
'Extend and Improve'	38	22
Extend tree crops	16	9
Grow Lucerne	10	5
Low pressure spray	2	1
'Increase production'	5	2
'Increase stock'	13	8
Stone & pip fruit	4	2
Subdivide and fence	4	2
Deer	3	2
'Develop'	1	1
General Cropping	7	4
Frost control	1	1
Other (1)	3	2
No response (2)	68	39
	n = 172 (3)	

Source: Study Survey

(1) Dairying, land purchase, stud breeding

(2) Compares with 70 'no-plan' responses

(3) Excludes 6 'non-irrigators'

Table 4.2.5

PLANNED DEVELOPMENTS : BY AREA AND WHOLE SAMPLE

	Upper Valley n = 18		Middle Valley n = 43		Lower Valley n = 111		Whole Sample n = 172	
1 Horticulture	-	-	1	2	24	22	25	15
2 Extend/Improve Irrigation	8	44	18	42	12	11	38	22
3 Extend tree crops; plant more trees	1	6	-		15	14	16	9
4 Lucerne; fine grass	1	6	2	4	7	6	10	5
5 Low	-		1	2	1	1	2	1
6 Increase production	1	6	-	-	4	4	5	2
7 Increase stock	2	12	5	12	6	5	13	8
8 Stone/pip fruit	-		-	-	4	4	4	2
9 Subdivide/fence	1	6	2	4	-	-	3	2
10 Stud stock	1	6	-	-	-	-	1	1
11 Deer	-		1	2	2	2	3	2
12 Acquire more land	-		-	-	1	1	1	1
13 General development	-		-	-	1	1	1	1
14 Cropping	-		2	4	5	5	7	4
15 Frost control	-		-	-	1	1	1	1
16 Dairying	-		-	-	1	1	1	1
General Horticulture (1, 3, 8)	-		1	2	43	39	45	26
General Pastoral (4, 7, 9)	4	22	9	21	13	12	26	14
NR	7	39	15	36	47	42	68	39

Source: Study Survey

n = 172

In the Upper Valley, planned developments seemed mainly to support the general feeling of 'more of the same'. Development potential is clearly there, and is seen to be there, but it is perceived as lying in the extension of present activities, and it will be remembered that water's role in the development of the hill country was most prominently perceived in this region. All of the suggested improvements had to do with pastoral extension, either through the specific mention of stock increases or through support, such as lucerne growing and pasture improvement. By far the largest development was simply the extension and improvement of irrigation methods so that existing pastoral growth could be extended.

Middle Valley: Most planned developments, as in the Upper Valley had to do with the expansion of existing irrigation systems and existing farm management systems, although deer, cropping and horticulture were mentioned as possible plans.

Lower Valley: Planned developments here were much more specifically expressed, with a far lower percentage opting for 'more of the same' than was the case elsewhere. The 'no response' rate was marginally higher than elsewhere, but given that many small units are to be found, the proportion of larger units to respond is quite high.

Specific horticultural schemes are the most frequently mentioned plans, with 39% of responses listing horticultural extension of one sort or another. Pastoral plans are far less common, and, although numerically greater than in the rest of the valley, as a percentage, they are far lower than elsewhere. Other schemes include mention of deer, cropping and dairying.

In summary, there is a marked difference between planned developments in the Lower Valley and elsewhere. Horticulture and orcharding are planned both as extensions and as new ventures. Elsewhere, given that horticulture, in the form of stone and pip fruit especially, is not viable, plans are firmly based upon traditional agricultural systems. Thus, given the wider opportunities in the Lower Valley, much more innovative schemes are listed.

When asked whether they would carry out such developments by themselves or in a form of partnership, almost all expected to do so themselves, with one opting to sell out to permit development, and several others mentioning the need to engage more staff, a point dealt with more fully below.

A diverse range of application systems were mentioned. Sprinklers and spray systems were most popular, but flooding was also considered. The options listed are set out in Table 4.2.6.

Here, the contrast is between flooding in the pastoral areas, associated with border-dyking and sprays, with most people having a specific system in mind, and with the Lower Valley where sprinklers and other overhead systems predominate and where 14 out of 63 have not yet selected a method.

The amount of time that such developments might take was generally quite short. Forty (40%) thought that 1-3 years was probable, while 66 (65%) expected 1-5 years and all but two expected completion within 10 years. Some 24, about a quarter, however, were not sure of the time required and could make no estimate.

Table 4.2.6

PREFERRED APPLICATION SYSTEMS

	Total		Upper Valley		Middle Valley		Lower Valley	
Sprinkler systems	24	24%	-		1	4%	23	37%
Border-dyking	19	19%	2	15%	7	28%	10	16%
Wild flood	15	15%	4	30%	11	45%	-	-
Spray	10	10%	3	23%	3	12%	4	6%
Overhead systems	8	8%	-		1	4%	7	-
Bore	1	-	-		-		1	-
Other[1]	5	5%	-		1	4%	4	6%
Not known	20	19%	4	30%	2	8%	14	22%

n = 102[2]

Source: Study Survey

(1) Boom 'Big Gun', Trickle

(2) Excludes 70 no/low plan responses, 6 non-irrigators

The price of reliable water is clearly a most important factor in any future proposal, and farmers were asked to estimate at what point their proposed developments would become non-viable. This was done in multiples of existing price levels at that time. These are set out for the whole area and by regions in Table 4.2.7.

Table 4.2.7

WATER COST AT WHICH DEVELOPMENTS WOULD BECOME NON-VIABLE

	Total		Upper Valley		Middle Valley		Lower Valley	
50% more	33	33%	3	23%	13	50%	17	27%
100% more	33	33%	5	38%	7	27%	21	33%
200% more	17	17%	1	8%	5	19%	11	17%
300% more	6	5%	-	-	-	-	6	10%
more than 300%	2	2%	-	-	-	-	2	3%
Unknown	11	11%	4	31%	1	4%	6	10%

n = 102

Source: Study Survey

The Middle Valley seems least able, by its own assessment, to stand more than a 50% increase which half thought would be prohibitive, while 77% felt that a 100% rise would render their plans unviable. Only one person was unable to make an estimate. Except for a much higher level of uncertainty, the Upper Valley returned much the same perceptions. In the Lower Valley orcahrding plans and perceived high profitability meant that, while 60% were unhappy with 100% or less as a rise, 30% felt that they could go above this, and two even felt that a 500% rise could be borne. This table thus indicates a willingness, albeit slight, on the part of orchardists to bear relatively high charges for reliable water. As is consistent with their other conservative attitudes, pastoral farmers are not prepared to acknowledge an ability to do this at all.

4.3 Consequences of Planned Developments

The consequences of planned developments, should it become possible to realise them, were also requested for a number of key areas. The first of these had to do with expected increases in overall farm income, and anticipated percentage increases are set out in Table 4.3.1.

Table 4.3.1

ANTICIPATED INCOME INCREASES CONSEQUENT UPON DEVELOPMENT

% Increase	Totals	Upper Valley	Middle Valley	Lower Valley
0 - 10	4	-	3	1
11 - 20	10	2	5	3
21 - 30	7	3	1	3
31 - 40	5	1	1	3
41 - 50	5	-	-	5
51 - 100	9	-	1	8
150	2	-	1	1
200	8	1	2	5
300	4	1	1	2
Unknown	48	5	11	32
				n = 102

Source: Study Survey

It is obvious that this is an area of some considerable uncertainty, with almost half of the total of the respondents unable to give a figure or declining to do so. This was notably the case in the Lower Valley, the only area, also, where more than half of those who quoted a figure expected 100% increases or more, although such figures were mentioned, to a degree, in the other areas as well. Both horticulture and the extensive expansion of large pastoral runs are expected to generate substantial increases, whereas returns from modest expansions of already reasonably developed pastoral

units are expected also to be modest.

A second major area of interest is the extent to which farm labour might be required. Table 4.3.2 lists expected man power requirements, both full-time and part-time.

Table 4.3.2

ANTICIPATED INCREASES IN MANPOWER REQUIREMENTS

Nos. Required	Totals	Upper Valley	Middle Valley	Lower Valley
Full-time				
1	18	6	4	8
2	9	-	3	6
3	3	1	1	1
4	2	-	1	1
Totals	53	9	17	27
Part-time				
1	16	4	5	7
2	9	1	1	7
3	-	-	-	-
4	3	-	-	3
5	3	-	1	2
6	2	-	-	2
12	1	-	-	1
15	2	-	-	2
'many'	4	1	-	2
Totals(1)	115			

n = 102

Source: Study Survey

(1) 'many' is excluded from this calculation

Specific planned requirements were for 53 full-time and 115 part-time staff, together with an undisclosed number under the category of 'many'. There was a very heavy concentration of demand in the Lower Valley, especially for part-time pickers and packers.

Almost everyone expected that their needs could be met by local people, but it is most unlikely that aggregate demand could be met in this way. This is evident when it is noted that demand is around Alexandra which, though it may be the largest centre of population, is likely to be subject to labour demand from other orcharding areas such as the Earnscleugh scheme as well as other industries such as tourism, whose requirements for part-time staff will all coincide. It is later estimated (Section 4.3) that each new job would have a multiplier impact of at least 1.0 and possibly as

high as 2.0. The implication is thus that, if estimates of full-time requirements are at all realistic, then a hundred or so new jobs are predicted, at the very least. These would be mainly within the Middle and Lower Valley. Their impact in places such as Omakau would be substantial, especially if dependent households are considered.

Of particular interest to business, and local contracting interests in particular, are the responses to questions requesting expected levels of investment and outlay to be detailed. Table 4.3.3 sets out the sums listed for each category and each region.

Table 4.3.3

EXPECTED EXPENDITURE PER INVESTMENT CATEGORY ($000s)

	Total	Upper Valley	Middle Valley	Lower Valley
Housing	466	-	270	196
Farm Buildings	393	31	168	194
Fertilizer	178	32	80	66
Machinery	687	70	350	267
Subdivision	136	20	98	18
Other(unspecified)	167	-	65	102
Totals	2,027	153	1,031	843

n = 102

Source: Study Survey

A total of about $2,000,000 was specified for all investments in capital over all areas. Most of this was in the Middle and Lower Valley, with relatively minor investments being specified in the Upper Valley area. The largest sums were recorded for the Middle area, with over half of the total ascribed to that district. Notable categories include machinery and equipment, housing and buildings, and the same was true for the Lower Valley, except that here diverse miscellaneous costs were relatively more important than elsewhere, presumably as a result of the specific requirements of horticulture. Cattle yards and sheep pens were the main item in this category elsewhere.

Farmers were also specifically asked if there were any other on-farm facilities that they thought they might acquire. These are summarised in Table 4.3.4 as are the off-farm facilities that it was thought might be required.

The table is largely self-explanatory. It is noteworthy that only in the Lower Valley are on-farm developments important, especially fruit irrigating and packing/storage plant. Among the off-farm services, better carrier facilities are requested, and, even excluding those who requested water, somewhat tongue in cheek, the Middle Valley sees its service demand as being off-farm, while the Lower Valley sees off farm development as just

as important as new on-farm facilities. If these were viable demands, then Omakau in particular could well benefit.

Table 4.3.4

EXPECTED NEW ON- AND OFF-FARM FACILITIES

On-farm	Upper Valley	Middle Valley	Lower Valley
Fruit cooler			3
Packing Shed	1		3
New implements	1		1
Overhead sprinklers/sprays	1		7
Machinery			1
More electricity		1	
Bridging			1
Improved race	1		
Storage dam			1
Vehicles			1
Tractor			1
Haybarn			1
Tree Shelter			1
Off-farm			
More contractors	1	1	2
Carriers (inc. rail)	2	3	9
Factory			1
Irrigation works		1	1
Abattoir/Freezer		1	1
Grain dryer/dresser		2	1
Horticultural services		1	2
Advisory services			1
Labour		2	
Water	1	1	1
Markets			2
Fruit storage			1
Machinery services		1	1

n = 102

Source: Study Survey

Finally, total costs and means of financing were asked for, and these are set out by region in Tables 4.3.5 and 4.3.6.

While a substantial number, 36%, were unable or unwilling to suggest a total cost for the plans which they had in mind, a clear pattern emerges from those who did. Schemes for the Upper and Middle Valley are generally more expensive than those in the Lower. Indeed, the expected total cost is highest for the Middle region, as was the case for on-farm investment. The aggregate for the Lower region is nearly as high, but is concentrated

in a larger number of relatively inexpensive plans, with the majority costing less than $25,000.

Table 4.3.5

EXPECTED TOTAL COSTS OF PLANNED DEVELOPMENTS ($000s)

	Upper Valley	Middle Valley	Lower Valley	
10 or less	1	3	11	
11 - 25	-	1	11	
26 - 50	4	4	9	
51 - 100	1	8	7	
101 - 150	2	1	-	
151 - 200	1	-	1	
more than	-	3	1	
maximum	200	500	400	
minimum	5	4	3	
Total	725	2,120	1,822	Total = 4,667
n.r.	4	10	23	
			n = 102	

Source: Study Survey

Table 4.3.6

INTENTIONS REGARDING PLAN FINANCE

	Upper Valley	Middle Valley	Lower Valley
Bank Loan	10	13	35
Income	2	7	12
Overdraft			2
Partnership			1
Higher Prices		1	1
Government Subsidy			2
n.r.	1	9	10
			n = 102

Source: Study Survey

There is little of note in this data. The 20% or so who did not respond have sometimes indicated that a choice cannot be made until the process is about to start. The others expected to be able to raise Bank Loans in the main, while significant numbers, especially in the Middle Region, expected to be able to finance their projects out of income.

Virtually no other options were considered, and even partnership was only mentioned once.

4.3.1 Non-irrigators

There are few properties anywhere in the Manuherikia Valley that have no access to irrigation at all, but there are many properties where existing irrigation could be both expanded and intensified. Because there are very few non-irrigators in any case, only six were contacted in the survey, and gave useful returns. Of these, only two were large landowners, in the upper part of the valley; the remaining four were smaller properties close to Alexandra, which were not receiving water at the present time. If they were to, then a total of 22 hectares could be irrigated, but, in common with many of the small units in the vicinity of town, the owners had only hazy intentions for the future, and it was clear that they had not seriously planned for the future. Their intentions tended towards minor horticultural production and 'hobby-farm' sheep feed.

Of the large landholders, one would expect to develop 350 hectares for pastoral development and the other 500 hectares for similar purposes. Both intended growing significant quantities of cereal crops although they clearly expected to put the bulk of their efforts into sheep production. They were planning on 3500-4000 and 2250 stock units respectively. Only one of the large landholders appears to be the subject of a potential development, and that would have to be a full valley scheme. The other would not benefit even from the most extensive option.

Since the sample frame was designed so that the widest possible number of farmers could be contacted, it is clear that there are very few people who would be brought in as wholly new irrigators under any realistic development, and it is clear that irrigation issues in the valley are primarily concerned with the maintenance of supply to existing irrigators and the provision of sufficient guaranteed water for those who are as yet undeveloped to be able to expand their production or diversify into new areas such as orcharding, or other forms of horticulture.

PART 5 ECONOMIC IMPLICATIONS

In this section the economic implications of each of the irrigation alternatives are identified. They are dsicussed under the headings of farm returns, farm numbers, on-farm employment, off-farm employment, local and regional area trading.

5.1 Farm Returns

Indicative comparative stocking rates by irrigation status are summarised in Table 5.1.1, and show that full irrigation will result in nearly a four-fold increase in stock carrying capacity. This does not reflect the full advantages of irrigation, however, since unit stock production levels increase - lambing, wool weights and drafting weights. In horticulture, particularly in stone fruits, Central Otago has a comparative market advantage because of its late season and there is expected expansion in apricots, peaches and nectarines. Intensive orchard developments are

labour intensive both in terms of on-farm and off-farm labout demand, but are only possible with the advent of irrigation.

Table 5.1.1

STOCK RATES : PASTORAL FARMS

District	Dryland	Full	Limited	Occasional[1]
			su/ha	
Downs	4.2	16.0	14.0	10.0
Blackstone	4.2	16.0	14.0	10.0
Becks	4.2	16.0	14.0	9.5
Drybread	4.0	16.0	13.0	9.5
Matakanui	3.6	15.0	12.0	8.5
Motuere	3.0	14.0	11.0	8.0
Springvale	3.0	14.0	9.0	8.0
Strathmore	2.5	12.0	10.0	5.0
Dunstan	2.5	12.0	9.0	5.0

Source: Ashworth-Morrison Cooper, 1983, Appendix 5

(1) In wet years, additional water is available to irrigate land over and above that supplied in dry or average years

The impact of various development alternatives in terms of gross farm income is summarised in Table 5.1.2. Under current land utilisation, pastoral production for the commanded area of 19,580 km is estimated to generate around $6 million, or nearly double that which would result if the Manuherikia and Omakau Schemes were inoperable. Expansion of pastoral irrigation as in Alternatives 5 and 6 would increase gross farm income to an estimated annual $7.3 million and $8.5 million respectively.

It is very difficult to accurately assess the gross earnings from horticulture, since production levels and product quality vary markedly from orchard to orchard. For indicative purposes, however, the data in Table 5.1.2 show that at current levels, horticulture contributes around one-third of the gross farm income from pastoral farms, but if horticulture does develop over 1200 ha, this land use will dominate in terms of gross income generation.

5.2 Farm Numbers

It is clear, both from the survey responses and discussions with officers of the Ministry of Agriculture Fisheries that any severe curtailment of the existing level of supply from the Manuherikia and Omakau Schemes, particularly from the latter, will have a dramatic effect on gross and net farm incomes and on the economic size of farm units. For comparative purposes, if the minimum flock size for an economic unit is taken as 2000 su this represents a minimum of 400-500 ha under dryland farming, or

Table 5.1.2

GROSS FARM INCOME UNDER PROPOSED DEVELOPMENT ALTERNATIVES

Alternative	1 (Dryland)	2	3	4	5	6
Pastoral Stock carried (su)						
Irrigated	38,110	156,160	156,160	139,510	201,510	240,710
Dryland	61,330	26,300	26,300	30,325	12,705	5,465
Total	99,440	182,460	182,460	169,835	214,215	246,175
Gross Income ($'000) (1)	3,206	6,098	6,098	5,723	7,292	8,461
Change in gross income relative to status quo ($'000)	-2,892	..	..	-375	+1,194	+2,363
Horticulture Area in Horticulture (2)	..	200	200	1,200	1,200	1,200
Gross Income ($'000) (3)	..	1,100	1,940	16,240	16,240	16,240

(1) Based on a gross income (1982 prices) of $32.15 - $34.75/su on irrigated pasture and $31.75/su on dryland. See Ashworth-Morrison Cooper, 1983 Appendix 7 - 8. Total pastoral gross income from 87,673 ha estimated at $8.7 million under Alternative 1.

(2) Assumes no alternative water supply, either from groundwater or river pumping, will be utilised in the event of closure of the Manuherikia and Omakau Schemes.

(3) Based on a gross of $9700/ha for existing horticulture and $14300/ha for new development - see Ashworth-Morrison Cooper, 1983. This assumes that the areas noted are in full production.

around 150 ha under irrigation. The farms "at risk" are therefore those pastoral units with areas of between 100-500 ha.

Data on farm numbers by size collated from the Study Team Survey are shown in Table 5.2.1. There are 37 units with areas between 100-500 ha and this corresponds with the survey responses on the impact of scheme closure. Thirty-nine respondents commented that this would result in uneconomic units (see Table 5.2.2).

Table 5.2.1

FARM NUMBERS BY FARM SIZE

Farm Size	Number
Less than 100 ha	79
100 - 399 ha	29
400 - 500 ha	8
Over 500 ha	27
Total	143

Source: Study Team Survey, May 1983

Table 5.2.2

TABULATED RESPONSES

'If it became necessary for the irrigation system that supplies you to be wound down, what general aspects of your farm system would have to change?'

Response	All Respondents	Lower Valley	Middle Valley	Upper Valley
Reduce stock/crop	46	13	28	5
Inability to produce	15	15	-	-
Bankruptcy, sell out	15	13	2	-
Uneconomic	7	4	1	2
Move	2	-	2	-
No development, no change	6	4	2	-
No lucerne/grass/crops/fruit	6	4	-	-
Shall bore/increase use of bore	4	4	-	-
Total respondents	184	103	57	24

Source: Study Team Survey, May 1983

In total, therefore, it seems likely that should the Manuherikia and Omakau Schemes be phased out some 35 - 40 farms would be "at risk" and may be amalgamated into larger units.

5.3 On-Farm Employment

The various irrigation development alternatives proposed will generate significant changes in land use, and the intensity of land use. These

changes will have a marked impact on the levels of on-farm employment, and the spatial distribution of demand for employment in the valley.

In general, the relativities between pastoral and horticultural labour demands are as shown in Table 5.3.1.

Table 5.3.1

PASTORAL AND HORTICULTURE LABOUR DEMAND

Land Use	Labour Demand - On Farm	
Horticulture - Intensive Orcharding	5 person/1 ha	2 ha/person
Pastoral - Intensive irrigation (16 su/ha)	1 person/2500 su	160 ha/person
Pastoral - Extensive dryland (4.2 su/ha)	1 person/2500 su	600 ha/person

Horticultural land use, particularly orcharding, is 80 times more labour intensive than irrigated pastoral systems. In turn, irrigated stock systems have 3.5 - 4.0 times the demand for labour per unit of land area than dryland systems. The overall impact of any change in land use therefore depands primarily on the extent of horticultural development, and then on the relative development of irrigation on pastoral farming systems

Aggregate data for the four irrigation alterantives are present in Table 5.3.2. The conclusions from the analysis are:

.. The major stimulus to employment comes from irrigation development for horticulture in the Lower Valley.

.. Alternatives 2, 3 and 4 are roughly comparable, in terms of their employment implications on pastoral farming systems.

.. Alternatives 5 and 6 generate a demand for additional labour in pastoral systems, in the order of 13 - 25 full-time equivalent positions.

.. Under a "dryland" scenario, employment demand drops by 33 positions from the current status quo on pastoral farms - this corresponds approximately with the predicted drop in farm numbers of 35 - 40.

Table 5.3.2

EMPLOYMENT[1] IMPACTS OF DEVELOPMENT ALTERNATIVES

Alternative	1 (Dryland)	2/3	4	5	6
Pastoral Farms					
Stock carried (su)	99,440	182,460	169,835	214,215	246,175
Change in stock nos relative to status quo	-83,020	..	-12,625	+31,755	+63,715
Employment implications	-33	..	-5	+13	+25
Change in stock nos relative to dryland	..	+83,020	+70,395	+114,775	+146,735
Employment implications	..	+33	+28	+46	+59
Horticultural Land Use (ha)	..	200	1,200	1,200	1,200
Change in land use relative to status quo	-200	..	+1,000	+1,000	+1,000
Employment implications	-100	..	+500	+500	+500
Change in land use relative to dryland	..	+200	+1,200	+1,200	+1,200
Employment implications	..	+100	+600	+600	+600
Aggregate Employment Implications					
Relative to status quo	-133	..	+495	+513	+525
Relative to dryland	..	+133	+628	+646	+659

(1) Based on average employment demands of 1 person/2500 su pastoral farming systems and 120 days/ha or 0.5 persons/ha for intensive orcharding systems.

5.4 Off-Farm employment

Increased farm output levels due to irrigation development create additional demand for goods and services from firms which both supply inputs to farms and/or handle farm output, with associated multiplier effects. This is termed the indirect effect. Furthermore, higher turnover levels and additional employment increase aggregated disposable income, which increases consumption expenditures with further concomitant multiplier effects. This is termed the induced impact.

Two recent studies suggest total employment multipliers for irrigated agriculture in North Otago and Canterbury of around 2.0 at the regional (statistical area) level - see Hubbard and Brown (1979) and Leathers, Sharp and Brown (1983). In other words, for every on-farm job created, one additional off-farm job is supported within the local region. Given the smaller regional definition in the Manuherikia Study and the fact that

leakages are high,[1] the employment multiplier from irrigated agriculture would be expected to be less than the figure of 2.0 noted above. On this basis the induced or consumption expenditure job impact of employment in agriculture is estimated at 0.4 off-farm : 1.0 on-farm for the Otago Statistical Division (see Hubbard and Brown, 1981). The range given includes some allowances for indirect job impacts, locally based (mainly in fruit storage and transport).

As noted in Section 1.4, Alexandra is the main focus for farm purchases and consumption expenditures, but given that the town is in an expansionary phase associated with the developments of Clyde, it is unlikely that closure of the Manuherikia Valley Irrigation Scheme would result directly in any redundancies. On the other hand, redevelopment of the scheme and expansion to service 1200 ha of horticulture would, if it eventuated, have a marked effect on the town. It has been suggested that around 300 permanent locally based on-farm jobs would be associated with such a development, and the consumption expenditure of these people could be expected to support a further 100-120 jobs in the local community.

5.5 Local and Regional Trading

5.5.1 Introduction

A survey of business establishments was conducted in the Manuherikia Valley. This section includes a copy of the questionnaire[2] followed by an analysis of the response.

From the Study Team Survey it was apparent that individual business firms in Alexandra or Ranfurly were not markedly dependent on the farm income generated from irrigation in the Manuherikia Valley. The only firms in these two locations to make the connection were the stock and station agents and this was more in relation to the turnover of their branch offices within the valley

5.5.2 Analysis

Location and type of Business - The highest percentage (39%) of businesses were located in Omakau. Substantial numbers were also located in Alexandra (21%), Ranfurly (14%) and Lauder (11%). Wedderburn, Oturehua and Becks were represented to a minor degree.

The most widely represented type of businesses were garages/vehicle dealers, which accounted for 18% of the total businesses. Stock and station agents, builders/builders' supplies and agricultural contractors each accounted for 14% of the total. Retail establishments, hotel/taverns, machinery sales and service, transport companies and firms involved in irrigation ditching or trenching were also represented but in smaller proportions.

Virtually all of the businesses had at least one establishment in

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(1) A significant proportion of goods and services are purchased from outside the region.

(2) Attached in Appendix

the region, one firm which was a shearing contractor was located out of the region but performed work on farms within the region and was the only one not located there. Twenty-nine percent had two establishments within the region, with the most common second establishment location mentioned being Omakau. Eleven percent of the enterprises had a third establishment located within the region.

Manuherikia Valley enterprises had been operated under their present ownerships for a period of time ranging from one to 120 years. Thirty-nine percent of the businesses had been operating for five years or less under the same ownership and 64% had been operating for 25 years or less. Eleven percent of the firms did not respond to the question.

Enterprises had been operating for a range of five to 120 years at the same location(s). Responses were spread fairly evenly over the range and evidently a number of the business owners did not recall the time period, as 21% of those queried did not respond.

Employment - When the number of working proprietors and salaries paid during the year were examined, thirty-nine percent of the businesses stated only one proprietor was involved in the enterprise, 31% had two proprietors, 4% had three proprietors and 25% of those queried did not respond, and eighty-two percent of those interviewed did not give the amount in salaries paid to the working proprietor(s). The responses that were given ranged from $14,000 to $30,000 per annum.

Full-time employees were considered to be those who worked for more than 30 hrs/week. The number of full-time employees varied considerably and ranged from zero to 28. Thirty-two percent of the firms did not employ any full-time staff. Eleven percent of the enterprises employed one full-time employee and thirty-nine percent employed between one and five full-time employees. Forty-six percent of the firms had no full-time employee wages to pay or did not respond to the question. Of those firms that did respond, wages and salaries paid ranged from $11,000 to approximately $500,000 per annum. Twenty-nine percent of the businesses paid wages or salaries between $11,000 to $40,000 per year.

Part-time employees, were those who worked for less than 30 hrs/week, and on that basis, sixty-eight percent of the enterprises did not hire part-time staff, 29% hired one part-time employee and 4% (i.e. one respondent) hired 86 part-time employees. Eight-nine percent of the firms had no part-time employee wages to pay or did not respond to the question. The enterprises that did respond, paid between $1,000 and $5,000 in part-time wages annually.

Most of the enterprises' staff resided locally in Omakau, Alexandra Ranfurly or Lauder, depending on the location of the firm.

Total Value of Sales and Income during the 1982/83 Accounting Year - Forty-six percent of the enterprises responded to a question concerning the annual value of their sales and income. For 1982/83 these firms valued their sales and income to range from $24,000 to $11,000,000. Thirty-two percent of the firms had sales and income between $24,000 and $150,000. Seven percent had revenue greater than or equal to $500,000.

Eighty-two percent of the enterprises made some proportion of their sales to firms or persons within the region. Responses ranged from 4% to

100% of total sales and 21% of the firms made between 4% and 50% of their sales to farms within the region.

Similarly, proportions of sales to firms/persons in Alexandra varied, also, so that thirty-two percent of the enterprises made some proportion of their sales to firms or persons in Alexandra. Responses ranged from 2% to 80% and 29% of the firms made between 2% and 50% of their sales to farms within Alexandra.

In Ranfurly, which proved to be rather peripheral, thirty-six percent of the firms made some proportion of their sales to firms or persons in Ranfurly. Responses ranged from 1% to 80% of total sales and 29% of the firms made between 1% and 55% of their sales within Ranfurly.

Changes in total value of sales over the last five years were analysed. Fifty-seven of the firms had an increase in their value of sales over the past five years, responses ranged from 8% to 180% and 36% had increases between 8% and 25%. Forty-three percent of the enterprises declined to respond to the query.

The most frequently mentioned first reason for an increase in sales values was inflation which was cited by 46% of the enterprises.

Increases in business and inflation were the two most frequently mentioned second reasons for an increase in sales values, both being cited by 11% of the firms.

Sales Impact - The effects of both an increase and a decrease in sales, which relate to scenarios of expansion and contraction, respectively.

The impact of a 50% increase in sales on employment would be modest. Forty-six percent of firms thought that a 50% increase in sales would bring about no increase in staffing requirements or did not respond to the question. Twenty-nine percent thought a sales increase would produce a need for one additional employee, 7% thought two more employees, 11% thought three more employees, 4% thought four more employees and another 4% thought 12 additional employees would be needed.

Similarly, capital expenditures would not be extensive, in the main. Sixty-eight percent of the firms thought that a 50% increase in sales would have no impact on capital expenditures or did not respond to the question. Answers from those enterprises that did think there would be an increase in capital expenditures gave a range from $8,000 to $600,000.

The impacts of a 50% decrease in sales on employment were that fifty-four percent of the firms thought that a 50% decrease in the present sales level would have no impact on staffing levels or did not respond to the query. Other answers ranged from a decrease of one employee to 14 employees. Twenty-five percent of the firms replied that a decrease of one employee would be necessary while a further 11 percent said a decrease of 2 employees would be necessary.

As far as capital expenditure was concerned, one hundred percent of enterprises thought that there would be no change in capital expenditure levels if there was a 50% decrease in sales or they did not respond to the question.

A variety of other impacts were mentioned, the most frequently cited

were closing of the business, sell the business, decrease in job opportunities and "no change".

The Effects of Irrigation Scheme Changes on Enterprises - Seventy-five percent of the firms thought that an upgrading of the system would produce an increase in sales or work, 7% stated that it would stabilise sales, and 14% did not respond to the query. Responses throughout the study area indicated a positive impact from any upgrading of the irrigation system.

The main responses to the query relating to the phasing out of the irrigation system were a decrease in sales or work (39%), no response (21%), closure of the business (18%) and no change (11%). Responses from most businesses in all areas of the Manuherikia Valley indicated negative effects associated with a phasing out of the system, although several firms throughout the valley thought that there would be no change in their operations.

As for businesses within the valley itself, at St Bathans, Becks, Lauder, Omakau, Ophir and Chatto Creek, the relationship between aggregate farm output and local business sales is more direct. For those with a high dependence on services of local farms, e.g. agricultural contractors, machinery sales and services, transport operators and garages, the possibility of the scheme being phased out brought severe reaction. Typical responses were "disaster", "sell out", "would finish any small business in the area". There are other firms, however, mainly located in Omakau, who have a larger proportion of their business located outside the immediate region, such as in construction and agricultural spraying. The impact on these businesses of changes in irrigation within the valley are negligible.

The Study Team Survey also revealed that many of the firms could increase their turnover substantially without affecting employment levels. Indeed, this spare capacity meant that 46% of the respondents thought that a 50% increase in their present sales level would have no impact on staffing levels.

On balance it seems unlikely that an increase in irrigation, as in Alternatives 5 and 6 would lead to an increase in the number of businesses. Rather, turnover would increase above current levels, with some related increase in employment, possibly 5-10 jobs. This impact is likely to be concentrated in Omakau. The converse situation, with scheme closure, will lead to business closures, possibly one in Lauder and Becks and three in Omakau, with an aggregate employment impact of 10-12 jobs.

PART 6 SOCIAL CONSEQUENCES OF FUTURE IRRIGATION

The social impacts of a development have both beneficial and adverse effects. These operate on a variety of scales, from the very local to the national, and affect individuals, families and communities, as well as the organisations to which they belong. Such effects can be predicted formally with greater or lesser certainty, but they are also perceived informally by local people, whose beliefs may or may not be correct. Nevertheless, the images of change that such people form are the basis for their own decision-making, and, so powerful are the consequences of deeply held beliefs, that they may well become self fulfilling prophecies.

6.1 Social Impacts as Calculated

The general economic scenarios, and their social consequences can be applied specifically to each of the irrigation alternatives, as follows. The impacts described would evolve over a period of years depending on the speed of implementation. The impacts are presented in tabular form with additional comments to explain and elaborate the main issues.

A multiplier of .4 persons/1 hectare is used in this section rather than the .5 persons/1 hectare used in the economic impact section. The .5 persons/1 hectare includes a substantial component of seasonal labour for harvesting and packing and a proportion of this labour would be provided by itinerant pickers who come to the area to help with the harvest and then leave. In economic terms this represents part of a full-time equivalent on-farm labour unit. In social terms this is an itinerant and seasonal labour component. This itinerant component of the labour demand multiplier for horticulture is estimated to be .1 person/1 hectare and therefore estimates in this section of permanent on-farm employment in horticulture are based on a multiplier of .4 persons/1 hectare.

The social structure of any community derives in the first instance from the economic base. Depending on the irrigation alternative adopted one of the following scenarios will emerge in the Manuherikia, with the consequent social effects.

6.2 Economic and Social Decline

A decline in the economic base of a community is generally reflected by a decline in the social vitality as measured by services available, participation in community activities and satisfaction with quality of life. As family resources are concentrated more on the economic survival of the family unit there is less time and energy available for community life. Similarly people no longer see their long term future in the community so that efforts are directed towards withdrawal and relocation of the family.

Both of these activities cause a period of social uncertainty, characterized by a decline in population and a gradual emergence of a new economic and social structure. Under the dryland alternative this scenario would emerge.

Alternative 1 - Dryland

This alternative assumes irreparable failure of the Manuherikia Scheme within five years and the Omakau Scheme within ten years. Horticultural production would cease unless alternative water could be used (e.g. groundwater). For pastoralists drawing from these schemes there would be shift to dryland farming and some consolidation of holdings to form economic units. At the head of the valley and on the terraces the maintenance and repairs of small schemes are primarily the responsibility of current users and would continue indefinitely. Therefore agricultural practices would be unlikely to change.

A summary of these impacts and their effects is set out in Table 6.2.1.

Table 6.2.1

IMPACT SUMMARY - ALTERNATIVE 1

	Alexandra	Lower Valley	Mid Valley	Upper Valley
Employment				
Horticulture	..	-60	..	..
Pastoral	..	..	-33	..
Urban	-25	..	..	..
Population	-75	..	-100	..
Services	Slight impact due to impetus for growth from Earnscleugh Scheme Tourism & Recreation	..	- Possible closure of Lauder School - Some business failures - Further decline in Omakau as the valley service centre	
		- Rural water supply required	- Rural water supply required	- Rural water supply required

The decline in employment and population in Alexandra rising from this alternative would be offset by the general pattern of growth. The loss of jobs in horticulture in the Lower Valley is unlikely to cause a significant drop in population because of the availability of alternative employment in Alexandra and the attraction of rural residential living; and the likelihood that at least some horticulturalists would find an alternative source of water probably groundwater.

The Mid Valley area would experience a noticeable decline in population, economic activity and social services. The Lauder School would be at risk in this alternative as would several locally based businesses (e.g. garages, general stores).

Respondents to the Study Survey listed a number of economic and non-economic concerns associated with a reduction in irrigation. They anticipated reduced production (especially in horticulture) leading to a reduction in farm incomes and an associated decrease in employment both on farm and in farm related businesses (9% of respondents employ a full-time staff and 11% employed part-time staff). The business survey confirms the residents concerns with 18% of business respondents anticipating closure if the irrigation schemes are phased out.

It was clear from the survey that respondents anticipated some amalgamation of units with a reversion to less intensive forms of production. Twenty percent of respondents said that their operation would become uneconomic. In absolute terms the study found that between 35 and 40 farms would be at "risk". The transition for those families to a new position of economic and social stability either through relocation, amalgamation of units or finding alternative employment would be disruptive in the extreme.

Social support would be needed for those households in terms of counselling and practical assistance, where possible, with moving or finding alternative employment, so that major regional planning and welfare problems could ensue.

For those pastoralists on economically viable units regardless of access to irrigation water, there would be a shift in emphasis to dryland farming techniques. Farm advisory officers can anticipate this and have adequate staff to provide support and advice during this period.

The farming community anticipate a drop in their standard of living and quality of life. They perceive a rise in their cost of living and production costs and a contraction and/or withdrawal of social services, personal and professional services and contraction of commercial activities.

A frequent concern associated with this scenario is that there will be a renewed wave of outmigration, particularly of the young as farm incomes fluctuate with seasonal water flows and employment opportunities contract.

These trends will be moderated by the economic buoyancy of Alexandra. As noted in the report, businesses in Alexandra are not markedly dependent on farm income generated from irrigation in the Manuherikia Valley. Alexandra has been a growing community since 1945 and although this growth rate is slowing it is anticipated that a modest growth rate of not more than 5% will be sustained to 1990. The level of commercial activity and social services now available at Alexandra will be sustained.

6.3 Continued Uncertainty

Long term economic uncertainty has a more subtle influence on a community. The momentum of previous years of greater economic stability will carry a community through short periods of economic uncertainty with little apparent change in social and economic activities. Long term uncertainty results in individuals deferring social and economic decisions involving a long term commitment. Thus, there is a growing sense of frustration and dissatisfaction concerning the uncertain future that is cumulative over time and is depicted in Alternative 2.

Alternative 2 - Status Quo

This alternative involves maintenance of the two major schemes in the valley with the probability of total collapse and system failure at any time during the next 5-10 years. The impacts are set out in Table 6.3.1.

With the continuation of irrigation schemes at their present levels in the valley no significant change is anticipated in employment, population or services. Alexandra's population will increase but the rate of growth will continue to decline. Tourism and recreation will continue to provide some stimulus for growth and the flow on effects from the Earnscleugh Scheme will generate some increase in employment.

Although the impact of sudden collapse of one or both schemes in terms of total population and services would be relatively minor, the impact on those families directly affected through loss of livelihood would be significant. The general affect on the community of continued uncertainty must be viewed as negative with regard to a sense of community stability and well being.

Table 6.3.1

IMPACT SUMMARY - ALTERNATIVE 2

	Alexandra	Lower Valley	Mid Valley	Upper Valley
Employment				
Horticulture	..	..	..	..
Pastoral	..	..	..	..
Urban	..	..	..	..
Population	..	..	..	..
Services	Minor expansion of social services parallel with anticipated modest population growth	..	..	..

This is the scenario evident in the valley now. As noted in the report, half of the respondents found that the present system of irrigation was unreliable and a majority of respondents said that they were under utilizing their land. The two most frequently cited reasons were lack of finance and insufficient water. With an assured supply the type of improvements planned ranged from increasing stock and horticultural production, to undertaking horticultural development and improving application systems. Assured supply is the key to growth in both Middle Valley pastoral farming and Lower Valley horticulture.

Since the late 1960's the imminent collapse of the irrigation schemes has been predicted and the probability of this occurring in one or both schemes increases with each year. In discussion irrigators have said repeatedly that they cannot plan ahead, with the prospect of catastrophic loss through system failure.

The valley population has remained relatively stable since 1971 as have social and commercial activities. This pattern is likely to continue but with continued dissatisfaction over the uncertainty of irrigation in the valley and fear of the onset of a period of economic and social decline as described above following collapse of one or both of the irrigation systems.

6.4 Economic and Social Stability

An assured delivery system of the current water supply would remove the economic and social uncertainty now experienced in the valley.

As noted in earlier sections, developments to consolidate and enhance present management programmes would be under taken. The present water supply is inadequate to realise a major increase in horticultural and pastoral potential, whereas long term planning based on an assured water supply would occur. There would not be a major increase in population, commercial services, social and community activities, but the uncertainty would be removed, and a more reasonable basis for long term satisfaction would be

introduced.

At first, the level of resident satisfaction with this predictable future will be mixed. During the growing uncertainty a number of options have been discussed resulting in rising expectations of what might be possible. A decision to essentially confirm present water supply will cause some initial opposition based on perceptions of what might have been.

Nevertheless, this phase would pass, and a longer period of commitment and stability would be established. Details of this position are set out in Alternative 3.

Alternative 3 - Assured Supply 'A'

This alternative would mean an assured water supply in the Manuherikia and Omakau Schemes with some increased storage capacity in the Manuherikia. This would enable horticultural development to increase from the present 160 hectares to a maximum of 200 hectares and ensure some frost fighting capability. Details of impacts and effects are set out in Table 6.4.1.

Table 6.4.1

IMPACT SUMMARY - ALTERNATIVE 3

	Alexandra	Lower Valley	Mid Valley	Upper Valley
Employment				
Horticulture	..	+16	..	..
Pastoral	..	..	..	..
Urban	+6	..	..	..
Population*	+20	+50	Stability or slight increase with transition to young families	..
Services	..	..	..	..

* rounded to nearest unit of ten

The population decline in Mid Valley is likely to stabilize with the natural cycle of an ageing population replaced with younger families.

This alternative would essentially maintain the status quo in population, employment, social and economic services.

6.5 Economic Growth and Social Expansion

Under alternatives 4, 5 and 6, a scenario of growth and development would emerge with the expansion of horticultural areas in the Lower Valley, by a factor of 6, and increased productivity on pastoral holdings elsewhere in the valley.

Alternative 4 - Assured Supply 'B'

This alternative would assure water in the Manuherikia and Omakau systems. However, the Manuherikia Scheme would be redeveloped to allow conversion of an additional 1000 hectares to horticulture and irrigation to remaining pastoral lands in the Lower Valley would cease. These effects are summarised in Table 6.5.1.

Table 6.5.1

IMPACT SUMMARY - ALTERNATIVE 4

	Alexandra	Lower Valley	Mid Valley	Upper Valley
Employment				
Horticulture	..	+400	..	..
Pastoral	..	-5	..	..
Urban	+160	..	..	..
Population	+480	+1300	Stabilize or slight increase with transition to younger families	..
Services	District planning threshold exceeded - Need to plan for additional land use allocation : re housing, neighbourhood commercial & recreational facilities - Increase capacity of undergound services	- Rural water supply required - Additional primary school - Limited development of land for local commercial facilities (e.g. petrol, general store)	..	..

Alternatives 5 and 6

These alternatives both involve an increase in horticultural development as described in Alternative 4. In addition there would be a progressive increase in the areas under full irrigation in both the Mid Valley and the head of the valley leading to more intensive management of pastoral lands. This is set out in Table 6.5.2, in terms of impact.

Table 6.5.2

IMPACT SUMMARY - ALTERNATIVES 5 & 6

	Alexandra	Lower Valley	Mid Valley	Upper Valley
Employment				
Horticulture		*		
Pastoral				+13 to +25
Urban	*			
Population	*	*		+10 to +80
Services	*	*	Modest increase in economic and social services spread throughout Mid and Upper Valley	

* Same as Alternative 4

A six fold increase in horticultural production will mean an increase in the population and employment opportunities in Alexandra, an increase in the population of the Lower Valley area by 200%, a slight increase in population in the Mid and Upper Valley and a large influx of seasonal labour.

The increased opportunities for permanent employment in Alexandra have been discussed in the report. The following paragraphs elaborate the implications of an increase, in permanent population in Alexandra, in residents in the Lower Valley through horticultural development and the large seasonal workforce associated with increased horticultural production.

Employment opportunities will increase with a general increase in productivity. Research carried out in North Otago (Gillies, 1977) has shown that the introduction of irrigation to pastoral units resulted in an increase in the employment of school leavers. A similar pattern can be expected in the Manuherikia with an increase in the water supply to pastoral units. As noted below, the numbers involved are relatively small, but are still significant, especially in the local context.

In addition there will be a general increase in employment in key sectors of the economy, wholesale/retail, transport/storage, community and personal services. Many of these new jobs will require training, capital investment and/or experience; therefore they will not be suited to young school leavers. However young people will benefit along with other members of the work force

as employment opportunities increase.

The perceived increase in opportunities for part-time farming is based on recognition of the present high proportion of part-time horticulturalists, and it may well be that some of the presently under-used land will be developed in this way.

In addition to these positive impacts there are a number of problems associated with a growth and development scenario, in particular-

- .. a lack of integration between an established community and new residents
- .. insufficient and inappropriate housing
- .. insufficient community facilities and social services
- .. facilities and services inappropriate to the needs of the community
- .. problems of settlement

Each of the above points must be considered in terms of the needs of new residents coming into the area either to take up jobs in an expanding Alexandra or as horticulturalists in the Lower Valley or as seasonal transient labour.

This influx represents three broad social groups with quite different needs and aspirations in terms of housing, services, and settling into the community. The first group are the "urban" people who will assume urban jobs and live an urban life style in Alexandra. The second group are the horticulturalists who will take over from the pastoralists as the most numerous population group in the Lower Valley. The third group will be the seasonal labour force. All newcomers will have special needs and problems. Some of these will be common to each group, such as unfamiliarity, loneliness and isolation, the common experience of all migrants to a new area.

In Alexandra the influx of new urban residents will represent a relatively small proportion of the total urban population. Nevertheless the District Planning threshold will be exceeded (as noted in the report) requiring an increase in the capacity of underground services as well as planning for the expansion of housing, community and commercial services. With appropriate planning and development for urban growth it is anticipated that this group will be absorbed into the social and economic life of Alexandra, although relatively high property prices may prove to be a problem, and one that will be exacerbated by increasing land values with assured horticultural possibilities.

In contrast the number of horticulturalists in the Lower Valley will eventually outnumber the pastoral population so that the physical and social characteristics of this area will change. Research in North Otago (Gillies, 1977) has shown that there is a tendency to a younger age structure in pastoral areas with the introduction of irrigation. It is anticipated that expansion of irrigation in the Lower Valley will similarly attract young families to the area to take advantage of the opportunity for horticultural development. The special needs of a young population must therefore be considered, as outlined below.

Moreover, the Lower Valley will be much more closely settled, as it is also anticipated that a large proportion of the horticulturalists will be

part-time, with additional employment off the unit. These families are more likely to have close and frequent contact with Alexandra, and to exhibit urbanised life styles.

The horticultural population will ultimately dominate the economic and social life of the Lower Valley. The problem of integration will be centred on the minority group of long term residents and their ability to fit into the new social and economic order.

The third group will be the seasonal labour force associated with harvesting. There is already a demand for seasonal workers in the tourist/restaurant trade and employment opportunities especially for women have increased markedly since 1971. Traditionally harvesting involves family members (wife and children) plus some casual labour as necessary.

The peak employment period in both these sectors overlaps. With the large increase in demand for seasonal labour in harvesting and the conflict with the peak demand period in the tourist/restaurant trade, it is anticipated that a major proportion of the seasonal work force required for horticulture will be transient, single workers. This group will have quite different needs for housing, community and recreation services. Integration in the community is unlikely by virtue of the transient and seasonal nature of the employment. The social objective may be to provide special housing and recreational facilities for short term residents. For example, to accommodate a seasonal workforce on this scale a hostel/recreation complex may be appropriate.

As was noted above studies elsewhere indicate that the increased population in the Lower Valley arising from redevelopment to horticulture is likely to be younger than the present norm for the area. (Gillies, 1977). Consequently there will be an increased demand for family oriented services including school, plunket, pre-school education, maternity services, general practitioner.

Vincent Hospital Board has a ratio of one general practitioner for 2200 people. On this basis the increased population in Alexandra and vicinity would be sufficient to justify the Hospital Board taking positive steps to attract another general practitioner.

Although the growth in employment, population and services would be concentrated on Alexandra, Clyde would experience some growth arising from the general increase in economic and social activity in the vicinity.

6.6 Perceptions by Study Area Residents

The calculated expectations of social impact were reflected in the perceptions of local people, who were in no doubt as to the consequences of both decline and growth.

6.6.1 Perceptions of decline

There is universal agreement that a reduction in irrigation would have a marked and serious impact, economic and social impact. Terms such as 'disastrous', 'calamitous', and 'devastating' are widely employed. Abandonment and amalgamation of farms are seen as immediate - and most undesirable - consequences, as are a reversion to less intensive forms of production and hence a contraction in regional income. Changes of that nature are expected

to lead to a sharp reduction in the demand for rural services and farm inputs, a consequent increase in costs for remaining farmers, a loss of both rural and urban jobs, and the collapse of property values. From both town and country a greater outflow of the young and young families is expected, a movement which in turn will lead to the loss of a wide range of services and facilities - health, educational, social, medical, welfare and recreational - and eventually to higher local living costs. Alexandra is expected to become merely a retirement centre and the Lower Valley in particular to beset by 'unemployment, bankruptcy [and] poverty'. Stagnation and a loss of confidence are expected to follow any reduction in irrigation. Indeed, there is a general feeling in the valley that such confidence is already brittle, that many existing services would soon be withdrawn, that some of its institutions are even now failing, and that the community's social and family life are under considerable stress. The expansion of irrigation is thus seen as a means of enhancing stability as well as stimulating renewed growth.

Specifically, therefore, comments on the economic consequences reflect four main areas of concern:

.. reduced production (especially fruit) leading to a reduction in farm incomes and an associated decrease in employment both on farm, and in farm related businesses

.. amalgamation of units with a reversion to less intensive forms of production

.. rising living and production costs for the remaining rural community as services are contracted or withdrawn

.. contraction in local trade and commerce

Social consequences reflect the outcome of these primary concerns, and three main areas of concern are listed:

.. sustained outmigration, particularly of the young as farm incomes fluctuate according to the season and employment opportunities contract

.. withdrawal of personal and professional services and decline in sporting and cultural facilities

.. increase in local discontent and dissatisfaction

6.6.2 Perceptions of growth

The expansion of irrigation in the Manuherikia Valley is generally expected to encourage and allow the subdivision of large, 'under-utilised' properties, a process for which there would be considerable local support. Subdivision and irrigation in turn are expected to lead to greater land and stock productivity, to permit considerable diversification in production, generate greater regional income, and augment the country's exports. Diversification is accorded some importance in the light of what many perceive to be long term problems of oversupply in and difficulties of access to traditional markets for traditional pastoral products. A reduction in the impact of the vagaries of the weather and increased and more stable incomes are similarly expected to encourage long term planning and investment by both

horticulturalists and pastoralists.

Subdivision, increased production and higher farm incomes are expected to generate a growing demand for farm inputs and services to the benefit of local suppliers, distributers, and contractors and thus greater employment prospects and opportunities. An increase in the latter is widely accorded considerable importance. Further, expanded and diversified production is expected, by some at least, to lead to the establishment of new processing industries to enhance the value of the region's exports and generate additional regional income and employment. The main beneficiary is expected to be Alexandra, a prediction which is based on what is perceived to be an intimate economic relationship between the town and the valley.

Running through many of the responses is a conviction that even a modest expansion of irrigation is essential if existing services and facilities are to be maintained quite apart from being improved. In general terms that expansion is seen as being necessary to enhance confidence in both the horticultural and pastoral sectors, stabilise and improve net farm incomes, encourage investment, protect and augment property values, and generate greater regional income and employment. There is, however, a strong belief in the potential of the valley for increased and diversified production upon the provision of a sufficient and assured supply of water at what are termed 'realistic' prices.

The expansion of irrigation is expected to confer many benefits other than the specifically economic on the Manuherikia Valley and Alexandra, not least again the maintenance of existing social networks, institutions and activities. Significant expansion is widely expected to stabilise and enhance the community's social fabric through encouraging the young to remain, promoting a better age-sex balance, supporting cultural and sporting groups, and ensuring both the retention and improvement of existing medical, social, and educational services and facilities. With irrigation the valley is expected to attract young, vigorous, and technologically receptive farmers and horticulturalists, and generally invigorate social and cultural life, instil confidence, and release energy, and enterprise otherwise discouraged by excessive uncertainty. That many of the new farmers and horticulturalists are likely to be part-time suggests to some that additional irrigation will be a useful means of encouraging the productive investment of capital from other areas of the economy into the export sector. The terms most commonly used to describe the expected social benefits of additional irrigation are 'a better place in which to live' and 'a thriving community'. Again fundamental, is a widely shared conviction that the release of the valley's productive and entrepreneurial forces awaits merely the provision of water.

Indeed, few suggest that the consequences, whether economic or social, will be other than beneficial, a reinvigoration of the activities and institutions of both town and country. Some concern is expressed, however, over the impact of closer settlement and greater traffic flows on roads and bridges, and hence on ratepayers. But only one respondent raised the possibility of an adverse impact of increased population on 'a tight rural community structure'.

In summary, therefore, the economic changes that are foreseen are covered, in order of importance by the following categories:

.. intensification of production (stock, horticulture, fruit)

.. more land brought into production

.. subdivision of holdings

.. increased farm profitability therefore increased employment opportunities both on farm, and in service industries

. increased regional income and thereby stimulate local trade and commerce especially in Alexandra and Omakau

The main areas of related social change were seen as:

.. greater social stability in general

.. enhance family stability in particular by creating more employment opportunities for the young

.. a larger population would strengthen existing sporting and cultural facilities, and personal and professional services, and encourage the development of new facilities and services

.. encourage a richer, more diverse community by providing opportunities for part-time farmers.

Thus, in general, there was a keen anticipation of the benefits of expanded irrigation and the consequences thereof for the economic and social life of the valley communities.

PART 7 CONCLUSIONS

The future of irrigation schemes in the Manuherikia Valley is uncertain at present; it is not known with certainty whether there will even be irrigation in the region in the long run, despite a long history of water application and a farm economy substantially dependent upon it. This may even be despite the beliefs about the high potential for substantial horticultural development that are currently held in the area most suitable for orcharding, around Alexandra.

In the lower regions of the valley, confidence in the potential promise of irrigated horticulture is strongly represented both among those who are presently engaged in that activity and potential horticulturalists alike, but uncertainty about the future of an assured water supply has restricted physical development, as has the reliability of the existing water supply, which is widely perceived as inadequate, not least because the Lower Valley is at the end of the queue for water by virtue of its location, furthest from the source of supply at the Falls Dam, and at the end of a dilapidated system of main races.

A further constraint to development is the proliferation of small properties in the area around Alexandra itself. Many of the landholders on such properties are not presently farmers, nor are they even part-timers in any real sense. Not only is their land devoted to uses that are consistent with their primarily residential character, but it is clear that the present owners have no clearly formulated or specific plans for development in the future, or, if they have, they are certainly not prepared to articulate them. It may be that market forces will overcome this hindrance, should reliable water become

an actuality; rising land values, consequent rateable values and the example of successful neighbours would all tend towards change, but there is no clear indication of how rapidly this would eventuate, if at all.

In the Middle Valley, from Omakau to Lauder, efficient pastoral farming is in operation. Farmers here are all full time and long term users of the land which they own. A high proportion feel that their properties are already fully developed, as a consequence of what water is available to them, while those do do not feel this see irrigation as the key to further on-farm development. In this area, too, concern was expressed about the reliability of existing water supplies, and it is clear that some development has been deferred in the light of doubts about the viability of future long-term supplies. Similarly, it seems that some of those who regard their units as fully developed under present circumstances see opportunities for further development should water become more reliably available.

In the Upper Valley, the same trends are apparent, but they are less strongly emphasised, and sometimes less clearly articulated. It is therefore clear that the present uncertainty with regard to the future of the various schemes in the valley is inhibiting development in each of the three sub-regional units that were identified, although the ways in which development is being inhibited vary, and the anticipated consequences are certainly substantially different.

If a dryland alternative for the region is accepted as the only feasible option then it will result in the failure of many farms, especially in the intensively farmed Middle Valley, and, not unnaturally, this option is perceived as disastrous throughout the region. If it transpires that this is the only possible choice, then a phased and predictable close down, according to an agreed timetable is essential, and, if such is to be the case, then it should be notified as soon as possible, and with as long a period of grace as can reasonably be allowed. This will enable as smooth a transition as possible for existing horticulturalists, who will need time to develop whatever alternative water resources as are available, if any. Pastoralists will be obliged, in the main, to turn to dryland farming techniques, or else to quit their properties altogether; those that remain will be obliged to acquire further land from their neighbours in order to create economic units. All of this would take time, and almost certainly cause hardship, no matter what was done.

It would be impossible to implement such a scheme without adverse side effects and some undesirable direct consequences; it is thus important that such should be recognised, and efforts made to mitigate them as much as possible. In all of this, time, and a known schedule are of the essence.

Continuing with the status quo is perhaps the least efficient option of all. The present supply systems are warn out, whether one is looking at main races, siphons or the Falls Dam itself. They are subject to sudden and catastrophic failure at any time, and this is almost certain to happen at some time within the next five to ten years. A recent major collapse of the Manuherikia race, fortunately repairable, although at a cost, serves only to emphasise that such catastrophes, in their very nature, will occur without warning, possibly at times of peak demand. Were such to eventuate on a scale that made repair impossible, or impossibly expensive, then it would mean an immediate cessation of supply to farmers below the failure.

This is the worst of all circumstances, and the disruptive social effects would be considerable, because, while it would be necessary for all involved

to plan in the expectation of such an event, the absence of a prepared timetable for the scaling down of operations would leave many farmers quite unprepared, human nature being what it is. Similarly, the need for the development of alternative supplies of water and alternative techniques of management would not be so clear as in a timetabled wind-down, although the present uncertainty is even more unsettling. Then, as now, investment would be deferred, and an unsatisfactory state of uncertainty would rag on for an indefinite and unspecified time. Clearly, simply waiting for an unscheduled failure should be avoided at all costs.

Option 3 does not involve a significant change in the area of land under irrigation, but it does provide that most essential of requirements within the region, a stable and assured level of supply. All of the information gathered in the study survey points to the critical need for a greater level of confidence and a longer planning horizon in the expectation of assured water delivery. This is critical to both investment confidence and social and community well-being. While this option is the least extensive of the various positive alternatives that are being considered, it does have the merit of providing stability for those already irrigating, and is thus likely to stimulate on-farm development, with positive, albeit perhaps minor social and economic consequences stretching beyond the farm and into the existing service communities. In many ways, it will lead to no more than an extension of existing agricultural policies, but with the enormous advantage of security.

Alternative 4 concentrates on an expansion of horticulture where such is feasible, and this is exclusively within the Lower Valley, where it relies upon the conversion of significant acreages into horticultural uses. If such were to take place, it would be in accordance with existing trends elsewhere in Central Otago, where new orchards are being developed or extended from existing units, from Roxburgh and Dumbarton to Cromwell and Bannockburn. The Earnscleugh Flats are presently under scrutiny for orcharding development under the impetus of an expanded irrigation scheme; the emphasis there would be on the development of a nectarine industry. Technical advances in other fields have led to significant earnings from such new products as dried apricots and the like, while overall horticultural returns are showing a healthy long-term increase throughout the region.

An option of this kind relies upon individual farmers turning to horticulture, notably orcharding, and upon existing operators expanding the level of horticulture on their own properties, or those that they might be encouraged to acquire. Discussions with farmers in the area suggest that at least some would be prepared to develop, to subdivide, take on a knowledgeable partner or manager, or even sell up completely, in order to facilitate horticultural development. Indications from the plans that were collected as part of the study survey further support the likelihood of such developments.

It is important that land presently tied up in small units should not be wholly denied to horticulture, as was indicated above. It is probable that assured water would go some way to encouraging those who personally have no plans to develop in fact to do so, while the successful growth of orcharding and the like is bound to entice some into following suit. As in all cases of the diffusion and adoption of innovation, local examples through the neighbourhood effect are likely to foster development, while the mounting opportunity cost of holding such land in suboptimal development in the form of extended gardens or pony paddocks should also act as a powerful incentive towards change. The fact that horticulture is well established in the Clutha Valley, and is strongly associated with Alexandra, whose Blossom Festival is a regional event, means that the ethos and context of orcharding is already

present. Infrastructural demands, notably for storage, specialist handling and transport and plant maintenance can be slotted into an existing regional assemblage, with some possibility of scale economies.

On the other hand, there will be requirements for seasonal labour that seem likely to exceed present supply, which is already inadequate for the existing regional orcharding industry, since the area is already experiencing considerable shortages in the availability of pickers and processors. As the peak demand for casual labour also coincides with the peak demand for similar labour in the growing tourist sector, considerable difficulties may well be experienced. Accommodating an itinerant work force may itself prove to be difficult, even if such a work force could be recruited.

Elsewhere in the region this proposal would permit substantial increases in productivity from the existing acreages of pastoral land. It is not expected that there would be any great population increases in the Middle or Upper Valley, or that the demand for local services would increase at all dramatically. Nevertheless, the social and economic benefits or steady growth, or even soundly based stability, on the farms of the region would be considerable.

Alternatives 5 and 6 involve the conversion of quite extensive areas into horticultural production. This would certainly involve an increase of service utilisation and population growth in the Lower Valley, and would in all probability lead to a further demand for new services both upstread and downstream of the producer. Included among these are such requirements as those for contractors to establish and maintain the necessary infrastructures on-farm, especially those associated with water supply and frost fighting, which represents a winter demand for water, as well as for processing, packaging and specialised transportation. If it is indeed true that the Central Otago railway link will not long survive the completion of Upper Clutha hydro works, as is rumoured, then the demand for road transport of horticultural produce will be that much more strengthened.

All of the benefits and costs associated with horticulture in Option 4 would hold good for 5 and 6, with the prospect of even larger developments, diversifications and consequent returns. Not only that, but horticultural developers could only be encouraged in their efforts by the wave of confidence throughout the region that would be attendant upon further consequences of these proposals. Both alternatives add significant areas to the acreage of pastoral land currently commanded by the schemes that exist at the moment. It is not expected that developments consequent upon this expansion would necessarily add more than small numbers, if any, to the Upper and Middle Valley populations and service structures, or that they could reasonably be expected to generate substantial off-farm developments under foreseeable circumstances. Nevertheless, the air of confidence and purposefulness that would surely emerge, would do much to encourage the climate wherein both pastoral and horticultural developments would be contemplated after a long period of caution and circumspection.

Discussions with local farmers' groups, and results from the study survey have established that farmers expect to be able to increase production if either of these schemes is implemented, and there is little doubt but that they could do so. However, it appears extremely unlikely that the very high costs associated with the expansion of reliable irrigation to pastoral farmers outside the present scheme can be justified on economic grounds, and that any great extension of supply to existing pastoral irrigators is similarly uneconomic, now and in any foreseeable future.

Given that a scheme involving wholesale redevelopment of the entire valley is unsupportable, and that the most widespread developments are clearly uneconomic, the repair and upgrading of each of the two major systems, the Omakau and the Manuherikia schemes, should be considered separately, on an individual basis. Each are major, but distinct elements of the present system, and it may be worthwhile scheduling their development as independent entities. Furthermore, expenditure on the provision of an alternative supply of water directed primarily at horticulture, such as the development of an additional supply from Dairy Creek, should be deferred. Such a scheme, possibly in association with the ongoing hydro works at Clyde, is outlined in Alternative 4, but it is apparent that associated land use changes cannot yet be foreseen, either in the directly affected locality or, by implication, in the wider region.

Until a final and comprehensive selection of an alternative can be made, serious attention should be given to a detailed examination and possible implementation of at least Alternative 3. This is essentially the provision of an assured supply of water, by whatever means, to existing users. This study has indicated the extent of existing investment in irrigation linked agriculture in the region, and has shown the perception that is commonly held, that simple assurance of water would be sufficient impetus to initiate a substantial round of development, in horticulture and pastoral farming alike. These investigations should include an analysis of the potential, if any, for cooperation and joint cost sharing with the Otago Electric Power Board in upgrading the intake structures and major races of the Manuherikia scheme so as to provide for both irrigation and power generation. Independently of all this, urgent attention should be given to the development of a reliable and independent system of stock water provision for the whole of the valley.

Finally, irrigation grew substantially out of the demands for water of the early gold industry of the latter parts of the Nineteenth Century. Today, a new industrial venture is under consideration, the possibility of developing the Hawkdun/Home Hills lignite deposits as a source of liquid fuels. Were such a decision to be taken, the requirements of such an industry could have profound effects for the supply of irrigation water, especially at the times of year when it is most needed. It is imperative that any decision taken in the Manuherikia should, in the light of this example alone, be considered in a regional context, and bearing in mind that irrigation in the region has supported a century of investment of capital and labour.

APPENDIX A HOUSEHOLD SURVEY INFORMATION

A copy of the Household Survey is set out on the following pages.

The Survey was conducted by students over a period of three weeks during May/June 1983. The questionnaire was left at each farm household for residents to complete and leave for collection at an agreed date. A total of 187 households were sampled.

MANUHERIKIA VALLEY IRRIGATION

SOCIAL AND ECONOMIC IMPACT STUDY

This study has been commissioned by the Ministry of Works and is being carried out by Sheppard and Rout of Christchurch and the Resource Development Centre of Otago University.

The survey's aims are to assess the social and economic consequences of a range of development options,both for the Manuherikia Valley itself and for a wider area of Central Otago.

Some of the information for which we ask may appear to be personal,but we can assure you that nothing that can identify anyone will be made public. Only aggregate information will be published,and you will remain completely anonymous.

Some of the questions may appear to have little to do with irrigation, but,in fact,every one of them is there for a good reason,and we hope very much that you will answer all of them as well as you are able. The study depends very much on everyone completing this questionnaire,and we hope that you,too,will help us by doing this.

When completing the farming questions,please remember that we are interested in the whole of your farm,and not just the presently irrigated land,so that the consequences of irrigation for opening up your hill country,for example,are of importance,too.

If you would like to write in any further points that you feel we may have missed,please do so;we welcome the opportunity to use as much material as possible. If you have any questions about this study,please ask the person who delivers this to you,or contact me at Otago University.

Thanks very much for your help.

Geoff Kearsley
Chairman,
Resource Development Centre
University of Otago

MOBILITY

1. How long have you lived at this address?

   .....

2. Where else have you lived in the past,and during what years?

Place	Years
.....	.....
.....	.....
.....	.....

3. If you moved into this area from somewhere else,what were your reasons for coming here?

   .....

   .....

4. Would you like to stay here,or would you prefer to move to somewhere else?

   Definitely like to stay

   Quite like to stay

   No special preference

   Quite like to move away

   Definitely like to move away

   What were your reasons for giving the answer that you did?

   .....

   .....

5. Have any of your immediate family or close friends moved away from the area?

   Yes

   No

   If they have,what do you suppose were their reasons for moving?

   .....

   .....

PATTERNS OF DAILY LIFE

1. Where do you normally shop for the following items? Please give the name of the town

   Food .....

   Household supplies and services .....

   Tobacco and alcohol .....

   Clothing and footwear .....

   Household furnishings .....

   Household equipment and appliances .....

2. Where do you go for the following services,if you use them?

   Garage .....

   Stock and Station agent .....

   Post Office .....

   Lawyer or Accountant .....

   Bank .....

3. Where do you go for the following health services?

   Doctor .....

   Chemist .....

   Dentist .....

4. If any of your children attend play groups,kindy or school,please say how many for each type,and say where the schools are.

	Number of children	Location of school
Play centre/kindy	.....	.....
Primary school	.....	.....
Secondary school	.....	.....
Other (please specify)	.....	.....

5. Do any members of the household belong to sports clubs or social groups? If they do,please name the club or group and say where it meets.

   .....

   .....

6. How would you rate the following services in your area?

	Very good	Good	Satisfactory	Poor	Very Poor
Shops for household supplies and food					
Shops for furniture, appliances,etc.					
Health					
Education					
Professional					
Welfare					
Recreational					

7. What facilities do you think your local area needs that are not at present available?

.....

.....

Where do you think they could best be located?

.....

PRESENT LAND USES

1. Are you a full time or a part time farmer?

Full time

Part time

2. If you have a job other than farming,please tell us what it is.

.....

.....

3. Are you the owner or lessee of this property?

Owner

Lessee

4. Please state the area of your farm that is owned in each of the following categories of land tenure.

Freehold .....hectares

Private lease .....hectares

Crown lease .....hectares

Other (please specify) .....hectares

5. For how long has your family been on this property?

.....

6. For how long have you,personally,been a farmer?

.....

7. What are the present main products of your farm?

	Percent of total
Pastoral	.....
Cash crop	.....
Horticulture	.....
Other	.....

8. Have you made any important recent changes to your farm,such as land use, irrigation,or new buildings?

Yes

No

If you have,could you please describe what they are,and say when you made them?

.....

.....

.....

SPECIFIC CROPS AND LAND USES

Please indicate the present percentages of the total land farmed in the following categories,as at December 1982.

	Percent of farm area
Native pasture	.....
Improved pasture	.....
Cultivated pasture	.....
Lucerne	.....
Cash crops ...cereals	.....
...seeds	.....
...other	.....
Fodder	.....
Farm woodlots/trees	.....
Horticultural crops	.....
Idle land	.....
Other (please specify)	.....

YIELDS

Cash Crops and fruit

If you carry any cash/horticulture crops,please list them below and state the yields obtained last season. Please state the units of measurement that you are using.

Crop type	Yield	Average farm gate price received(in $/unit)
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Stock

If you carry stock (sheep/cattle),please list the numbers carried last winter, their breeds and the number per hectare that you carry.

Animal Type	Breed	Numbers	Number per hectare	Proportion of farm income
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

What is your average stock carrying capacity?

.....

What proportion of your gross farm income is derived from stock?

.....

Stock performance (1982-83)

Sheep Lambing percentage (survival to flock/sale) .....

Percentage of lambs sold fat .....

Kilo meat weight per lamb .....

Kilo wool weight per ewe .....

Cattle Calving percentage .....

Sale weight of cattle .....

Other Please state (e.g. deer) .....

PRESENT IRRIGATION

1. What area of your farm is irrigated?

.....

2. What method of irrigation do you use?

.....

3. What scheme do you draw water from?

.....

4. For how long have you been irrigating?

.....

5. Do you always receive your quota of water?

Yes

No

If you do not, please describe the circumstances in which you do not (e.g. drought conditions) and the amount of shortfall as a percentage of your quota.

.....

.....

6. How reliable do you find the present system?

Very reliable

Usually reliable

Not very reliable

Unreliable

Very unreliable

7. What is the present use of your irrigated land?

Type of land use	Area	Yield
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

8. How much water do you use in an average year?

.....

9. During which months do you irrigate?

In dry years .....

In wet years .....

10. Have you made any recent changes to your irrigation system?

Yes

No

If you have, please describe the changes that you have made for each of the following categories.

Area .....

Land use .....

System of irrigation .....

Amount of water used .....

FARM EMPLOYMENT

1. If members of your family help on the farm, please complete the list below.

	Member 1	2	3	4	5
Relationship					
Main duties					
Length of service					
Remuneration					

2. If you employ staff who are not members of your family, please complete the list below.

	Full time Staff		Part time Staff	
	Member 1	2	Member 1	2
Main duties				
Time employed (months per year)				
Remuneration				
Location of residence				

LAND CAPABILITY

1. Do you believe that you are using your land to its full present capacity?

Definitely

Probably

Unsure

Probably not

Definitely not

2. If you are not,what are the main factors that are preventing you from doing so?

Lack of finance

Weeds

Pests

Insufficient water

Inadequate prices

Lack of markets

Other (please specify)

REGIONAL EFFECTS OF FARMING

1. What transport companies usually deliver supplies to your farm?

Company Name	Location
.....	.....
.....	.....

2. What transport companies normally collect produce from your farm?

Company Name	Location
.....	.....
.....	.....

3. From where do you buy the following farm supplies? Please give name of place,e.g. Omakou,Alexandra,etc.

Breeding stock .....

Other stock .....

Seed,etc. .....

Fertilisers,sprays,etc. .....

Farm implements .....

4. Could any of the off-farm facilities that you use be more conveniently

located? If so,please say which ones and where,(e.g. seed purchases,Omakou)

.....

Is there any potential now for better off-farm facilities to be provided in your district? If so,where ought they to be located?

.....

.....

FUTURE IRRIGATION

Present Irrigators

If water is assured for the long term,at rates comparable to those at present;-

1. What specific on farm developments,if any,would you plan to make?

.....

.....

.....

2. Would you carry out the above planned developments yourself,or would you take on a partner or subdivide your land?

.....

.....

3. What type of application system would you use?

.....

4. How long would it take for you to bring in such developments?

.....

5. Given your present price for water,what level of price increase would make the developments that you propose impractical?

50% more

100% more (twice as much)

200% more (four times as much)

300% more (six times as much)

If your proposals are still practical at a 300% price increase for water,at what point would they cease to be practical?

.....

6. What are the returns that you would expect from the irrigation based developments listed above?

Crop	Area	Expected yield
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Average stock carrying capacity	Area	Expected yield
.....	.....	.....
.....	.....	.....
.....	.....	.....

7. About how much,as a proportion,do you expect such developments would increase your gross farm income?

.....

8. How much further employment do you think the above developments would create on your farm,for each of the following categories?

Full-time persons .....

Part-time persons .....

9. If you expect to need further labour,how much of it do you think could be provided by people currently living in the district?

.....

10. Describe the extra investment do you think you would have to make in each of the following categories as a consequence of future irrigation?

Housing (on-farm) .....

Farm buildings .....

Fertiliser,etc. .....

Machinery and equipment .....

Subdivision .....

Other (please specify) .....

11. Are there any other on-farm facilities that you do not presently have that you think you might require as a consequence of irrigation development?

.....

.....

12. What new off-farm services,or increased levels of present services,do you think you might require?

.....

.....

13. What would be the best practical method of financing the developments that you have proposed?

.....

.....

14. What do you expect will be the total cost to you of the developments that you have proposed (1983 dollars)?

.....

15. Which of the following do you consider to be the best use for more water if it were made available on your farm?

As a safeguard against drought

As a means of increasing yields in present land uses

As a means of increasing the carrying capacity of hill country

As a means of diversifying the farm into new land uses

Other (please specify)

If it became necessary for the irrigation system that supplies you to be wound down;-

1. What general aspects of your farm system would have to change?

.....

.....

2. What do you expect the specific consequences would be for the following?

Yields per hectare per presently irrigated crop .....

Stock yields .....

Pattern of land use .....

Employment (on-farm) .....

Farm profitability .....

Other (please specify) .....

NON IRRIGATORS

If you are not at present an irrigator,but were offered the opportunity to become one;-

1. Would you adopt irrigation on your property?

.....

2. What area of land would you expect to irrigate?

.....

3. What would be the specific uses that you would irrigate for?

Crop	Area	Expected yield
.....	.....	.....
.....	.....	.....
.....	.....	.....

Stock	Carrying capacity
.....	.....
.....	.....
.....	.....

4. What amount of water would you expect to have to take?

.....

SOCIAL CONSEQUENCES OF FUTURE IRRIGATION

If irrigation were expanded in the Hanuherikia;-

1. What do you expect to be the main economic changes to the district?

.....

.....

2. How would the community benefit in non-economic ways?

.....

.....

3. Are there any other changes (good and bad) that you can think of?

.....

.....

If irrigation were to be reduced;-

1. What overall economic changes would there be for the valley?

.....

.....

2. What social and community changes do you think there might be for the valley?

.....

.....

Thank you for the time that you have taken to complete this questionnaire.

HOUSEHOLD COMPOSITION

This section is about the composition of your household. The information requested is necessary for our calculations of the effects of providing various levels of irrigation service.

While it may seem quite personal in nature, you can be sure that it will remain strictly confidential and will only be published in such a way that people cannot be identified personally.

This section should be filled out for every resident member of your household.

1. Are you male or female?

Male

Female

2. How old are you?

.....

3. What is your relationship to the head of the household or the person in charge of the dwelling?

Occupier of house

Husband or wife of occupier

Daughter or son of occupier

Boarder

Flatmate

Grandchild of occupier

Father or mother or in-law of occupier

Brother or sister of occupier

Other (please specify)

4. What is your present marital status?

Never married/single

Married

Permanently separated

Widowed

Divorced

De facto relationship

5. What is your present occupation (if appropriate) ? Please be as specific as possible.

.....

This section should be filled in by the head of household once only per household.

6. If someone has moved away in the last year, please give their :

Relationship to household head .....

Age and sex .....

Present location .....

7. If someone has moved away in the last five years, please give their :

Relationship to household head .....

Age and sex .....

Present location .....

APPENDIX B BUSINESS SURVEY INFORMATION

A copy of the Business Survey is set out on the following pages.

Representatives of 28 business enterprises in Alexandra, Omakau, Lauder, Becks, Oturehau, Wedderburn and Ranfurly were interviewed during June 1983. Two thirds of the sample was from Omakau and Alexandra while the remaining businesses were distributed among the centres listed.

The results of the Survey provided information on the length of ownership, employment, value of trade and impact of possible changes in irrigation.

MANUHERIKIA VALLEY IRRIGATION

BUSINESS SURVEY

This study has been commissioned by the Ministry of Works and is being carried out by Sheppard and Rout of Christchurch and the Resource Development Centre of Otago University.

The survey's aims are to assess the social and economic consequences of a range of development options, both for the Manuherikia Valley itself and for a wider area of Central Otago.

Some of the information for which we ask may appear to be persona but we can assure you that nothing that can identify anyone will be made public. Only aggregate information will be published, and you will remain completely anonymous.

Some of the questions may appear to have little to do with irrigation, but, in fact every one of them is there for a good reason and we hope very much that you will answer all of them as well as you are able. The study depends very much on everyone completing this questionnaire, and we hope that you, too, will help us by doing this.

If you would like to write in any further points that you feel we may have missed, please do so; we welcome the opportunity to use as much material as possible. If you have any questions about this study, please ask the person who delivers this to you, or contact me at Otago University.

Thanks very much for your help.

Geoff Kearsley
Chairman,
Resource Development Ce
University of Otago

MANUHERIKIA VALLEY IRRIGATION

IMPACT STUDY

BUSINESS SURVEY QUESTIONNAIRE

1. Name of enterprise .....

2. Address .....

3. What is the usual description of your enterprise (NB if applicable, whether wholesale or retail activity)

   .....

   .....

4. How many establishments does your enterprise operate within the region (see map) and where are they located?

   .....

   .....

   .....

   .....

   .....

5. How long have these enterprises been operating?

   a) Under present ownership ..... years

   b) At this (these) locations ..... years

   .....

   .....

   .....

   .....

6. Employment (1982/1983 accounting year)

	Number	Salaries & Wages paid during the year ($)
Working proprietors	.....	.....
Full time employees (>30 hrs/week)	.....	.....
Part time employees (<30 hrs/week)	.....	.....

7. Where do these people reside? .....

.....

.....

.....

.....

.....

8. Total value of sales of goods and services and other income made by these establishments listed in Question 4 during the 1982/83 accounting year

$ .....

9. a) What proportion of sales (see Question 8) was made to firm/persons from within the region (see map)?

..... %

b) What proportion of these sales (see Question 9a) was made to farms/farmers within the region (see map)?

..... %

10. a) What proportion of sales (see Question 8) was made to firms/persons located in Alexandra?

..... %

b) What proportion of sales (see Question 8) was made to firms/persons located in Ranfurly?

..... %

11. a) How has the total values of sales (see Question 8) changed over the past five years (Give % increase/decrease per year)

.....

b) What are the major reasons for the changes noted in 10(a) above?

.....

.....

12. What would be the impact on your staffing and capital expenditure of

	Employment	Capital Expenditure
a) 50% increase in sales current levels (Q 8)	.....	.....
	.....	.....

12. cont.

	Employment	Capital Expenditure
b) 50% decrease in sales below current levels (Q 8)	.....	.....
	.....	.....

c) What other impacts would you expect from such an increase/ decrease in sales?

.....

.....

.....

13. How do you think any changes in the Manuherikia Valley Irrigation Scheme will affect your enterprise -

a) If the Scheme is upgraded? .....

.....

.....

b) If the Scheme is phased out? .....

.....

.....