A STUDY OF
HILL COUNTRY DEVELOPMENT
ON HOROWHENUA
SHEEP FARMS

A thesis presented in partial fulfilment
of the requirements for the
Degree of Master of Agricultural Science
in Agricultural Economics and Farm Management
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CHAPTER ONE

INTRODUCTION AND THESIS GUIDE

1.1 Introduction

The Horowhenua district, which comprises an occupied area of 209,629 acres,[1] is an important food producing region for the cities of Wellington and the Hutt Valley. Town milk production, market gardening and small fruit farming are continually expanding in order to cope with an increasing food demand. Associated with this expansion has been the development of an intensive farm advisory service.

This service has enabled detailed knowledge to be obtained about various aspects of lowland farming. However, over the same period of time only limited contact has been made with hill country farmers. As a result detailed knowledge of hill country farming is lacking.

It was this lack of knowledge which was primarily responsible for this study. The study was encouraged by the Department of Agriculture whose officers gave valuable assistance to the author.

1.2 Objectives of the Study

At the time of the study rising costs and falling prices were beginning to erode farm profits. On areas of hard hill country the problem was being accentuated by factors peculiar to this class of land[2]. The continuation of this cost price squeeze will result in a continual decline in real farm incomes

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(1) Source: Statistics of Farm Production For the Season 1966-67, Department of Statistics Publication.

unless some action is taken to offset it. One method of maintaining farm incomes is to increase production. Hence for many hill country farmers development may be a means of economic survival.

The study therefore had three main objectives. These were:-

(i) to determine present management practices and problems.

(ii) to define the development techniques being used and the stock increases being obtained.

(iii) to ascertain the likely profitability of future development.

The first two objectives, in addition to providing background information on Horowhenua hill country farming, had two other important roles. These were to define a management system representative of district practices and to determine the potential for increased production. The third objective aimed at determining the feasibility of future hill country development.

To be meaningful, an estimate of potential production has to be made in relation to three factors. These are the farming environment, the ability of the farmers themselves, and

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(2) These factors include low stock performance, the sale of predominantly store stock and the dependence on wool for 40 to 50 per cent of the income. Rikys and Glenday (1) have stated that this class of farm has always been the most vulnerable - both to falling prices and rising costs; to lower wool prices; to a poor season; to a fall in prices - all these can be passed on to the store farmer by the farmer on the better country paying less for his replacement stock.

the present level of technical knowledge. Consideration of these factors should result in the determination of a potential stocking rate which will be readily attainable by the farmers concerned.

Potential production levels were determined from three sources of information. During the course of a random survey farmers were asked what did they consider to be the potential stocking rate for their farm. These views were reinforced by information obtained from a purposive survey of farmers who had completed development programmes.[3] Finally account was taken of an estimate made by During (3) which was based on soil fertility and climatic aspects.

Variation in factors such as resource structures, attitudes, and the degree of management skill make it impossible to devise a blueprint for hill country development. Basic principles can be defined but the actual development programme will depend upon the individual farm situation.

In order to analyse the profitability of future hill country development three representative farms were selected. These farms were considered to be typical of three of the four main types of hill country farms.[4] Development programmes were devised for the representative farms and the feasibility of future hill country development determined by analysis of these programmes.

After evaluating the feasibility of future hill country

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(3) This survey also provided information on the rate at which stock increases are possible.

(4) See chapter six.

development the alternatives to development were considered.

1.3 Thesis Guide

This section describes the content of the remaining chapters in the thesis. The Horowhenua hill country environment is described in chapter two. Also contained in this chapter is a review of past hill country studies and a discussion on methods of analysing the profitability of development.

Chapter three is concerned with procedures used in the study. Farm surveys are briefly reviewed and the two surveys undertaken by the author described. This is followed by an outline of the place of representative farms as a research technique. The chapter concludes with a brief description of Gardner's computerised evaluation program. This program was used by the author to financially evaluate the development programmes devised for the representative farms.

Information gathered in the random survey is contained in chapter four. This information includes details of management practices as well as objective data.

A description of development programmes undertaken by survey farmers can be found in chapter five.

Chapters six and seven describe and evaluate development programmes devised for the representative farms. The profitability of the programmes is analysed under two methods of financing development.

The potential for, and the feasibility of increasing production on Horowhenua hill country farms is analysed in chapter eight. Potential stocking rates are determined together with the inputs required to obtain this potential.

The likelihood of significant production increases occurring in the near future is also examined. The chapter concludes with a discussion on some of the alternatives to hill country development.

Definitions of common farm terms are contained in a glossary.

Throughout the thesis references to bibliography are made thus (0) while footnotes are indicated thus.[(0)]

CHAPTER TWO

THE HOROWHENUA DISTRICT AND HILL COUNTRY DEVELOPMENT STUDIES

2.1 Introduction

The initial part of this chapter outlines background information on the Horowhenua hill country. This is followed by a brief review of past hill country studies and a discussion on methods of analysing development programmes. The chapter concludes with an outline of the approach used in this study.

2.2 Location

The Horowhenua[1] district is a narrow coastal area on the west coast of the southern part of the North Island. The district extends from Shannon in the north to Paekakariki in the south; a distance of approximately 45 miles. At Paekakariki the hills rise sharply from the coast and the district narrows to a point.

The eastern boundary of the district is formed by the Tararua ranges while to the west the Tasman sea creates a natural boundary. In the north the Manawatu river divides the region from the Manawatu district.

The location of the region in relation to the rest of the North Island is shown in figure 2.1.

2.3 Physical Features

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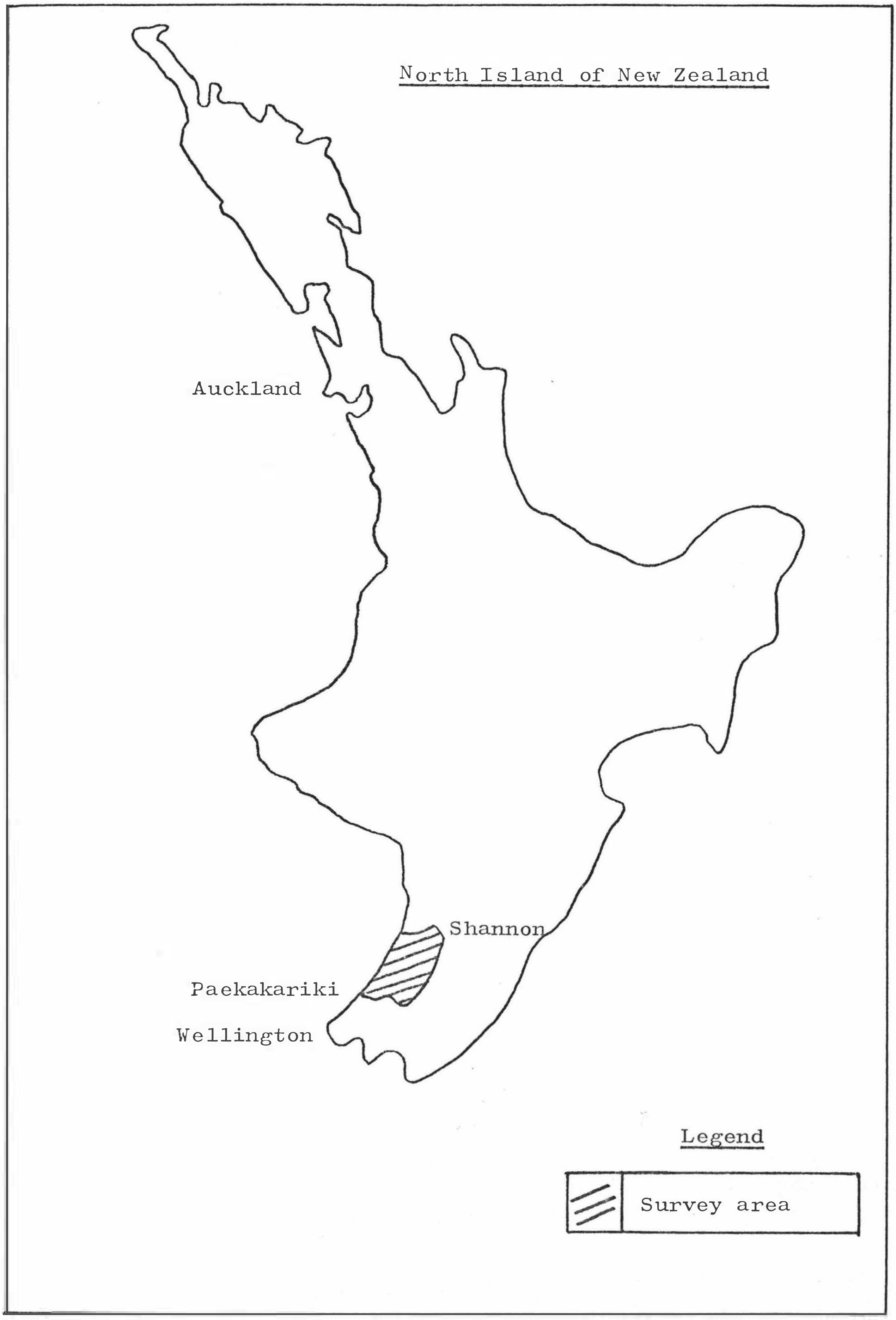
(1) Horowhenua is a Maori name which means "the great land-slide." According to Maori legend the area from Levin to the Ohau river was a gravel deposit. It was a fan of detritus which had the appearance of an enormous landslide from the Tararuas.

Figure 2.1 Location of the Survey Area



2.3.1 Topography

As indicated in figure 2.2 five major landforms can be identified in the survey area. These are the coastal sand dunes, the central plain, the clay loam terraces, the greywacke hill country and the ranges covered in native bush. The land forms are dissected by four rivers. To the north the Manawatu river flows out to sea at Foxton. The Ohau, Otaki and Waikanae rivers have their headwaters in the Tararua ranges and flow westward to the Tasman Sea. These three rivers and their associated valleys divide the hill country and terraces into four blocks. The contour of these blocks varies from easy and rolling to steep and broken.

In early years broad leaved-podocarp forests were predominate. These forests merged into Beech forest at 1,000 feet above sea level and into lowland shrubs and swampland vegetation near the coast. Today most of the land below 1,200 feet has been cleared and replanted in pasture.

2.3.2 Soil Types[(2)]

The hill country soils have been largely derived from greywacke and some ash deposits. The soils can be divided into two major types, viz the <u>soils of the uplands</u> and the <u>soils of the hilly and steeplands</u>.

The <u>upland soils</u> occur on flat to undulating terraces and on rolling and hilly lands with an annual rainfall of 32 to 45 inches. Nutrients are continually being lost from these soils

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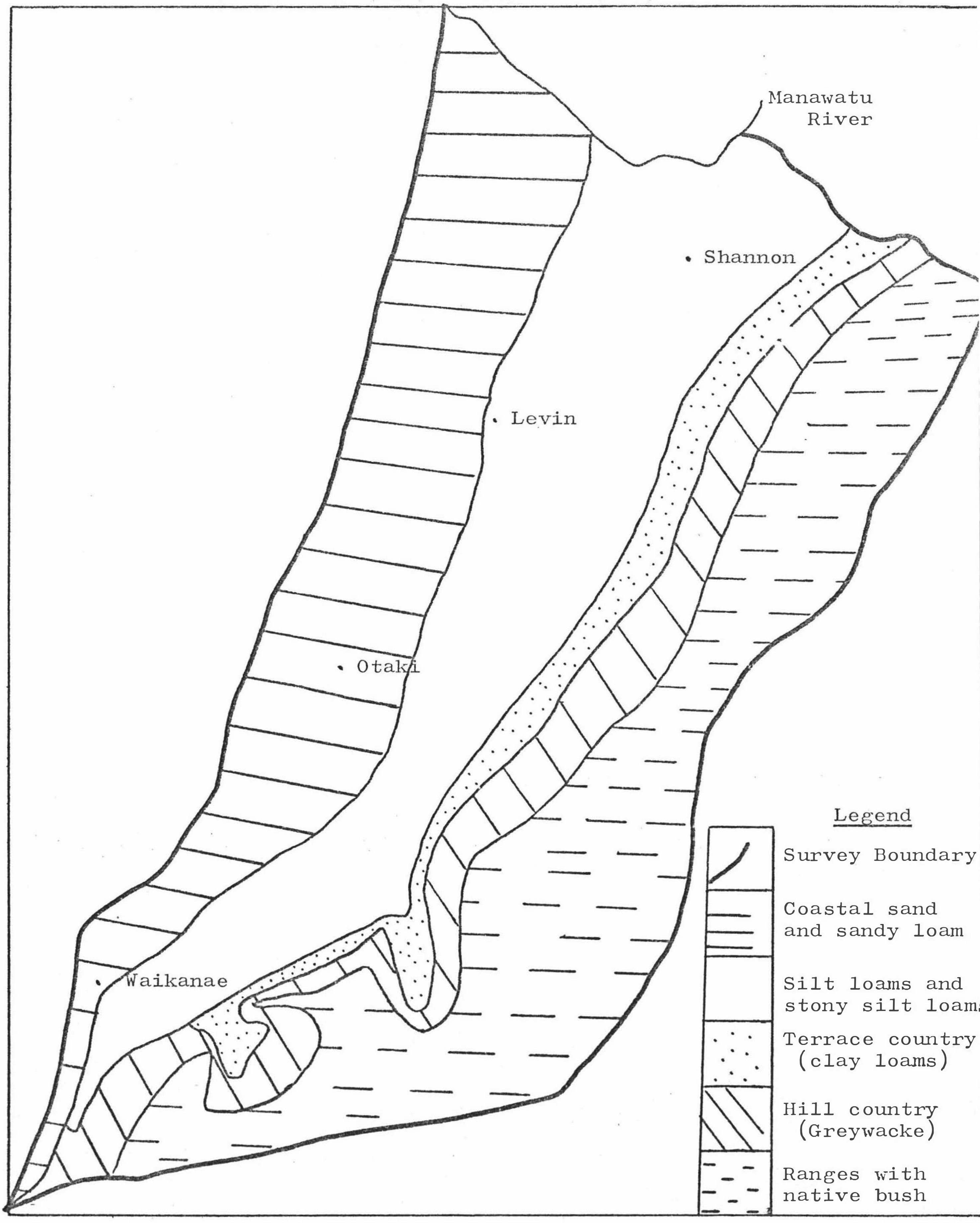
(2) Information appearing in this section was obtained from reference (2).

Figure 2.2 Major Landforms Of The Survey Area



either by erosion or by leaching. These losses are however, partly counter-balanced by the weathering and recirculation of nutrients by plants and soil organisms.

Soils of the hilly and steeplands are generally free draining soils. Differences are chiefly related to the parent rock and to the climate. The upland soils, which are formed from greywacke, are notable for their contribution to successive zones of land. This pattern is due to the influence of climate on soil formation. There is a transition from a mild and sub-humid climate at the coast to a cooler and wetter climate inland. Associated with this is a progressive decrease in both the clay content and the mineral nutrients of the soils. This occurs as a result of slower weathering and greater leaching.

The following subsection lists and briefly discusses the characteristics of the hill country soil types.

2.3.2.1 Main Soil Types[3]

(i) Blemont and Ramiha soils (33c)

These soils are formed on mixed greywacke loess and ash deposits beneath the cooler and wetter climate of the uplands. Drainage varies from slightly restricted to unimpeded. A continual loss of nutrients occurs under the moderate rainfall. The soils are brown friable silty or sandy loams and they have a low natural fertility. Applications of phosphorous, calcium and molybdenum are required to maintain productive pastures.

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(3) The soil reference numbers quoted e.g. (33c) are standard for New Zealand soil maps.

The associated Renata soils are very strongly leached and their profiles show distinct clay coatings on the subsoil and the formation of a thin iron pan. This is indicative of weak podzolisation. These soils are located in the hill country region between Paekakariki and Waikanae.

(ii) Makara - Pahoa soils (35a)

These soils were developed on steep slopes under mull forming broad leaved podocarp forests. The soils are more brown and friable than the Paramata soils and are only moderately leached. The rainfall is absorbed evenly and erosion under grassland is limited to a few slips situated above seepage sites. With phosphate, lime and molybdenum topdressing the soils will maintain reasonable quality pastures. This is the main soil type of the hill country region and extends from Paekakariki to Shannon.

(iii) Ruahine - Rimutuka soils

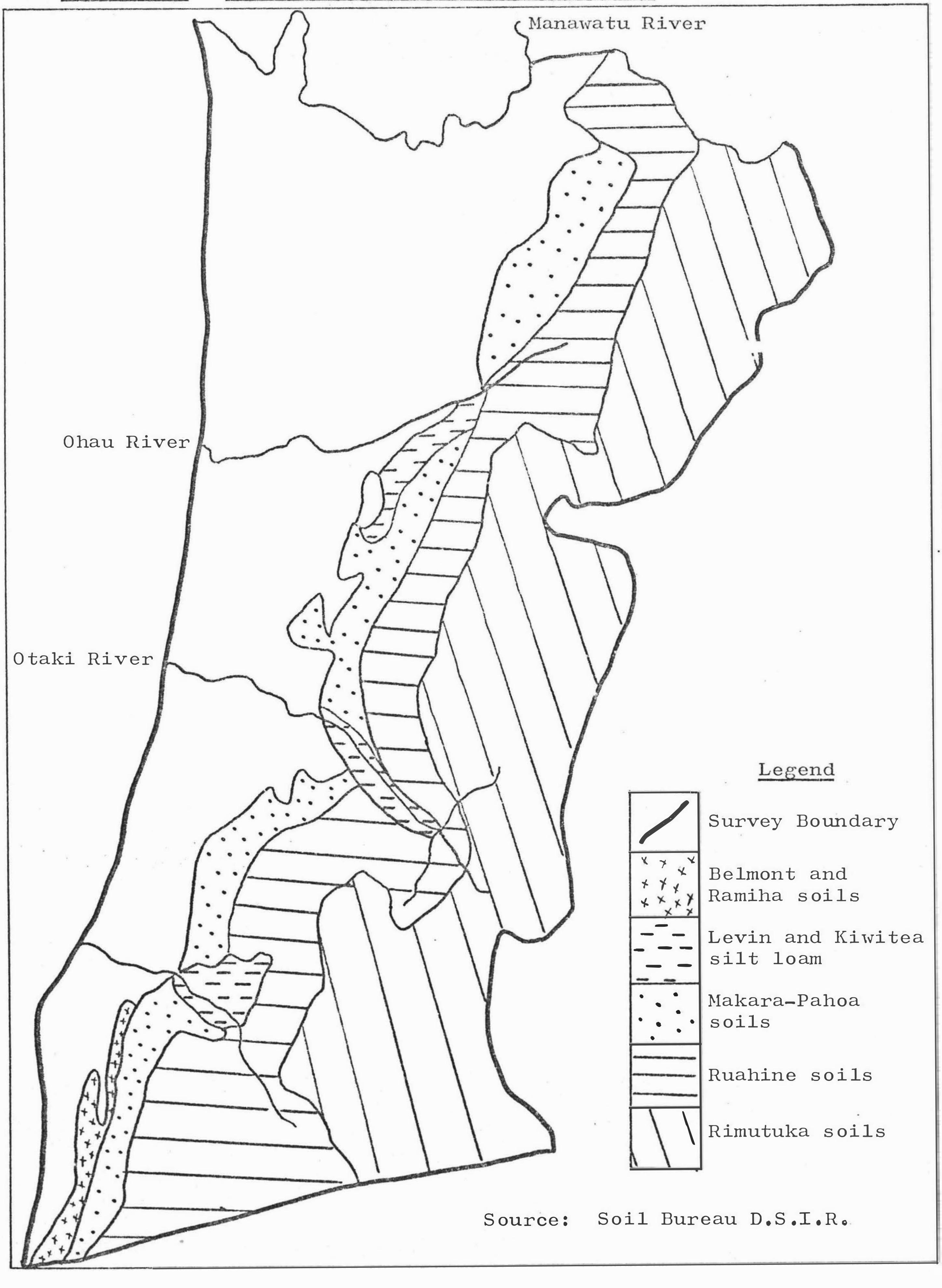
(a) Ruahine Soils (123)

Beneath the native rimu, the beech or kamaki forest, the surface consisted of two to three inches of reddish brown raw humus. This organic store of fertility was maintained under forest but rapidly eroded when the land was cleared for pastoral farming. The erosion exposed a soil which was deficient in many plant nutrients. Frequent topdressing with phosphate and lime is required to maintain pastures.. If this is not done ferns and manuka rapidly invade the pastures. These soils are well suited to forestry.

(b) Rimutuka Soils (124)

Located above 1,500 feet these soils consist of strongly

Figure 2.3 Horowhenua Hill Country Soil Types



acid loams with a thick covering of humus. The fertility is very low and they are best retained for protection forest to conserve water supplies.

(iv) Levin and Kiwitiea Silt Loam (66c)

Many hill country farms have areas of flat land. These areas consist of this soil type which is an example of the yellow-brown earths and intergrades. These soils have been formed from mixed greywacke and volcanic ash sediments under a mild humid climate. They are moderately leached and when topdressed with phosphate, lime and molybdenum they will maintain highly productive pastures.

The distribution of the various hill country soil types is shown in figure 2.3.

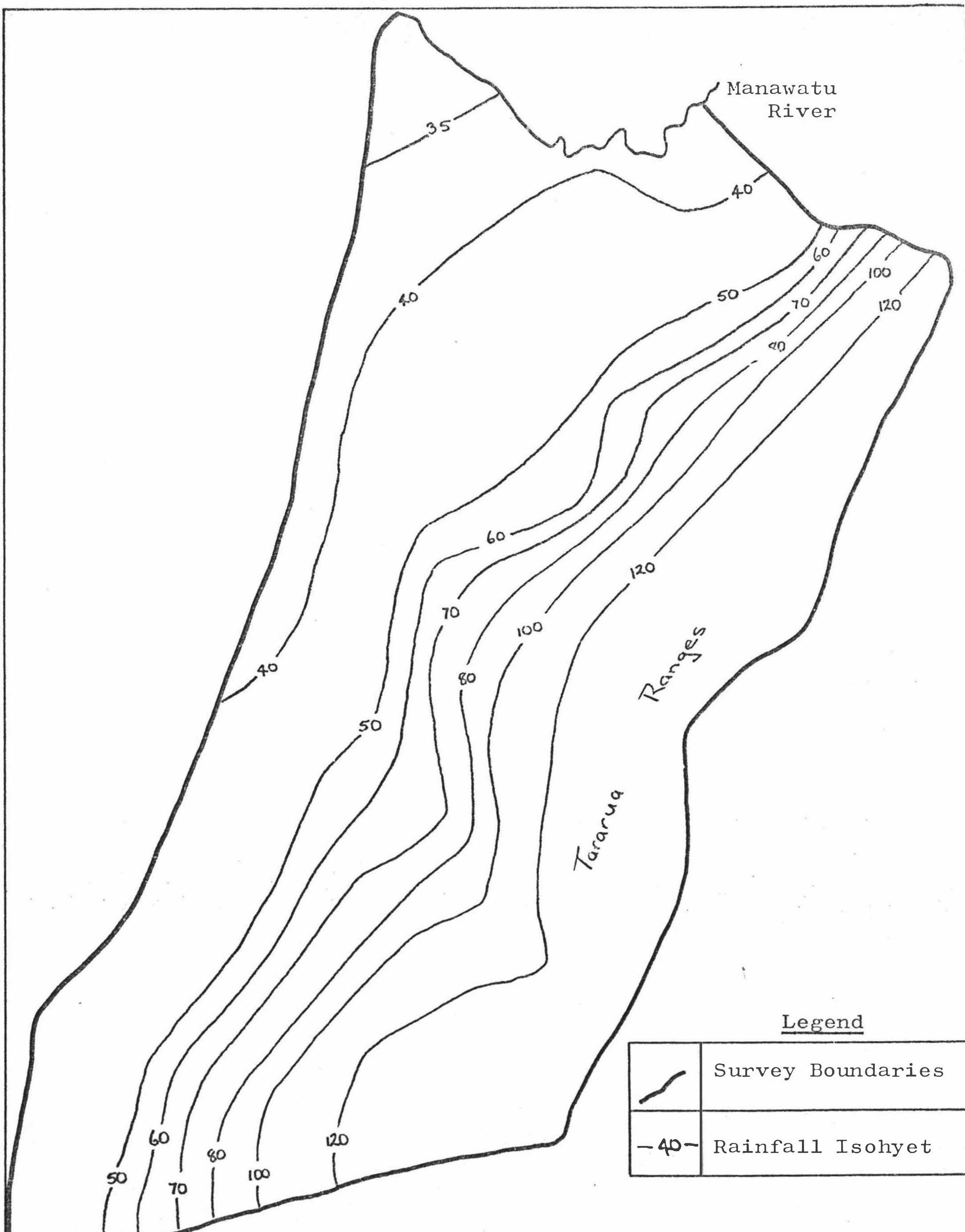
2.3.3 Climate

The rainfall distribution for the survey area is given in figure 2.4. The map indicates the wide variation in total rainfall from the coast to the Tararua Ranges. At some coastal places there is less than 35 inches of rain per annum compared to more than 120 inches in the Tararua Ranges. A large part of the hill country area has between 40 inches and 60 inches of rain per annum.

The rainfall is reasonably well distributed throughout the year. However summer dry periods frequently occur from December to March. Serious droughts occur about once every ten years. The wettest month is June and the driest month is January.

The mean temperatures near the coast vary from a minimum of 45 degrees in July to a maximum of 64 degrees in December.

Figure 2.4 Rainfall Distribution



Source: From N.Z. Meteoroligical Data.

Greater fluctuations occur on the hill country due to the much higher altitude.

In the winter snow falls on land over 1,000 feet above sea level. Cold southerly winter winds in the southern part of the district can cause heavy lamb losses. The prevailing winds are westerlies.

The rainfall distribution, mean temperature and hours of sunshine for Levin and Paraparaumu are listed in table 2.1.

2.4 Auxiliary Services

The survey area is well served with respect to essential services. This has greatly assisted the development of the area. The following subsections give a brief outline of these services.

2.4.1 Roads, Communications And Transport Services

In the survey area roads are of a high standard with only a small minority being unsealed.(4) This allows quick access to and from country farms. By road all hill country farms are within 12 miles of a major town.(5) Hence, the hill country is not an isolated region as in some districts but rather an integral part of the whole district.

Postal and telephone services to hill country farms are both adequate and reliable. Only a few hill country farms share a party telephone line. Rural mail deliveries occur six times a week.

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(4) This is probably a reflection of the shape of the region. Two main highways serve as central roads off which side roads service the coast and hill country areas.

(5) The major towns of the district are Shannon, Levin, Otaki, Waikanae, Paraparaumu and Paekakariki.

Table 2.1 Climatic Data For Two Major Towns In The Survey Area

	Month	Mean Temperature	Rainfall (inches)	Hours Of Sunshine
Levin	January	62	4.4 (2.8)	219
	February	61	2.2 (3.3)	196
	March	60	1.7 (2.9)	N.A.
	April	54	3.1 (3.1)	139
	May	52	4.1 (4.1)	109
	June	45	1.6 (4.3)	126
	July	45	1.9 (3.8)	122
	August	48	4.0 (4.0)	91
	September	54	2.1 (3.2)	123
	October	52	2.3 (4.1)	166
	November	59	1.0 (3.2)	222
	December	64	5.0 (3.6)	190
Paraparaumu	January	62	4.8 (2.6)	229
	February	60	1.5 (3.0)	215
	March	61	0.7 (2.8)	210
	April	55	1.7 (3.0)	138
	May	51	3.5 (3.5)	112
	June	45	1.6 (3.8)	148
	July	44	1.8 (3.9)	122
	August	48	1.9 (4.0)	118
	September	54	3.4 (3.4)	132
	October	52	1.8 (4.0)	196
	November	58	1.5 (2.8)	263
	December	63	2.9 (3.4)	221

Notes -
1. Figures refer to the year 1969.
2. Average rainfall figures are shown in brackets.
3. N.A. means not available.
4. Source: "Extracts from the New Zealand Gazette."

There is a daily bus and railcar service to and from the major towns in the district. The main north railway line which passes through all towns in the area is in close proximity to hill country farms. This enables stock to be rapidly transported to freezing works. A lot of stock is, however, sent by road. Numerous road transport companies situated at Shannon, Levin, Otaki and Paraparaumu extend a reliable service to farmers.

2.4.2 Agricultural Contractors

There are an adequate number of agricultural contractors in the region. These contractors undertake harvesting, spraying, cultivation, drainage and fertiliser spreading.

In addition to these services contract shearing gangs as well as individual shearers are available throughout the year for shearing and crutching.(6) Some shearers also provide a fencing service during the autumn and winter months.

2.4.3 Fertiliser Works

There are no fertiliser works in the area. The bulk of the fertiliser is purchased from the Kempthorne and Prosser fertiliser works at Wanganui. The fertiliser is railed to the depot nearest to the particular farm and then trucked to the farm gate. Lime is obtained from Amners Limeworks at Pakipaki, the Hatuma Limeworks at Takapau and, in some instances, from the Gorge Limeworks at Woodville. During the course of the study the author did not hear of any serious delays in fertiliser deliveries.

2.4.4 Freezing Works And Saleyards

Within the Horowhenua region the main saleyards for breeding and store stock are situated at Levin. In the

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(6) See glossary of terms.

southern part of the region Glenside and Pauhatanui saleyards provide other outlets for breeding stock. Some stock from the northern part of the survey area are sold at Feilding.

Three freezing works and one abattoir provide the main slaughtering and freezing facilities for stock from the region. The three freezing works are situated outside the survey area at Longburn, Petone and Ngauranga. They are owned by the Co-operative Wholesale Society, the Gear Meat Company and the Ngauranga Meat Company respectively.

2.5 Farm Extension Services

Farmers in the district are well served with technical information. This information comes from a wide variety of sources, e.g. the Department of Agriculture,[7] the New Zealand Dairy Board,[8] Farm Improvement clubs, private advisers, stock firms, machinery firms, seed firms, veterinarians, and accountants.

Mass media extension services to farmers include farming journals, newspaper articles and radio broadcasts from the national broadcasting station. In addition sheep and dairy farmers' field days have been inaugurated in the district by the Department of Agriculture. Many farmers from the district also travel to Palmerston North for the Massey University dairy farmers' and sheep farmers' conferences.

In the past management and financial advice, given by advisers of the Department of Agriculture, Dairy Board and

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(7) Offices situated at Levin and Wellington.

(8) The Dairy Board consulting officer servicing the district is based in Palmerston North.

Farm Improvement Clubs, has been largely directed towards town milk producers.[9] As a result hill country farmers have been largely neglected.[10] In recent years some hill country farmers have joined the Farm Improvement Club in order to obtain regular management and financial advice. However many hill country farmers cannot financially afford such a service. There is therefore, a need for an improved hill country advisory service from the Department of Agriculture.

2.6 Lending Institutions

Short term finance is available from stock firms, (mainly for stock purchase) insurance companies and trading banks. The trading banks are the main source of short term credit. However, short term finance does not provide suitable capital for hill country development. For this purpose the principal sources of capital are the State Advances Corporation and Marginal Lands Board. These two institutions have lent to a number of hill country farmers for the purchase of properties and for development.[11]

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(9) This has been due to the greater relative importance of the town milk industry in the area and to the greater demand for management advice from this group.

(10) The responsibility for the lack of advisory services can be attributed to both hill country farmers and advisers. Hill country farmers do not seek outside advice as much as town milk farmers. This may be because they are unaware of the advisory services available to them. If this is true then the Department of Agriculture has been remiss in allowing advisory services to these farmers to deteriorate.

(11) At the time of the study eleven survey farmers (44%) had received government finance.

2.7 Summary

The important points that have arisen from this section are:-

(i) The hill country is of low natural fertility and variable topography.

(ii) The total rainfall varies from 35 inches to 120 inches with an average rainfall of 40 to 60 inches on the hill country farms.

(iii) Summer droughts can occur and snow falls on the hill country in the winter.

(iv) The hill country is readily accessible and well supplied with essential services.

(v) Because of the proximity to road and rail, transport costs in relation to other hill country areas, are low.

(vi) There are no fertiliser or freezing works in the area.

(vii) Finance has been readily available to hill country farmers for development.

(viii) There is need to improve advisory services to hill country farmers.

2.8 Hill Country Development Studies

Detailed studies of hill country development have been published only in the last decade. This has occurred as a result of the need to increase agricultural production and the realisation that the major part of this increase would come from the hill country. Most of the investigations into hill country development have been concerned with aspects of profitability. The case study[12] approach, involving either an *ex poste* or an *ex ante* analysis, has been the technique most commonly used to analyse profitability.

In 1963 Wright (4) investigated the relative non acceptance by farmers of the Te Awa type of hill country development.[13] The physical and economic aspects of development and the factors restricting or preventing development were studied by means of a farm survey. The survey, limited to the hill country of the Wanganui-Rangitikei-Manawatu region, indicated that lack of knowledge was probably the greatest handicap to faster hill country development. On the basis of two case studies both budgeted into the future Wright concluded that development is only marginally profitable to the individual farmer.

A study undertaken by Holden (5,6) in 1965 aimed at analysing two aspects of hill country development viz the *post tax* profitability of development and factors preventing increased production on hill country. An *ex poste* analysis using current prices was carried out on development programmes implemented on North Island hill country farms. From the study Holden concluded that after allowing for price changes 75 per cent of the programmes were profitable. Of the factors influencing profitability the principal determinant appeared to

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(12) This involves a study of a development programme implemented under an actual farm situation.

(13) This type of development involves adequate subdivision, topdressing and oversowing with legumes, control of grassgrub and Porina and the complete utilisation of all pasture growth.

be the rate of stock increase per annum.

Feasible development procedures were devised by Frengley, Tonkin and Johnson (7) for two hill country properties in North Canterbury. The physical and financial implications of these procedures were then analysed using an ex ante analysis. The analysis indicated that the programmes would be profitable under the assumptions made. Postscripts to both studies detailed the changes made to the development programmes as a result of unforeseen factors, e.g. a drought and a fall in wool price.

Johnson (8) examined the effect of falling wool prices on Taranaki hill country development. Two retrospective studies were undertaken on farms where development had been suspended and two forward studies where the development process had been altered. Johnson concluded from this study that

> "in general the cheapest form of development is adding more stock to already developed farms"

and that

> "further prudent development will still give a satisfactory return on the additional capital spent."

A major study of the potential for increased production on hill country sheep farms in the Wairoa county was made in 1967 by Cartwright (9). From the results of a survey Cartwright stated that

> "with the present level of technical and managerial knowledge the area has a potential stocking rate of five ewe equivalents per acre."

The profitability of past development programmes were analysed using a combination of *ex poste* and *ex ante* analyses. A hypothetical farm development programme was then constructed and evaluated. From this analysis Cartwright concluded development should remain profitable to the nation over virtually all foreseeable price combinations.(14) The analysis suggested development should be profitable to farmers over some price combinations.

2.9 The Profitability of Development Programmes

There are two main methods of analysing the profitability of development programmes, viz. the case study approach and the use of a generalised model.

There are two types of case studies. These are the *ex poste* or *retrospective* study and the *ex ante* or *forward* study. The *ex poste* study is a historical study usually based on the analysis of farm accounts. An *ex ante* study is based on forward budgeting methods.

2.9.1 Ex poste Studies

The profitability of past development programmes has been affected by economic conditions during that period. The level of prices and costs operating at that time have influenced the decisions made. In order to isolate the development programme from the conditions governing it, two conventions are possible with respect to costs and prices. These are to use *actual*

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(14) In his study Cartwright varied the price of wool from 27d. per pound to 51d. per pound. This range does *not* however include the present price level for wool. This situation indicates the difficulty in accurately forecasting future price levels.

costs and prices converted to real terms[(15)] or to use standardised costs and prices.

If all physical quantities used in the development programme are available then a series of deflated prices can be applied to these quantities in order to obtain the required real values. Unfortunately most accounting data does not provide this information.[(16)] The derivation of real values therefore relies on the use of a price index.[(17)] These indices, like most general indices, have a number of weaknesses. The most important of these is that they are based on a specific input mix which may not be representative of the input mix used in the particular programme under review.

The second convention is to use standardised costs and prices. These are applied to the recorded physical production data. Both Cartwright and Holden used this convention in their studies. Cost indicies were applied to previous expenditure and the output was given a long term expected value.

Cartwright states that both advantages and disadvantages acrue from using standardised costs and prices. The advantages are two-fold. Firstly the effects of short term market forces on prices and costs are avoided. Secondly it prevents the analysis of one farm being biassed with respect to other farms

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(15) In order to convert actual costs and prices to real terms it is necessary to choose a base year. Indices of price changes from this base year are then used to bring costs and returns to constant values or real terms.

(16) Farmers' accounts have in the past been prepared for tax purposes rather than for management use.

(17) For example such as the one published by the New Zealand Meat and Wool Boards Economic Service.

by virtue of it receiving high or low premiums by chance. The disadvantages are that genuine premiums obtained by farmers through trading skill are eliminated and that price and cost forecasts may be poor. Thus a plan shown to be feasible at standardised costs may be infeasible at inflated costs.

The use of standardised costs and prices allow statements such as

"this is the profitability of the development programme if undertaken now"

to be made.(18)

It is difficult to attach much importance to these statements. The decision making environment has been changed and time has altered such factors as:-

(i) prices and costs,

(ii) the degree of technical knowledge,

(iii) the availability of, and the terms for, loan money,

(iv) the economic climate and the financial position of individual farmers.

These factors profoundly influence the actual development programme implemented by individual farmers. Therefore exact replicas of past development programmes are unlikely to be repeated in the future. The author believes that <u>ex poste</u> studies of past development programmes should be made using <u>actual</u> prices and costs. It was these prices and costs which influenced the speed and type of development undertaken. Such

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(18) These statements imply that all assumptions will hold into the future.

analyses are, however, of academic curiosity only. Their contribution to deciding how capital should be allocated to future agricultural development is limited.

2.9.2 Ex ante Studies

Ex ante studies avoid the price problem by assuming current prices or some combination of present and past prices. The forward budgeting technique enables the analyst to evaluate now the profitability of a feasible future development programme. The analysis is however dependent upon the present level of knowledge. This means that because the future cannot be predicted accurately, price and technology changes will affect:-

(i) the proposed development plan,

(ii) the profitability of the development.

As a result detailed financial evaluations must be tentative because any deviation from the original development plan means that the financial evaluation is no longer applicable.

Some recent *ex ante* studies[19] have incorporated rising input prices. In these studies the computational burden is increased. The base year situation has to be reassessed for each year of the development plan. If this is not done, the base year does not reflect what would have happened in the absence of development.

2.9.3 Combined Ex Poste And Ex Ante Studies

In studies where the development process is incomplete

(19) See reference (12).

some workers[20] have used a combined *ex poste* and *ex ante* analysis. This type of analysis involves the use of actual and projected costs and prices. These are applied to the completed part of the programme and to the future *likely* plan respectively.

Cronin (11) has stated that such analyses can make allowance for unforseen variables which entered into the development programme as it proceeded. Furthermore, the results already obtained can be used with a greater degree of certainty than his (Cronin's) projection of future results.

The author however, does not believe that these combined analyses provide information relevant to future development. The base from which development will start has been changed as has the decision making environment. The level of technology has also changed thereby altering the level of production which is technically feasible. Hence development programmes undertaken in the past are unlikely to be replicated in the future.

2.10 The Generalised Model

The profitability of hill country development can be examined by formulating a generalised model of a development programme.[21] The sensitivity of profits to changes in one or more variables[22] can then be studied. This type of

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(20) For example Cartwright (9) and Cronin (11).

(21) That is a development programme which with slight modification could be applied to a number of farms.

(22) These variables include price forecasts, costs, speed of development, interest rate, and degree of equity.

analysis is basically a financial evaluation of one development programme. Such a model must be able to take into account the physical changes made to the development programme when important variables alter.

In theory the generalised model is useful in indicating the range over which variables can alter without the programme becoming unprofitable. It does not however indicate in practical terms how farmers should alter development to offset the effects of these changes on the profitability of development. From a farmers point of view this is an important aspect of development planning.

2.11 The Approach Used

Farmers are interested in the profitability of future development. For this reason the author believes an *ex ante* analysis of development programmes is necessary.(23) While the future cannot be predicted accurately forward budgeting does make the best use of present knowledge. Consequently it aids in determining the most efficient use of resources.

It is however, impossible to furnish a blueprint for hill country development. The speed and the direction of the development is determined by the individual farm situation. Most of the important decisions concerning development involve

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(23) The development programme so analysed is one which is feasible under the existing farm situation. Analysis of *past* development programmes using projected costs and prices should not be used to determine whether future development will be profitable. The principles of past development programmes e.g. stock increases, may be applicable to the future but it is unlikely that the actual development programme itself is applicable under present price structures.

change. This leads to uncertainty about future events and to uncertainty about the impact of events on a feasible development programme.

Despite the uncertainty, decisions have to be made now about development to be undertaken in the future. Using present knowledge a development plan can be formulated to achieve some future goal. As the plan is implemented throughout time, additional information will become available. This information will inevitably mean, in a dynamic agriculture, modifications to the basic plan. Thus by the time the goal[24] is reached the completed programme may be significantly different from the original plan. As a result a detailed financial evaluation of profitability is likely to be of academic interest only.

The major difficulty with an *ex ante* analysis is how to incorporate the effect of changing product prices in the analysis. Several problems are involved. The first problem is associated with the timing of these price changes. These changes can occur at any point in a development programme and the remedial action taken will vary according to the point at which the change occurs.[25]

The extent of the price changes also influences the action taken. It is however, difficult to accurately forecast either

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(24) Marked changes in variables affecting development may result in the completed goal being different to the proposed goal before development.

(25) A price fall in the year immediately after the implementation of the development programme is likely to have a greater effect than a price fall at a point where development is generating additional profits.

the extent of, or the timing of price changes. If accurate forecasts were possible there still remains the question of what action the farmer will take. Individual farmers vary in their managerial ability[26] and hence in the alterations they will make to development plans under changing conditions. Thus the effect of price changes can be analysed in a normative sense but not in a positive sense.

Today, because of the uncertainty about the effect of future price falls on development, farmers may still refrain from undertaking development.[27] This is despite the fact that development could be shown to be profitable. Thus it might be considered that some attempt should be made to:-

(i) incorporate changing product prices,

(ii) indicate the remedial action that should be taken to offset price falls and protect the capital already invested.

However the problems involved in accurately forecasting future price trends and hence changes to the development programme make this a difficult assignment. For this reason the desirability of future Horowhenua hill country development has been analysed using constant product prices and costs. The development programme with the highest profitability under

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(26) Managerial ability is an important input in any development programme.

(27) This is probably true of the majority of Horowhenua hill country farmers who prefer the status quo situation to the possibility of losing the limited capital they have and at the same time increasing their indebtedness.

these assumptions can then be selected.[28]

The effects of future price changes cannot be satisfactorily analysed by budgetary methods. Annual revision and evaluation of ex ante programmes is therefore an essential requirement. In reality the planning of future development programmes involves detailed planning for the initial years and broad planning for the latter years. As prices and technology change so must the development programme if the effects of non beneficial changes[29] are to be minimised and beneficial[30] changes maximised. These changes may not result in the optimisation of profits. They will, however, ensure that profits will be greater than those that would occur in the absence of revision.

From a financing point of view lending institutions are likely to have greater confidence in development which is annually revised and evaluated. They may also be more willing to provide additional capital if this is required.

2.12 Summary

The following points have emerged from the review of hill country studies and from the methods of analysing development

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(28) This method of selecting the development plan to be undertaken is, in theory, similar to the selection method of a profit motivated farmer. Frequently however, sub-optimal investment decisions are made because farmers are unwilling or unable to invest on a scale which will earn the optimum return.

(29) Non beneficial changes would include falling product prices and adverse climatic conditions e.g. drought.

(30) Increases in product prices and a technology change resulting in higher productivity are examples of beneficial changes.

programmes:-

(i) Hill country development studies have been published only recently.

(ii) Predictions about the profitability of future development have ranged from:
"marginally profitable" (Wright 1963)
to
"development would be profitable over wide price ranges"
(Cartwright 1967)

(iii) Both the case study approach and the generalised model have been used by research workers in determining the profitability of development plans.

(iv) The case study approach involves the use of an <u>ex poste</u> or an <u>ex ante</u> analysis.

(v) There are problems involved in using both types of analyses. If an <u>ex poste</u> analysis is used the problem is in deciding what costs and prices to use. With <u>ex ante</u> analyses the problems revolve around uncertain knowledge of the future.

(vi) The magnitude of these problems are increased with combined <u>ex poste</u> and <u>ex ante</u> analyses.

(vii) Use of a generalised development model is in theory useful in indicating the range over which prices can alter without causing the development programme to be unprofitable. The problem is that it does not indicate how farmers should alter their development plans in response to these changes.

(viii) The author has used constant prices and costs in an *ex ante* study of Horowhenua hill country development.

CHAPTER THREE

PROCEDURES USED

3.1 Introduction

The study of the profitability of future Horowhenua hill country development involved the use of farm surveys, representative farms and a computerised financial evaluation program.

The farm surveys enabled essential information to be collected on such aspects as management practices and problems, productive performance and hill country development techniques. Feasible development programmes[1] were then formulated for farms representative of hill country sheep farms in the region. Later the financial implications of these programmes were evaluated using Gardner's computerised evaluation program.[2]

This chapter begins with a brief summary offarm surveys. The surveys undertaken by the author are then described and the place of representative farms as a research technique discussed. The chapter concludes with an outline of Gardner's program and a comment on some limitations that became apparent while using the program.

3.2 Farm Surveys

Farm surveys are one form of farm management research and involve the collection and analysis of farm data. They may

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(1) We refer to a computer "program" but a development "programme".

(2) This program was slightly modified to include data from a cattle breeding program devised by the author. This program was devised because Gardner's program did not allow for a cattle breeding policy. The program is outlined in appendix B.

form the basis for studying particular farm practices, for determining impediments to increased production and for evaluating new technology in farming. Candler emphasised the importance of farm surveys when he stated

> "Farm surveys may be the best, indeed the only way of collecting information on the success of new practices at the farm level."

As a research technique surveys have been used since the beginning of the century.(3) The surveys carried out by early workers were of two types viz. descriptive or enumerative surveys and interview or management surveys. The characteristics of these types of surveys are briefly outlined in the following subsections.(4)

3.2.1 Descriptive or Enumerative Surveys

The majority of farm surveys have been of this sort. Such surveys are designed to find out about farms and farmers. They consist essentially of the collection of farm records either by mail questionnaires or by farm visits. The information required is rigidly defined by means of a set questionnaire. The main use of these surveys is probably to provide descriptive information on farming. They can also indicate where further detailed research may be required.

3.2.2 Interview or Management Surveys

This type of survey is basically a means of testing a

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(3) A comprehensive review of these early surveys can be found in (13).

(4) For a discussion of the limitations of these types of surveys the reader is referred to (14).

hypothesis.[5] It involves the collection of both subjective[6] and objective[7] data. Candler (15) has formally defined management surveys as

> "A series of interviews with farmers to give information about some one management practice."

During the interview discussion usually ranges from topic to topic. A set questionnaire is not used but in some instances interviewers may use a schedule or list of topics. This acts as an aid to remembering the points they wish to discuss. A high degree of interviewing skill and agricultural training is needed for these surveys because of the subjective nature of much of the data. Management surveys are likely to improve the understanding of differences in farming performance and hence provide a means of formulating useful recommendations for farmers.

Three types of management surveys have been identified by Candler (16) and these differ only in their objective.

Briefly they are:-

(i) Research or Pre-release surveys

These are designed to determine whether there is likely to be a place for a new product or for a new management practice. They involve a survey to determine current management practices followed by an analysis of a management

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(5) For example more cows and more fertiliser mean greater profits.

(6) This involves information on such aspects as intentions, motivations, expectations and attitudes.

(7) Data of this sort is specific data such as stock numbers, fertiliser usage and number of acres.

system which includes the new practice or product. From this an estimate of the likely profitability of the new practice or product can be obtained.[8]

(ii) Post-Release or Early Adoption Surveys

This type of survey is designed to obtain information on farmers experiences with a new management practice. To be useful such a survey needs to be carried out before the bulk of farmers have changed to the new practice. The aim is to establish the profitability of the new practice and to define the conditions necessary for success. The timing and wide publication of results are two important aspects of this type of survey. An early adoption survey has been carried out by Grahame (19).

(iii) Non Adoption or Behaviourist Surveys

In this type of survey the research worker wants to find out why some farmers are refraining from adopting a new practice or product. Such surveys involve difficulties of obtaining the real reasons for nonadoption[9] and in checking for consistency of replies.[10]

The reliability and value of the results obtained from interview surveys depend largely upon the training and interviewing skill of the research worker. This point has

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(8) The results of such analyses depend largely upon the assumptions made. Pre-release surveys have been carried out by Frampton (17) and Williams (18).

(9) No farmer is likely to admit to a lack of drive or to ignorance.

(10) Cronin's (11) study of the factors preventing high production on some dairy farms in the Rangitaiki Plains deals with this point in some detail.

been made by Schapper (14) who stated

> " . . . . . . a high degree of interviewing skill and appreciation of interviewing as a scientific procedure are pre-requisite's for reliable results."

3.3 Horowhenua Hill Country Surveys

Two surveys were undertaken. The initial survey involved a random survey of hill country sheep farms in order to

(i) obtain physical and production data

(ii) define management practices and hence a management system typical of district practices

(iii) determine attitudes of farmers to development

(iv) pinpoint factors hindering or preventing development.

The purposive survey was undertaken in order to study development methods currently being used by progressive hill country sheep farmers. This survey was conducted on a case farm basis. Each farm and farmer was treated as an entity and conclusions were drawn on the basis of this and not from aggregated data.

3.3.1 The Survey Area

The survey area included all the hill country between Shannon in the north and Paekakariki in the south. The total area of approximately 70,000 acres represents a small portion of the hard hill country of the North Island. Such hill country has frequently been referred to as second class hill country.[11]

3.3.2 Identification of Survey Farms

With the assistance of Mr R. Gill[12] all sheep farms in the survey area were identified. Of these 70 were classified as hill country sheep units[13] including 14 whose owners derived income from other sources.[14] These latter properties were included in the random survey for two reasons: they formed a significant percentage (20%) of the sheep farms in the survey area and physical and management information only was required from the survey. It was thought that management practices on these farms were unlikely to be significantly different to those used on self-contained sheep units.[15]

Identification of purposive survey farms was more difficult. As there had been little advisory contact with hill country sheep farmers, those undertaking development work were generally unknown to local advisors. For this reason assistance was obtained from accountants, stock firms and produce merchants in identifying farmers who had or were, carrying out hill country development. Some of these farmers were later excluded from the survey because of either an

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(11) This has been defined by the New Zealand Meat and Wool Board's Economic Service as hill country carrying approximately two sheep per acre plus cattle (approximately one beast to seven or eight sheep). Wool provides some 40 per cent of the revenue and the balance is derived in about equal proportions from the sale of store sheep and store cattle.

(12) Livestock Instructor for the Department of Agriculture in Levin.

(13) For the purpose of the study a hill country property was defined as a farm with 60 per cent of its area steep and unploughable.

(14) These sources included town milk products, agricultural contracting, opossum trapping and shearing.

(15) The results of the random survey proved this assumption to be correct.

unsystematic approach to development or unsuitable records.

3.3.3 Selection of Survey Farms

Twenty three farms[16] were selected for the random survey in the following manner:-

(i) numbers were assigned randomly to the hill country sheep farms

(ii) numbered discs corresponding to individual farm numbers were then placed in a barrel

(iii) a disc was drawn from the barrel after it had been revolved.

The farms selected included five which derived income from sources other than sheep farming.

Initially seven farms were selected as being suitable for the purposive survey. Two of these were later rejected because of unsuitable records and the absence of any real development plans. The small number of purposive farms is a reflection of the absence of planned development on this area of hill country.[17]

The location of the survey farms is shown in figure 3.1.

3.3.4 The Survey Method

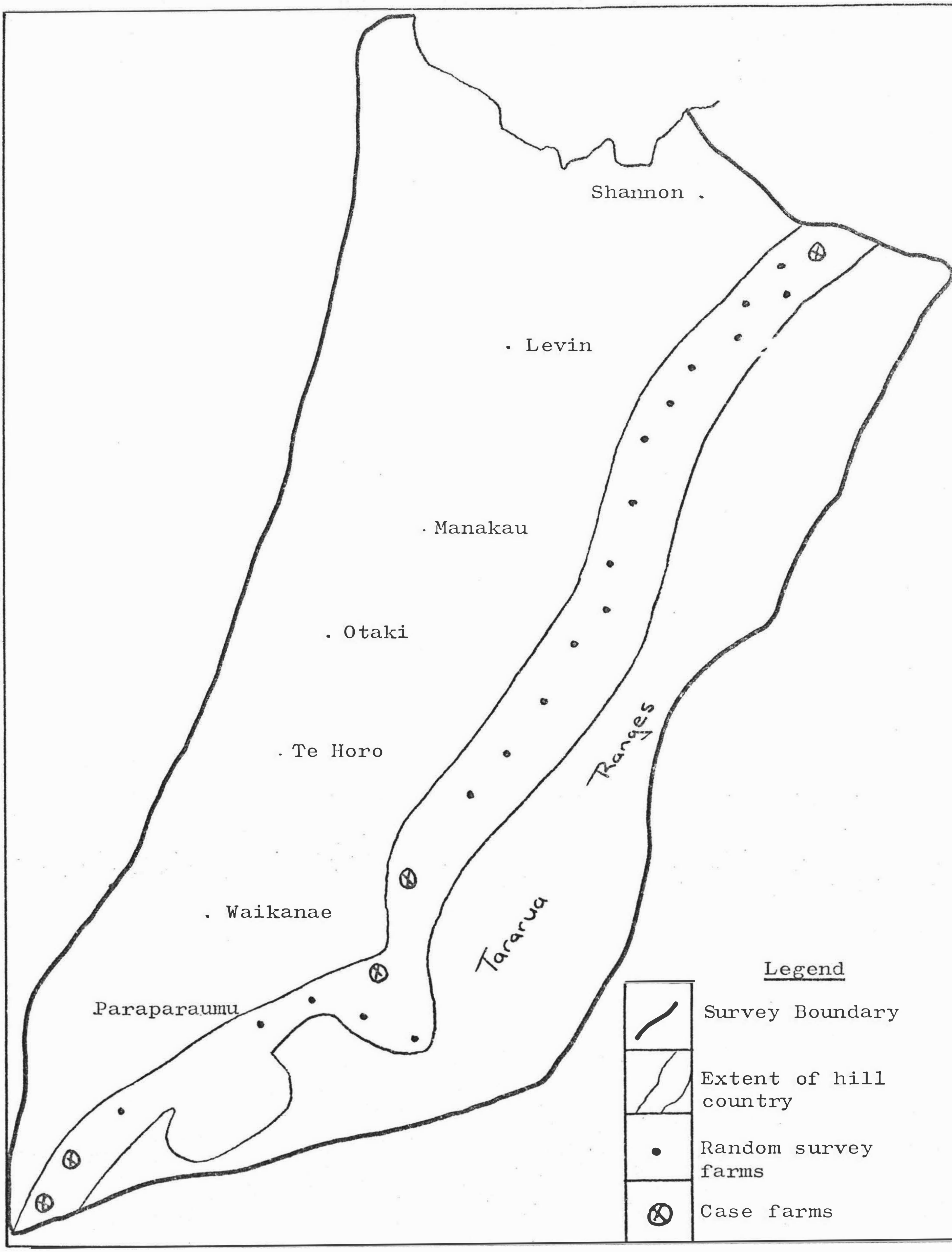
Farmers in the Horowhenua district were first made aware of the proposed hill country survey by means of a newspaper article.[18] This article was written two months prior to the

(16) This size sample of farms was taken in order to ensure an adequate coverage of hill country farms throughout the survey area.

(17) The author is reasonably certain that no hill country sheep farm which had achieved significant production increases in recent years was omitted from the survey.

(18) Levin Chronicle November 1968.

Figure 3.1 Distribution Of Survey Farms



survey and was followed by a letter[19] outlining the reason for the survey.[20] Survey farmers were then telephoned and asked if they wished to participate in the survey. In most cases farmers were pleased to co-operate and a time and date for a meeting was arranged.

Of the 23 random survey farms 20 were visited. The reasons given by the three farmers for non-participation in the survey were -

(i) not interested - the farmer concerned did not believe that the survey was likely to be beneficial to him.

(ii) ill health - the owner of the farm was seriously ill in hospital.

(iii) the farm had just been sold - the owner was involved in shifting and did not have time to participate in the survey.

After the random survey farms had been visited the case study farmers were contacted. The procedure followed was similar to that employed with the random survey farmers with one exception. A slightly modified letter was sent to these farmers in which it was made clear that financial as well as physical information was required.

The random survey was carried out in February and March of 1969. The purposive survey commenced in April of the same year and was completed by June.

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(19) The letter is reproduced in appendix A.

(20) This method of approach gave farmers time to think about the survey. The author believes that this assisted the co-operation he obtained.

3.3.5 Interview Technique and Experiences

Each survey commenced with an inspection of the farm. The initial part of this period was concerned with gaining the farmers confidence(21) and obtaining knowledge of the physical properties of the farm.(22) This was followed by a random discussion of the various management practices employed by the farmer.(23)

Initially provision was made for two surveys per day. This practice was discontinued after the first attempt. The lack of working time(24) meant that surveys were rushed and farm impressions not clearly defined in the author's mind. It was also difficult to adjust to two different personalities within a short period of time. Interviewing was not easy and different approaches were often necessary in order to obtain the required information.(25)

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(21) This is essential if a farmer's full co-operation is to be obtained. Warren (10) reported that it was essential to have rapport between the research worker and the farmer.

(22) This is essential to the understanding of management practices.

(23) This process allowed the farmer to talk more freely about the farm and in particular the problem involved in farming it. Grahame (19) has summarised the advantages of this freeflow type of interview.

(24) In general farmers preferred their farms to be visited between the hours of 9 a.m. and 5 p.m. Consequently a maximum of 8 hours per day was available for the surveys. This restricted farm visits to one per day.

(25) For example one farmer may constantly diverge from one particular topic during the course of the conversation. In such a case the interviewer has to bring the farmer back to that particular topic in order to obtain all the information required. On the other hand a reticent farmer needs to be drawn out in order than his views are fully expressed.

More time was spent with individual farmers in the purposive survey than in the random survey. As well as discussing management practices, physical and financial aspects of development were examined in detail. Records of development and financial accounts were borrowed by the author. These were returned after a thorough examination.

Certain topics were discussed more on some properties than on others. In general the author found most farmers were knowledgeable on stock management, but less informed on pasture management. Development was a sensitive subject with some farmers. The author made it clear, before any discussion on this aspect, that he was not there to criticise. This probably resulted in all farmers freely expressing their views on the question of future development.

During the course of the survey the author gained the benefit of time spent in the area as a farm adviser (1967-68). Some of the survey farmers were known to the writer prior to the commencement of the survey. This greatly assisted the collection of information and the co-operation received. Overall, farmer co-operation was excellent. A number of the random survey farmers offered financial information although this was not required. Others provided detailed information regarding personal drawings and the adjustments made to combat the cost price squeeze.

The surveys created much interest. By the time the first few visits had been completed a large percentage of hill country farmers had become aware of the study. Some farmers not included in the survey were eager to participate. The writer gained the impression that hill country farmers would participate readily in any study they thought might be beneficial.[26]

3.3.6 The Survey Data

Data from the two surveys can be found in chapters four and five. Chapter four deals with information collected from the random survey, and includes data on farm size, stock numbers, production performances and attitudes to development. The information from the purposive survey is contained in chapter five.

3.4 The Value of Representative Farms As A Research Technique

The particular technique used in any research study is determined by four main factors. These factors are the time, funds and data available and the complexity of the problem. For certain types of management problems, e.g. development, a sufficient element of similarity may exist between farms to realistically specify a typical or representative farm. On this farm development opportunities can then be analysed.

Most farmers adjust slowly to new conditions and technology and all differ in their degree of adjustment. For this reason farmers can be classified into three groups viz.

(i) the innovators - these are the pioneers in the farming world. They are the first to try out new ideas and are to the forefront in farming knowledge.

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(26) A number of farmers were genuinely concerned with the state of hill country farming in the area. Many felt that a lot of the hill country had reverted over the years, and thought that some sort of action was required to reverse this trend.

(ii) the non adopters - this group comprises men who are limited in their ideas and managerial ability.

(iii) the mass of farmers - this group determines what is most commonly found as to size, organisation and farm practices.

Groups one and two are minority groups and it is from group three that representative farms are chosen. This group, however, does not remain static, nor do their farming methods. As a result typical farming methods cannot be determined once and for all. By identifying the primary factors which influence the particular decision under study refinements can be made in the selection of the representative farm. This means that the use of the representative farm must be closely tied to the stated purpose or problem.

The object of the representative farm is to embody the attributes of the farms that it represents. These attributes include the quantity and quality of resources, the cost of inputs and prices of outputs and any other restrictions.

The selection of a representative farm involves a number of difficulties. A single farm model is unlikely to adequately represent all the significant characteristics of any group of farms. Each farm itself is unique in that the particular combination of resources and managerial ability are peculiar to that farm. This means that results and recommendations from any study must be revised or adjusted when applied to a particular farm.

Representative farm studies are static in nature whereas the farm firm is operating in a dynamic environment. A typical farm no matter how selected remains typical as long as technology and other attributing factors remain constant. Doubts can also be raised as to whether any model farm can effectively provide guidance to individual farmers who differ in such things as managerial ability, age and goals.

Despite these problems the representative farm can still serve as a useful educational tool for many kinds of management problems. This is especially true where the representative farm typifies a narrow or specialised type of farming. It cannot, however, replace individual farm analysis and planning as no two farms are identical.

The three representative farms selected for this study are described in chapters six and seven. The following subsection describes the program used to financially analyse development programmes devised for these farms.

3.5 Financial Analysis of Development Programmes

Once a physical development plan has been constructed the next task is to determine its financial feasibility. This has usually involved completing a number of repetitive calculations e.g. cash budgets, stock reconciliations. Recently, however computer programs have been devised for financially evaluating planned development programmes.

These programs, compiled by Sanderson and MacAurthur (Lincoln) (30) and Gardner (Massey) (20), reduce the time involved in routine calculations and allow the scope of the analysis to be extended. They do not, however, reduce the need for a full and detailed understanding of the development problem. Nor do they relieve the research worker of the responsibility of planning the physical programme.

In this study Gardner's program was used to financially evaluate development programmes devised for the representative farms. The program is briefly outlined in the following subsection.[27]

3.5.1 Gardner's Financial Evaluation Program

Basically this program analyses the financial requirements and profitability[28] of development programmes feasible for all resources other than finance. Data from the physical development programme is analysed by five main programs. These are:-

(i) the base year program - which determines a pre-development cash flow situation. Data from it is used in evaluating the profitability of the development[29] programme using the present value measure.

(ii) the financing and stock reconciliation program - used to calculate stock purchases and sales, cash

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(27) For a more detailed discussion of Gardner's program the reader is referred to (20).

(28) The profitability of the development plan is determined by three criteria viz. the present value, payback period and the increase in post tax drawings. The present value measure is outlined in appendix F. The payback period can be defined as the time taken for the net cash proceeds from development to equal the net cash outlay of the development.

(29) Note that for the purpose of calculating profitability, the difference between the base year cash income and cash expenditure is assumed to represent the level of personal drawings prior to and during development. This figure is not however used in the calculation of annual overdraft requirements.

budgets and overdraft requirements for each year of development. The specification of a percentage change in wool production and in the price of wool allows a parametric evaluation of yearly overdraft requirements to be made.

(iii) the post development program - which is similar to the base year program and determines the cash flow situation after development has been completed.

(iv) the evaluation program - used to calculate the profitability of the development plan.

(v) the parametric evaluation program - if the development plan has a positive present value this program undertakes a parametric evaluation of profitability for a specified change in wool production and in wool price.(30)

Output data from Gardner's program includes production and financial data for each year of development, pre and post development data and profitability calculations.

Use of this program reduced the time required to analyse development programmes and enabled a more detailed analysis to be undertaken. However, during the course of the study some program limitations became apparent. Consequently the results of the analyses had to be studied in relation to these limitations. Such limitations do not, however, detract from the usefulness of Gardner's program. They are a reflection

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(30) The specified change is a plus and minus percentage of the expected yeild and price levels.

of the inherent difficulty of incorporating farm management logic into computer terms.

3.5.2 Program Limitations

The program requires maximum and minimum culling rates to be specified for all classes of sheep. This provides a certain amount of flexibility but also leads to management anomalies. With this system small numbers of breeding ewes can be purchased in any one year. In actual practice a farmer would either cull less heavily or not bother to buy the additional ewes. Similarly the program allows the number of breeding ewes to be increased rapidly by retaining old ewes. When the rate of increase declines these old ewes are still retained. As a result an unrealistic number of two tooth ewes are sold.

Stock losses cannot be altered during the development programme. This means that direct allowance cannot be made for higher stock losses when stock are being used to "break in" land. Although lambing percentages can be altered this does not completely allow for the reduced value of the stock sold. Nor does it make any proviso for the increased numbers of replacement stock required.

Development expenditure for taxation purposes is deducted from the gross income in the year in which it occurs. As a result taxation payments cannot be minimised.(31) This

(31) Taxation laws allow development expenditure incurred in any one year to be deducted over several years. Such a provision can reduce the total amount of tax paid during development and hence the overdraft required to finance development.

adversely affects the maximum overdraft figure, the time to repay borrowed money and the profitability of the programme. These variables are also affected by the absence of nil standard values in the program.(32)

It is assumed in the program that the interest rate on capital borrowed for development is equal to the discount rate used in determining the present value. This assumption is not necessarily true. For example where there is a large degree of uncertainty the correct discount rate to use may be ten per cent. This may not be equal to the interest rate on development finance borrowed from, for example, the State Advances Corporation. The assumption does however, enable the sensitivity of the present value to changes in interest rate to be explored.

In evaluating the profitability of the programme the base year surplus(33) is used as the figure for personal drawings e.g. if the base year surplus is $3500 then this figure is used for personal drawings during development, when calculating profitability in terms of a present value. This practice can render a development programme unprofitable because -

(i) all development finance has to be borrowed

(ii) repayment of borrowed money can only be done out of

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(32) Under New Zealand income tax laws, livestock are treated as trading stock and the taxable income is adjusted by the difference in the value of the opening and closing stock. However use of the nil value system allows stock increases above the basic rating to be allocated a nil value. This reduces the amount of taxable income and hence the amount of taxation payable. For further details the reader is referred to reference (21).

the additional post tax income generated by development.

In many instances farmers are prepared to divert money from personal drawings (consumption) to development. This reduces the amount of off farm capital required and affects the financial feasibility of the programme. In this study a simple method was used to reduce the base year surplus and divert income into development.[34]

The parametric evaluation of profitability calculates the change in the present value, payback period and post tax cash surplus for various specified changes in wool price and wool production. For these calculations to be relevant the following must hold:-

(i) the assumed change in the wool price and in the total wool production must occur in year one of development, and remain at these levels for the remainder of the development period.

(ii) the development plan must not alter.

(iii) the base year surplus must represent the actual level of personal drawings during development..

If one of these criteria does not hold, the analysis is no longer meaningful.

The parametric financing analysis determines for each year the affect of various changes in wool price and wool

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(33) That is the difference between total cash income and total cash expenditure in the pre-development situation.

(34) The method used is described in appendix C.

production on the annual overdraft or cash surplus and on the cumulative deficit or cash surplus. This calculation is based on the assumption that in any one year the budgeted wool price and wool production have been realised in the preceding years. The further into the future the analysis goes the more unrealistic the assumption becomes. The analysis may therefore only be really relevant for the initial years of development.

CHAPTER FOUR

THE RANDOM SURVEY FARMS

4.1 Introduction

The first part of this chapter deals with the basic information obtained from the random survey farms. This includes details of farm ownership, resources, size, topography stocking rate and stock performance. The second part of the chapter deals with the managerial practices encountered on the survey farms. Stock and pasture management practices used to maintain production are analysed in some detail. The important weeds and pests found on the survey farms and the methods used to control them are also described.

4.2 Farm Size

The size of hill country sheep farms in the Horowhenua district varies widely. The group A farms[1] vary in size from 230 acres to 400 acres. Group B farms[2] range from 300 acres to 9000 acres. Of the group B farms seven are less than 1,000 acres and six are less than 2,000 acres in size. Three of the group A farms are less than 300 acres and the other one is 400 acres in size. The size of individual farms is given in table 4.1.

The survey indicated that the majority of hill country sheep farms in the Horowhenua district are less than 1,500 acres in size. Excluding the two large properties of 6,000 acres and 9,000 acres the average size is 1,090 acres.

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(1) Group A farms (1-4) are those which earn income from other agricultural sources as well as from sheep farming.

(2) Group B farms (5-20) are self contained hill country sheep units.

Table 4.1 Size and Topography of Random Survey Farms

Farm Number	Size - acres	% Unploughable
A 1	250	95
2	230	86
3	268	74
4	400	75
B 5	9,000	95
6	950	65
7	2,097	80
8	420	67
9	1,213	80
10	1,144	80
11	548	70
12	745	81
13	850	75
14	1,858	67
15	1,441	69
16	317	65
17	1,045	86
18	1,230	80
19	6,000	68
20	1,412	95

4.3 Topography

The topography of the individual farms ranges from easy hill country with some flat land to very steep broken country with little or no flat land. For each survey farm the land is classified as ploughable or unploughable. This provides an indication of the relative topography for each farm. Such a classification is approximate as it is based on farmers' opinions and the author's visual assessment. The classification is given in table 4.1.

All survey farms have some land which is ploughable. The area of ploughable land varies from five per cent on three farms to 35 per cent on two properties. On most farms between 11 and 25 per cent of the total land is ploughable.

4.4 Land Use

For each farm the land area is divided into three categories -

(i) Pasture - both native and sown pasture

(ii) Unproductive land capable of being developed - land infested with fern, scrub and other weeds.

(iii) Waste - land covered by buildings, races, native bush, as well as other areas which cannot be developed.

These categories are approximate and represent largely a visual assessment due to the lack of reliable farm maps. Details of land use are given in table 4.2. Five of the 20 farmers are utilising all the productive land on their farms. On the other 15 farms there are areas of land which could be brought into productive use. Large areas of native bush on six farms account for a high percentage (10% or more) of the farm being classified as waste.

4.5 Drainage and Water Supply

Generally natural drainage is adequate on all properties. Only one farmer is concerned with hill paddocks becoming very wet in the winter. Drainage is more of a problem on the flat land with five of the survey farmers utilising vee, tile and mole drains to advantage.

Table 4.2 Land Use on Random Survey Farms

Farm Number	Land in Pasture (%)	Land Potentially Productive (%)	Permanent Waste (%)
A 1	80	Nil	20
2	78	9	13
3	89	8	3
4	93	5	2
B 5	50	6	44
6	68	26	6
7	67	28	5
8	95	Nil	5
9	96	Nil	4
10	88	8	4
11	89	6	5
12	94	Nil	6
13	94	Nil	6
14	95	2	3
15	79	11	10
16	88	6	6
17	62	8	30
18	61	16	23
19	34	57	9
20	94	4	2

In very dry summers the natural water supply on some survey farms at Paekakariki fails. Elsewhere throughout the district abundant natural water supplies exist on all properties. On some farms where further subdivision is envisaged, water supplies will need to be extended.

4.6 Buildings

On all the farms surveyed woolsheds, sheep yards and cattle yards were adequate. Four farmers on larger and more broken country had two or more sets of sheep yards. This facilitated handling of the stock and reduced the time involved with stock operations. Only one farm had two sets of cattle yards. Cattle yards were generally poorer in condition and layout than the sheep yards.

Accommodation for married permanent men is of a satisfactory standard. Farm houses range in quality from houses built more than 30 years ago to modern homes. The overall standard of farm housing is good.

4.7 Tenure of Farms

Tenure of the individual farms is listed in table 4.3. All but two farms are freehold properties. The exceptions are a Maori leasehold property and a Crown Land property.

The Maori lease property consists of two blocks of land with leases of 17 and 15 years respectively. This property is situated in an area where much of the land has been owned by the Maori people. The Crown Land property is the Lands and Survey's farm, Whareroa, situated at Paekakariki.

4.7.1 Management of the Survey Farms

The responsibility for the management of the survey farms is given in table 4.3. Individual owners are responsible for management on 80 per cent of the farms. The other four farms are controlled by managers. The degree of absentee ownership in the district is small. Only five of the 70 hill country farms identified by the author have absentee owners.

4.8 Farm Owners

The age distribution of the sixteen owner operated farms is listed in table 4.4.

Table 4.3 Tenure and Responsibility for Management of Random Survey Farms

Farm Number	Tenure	Responsibility for Management
A 1	Freehold	Owner
2	Maori lease	Owner
3	Freehold	Owner
4	Freehold	Owner
B 5	Freehold	Owner
6	Freehold	Owner
7	Freehold	Manager
8	Freehold	Owner
9	Freehold	Owner
10	Freehold	Owner
11	Freehold	Manager
12	Freehold	Owner
13	Freehold	Manager
14	Freehold	Owner
15	Freehold	Owner
16	Freehold	Owner
17	Freehold	Owner
18	Freehold	Owner
19	Freehold	Owner
20	Crown land	Manager

Table 4.4 Age Distribution of Survey Farmers

Age group	30-40 years	40-50 years	50-60 years
Number in group	4	4	8

The farmers in the 30 to 40 year age group tended to be the more progressive farmers. All these farmers have recently carried out development work and are keen to progress further.

All farmers in the 40 to 50 year age group have taken over the management and then the ownership of family farms. This group tends to be more conservative than the younger age group but have more resources at their disposal.

Half the owner operators are more than 50 years of age. The author found farmers in this group tended to have fixed ideas about management practices. Five of the eight farmers in this group will eventually transfer control of the farms to their sons.

Of the 16 owner operated farms, eight have owned their farms for ten years or less, four for ten to twenty years, and four more than twenty years. Five of the 16 owners have had farming experience in areas outside the Horowhenua district. The experience has ranged from mixed cropping and dairying through to sheep farming. One farmer also has practical knowledge of accountancy and business management. The other 11 owners are farmers who have spent many years working on farms in the district.

All four managers are capable men with a number of years of farming experience. The writer considers that the managerial ability of these men is equal to that of the resident survey owners.

4.9 Farm Labour

Permanent labour is employed on 13 of the 20 random survey farms. On five of these farms the permanent labour is the owner's sons. The number of permanent men employed ranges from one to five. Ten farms employ one, two farms three, and one farm five permanent men. All of the farms organised by managers employ permanent labour.

The men employed on the farms are usually experienced shepherds. However larger units also employ mechanics and unskilled labour. Falling prices and rising costs have caused two farmers to reduce the number of permanent labour units on their farms.

Fourteen farmers employed either contract or casual shearers. Contract fencers and scrubcutters were hired by 16 farmers. Four of the survey farms did not employ outside labour.

A measure often used as an indicator of labour productivity is the number of breeding ewes per labour unit. This is a ratio and as such suffers from a number of disadvantages. One disadvantage is that it assumes the size of the breeding flock determines the number of labour units required. This is often not the case as is illustrated by farm number 19. Because all development work is carried out by farm labour a mechanic/welder is employed. Hence in this instance the size of the breeding flock does not determine the number of labour units. Despite this the measure does give some indication of the number of breeding ewes being handled by labour units. On the Horowhenua hill country the number of breeding ewes per labour unit ranges from 350 to 1500. The average is 873 ewes per labour unit. The ratio of 1,000 breeding ewes per labour unit is exceeded on ten farms.

Casual labour is available for work on hill country farms as all farms are close to major towns. However a few survey farmers have difficulty in hiring experienced casual labour. The average wage for casual workers in the northern and central areas is one dollar ($1) per hour. Competition for labour with the industrial sectors of Wellington and the Hutt Valley forces hill country farmers at the southern end of the district to pay up to one dollar twenty five cents ($1.25) per hour for casual labour.

4.10 Stocking Rates

Several classes of stock(3) are found on all farms. These have been converted to ewe equivalents (E.E.) using the coefficients in table 4.5. The coefficients in table 4.5 are similar to those used by Cartwright except that a fixed coefficient has been used for adult wethers.(4) The critical period for stock feed is in the late winter - early spring period. For this reason all stocking rates have been calculated from the winter stock numbers. The number of breeding ewes and breeding cows present on each survey farm is shown in table 4.6. The total number of ewe equivalents is also listed.

Of the group B farms one has less than 1500 E.E. and seven more than 2500 E.E. All group A farmers have between

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(3) For a definition of the various stock classes the reader is referred to the glossary.

(4) This assumes that the marginal rate of substitution of adult wethers for breeding ewes is constant for any one overall stocking rate. Cartwright in his study used a diminishing marginal rate of substitution of breeding ewes for adult wethers, i.e. three breeding ewes and six adult wethers have equivalent feed requirements at a stocking rate of 3 E.E. per acre. At a stocking rate of 6 E.E. per acre six ewes and eight wethers have equivalent requirements for feed.

Table 4.5 Conversion Coefficients for Stock Wintered

Class of Stock	Ewe Equivalent (E.E.) per Animal
Ewe Hogget	0.75
Wether Hogget	0.75
Breeding Ewe (2th and older)	1.00
Ram (2th and older)	1.00
Wether (2th and older)	0.50
Rising one year cattle	3.00
Rising two year cattle	4.00
Cattle two years and older	5.00

1000 and 1500 E.E. The stocking rates for the random survey farms are shown in table 4.7.

Stocking rates in the table are expressed in four ways. Column two indicates the stocking rate on grazeable pasture. Only six farmers are achieving a stocking rate of 4 E.E. per acre or better on this basis. Five farmers have a stocking rate of less than 3 E.E. per acre. On most farms (45%) the stocking rate is between 3 E.E. and 4 E.E. per acre.

Column three lists the stocking rate in terms of ewe equivalents per potentially productive acre. These figures allow comparison between the farmer's estimated potential stocking rate and the stocking rate presently being achieved.

The number of sheep ewe equivalents per productive acre are given in column four. Only two of the 20 farmers surveyed are carrying more than three sheep ewe equivalents per productive acre. The majority (65%) of the farmers have a carrying capacity of two to three sheep equivalents. The remainder are stocking at less than two sheep ewe equivalents

Table 4.6 Breeding Stock on Random Survey Farms 31.6.69

Farm Number	Breeding Ewes	Breeding Cows	Total Ewe Equivalents
A 1	650	-	826
2	350	-	548
3	450	-	592
4	1000	46	1570
B 5	2000	200	6200
6	900	66	1627
7	2250	170	4663
8	1200	55	1860
9	2010	90	3210
10	963	96	2414
11	1000	83	1740
12	1050	-	2418
13	2000	170	3568
14	2200	700	7742
15	2250	120	3710
16	450	15	1348
17	1250	60	1898
18	1700	60	2396
19	3500	150	7260
20	5500	246	8534

Table 4.7 Stocking Rates on Random Survey Farms 31.6.69

Farm Number	Ewe Equivalents (E.E.) per Productive acre	Ewe Equivalents per potentially productive acre	Sheep Ewe Equivalents per productive acre	Sheep E.E. / Cattle E.E.
(i)	(ii)	(iii)	(iv)	(v)
1	4.3*	4.3*	4.3	NA
2	2.9*	2.6*	2.9	NA
3	2.5*	2.3*	2.5	NA
4	3.7	3.4	2.9	3.6
5	1.2	1.1	1.0	5
6	2.7	2.1	1.9	2.3
7	3.4	2.3	2.9	3.2
8	4.9	4.9	4.1	5.1
9	2.6	2.6	2.0	3.3
10	2.4	2.2	1.5	1.6
11	3.5	3.3	2.6	2.9
12	3.2	3.2	1.7	1.1
13	4.7	4.7	3.5	2.7
14	4.7	4.6	2.2	0.9
15	3.4	3.0	2.7	3.8
16	4.0	3.7	2.9	2.6
17	2.9	2.6	2.3	3.8
18	3.2	2.5	2.1	1.9
19	3.0	1.2	2.5	5.0
20	4.6	4.4	3.8	4.7
Average	3.3	3.0	2.5	3.1

Notes -

1. * Plus varying numbers of town milk replacement stock wintered.
2. NA denotes non applicable.

per productive acre.

The ratio of sheep ewe equivalents to cattle ewe equivalents is given in column five. There is considerable variation in these figures and it is difficult to draw any worthwhile conclusions. However even on the most improved hill country property some cattle are needed to control weeds which sheep will not eat.

4.11 Stock Performance

Lambing percentage, calving percentage[5] and the percentage of lambs fattened are listed in table 4.8. These figures refer to the 1968-69 season. This season was one in which large numbers of breeding cows died on some properties in the Horowhenua district.[6] This has affected some of the calving percentages shown in the table.

Lambing percentages vary from 75 per cent to 110 per cent. The higher figure was obtained by a Perendale flock. Sixteen of the survey farms have lambing percentages between 80 per cent and 90 per cent. The average lambing percentage of 86.7 per cent is similar to the Meat and Wool Board's figure for hard North Island hill country.[7]

There is a greater variation in calving percentages than there is in lambing percentages. The average calving

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(5) For definitions of lambing and calving percentages the reader is referred to the glossary.

(6) Due to feed shortages large numbers of breeding cows were fed on fern and other roughage. Prolonged feeding of too much roughage caused malnutrition resulting in large losses.

(7) N.Z. Meat and Wool Board's Economic Survey 1968.

Table 4.8 Stock Performance on Random Farms

Farm Number	Lambing Percentage	Calving Percentage	Percentage of Wether Lambs Fattened
1	75	NA	Nil
2	100	NA	38
3	80	NA	Nil
4	80	80	Nil
5	80	60	Nil
6	90	75	Nil
7	80	90	20
8	90	90	90
9	90	95	Nil
10	85	80	Nil
11	110	90	Nil
12	90	NA	70
13	90	90	90
14	100	90	70
15	90	80	90
16	80	90	90
17	80	80	Nil
18	70	40	70
19	85	85	80
20	85	90	40
Average	86	81	

Note -

1. NA denotes non applicable.

percentage for the 16 farms is 81 per cent with a range of 40 per cent to 95 per cent. Eleven of the 16 farms have calving percentages between 80 per cent and 90 per cent.

Only nine of the 20 random survey farms are selling all store lambs.(8) The other 11 farmers are selling as many fat lambs as is possible.

Wool production figures have been collected from ten of the twenty farms. These show a range of 10-55 lb of wool per potentially productive acre. The average figure is 25 lbs. This is four pounds higher than the Meat and Wool Board's figure for North Island hard hill country.(9) Not too much significance should be attached to this figure as farmers sheep policies vary widely. These policies affect the wool production from each farm.

4.12 Recent Production Increases on Random Survey Farms

This section deals with recent production increases, in terms of increased carrying capacity, achieved by random survey farmers. Table 4.9 records these increases in terms of ewe equivalents.

In the table column two refers to the total increase in ewe equivalents on individual farms from the base year. In most cases the base year is the 1964/5 season. Column three indicates the number of years over which increases in ewe equivalents were taken, i.e. the number of years between the base year and the 1968/9 season. The total increase in ewe equivalents from the base year expressed as a percentage is listed in column four. Variability in the changes in stocking rate between farms is shown by the average annual percentage change in column five.

Annual stocking rate changes over the last five years are

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(8) See glossary.
(9) N.Z. Meat and Wool Board's Economic Survey 1968.

Table 4.9 Recent Production Increases on Random Survey Farms

Farm Number (i)	Total Increase In E.E. From Base Year (ii)	Number of Years for Increase (iii)	Percentage Increase From Base Year (iv)	Average Increase in E.E. per year (%) (v)
1	Nil	5	Nil	Nil
2	Nil	5	Nil	Nil
3	140	7	18	2.6
4	286	5	27	5.4
5	-500	5	-8	-1.6
6	150	5	9	1.8
7	850	5	22	4.5
8	Not available			
9	700	4	30	7.5
10	260	2	11	5.5
11	700	5	69	14
12	Nil	5	Nil	Nil
13	900	5	31	6.2
14	600	5	8	1.6
15	1000	3	* see below	
16	Nil	5	Nil	Nil
17	562	5	42	8.4
18	1500	3	170	56.6
19	4670	5	213	42.6
20	3400	5	91	18.2

Notes -

1. * Farm 15 had recently been enlarged through the acquisition of more land so figures in columns 4 and 5 are not meaningful.

2. The method of development associated with stock increases on farm number 20 is described in chapter 5.

shown for 18 farms. The figures show that five of these farms have had no increase in total ewe equivalents in the last five years. Seven farms have had an average increase in ewe equivalents of more than six per cent per year. On these latter farms development work has been carried out.

The remaining six farms had annual growth rates between one per cent and six per cent. These farmers have had no fixed pattern to their increase in ewe equivalents. The season, as much as anything, has determined the yearly increase in stock numbers.

4.13 Future Production

Owners of survey farms were asked what they considered to be the potential carrying capacity of their farms. Answers ranged from 3.5 E.E. per acre to 10 E.E. per acre.(10)

Most farmers (75%) consider their farms could carry 5 E.E. per productive acre when fully developed. Compared to the district average of 3.0 E.E. this represents a substantial increase in carrying capacity. The likelihood of this increase in carrying capacity being achieved in the future is slight (see pp 244/5). Only four farmers envisage large increases in carrying capacity in the next five years. These farmers already have development programmes under way. Most of the survey farmers have no plans for substantially increasing production.

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(10) The Lands and Survey farm is aiming at achieving a carrying capacity of 10 ewe equivalents per acre. The author does not consider this physically nor economically feasible with present technology. (see P.234)

4.14 Attitudes to Development

Although many survey farmers believe significant production increases are possible, few farmers are attempting to achieve them. During the survey the author attempted to obtain information on farmers' attitudes to development and their reasons for not increasing production.

Fifty per cent of the survey farmers said that they are interested in future development. It is significant that of these half are prepared to borrow capital for development work.(11) The other half are only prepared to develop their farms out of income. This is because of the uncertainty surrounding future cost and price movements. If capital is borrowed for development and prices continue to fall and costs to rise, then it would be difficult to meet the financial charges incurred. In addition these farmers believe that they could lose capital already invested in their farm.(12) This group of farmers consider that it is unlikely to be profitable to borrow for future development.

However with the present price cost relationship development out of income is limited. The amount of cash available for reinvestment in the farm is decreasing.(13)

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(11) These farmers consider that there is adequate off farm capital available for development work, and that it would be profitable to borrow for development.

(12) This could occur through the reduction in equity associated with a borrowing programme not being offset by a profitable development programme.

(13) This is especially true for farmers with low incomes and low equities.

Rapid increases in carrying capacities are therefore unlikely to be achieved from income and any production increase is likely to be spasmodic.

For various reasons ten farmers (50%) are not prepared to undertake development work in the foreseeable future. Three farmers in this group consider a consolidation phase[14] is essential at the present time. They are of the opinion that such a period would improve their financial position. In their view development at present prices would be unprofitable.[15]

Since they have freehold farms, two farmers are content with their present financial situation. At the present moment they consider there is no real incentive to develop their farms to higher productive levels.[16]

One farmer said he is too old to consider any more development work. He is preparing to give control of the farm to his son. On another farm the absentee owner is preventing development. Surplus cash is being used for personal use rather than for worthwhile development.[17]

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(14) In this context consolidation refers to the improvement of the productive performance of the existing stock. For the heavily committed farmer this may be the only possible method of maintaining income levels.

(15) This statement was made intuitively by the three farmers concerned. No attempt had been made to evaluate the likely outcome of planned future development.

(16) There can be no such thing as "staying put" under a system of rising costs and falling incomes. If the real net income is to be maintained production will have to be increased.

(17) An annual fertiliser application probably could raise carrying capacity by 50 per cent on this farm.

Two farmers consider this class of hill country will not be an economic proposition in a few years time. The reason for this belief is rising costs and falling prices. Development therefore will not be considered under any circumstances. These farmers are wanting to sell their farms and reinvest the capital in another industry.[18]

One farmer said he is not interested in development because development finance is too costly, i.e. interest rates are too high. He said that low interest money should be available for the development of this class of hill country. However if development itself is profitable then it should be profitable to borrow for development under the existing interest rates.

In summary the reasons for hill country farmers refraining from carrying out development are many and varied. The three most important factors are an aversion to debt, the belief that development is unprofitable and uncertainty about the future. If farmers are to be encouraged to increase production[19] then they must be shown that:

(i) increased production will increase post tax profits

(ii) it is profitable to borrow for development

(iii) planned development will not be adversely affected

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(18) The implicit assumption is that the capital released will earn a higher return in industry than in farming.

(19) From both the farmer's and the nation's point of view increased production is necessary in order to maintain the standard of living.

by further price falls.

For this purpose greater emphasis must be placed on farm management advice. More information must be supplied to individual farmers which will enable them to increase their managerial ability[20] and hence their efficiency.

4.14.1 Adjustments Made to Offset the Cost Price Squeeze

At the time of the survey farm costs were steadily increasing and product prices were falling. During the course of the surveys many farmers mentioned adjustments they had made in an endeavour to maintain net incomes. The action taken to maintain incomes varied according to the individual farm situation.[21] The adjustments made by the survey farmers are briefly listed below:-

(i) reduced labour force - many hill country farmers have reduced the number of permanent labour units. This has increased labour productivity and reduced fixed costs.

(ii) substitution of own labour for contract labour - some farmers have joined together and assisted each other with stock operations e.g. shearing. This has reduced cash costs.

(iii) reduced maintenance and development expenditure - the amount of fertiliser applied, and the amount of

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(20) This assumes that managerial ability is a farm input i.e. each farmer has his own performance level which differs from that of other farmers.

(21) The level of debt, size of farm, cost structure, and personal income requirements will all affect the type and amount of adjustment required.

fencing repairs has been markedly decreased.

(iv) supplementing farm income by off farm work.

(v) reduced personal drawings - e.g. farmer A $1,374 to $600; farmer B $2,272 to $1,491.

(vi) increased production.

Up to the present time the cost price squeeze has largely been offset by reducing maintenance expenditure and personal drawings. These measures cannot, however, be continued indefinitely. Inevitably farmers will have to look to increased efficiency(22) and productivity as a means of maintaining net incomes.

4.15 Stock Management

This sub section deals with the seasonal management of breeding ewes, ewe hoggets, dry sheep, breeding cows and dry cattle.

4.15.1 Breeding Ewes

The Romney ewe was the main breed of ewe on the majority (75%) of survey farms. Perendale ewes were being farmed only on four properties. On two of these properties the lambing percentage was significantly (10%) higher than Romney lambing percentages. At the time of the survey two farmers were in the process of changing breeds. The change was from the Romney to the Perendale and Coopworth breeds. This was an attempt to improve lambing percentages.

Lambing dates varied from the 1st August to the second

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(22) This may involve increased output per unit of resource, the elimination of non essential costs and improved management.

week in September. On four farms lambing commenced on the 1st August, on eight farms the middle week in August, on seven farms the beginning of September and on one farm the second week in September. Ewes were set stocked[23] over lambing on all survey farms. Where possible all ewes were lambed on the flats and then moved onto the hills. On farms with only small areas of flats the majority of the lambing occurred on the hills.

Weaning[23] dates varied from 1st December to mid January. On a number of farms the weaning date was determined by the ewe shearing date. One farmer had the unusual practice (for this class of country) of weaning in December. Ewes and lambs were then shorn in January after the lambs had recovered from the effects of weaning. Only one survey farmer shore his ewes twice a year. This was done at weaning time (December) and just prior to tupping[23] (April). The farmer said that on his extensive property where shepherding was minimal this practice reduced ewe losses.

Ewes were mobstocked[23] after weaning on 17 survey farms. By doing this farmers hoped to build up fertility and control rough pastures. This practice was not undertaken on farms where there was inadequate subdivision.

The culling of ewes varied according to whether stock numbers were being rapidly increased. In established flocks a standard practice was the sale of cast-for-age (C.F.A.) ewes.[23] Many of these farmers also sold surplus two tooth ewes.

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(23) See glossary.

These ewes were culled on the basis of constitution, wool and teeth. Where stock numbers were being built up rapidly culling was less ruthless. On these farms many five year ewes were kept for at least another one and sometimes two seasons. Two farmers said that hill country ewes were being sold too early at five years of age. They stated that ewes could be successfully retained for another year. Dry two tooth ewes were kept on most properties but older ewes which had not produced a lamb were culled.

Most survey farmers endeavoured to save feed for flushing.(24) This was difficult to manage on farms with small areas of flats and in seasons with long dry summers. In these seasons lambing percentages were below average.(25) Where subdivision was inadequate flushing of ewes consisted of moving them to another paddock.

The two tooth ewes were generally tupped separately to mixed age ewes. Farmers using Perendale rams had a lower rams to ewes ratio (2 : 100) than those farmers using Romney rams (2.5-3 : 100). A tupping crayon was used on only one farm. The farmer believed the effort involved was worthwhile because he was able to predict lambing patterns.

Post tupping management of breeding ewes was fairly uniform. Grazing management on all farms was tightened. Most farmers mobstocked the ewes for six to eight weeks and

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(24) See glossary.

(25) In the 1970/71 season lambing percentages on some survey farms were between 60 and 70 per cent. This was an aftermath of the summer drought of 1970.

then set stocked. Three farmers mobstocked right through until crutching (July) and then set stocked. This practice resulted in an accumulation of feed ahead of the ewes which was utilised just prior to lambing.

Breeding ewes were fed autumn saved pasture just prior to lambing on three survey farms. To achieve this ewes were restricted to a maintenance level of nutrition until three to four weeks before lambing. The ewes were then moved onto the saved pasture and a rising plane of nutrition. The area of pasture saved varied according to the number of ewes. As an example, one farmer closed 200 acres of flats for three months (from April to July) for 3000 ewes.

Inability to provide sufficient grass one month prior to lambing has led to one farmer feeding hay to his ewes. The amount fed varies according to the season. As much as one-third of a bale per ewe per month has been fed. There has been no difficulty with ewes refusing to eat the hay. This is probably due to the practice of culling ewe hoggets which refuse to eat hay.

The provision of a winter crop for breeding ewes had been a practice on several farms in the past. At the time of the survey no farmer was growing a winter crop.

4.15.2 Discussion

At the present time there are few Perendale sheep being farmed on the Horowhenua hill country. Considering the physical and climatic conditions this is difficult to understand. On the Horowhenua type of hill country the Perendale has a number of advantages over the Romney.

These advantages include:-

(i) a higher lambing percentage (see p. 77)

(ii) greater hardiness - average stock losses on farms running Perendales were significantly (2%) lower than on survey farms carrying Romneys.

(iii) a lower labour input - there is less shepherding with Perendales.

(iv) more sheep can be carried per acre.(26)

The author considers that on many survey farms a change from Romneys to Perendales would be one way in which:-

(i) production costs would be reduced.

(ii) gross income could be increased.

(iii) labour output and hence the number of breeding ewes carried increased.

The majority of survey farmers were attempting to lamb according to feed patterns. However some farmers would benefit by adjusting the lambing date. Where the spring pasture growth is slow lambing should generally be delayed to the beginning of September. On farms where the spring growth is earlier farmers can usually lamb earlier. This general concept is reinforced by experiences on the Lands and Survey Department's farm at Paekakariki. Increased fertility associated with increased fertiliser and stocking rates has successfully altered the lambing date from the 28th August to

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(26) Survey farmers who have changed to the Perendale breed have stated that on the same area they are able to carry more Perendales than they could Romneys. A ratio of five Perendales to four Romneys was mentioned.

the 1st August.

The division of ewes into late and early lambers has a number of advantages. It ensures that most of the ewes which are near lambing get the saved feed, it facilitates docking and the dry ewes are in late lambing paddocks. However on survey farms with inadequate subdivision this would not be possible.

Early weaning of lambs confers flexibility in stock and pasture management. Ewes can be used to effectively control bracken fern while it is still in the vulnerable early frond stage. If feed is scarce early weaning means that the ewes do not compete with the lambs for the available feed. This is particularly important in areas which are susceptible to summer droughts. Many survey farmers maintained it was not desirable to wean any earlier under their management system. Evidence from the Whatawhata hill country research station disputes this claim. Clarke (22) has found that irrespective of the quality of management by January later weaned lambs are no heavier than earlier weaned lambs. Where the best possible provision is made for early weaned lambs they do better than the later weaned lambs.

For mobstocking to be successful the author believes that minimum stocking intensities of 100 ewe equivalents per acre and quick paddock changes are essential. This concentration of mouths and hooves effectively utilises all growth and imposes the least hardship on the stock. Many survey farmers are not as successful as they could be with mobstocking. This lack of success is due to insufficient grazing intensity and too long a period between paddock changes. Thirty to forty ewe equivalents per acre is the maximum stocking intensity being achieved. Many farmers are grazing ewes at 10-15 ewe equivalents per acre.

The use of autumn saved pasture means that a reserve of feed is available for use in periods of poor pasture growth, viz. late winter and early spring. The author believes that this practice would overcome cattle feeding problems on a number of hill country farms.

4.15.3 Hogget Management

The breeding of ewe replacements was the normal practice on all survey farms. The management programme after weaning aimed at providing ample feed in an endeavour to grow good sized two tooth ewes. On many farms however, the two tooth ewes tended to be rather small.

From weaning through to the following spring a regular drenching programme was carried out. The number of drenches and the drench used varied. Two and up to five drenches per hogget were common on many farms. The most popular drenches were Thibenzole, Cestagon and Nilverm. Twenty-five per cent of survey farmers dosed their hoggets with selenium. These farmers found it helpful in rearing ewe hoggets. However two other farmers had discontinued this practice as no growth responses were observed.

Wintering systems varied. The more progressive farmers wintered ewe hoggets with young cattle. On most farms ewe hoggets were wintered either in a single block or in two or three blocks. Seven farmers provided supplementary winter feed for the hoggets. This consisted of choumoelier and swedes in five instances and hay in the other two. Hay feeding was ad lib and commenced in June.

The ewe hoggets were usually shorn in August or September and again the following March/April as two tooths.[27] One survey farmer only shore in December. His reason was that the country was too cold for second shearing.

Culling of ewe hoggets was largely on weight and wool quality. Many farmers also culled woolly faced hoggets. The fecundity[28] of these sheep is generally lower than open faced sheep.

4.15.4 Discussion

All survey farmers recognised the need to have well grown two tooth ewes. This is necessary if good lambing percentages and wool weights are to be obtained. Many farmers were unsuccessful in rearing good sized two tooth ewes. This failure not only results in an immediate loss in production from these sheep but also lower productivity over their lifetime (24).

Ewe hoggets are susceptible to disease, climatic conditions and feed changes. The major reason for poor growth is the failure of the farmers to provide feed of adequate quality. The author considered that the best two tooth ewes were found on properties where ewe hoggets were grazed in

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(27) Manika Wodzicka-Tomaszewska et al (23) have shown that pre-tupping shearing of two tooths can often substantially increase the lambing percentage by decreasing the number of dry ewes.

(28) See glossary.

association with cattle.

Two non survey farmers have adopted practices which are aimed at obtaining better quality two tooth ewes. One of these farmers buys in replacement two tooth ewes. He considers that these sheep are better than the replacements he can breed. The other farmer grazes his ewe hoggets on lowland farms in an endeavour to have bigger two tooth ewes.

4.15.5 Wethers

Adult wethers were found on three of the twenty survey farms. The individual policies and the farmer's reasons for using wethers were as follows:-

(i) to increase management flexibility - the wether lambs that were not sold fat were carried through and sold as two tooth wethers. The farmer said that on untopdressed hill country where the effects of a bad season are likely to be more severe, this policy gave him increased flexibility. If there was insufficient feed the wethers could be sold. This would avoid the necessity to sell capital breeding stock.

(ii) to reduce labour and fertiliser requirements - all wether lambs are kept and sold as adult wethers. These wethers are run on an untopdressed isolated block with difficult access. The wethers are farmed for wool production. Each year the worst wethers are sold. The farmer said that they give a return from a block which could not support ewes without an annual fertiliser application. Their annual labour requirement is small and does not interfere with the labour requirements of the breeding ewes.

(iii) for use in developmental work - this farmer buys in four tooth wethers and these are used for developing paddocks. They are sold as full mouth wethers and represent 17 per cent of the total sheep present on the property.

4.15.6 Discussion

In the author's opinion wethers are only justified in the second instance and then marginally so. Ewes are still the most profitable class of stock to carry on this type of hill country.(29) They can be used successfully for developmental purposes(30) and steps can be taken in adverse seasons to ensure sufficient feed is available for them.

4.15.7 Breeding Cows

These are present on sixteen survey farms. The main breed is Aberdeen Angus. Five farmers run cross breeds, either Aberdeen Angus/Hereford, or Aberdeen Angus/Shorthorn. These farmers consider the crossbreed is a hardier animal and better suited to this class of country.(31)

Calving occurs mainly in September and October. Two farmers calve their breeding cows outside this period - in July and December. This is to avoid clashing with lambing

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(29) See appendix D.

(30) Inglis (25) stated that the ewe is a better developer than the hogget, the wether or the cattle beast.

(31) American studies indicate that crossbred cattle will have greater vitality, fertility, milk production and higher growth rates than purebred animals. However the extent of the advantages of crossbreeding in New Zealand have not been evaluated.

and to avoid labour problems. The farmer who calves his cows in July feeds them on autumn saved pasture until weaning. The same farmer docks very early - ten days after calving. This is however, an exception to the general practice. After weaning (March/April) the breeding cows are used to control surplus feed and secondary growth. On some farms they also play an important role in developing new blocks. Many of the older cows deteriorate in condition under this treatment and are culled.

The provision of feed for breeding cows in the late winter early spring period is inadequate on many survey farms. Many farmers attempt to winter breeding cows on large areas of fern and other roughage. Autumn saved pasture was provided on three farms and hay on four farms. The best wintering system encountered was one where 150 acres of pasture is closed in March and fed to 120 breeding cows in July. This area of saved pasture provided sufficient feed until pasture growth recommenced in spring.

Of the 16 properties running breeding cows, 14 rear their own replacement heifers. During the first winter these heifers are fed saved pasture and hay. The amount of hay fed varies according to the season, but ranges from eight to 20 bales per head. In the second winter the two year heifers are not fed quite as well. Heifers are not mated until two years of age on 13 of the 14 farms. The ability to provide adequate winter feed for his young stock enables one farmer to calve his heifers as two year olds.

No set culling[32] practice could be determined on many farms. Cattle losses are high and this reduces the number of cull stock. Surplus female replacements are sold as two year heifers, yearling heifers and weaner heifers.

In recent years lice have been found on cattle on some survey farms. As a result three farmers are spraying annually for lice and other farmers are considering it.

4.15.8 Discussion

The Horowhenua hill country is not particularly suitable for breeding cattle. The steep broken nature of the land on many farms and the lack of adequate late winter early spring feed result in losses being high (7-10%). However on all these farms some cattle are necessary to assist in pasture management.[33]

Inadequate winter feed contributes to large losses of breeding cows. This is especially so in winters with serious feed shortages, e.g. 1968/69. Research (26) has shown that poor feeding of breeding cows in late pregnancy can seriously affect calving percentages and weaning weights. The author is of the opinion that inadequate feeding of breeding cows could possibly be the reason for low calving percentages on some survey farms.

The survey farmers were generally aware of the need to provide more supplementary feed for their breeding cows.

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(32) See glossary.

(33) Te Awa results indicate that cattle are necessary to prevent reversion. Sheep are unable to control toe-toe, and sedges.

However some farmers were reluctant to buy in hay. Others felt that the problem could not be solved until more fencing was erected.

The physical conditions, as well as the management practices used, meant that early mating of heifers was impossible. The heifers were not well enough grown and the quantity of feed was insufficient for both the calf and the growing heifer.

4.15.9 Dry Cattle

Dry cattle were farmed on four survey farms. On two of these farms town milk supply cows were used to control pasture growth. These animals could not be grazed hard and consequently pasture control was not as good as it could have been.

One farmer was using Hereford/Friesian cross cattle obtained from his town milk supply herd. These animals were reared either by nurse cows or by hand. After weaning they were used to control growth on the sheep property. They were sold at two years of age.

The remaining farmer buys in eighteen month old steers and sells them as three year olds. These steers play an important role in fern control and other developmental work. Mature steers are used in development work on four farms running breeding cows. All other breeding farms sell their steers as weaners.

4.16 Pasture Management

On many farms pasture is the sole source of feed. Therefore the only control a farmer has over the nutrition of his stock is through pasture management. The aim should be to adopt a system which will result in greater pasture productivity and ensure that the animals' requirements are met. This is especially important in the critical late winter early spring period. The pasture management techniques being used on survey farms are described in the following sections.

4.16.1 Fertiliser Practices

With the recent cost - price squeeze many survey farmers have either reduced the amount of fertiliser applied, or stopped applying it altogether. Since 1966 six survey farmers have not applied any fertiliser and a further three have not applied fertiliser to hill paddocks. This means that the hill country on nine survey farms has not been topdressed for at least three years.

The quantity and type of fertiliser used by farmers with annual fertiliser programmes is given in table 4.10.

On these farms the average application rate is between two and three hundredweight (cwt) per acre. Fertiliser is applied to the whole farm on nine properties. On the other two farms less than half of the productive area receives fertiliser annually. Molybdic superphosphate is used on four of these farms. Other farmers have stopped applying molybdic superphosphate as they have not observed any benefit from it. One farmer reported tauhinu country as being responsive to this fertiliser.

Two farmers apply manures not commonly used in the district. The Manager of Lands and Survey farm at Paekakariki considers the property is cobalt deficient. As a result in the 1968/69

Table 4.10 Survey Farms With Regular Topdressing Programmes

Farm Number	Quantity Per Acre (cwt)	Type of Fertiliser	Percentage of Productive Area Topdressed
1	2½	Aerial superphosphate	100
2	3	Aerial superphosphate ✝	100
3	2½	Molybdic superphosphate	100
5	2	Aerial superphosphate *	18
8	2½	Aerial superphosphate	100
11	3	Aerial superphosphate *	100
13	2½	Aerial superphosphate	100
14	2	Aerial superphosphate	100
15	2	Molybdic superphosphate	45
17	3	Aerial superphosphate	100
20	3½	Cobaltised aerial superphosphate	100

Notes -

1. ✝ Every third year basic slag.
2. * Every third year molybdic super.

season cobaltised superphosphate was applied for the first time. Evidence for a cobalt deficiency has come from Andrews (27). He has stated that certain areas of the Horowhenua and Hutt counties are probably cobalt deficient in some years and in some circumstances. This deficiency is likely to be more prevalent in young sheep. The deficiency results in a progressive loss of appetite and a resulting loss in condition.

One survey farmer applied basic slag to his pastures every third year. Research has shown the effectiveness of basic slag depends upon soil acidity and soil type.

On lime and molybdenum deficient soils molybdic superphosphate gives as good a result as basic slag. As basic slag is almost twice the cost of molybdic superphosphate the author feels its use on hill country is not warranted.

Many survey farmers believed the hill country could be farmed without fertiliser for three years. After this period the pastures would deteriorate. Some survey farmers without regular topdressing programmes admitted that certain pastures had deteriorated over the years. On many of these farms the author found evidence of ratstail infestation which is often associated with low fertility. The infestation is probably due to a combination of low stocking rate and a lack of fertiliser.

For newly developed blocks of land an initial application of 6 cwt of superphosphate was common. One farmer from his experience believes that this quantity is inadequate. In future he intends to use 9 cwt of superphosphate as an initial application.

Most manure was applied by air and farmers preferred autumn applications to spring applications. Only one farmer topdressed in both the autumn and the spring. He said that because of leaching, better results were obtained from twice yearly applications of fertiliser.

4.16.2 Discussion

The natural fertility of the Horowhenua hill country is low, especially in the Manakau area.. Thus fertiliser is needed in conjunction with stock for fertility buildup. The complete utilisation of the available pasture by the grazing animal is more important than the exact amount of fertiliser applied. However shortages of basic elements must be corrected. For this class of hill country, phosphate, and in certain areas molybdenum, are the two main elements that are deficient. Application of these elements is therefore necessary for improved fertility.

The author gained the impression that on many of the survey farms manure was wasted. While many farmers were prepared to apply large quantities of manure. not all were prepared to increase the stocking rate and hence utilise the additional feed grown. As an example, one farmer believed it was not possible to increase the stocking rate on new blocks until three years after the initial application. Unless the stocking rate is high enough to immediately cope with the extra grass growth no benefit is gained from the extra fertiliser. In the development of new pasture the most important factor is utilisation. Thus an increase in fertiliser application and stocking rate must occur simultaneously.

Where only small quantities of fertiliser are applied each year attention must be focused on how this fertiliser can be best used. By establishing priorities the best use of the available fertiliser is ensured. The first priority should be newly developed blocks. Maintenance dressings must be applied annually to these blocks to consolidate the gains in fertility made from previous fertiliser applications and good grazing management. The next area to receive fertiliser should be the well established pasture. The bulk of the production comes from this area and to maintain this regular fertiliser application is essential. Only after these two areas have been topdressed should the cold, dry or unproductive areas be considered. There is little point in applying fertiliser to unresponsive pastures, e.g. pastures containing little clover.

The quantity of fertiliser to apply to maintain pastures will vary from farm to farm, and will depend on a number of factors. These factors include the level of pasture production, the removal of nutrients in the form of animal products and the loss of nutrients from the soil by leaching. Recent Australian work[34] has shown that the fertiliser requirement of a pasture on any particular soil depends particularly on the stocking regime. The heavier the stocking rate the less fertiliser the pasture requires. This suggests that higher stocking rates do not imply a greater fertiliser requirement. In fact it is likely that the optimum fertiliser application will be smaller.

4.16.3 Subdivision

With the exception of three farms, subdivision on the survey farms was inadequate. The reasons for this were varied. On some farms the natural terrain made the siting of fences difficult. Natural fence lines were the rule rather than the exception on these farms.

The major reason for the lack of adequate subdivision was

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(34) Source: Journal of Agriculture November 1968 p. 100.

undoubtedly finance. Fencing is costly to erect and immediate financial returns from it are not obvious. Recent subdivision on some survey farms could have been greater. Many farmers are still erecting the traditional well battened seven wire fence. By using the Pearse ten wire fence the cost would have been substantially reduced allowing more fencing to be erected.(28) The more progressive farmers in the district are now beginning to use this type of fence.

Opinions about the value of electric fencing varied. Two survey farmers are obtaining good results from electric fences. Other farmers say that they are not satisfactory on this class of hill country.

4.16.4 Discussion

The lack of subdivision has contributed to incomplete utilisation of pasture and ineffective control of weeds on some survey farms. In addition an adequate grazing intensity has not been achieved. This has limited the effectiveness of a lot of mobstocking.

The author is convinced that pasture production would be greatly improved if sufficient grazing intensity was exerted all the year round.[35] Many hill country pastures are undergrazed. Stock numbers, not paddock size, is the most important factor in grazing management. Te Awa results (29) however, show that subdivision can be used as a means of increasing the stocking rate. This increased stocking rate

(35) Results from Whatawhata Research Station show that hard-grazing of hill blocks carrying 4.2 ewes per acre and receiving 2-3 cwt of superphosphate annually will produce 66% more available dry matter than lax grazing.

will result in greater grazing pressure being applied. The end result will be a change in pasture awards. Native grasses e.g. browntop and danthonia will be replaced by more productive species.

4.16.5 Oversowing and Pasture Improvement

Many survey farmers had oversown hill country pastures in the past and four were regularly oversowing with white clover. Most farmers said that pasture improvement could be achieved by oversowing. The general pattern was to apply 4 lb of pelleted white clover seed with 4 cwt of aerial superphosphate or molybdic superphosphate. The cost of this varied from $8 to $9 per acre. One farmer oversowed hill pastures with 10 lb of perennial ryegrass per acre. Establishment was poor on some paddocks. On others, where grazing management before oversowing had been better, reasonable establishment occurred.(36)

4.16.6 Reversion

The degree of reversion throughout the Horowhenua hill country area varies. Reversion is a greater problem in the Manakau region than in other areas. On some properties reversion to native bush has occurred. According to the farmers concerned this will be left. Elsewhere adequate topdressing and good grazing management is necessary to prevent reversion to fern, scrub and tauhinu. Shannon

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(36) Best results from oversowing are obtained when the area is kept closely grazed for several months. This enables the young clover plants to receive maximum light and to become properly established.

survey farmers said that without topdressing it is difficult to stop tauhinu infestation.

In parts of the Reikorangi valley reversion has occurred rapidly. Areas on some of these survey farms have been planted in pine trees. Greater reversion to fern, scrub, and other weeds in the Manakau, Otaki and Reikorangi areas means that many survey farmers have large areas of virtual waste land. Development is required to bring these areas into productive use.

4.16.7 Weed Control

The main weeds found on survey farms were gorse, tauhinu, bracken fern, hard fern, ragwort and ratstail. The control measures used and the degree of success achieved are listed below.

(i) Gorse (*Ulex europaeus*) -- this weed was present on 90 per cent of the survey farms. A programme of spraying, burning and oversowing with 4 lbs of white clover and 4-5 cwt of superphosphate is usual where dense stands are present. Some farmers have been spending up to $800 per year on gorse control. Over the last few years however this has been substantially reduced because of the lack of finance. Consequently on some farms money previously spent has been wasted. Areas which were cleared of gorse two years ago have become reinfested. Where farmers have been able to maintain spraying programmes control has been effective. One survey farmer is at present planting 50 acres in pine trees as a means of controlling gorse.

(ii) Tauhinu (Cassinia leptophylla) - present on half of the survey farms. On farms where it is scattered control is by cutting and pulling. Where tauhinu growth is thicker cutting, burning and oversowing with clover and superphosphate is used as a means of control. Satisfactory results are achieved provided annual topdressing is carried out in conjunction with good grazing management. The author gained the impression that tauhinu infestation was increasing on some farms where grazing is lax and topdressing absent.

(iii) Bracken Fern (Pteridium esculenta) - farmers have little difficulty in controlling this weed. Control is either by the judicious use of sheep and breeding cattle[37] or by burning and oversowing in the autumn.

(iv) Hard Fern[38] (Paesia scaberula) - survey farmers found this fern more difficult to eradicate than bracken fern. The weed was present on ten survey farms. Control measures varied according to the degree of burning in the past. Burning, followed by fertiliser and stock has been effective on areas not previously burnt. Control by this means was more effective than crushing, topdressing and oversowing as pasture

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(37) Prolonged grazing of cattle on bracken fern can result in bracken fern poisoning. The main symptoms which may not be seen until some time after removal from the fern are dullness, emaciation and loss of appetite.

(38) Also known as ringfern or carpet fern.

establishment was quicker. However this latter method of control was found to be better on areas which had been frequently burnt in the past.

(v) Ragwort (Senico jacobaea) - on sheep farms this can be effectively controlled by sheep.[39] However on some farms there were many areas of infestation. The author suspected grazing management was at fault on these farms.

(vi) Ratstail (Sporobolus capensis) - many survey farmers did not mention ratstail as a weed although it was present on a large number of farms. The degree of incidence varied but was generally heavier on low fertility farms. In general ratstail areas are more closely grazed under mobstocking.

(vii) Minor weeds - Weeds found on two or three survey farms were manuka (Leptospermum scoparium), blackberry (Rubus fruticosus), barley grass (Hordeium murinum), drooping sedge (Carex sp.), tutu (coriera sarmentosa), and variegated thistle (Cirsium sp.). The usual method of control was cutting and/or spraying.

4.16.8 Pasture Pests

The incidence of porina and grass grub varied on survey farms. Porina was more prevalent than grass grub but received the least attention from farmers. Grass grub was always

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(39) Too great an intake can result in a large accumulation of copper in the liver and death can occur as a result. Care should be taken to ensure the sheep are not grazed for too long a period on ragwort.

controlled either by DDT super or by DDT prills. Of the 13 farmers who reported porina infestation only three attempted to control it.

Many farmers were unaware Porina could seriously reduce pasture production and hence carrying capacity. The author considers that Porina infestation is probably prevalent throughout the Horowhenua hill country. On the lightly stocked pastures many farmers are unaware of its presence.

4.17 Summary

The important points from this chapter are:-

(i) The size of the random survey farms range from 250 acres to 9,000 acres, with an average of 1,090 acres.

(ii) On average 78 per cent of the area of the survey farms is unploughable.

(iii) Permanent waste accounts for ten per cent of the total area of survey farms.

(iv) One in five of the survey farms is controlled by a manager.

(v) Half the survey farmers are more than 50 years of age.

(vi) Permanent labour is employed on 65 per cent of the random survey farms.

(vii) The average number of ewe equivalents per potentially productive acre is 3.0. This is low compared to the considered potential of 4.5-5.5 ewe equivalents.

(viii) Calving and lambing percentages are low, averaging 81 per cent and 86 per cent respectively.

(ix) Stock sales consist mainly of breeding and store stock.

(x) Only small increases in production are being achieved on the majority of farms. Where development has been undertaken ewe equivalent increases in excess of six per cent per annum have been achieved.

(xi) Plans for future production increases are negligible.

(xii) Lack of confidence in the future, aversion to borrowing and the belief that development is unprofitable are the three important factors inhibiting development.

(xiii) The Romney is the main breed of sheep on this hard hill country and there is generally little variation in sheep management practices.

(xiv) Many farmers have difficulty in growing good sized two tooth ewes and replacement heifers.

(xv) Progressive farmers are making use of autumn saved pasture for breeding ewes and breeding cows.

(xvi) Provision of late winter early spring feed for breeding cows is inadequate on many farms.

(xvii) Forty-five per cent of the survey farmers have not applied fertiliser to the hill country since 1966.

(xviii) On many farms stocking rates are not high enough to completely utilise all the feed grown.

(xix) Subdivision is inadequate on the majority of farms for good pasture management.

(xx) There is a slow acceptance of the Pearse ten wire fence by farmers. The "conventional" fence is still favoured.

(xxi) A lot of expenditure on gorse control has been wasted on some farms through financial inability to continue follow-up sprays.

(xxii) The major weeds are gorse, tauhinu and hard fern.

(xxiii) Porina caterpillar is prevalent throughout the district.

CHAPTER FIVE

THE PURPOSIVE SURVEY

5.1 Introduction

The aim of the purposive survey was to identify development techniques being used by farmers and the production increases being achieved. This chapter describes the results of this survey. The description involves a detailed outline of the physical programmes and a discussion on various aspects of these programmes. The author has made no attempt to analyse profitability. An economic analysis would, in most instances, involve both an *ex poste* and an *ex ante* analysis. Such an analysis is unlikely to provide any worthwhile information concerning the profitability of future hill country development.

5.2 Case Farm A

This farm is situated in the Te Horo district and consists of 870 acres of steep hill country. The farm rises from 250 feet at the front to 1,300 feet at the back. Only 25 acres are ploughable. When development commenced in 1965 there were 520 productive acres and tauhinu infestation was increasing..

The average annual rainfall of 50 inches is unevenly spread throughout the year. Droughts can occur, either in early summer (November) or early autumn (February). The prevailing winds are westerlies.

The soils are derived from greywacke. They are classified as Makara stony loam and Ruahine stony silt loam and are of low to medium natural fertility. The subsoils are poorer and more acid. Such land tends to revert readily to fern and tauhinu.

The pattern of pasture growth varies depending upon the altitude. On the higher slopes above 1,000 feet the growing season is shorter. Spring growth commences later and autumn growth ceases sooner than on the lower slopes. Feed shortages are most serious in August and early September. This necessitates late lambing (September) and late calving (October).

The farm is freehold and owner operated.

5.2.1 The Development Programme

At the time of the survey (1969) development had been carried out for four years. The basic pattern of development had consisted of bringing into production land covered in light bush, manuka, tauhinu and fern. This was achieved by trampling with cattle, burning and oversowing with molybdic superphosphate and clover seed.

The method of development consisted of fencing off a small unproductive block. High concentrations of cattle and ewes were then used to break down light bush, remove fern and crush scrub and tauhinu. Depending on the amount of fern and seasonal conditions, burning was carried out in the autumn. White clover seed was spread by hand onto the burnt areas.(1) In the spring seven hundredweight (cwt) of molybdic superphosphate was applied by air and another 3 cwt in the following

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(1) It was considered inpractical to oversow small blocks (20 to 30 acres) by air.

autumn. The block then received an annual maintenance dressing of 2 cwt of superphosphate.

The land development programme and the associated stock increases are shown in table 5.1.

Stock increases in terms of total ewe equivalents (E.E.) have been small. There has been an increase of 673 E.E. in five years. Breeding ewes have increased by 70 per cent, but the number of breeding cows has been reduced by 20 per cent. This has occurred because of increased competition between sheep and cattle for feed supplies. Roughage such as fern has been eliminated with development.

Table 5.1 Case Farm A - Land Development Programme and Stocking Rate Increase

	Year				
Land Programme	1965	1966	1967	1968	1969
Fertiliser (tons)	80	75	45	30	80
Subdivision (chains)		30	30	60	
Tracks (dollars)		76		106	
Stock Wintered					
Breeding ewes	937	1050	1350	1400	1500
Sheep ewe equivalents	1402	1531	1698	1798	1874
Breeding Cows	52	39	85	44	43
Cattle ewe equivalents	410	377	505	266	246
Total ewe equivalents	1812	1908	2203	2073	2134
Ewe equivalents per potentially productive acre	2.2	3.2	3.7	3.5	3.6

Associated with development have been a number of management changes. The inability to grow replacement heifers large enough caused the owner to change to a buying-in policy. In-calf rising three year heifers are now purchased in the autumn. To avoid running large numbers of dry stock culling of ewe replacements now occurs at the ewe hogget stage.

Because the ewes were usually low in condition at lambing time grazing management was altered in 1967. Since then breeding ewes have been rotationally grazed up to May and then set stocked until weaning. Formerly the ewes were rotationally grazed through to lambing.

This development programme resulted in 80 acres of new land being brought into production. Development was financed by a State Advances loan of $2,000 and by surplus income. Falling wool prices and the desire to reduce a short term loan affected the programme in the last three years. Fertiliser application was lower than planned and the increase in ewe equivalents was not maintained.

The ability to finance development largely out of income was achieved by reducing personal drawings and eliminating labour costs. Farm operations such as shearing, crutching, lambing and fencing were all done by the owner.

At the time of the survey the owner was consolidating on the development work already completed. Future development will consist of intensification on the existing productive land. It is hoped through increased fertiliser application to lift ewe numbers to 1,900 by the year 1975. Cattle numbers will remain static. The cost of development has been $18 per ewe equivalent increase.[2]

5.2.2 Factors Affecting Development

The most important factor affecting development was the desire on the part of the farmer to develop out of income. During the development period, income, and hence the money available for development, was reduced by several events.

The use of cattle as bulldozers resulted in high cattle losses (10%) and below average cattle performance. Ewes bought in to increase stock numbers failed to do well on this class of country. Wool prices fell by almost a third in the middle stages of development. These factors combined to reduce the amount of cash available for development. In addition a lot of potential development finance was used to reduce a short term livestock loan.

5.2.3 Conclusions

This programme shows the effect of price falls on development done out of income. It adds emphasis to the need to concentrate on quick financial returns when trying to develop out of income. The reduction in fertiliser application in the middle stages of development affected the stock increases achieved. The stocking rate of 3.6 E.E. per acre is low in relation to the potential of the farm. The author considers that increased fertiliser application could raise the stocking rate to 4.5 E.E. per acre.

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(2) This has been the actual cash cost to the farmer. The figure does not take into account the retention of breeding stock or any allowance for the farmer's labour.

5.3 Case Farm B

This farm is situated at Waikanae and can be divided into two parts. The front section of 400 acres rises very steeply from 300 feet to 1600 feet above sea level. The top section of 818 acres is badly broken by gullies and depressions. Access to the top area is possible only by horseback. As a result subdivision is minimal.

The natural fertility of the soils is low and topsoils are thin. Reversion occurs readily. The pastures consist mainly of browntop, danthonia, ratstail and sweet vernal. There is little pasture growth in the late autumn/winter period. Lambing and calving dates are delayed until September because of slow spring growth.

The climate is similar to that experienced by case farm A. The farm is owner operated.

5.3.1 The Development Plan

In 1966 a State Advances loan of $6400 was obtained. This was used to bring into production 60 acres of tauhinu infested land and to purchase additional livestock. Indian scrubcutters were used to cut the tauhinu which was burnt in the autumn and oversown with grass and clover seed.[3] The area was fenced and 8 cwt of aerial superphosphate was applied in the autumn, 6 cwt in the spring and the same amount again in the following autumn. The cost of developing the 60 acre block on a per acre basis was high. Individual costs are

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(3) A mixture of ryegrass, dogstail and white clover was sown. Establishment of ryegrass seed has been poor. Dogstail seed established well.

given in table 5.2.

Table 5.2 Case Farm B - Development Cost of Tauhinu Land

Item	Total Cost	Cost per Acre	Cost per Ewe Equivalent Increase
	$	$	($/E.E.)
Stock	720	12.00	
Fencing	635	10.58	
Manure	2600	43.33	
Seed	375	6.25	
Scrubcutting	1120	18.66	
Total	$5450	$90.82	$45.41

As a result of development the stocking rate on this block was raised from 0.5 ewe equivalent per acre to 2.5 ewe equivalents per acre.

The owner considered land development had been completed at the time of the survey.

The second phase of the development programme involved increasing the stocking rate on the potentially productive land. This was achieved by retaining most of the ewe hoggets and by buying in two tooth Perendale ewes. An increase of 795 ewe equivalents(4) was achieved for a total cash outlay of $950. A comparison of the costs for the two development stages is given in table 5.3.

Associated with the second phase of development was a

(4) Fertiliser application was not increased on this area. The annual fertiliser application is 30 tons of aerial superphosphate applied to a different paddock each year. A time lag of eight years exists between applications.

Table 5.3 Case Farm B - Total Development Cost

Stage	Objective	Cost	Ewe Equivalent Increase	Cost Per Ewe Equivalent Increase
		$		($/E.E.)
One	Development of 60 acres of tauhinu	5,450	120	45.41
Two	Utilise all the grass being grown on the productive land	950	795	1.25
Total Development		6,400	915	6.9

change in the breed of sheep. Cheviot rams were mated to the Romney ewes to produce first cross Perendale ewe lambs. Perendale rams were then mated to the resultant two tooth ewes. The change was an attempt to improve lambing percentages, reduce stock losses and grow bigger sheep.

5.3.2 Conclusions

The development programme provides an example of poor allocation of development finance. Borrowed money was initially used to develop unproductive land. As shown in table 5.3 this was a costly process in relation to the stock increases achieved. In any development programme the starting point should be the complete utilisation of all grass being grown. This involves adding more stock and results in an immediate increase in financial returns. The next step should be to grow more grass on the existing productive land. This is a less costly method of development than clearing land of weeds.

The author believes that stage two of this programme should have been implemented first. Development should then have been concentrated on the already productive land. Subdivision and annual fertiliser applications would have resulted in a greater increase in stock numbers than that achieved by clearing tauhinu.

Implementing stage two of the actual programme first would also have increased the post tax cash surplus. This in turn would have provided income for growing more grass and reduced the amount of off farm capital required for development.

5.4 Case Farm C

This farm is situated at Paekakariki. The total area is 1171 acres of which 1100 acres is potentially productive and 23 acres ploughable.

The farm has been managed in three sections. The front block consists of 700 acres and has been cleared of bush the longest. The middle block had reverted to fern and tauhinu by 1961. The back block of 121 acres has been treated largely as a reserve.

The soils are mainly shallow grey powdery silt loams with the occasional stone scree slopes beneath greywacke outcrops. There are smaller areas of deeper more fertile brown silty loams. The main soil group has poor structure and moisture retention and this limits responses from fertilisers. The brown silt loam group however, gives a good response to applications of phosphate and molybdenum.

The main winds are northerlies and norwesterlies. The cold southerly winds are a cause of stock losses especially in the winter. Rainfall is in the vicinity of 45 inches per year and summer droughts can occur.

The farm is run as a partnership.

5.4.1 The Development Programme

The development programme can be divided into two phases. The first phase commenced in 1961 and entailed subdividing the front block of 700 acres. This was achieved by using electric fencing and a Waikato mains controller. Worthwhile stock increases were achieved and the development was financed out of income. Details are given in table 5.4.

The subdivision enabled more efficient grazing of the poor native pasture and prepared the way for the second stage of development.

For this stage a development plan was drawn up. The plan involved oversowing pastures, livestock increases and annual fertiliser application.(5)

Development finance of $8,858 was obtained from the State Advances Corporation. Development commenced in 1965 and the farmer did not deviate from the budgeted plan. Due to falling wool prices (from 35.9 cents per pound to a low of 21.6 cents per pound) and large breeding cow losses a second loan had to be obtained in order to complete the programme. This loan of

(5) Prior to this 2 cwt of molybdic superphosphate per acre was applied every third year.

Table 5.4 Case Farm C - Stock Increase Achieved By Subdivision

Stock Wintered	Year			
	1961	1962	1963	1964
Breeding ewes	1,000	1,100	1,210	1,400
Sheep ewe equivalents	1,491	1,585	1,785	2,018
Breeding cows	39	25	54	47
Cattle ewe equivalents	248	280	395	420
Total ewe equivalents	1,739	1,865	2,180	2,438
Annual percentage change in ewe equivalents	N.A.	7.2	16.9	10.6
Ewe equivalents per potentially productive acre	1.7	1.8	2.1	2.3

Note -

1. N.A. denotes non applicable.

$12,692 was obtained in July 1967.

In 1965 five hundredweight of aerial superphosphate and 4 lbs of white clover seed per acre were applied to 350 acres. This was followed by another 5 cwt of aerial superphosphate the following year. In the same year the remaining area of the front block was oversown with 4 lbs of white clover seed and 5 cwt of superphosphate per acre.

Five hundredweight of aerial superphosphate per acre was applied to the middle block in 1967. Forty chains of fencing was also erected. Fern and tauhinu were burnt on the back block and oversown with 12 lb of Ariki ryegrass and 3 lb of white clover seed per acre.

The land development programme ended at this point. In the 1968 season a maintenance dressing of 2 cwt of superphosphate per acre was applied to 700 acres. A summary of the land development programme together with the stock increases achieved is given in table 5.5.

Table 5.5 Case Farm C - Land Development Programme and Stocking Rate Increases

Land Programme	Year				
	1965	1966	1967	1968	1969
Fertiliser (tons)	87	175	83	70	
Seed (lbs)	1600	1600	1050		
Subdivision (chains)			40		
Stock Wintered					
Breeding ewes	1400	2400	3100	3350	3200
Sheep ewe equivalents	2018	3535	3838	4170	3928
Breeding cows	47	60	78	80	60
Cattle ewe equivalents	397	437	484	549	463
Total ewe equivalents	2415	3972	4322	4719	4388
Ewe equivalents per potentially productive acre	2.3	3.8	3.9	4.2	3.9

In the seven years of development there was an increase of 2980 E.E. This represents a 170 per cent increase in carrying capacity. The 1969 figures for stock wintered show a decrease of 331 E.E. This was not due to the inability of the farm to carry 4.2 E.E. per acre. It was an attempt by the partners to reduce costs in order to be able to continue farming.

The cost of the development programme on a per ewe equivalent increase basis is approximately $8.

There has been a number of management changes associated with development. Shorn two tooth wethers were bought for

\$3 to \$4 and put on the back block of unproductive land. By doing this a portion of this block has been brought into production. The use of wethers gave management flexibility as they could also be utilised on the front two blocks as required.

In the 1967 season, replacement two tooth breeding ewes were purchased and all ewe lambs sold. The partners said that because the bought in ewes are bigger than the replacements they breed a higher lambing percentage is likely.[6]

The grazing management of breeding ewes also changed as a result of development. Set stocking all the year round was carried out prior to development. Since development the ewes are set stocked only in the period from lambing to weaning.

5.4.2 Conclusions

Three main points can be learnt from this development programme.

The first point is that significant increases in stocking rate can be achieved by subdivision alone. As a result of subdivision the stocking rate was increased by 0.6 ewe equivalents per acre. This was due to better utilisation of pastures and better weed control.

The application of techniques proven at Te Awa[7] has led

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(6) An analysis done by the author based on information provided by the partners and using 1968/69 prices showed a monetary advantage on this property from rearing own replacements.

(7) These techniques include heavy topdressing, oversowing with grasses and clovers, and efficient management with high stocking rates to ensure complete pasture utilisation.

to the rapid improvement of the poor native hill country pasture. The author visited the farm in mid-winter and was impressed with the pasture and general condition of the animals. The farm "stood out" from the surrounding undeveloped hill country properties.

The most important lesson that can be learnt from this case study is the need to have flexibility in a development programme. Rigid adherence to a development plan has in this instance led to financial difficulties. In order to remain on the farm, capital repayments and some interest repayments have had to be postponed. The partners maintain that if prices remain static for another three years they will have to sell up. Even if prices rise fertiliser application is unlikely for a number of years. As a result pastures will tend to 'run out' and the value of the completed development work will be lost.

5.5 Case Farm D

This farm, situated in the Shannon area, was purchased in 1964, and is run as a partnership. One partner manages the farm whilst the other partner works as a plasterer. This has enabled a lot of development work to be financed out of income. A Marginal Lands loan of $10,000 has also been used for development.

The farm consists of 2100 acres. This is made up of 700 acres of easy front hills, 500 acres of potentially productive land and 900 acres of regrowth bush.

The farm rises from 400 feet to 2000 feet above sea level. Winters are cold and snow falls on the upper parts of the farm.

The rainfall of 60 to 80 inches per annum is evenly distributed. Summer droughts are rare.

The soils are formed from greywacke and are of low fertility. Reversion to fern occurs readily. At the time of purchase the pastures were in a poor condition. The clovers had almost disappeared and browntop and danthonia were prevalent. The farm had never been topdressed.

5.5.1 The Development Programme

Development started immediately on purchase of the farm in 1964. The first development carried out was on the 700 acres of front hills. Two and a half miles of subdivision was erected and rotational grazing of breeding ewes commenced. Four hundredweight of superphosphate was applied to 300 acres.

A Marginal Lands loan was obtained in the second year of development. This money was spent on new pasture (40 acres), livestock and fertiliser. During the second and third years of development 8 cwt of superphosphate, including 3 cwt of molybdic superphosphate, was applied to 700 acres. Burning by flame thrower and oversowing with white clover was carried out on another 300 acres. Two miles of subdivision was also completed.

The third year of development saw the introduction of Perendale ewes. This was achieved by purchasing Perendale ewes and by mating a Cheviot ram with Romney ewes.

In the fourth year of development access was improved by bulldozing two miles of tracks. There was no application of fertiliser. This was because the partners did not wish to go further into debt.

Erection of two main boundary fences and the recommencement of fertiliser applications occurred in 1968. Crushing and burning of some scrub was also carried out.

The increase in stocking rate associated with the development programme is shown in table 5.6. The table shows that the stocking rate has almost doubled as a result of the development. Despite this the stocking rate is still below the district average of 3.0 E.E. per acre. Consolidation of this development work will be the keynote for the next two years. When ewe numbers reach 2000 development will recommence on the 500 acre block. This development will be financed out of income. If this is not possible capital will be borrowed.

Table 5.6 Case Farm D - Increases in Stocking Rate Associated With Development

Stock Wintered	Year				
	1964	1965	1966	1967	1968
Breeding ewes	730	1000	1520	1720	1720
Sheep ewe equivalents	962	1215	1937	2174	2174
Breeding cows	80	86	96	102	102
Cattle ewe equivalents	640	725	777	840	840
Total ewe equivalents	1602	1940	2714	3014	3014
Ewe equivalents potentially productive acre	1.3	1.6	2.2	2.5	2.5

5.5.2 Conclusions

The increase in carrying capacity has been achieved by concentrating on the least difficult land. The development programme has been flexible enough to stand the effects of the fall in wool price. Heavy initial inputs of fertiliser allowed fertiliser application to be stopped in year four of development without any significant deterioration in pasture production.

The slow increase in carrying capacity is a result of large financial commitments and the desire not to go further into debt.

The consolidation period aimed at intensifying stocking rate on the developed land should enable the farm to be placed on a sound financial basis.

5.6 Case Far E - Random Survey Farm Number 20

Whareroa is situated at Paekakariki and is managed by the Lands and Survey Department. The sheep unit is 1412 acres in size and consists of moderately steep hill country. There is also access to 700 acres of sand dunes which provide additional grazing during the year.

The farm rises from 50 feet to 1600 feet above sea level and has a norwesterly aspect. Rainfall averages 40 inches per annum and is unevenly distributed. Summer droughts are common. The winters are cold and falls of snow occur on the higher slopes.

The soils are of medium fertility being derived from greywacke. They are molybdenum deficient and also respond to phosphate applications.

The farm is run by a manager who implements policy decisions of two field officers.

5.6.1 The Development Programme

Development commenced in 1967 and up to 1969 it has consisted of subdivision, livestock increases, fertiliser application, scrub cutting, gorse and varigated thistle control.

The details of the development programme together with livestock increases are given in table 5.7.

Table 5.7 shows that the stocking rate was doubled in the first year of development. As a result of this stock performance was seriously affected. Table 5.8 provides a comparison of the livestock performance in 1966 and in 1967.

Table 5.7 Case Farm E - Land Development And Stocking Rate

	Year				
Land Development	1966	1967	1968	1969	1970 (Estimated)
Seed (lb)		360			
Fertiliser (ton)		70	230	250	
Subdivision (chains)		240	90	65	
Scrubcutting (acres)		200	300		
Hormone spraying (acres)		200	200	165	
Cropping (acres)			20	20	
Stock Wintered (1)					
Breeding ewes	2177	3880	4691	6327	5500
Sheep ewe equivalents	2724	4723	5585	7454	6600
Breeding cows	82	122	113	200	246
Cattle ewe equivalents	1222	3061	1433	1510	1934
Total ewe equivalents	3946	7784	7018	8964	8534
Ewe equivalents per potentially productive acre	1.9	3.9	3.5	4.4	4.2

Note -

(1) The stock figures for 1970 have been adversely affected by the drought.

Table 5.8 Case Farm E - The Effects of Doubling Stocking Rate on Stock Performance

Item	Year	
	1966	1967
Lambing percentage	84	73
Ewe losses (%)	6	7
Wool production (lbs)	49,732	32,642
Calving percentage	96	90
Breeding cow losses (%)	2	7

The stocking rate was reduced in the second year of development to allow pasture establishment and livestock performance to improve. Table 5.9 records the stock performances in 1968 and 1969. The table reveals that two years after the stocking rate was doubled stock performance was back to the pre-development levels.

Table 5.9 Case Farm E - Stock Performance After Stocking Rate Increases

Item	Year	
	1968	1969
Lambing percentage	74	80
Ewe losses (%)	3	4
Wool production (lbs)	60,000	80,000
Calving percentage	98	90
Breeding cow losses (%)	2	3

Development is still continuing and the aim is to run ten ewe equivalents per acre. The field officers concerned do not consider development work being done on Whareroa is outside the scope of the average hill country farmer. However, development at Whareroa has two advantages and one disadvantage over development carried out by other hill country farmers. The advantages are an interest charge on borrowed money of four per cent per annum and the ability to transfer stock from other Lands and Survey farms.

Whareroa is farmed as an endowment for the Queen Elizabeth Park Domain Board. All income goes into a consolidated fund. Field officers prepare a budget for each year's operations which is either approved or altered. As a result development does not always proceed in the manner the field officers would like.

5.6.2 Conclusions

The author would like to see Whareroa used as a demonstration hill country sheep farm. Undoubtedly many lessons will be learnt from this attempt to reach stocking levels in the vicinity of 10 E.E. per acre. Already one important piece of information has emerged from the development programme. This is that the detrimental effect on stock performance caused by a rapid initial increase in stocking rate is only a temporary phase.

If Whareroa was used as a demonstration farm physical and financial records would need to be improved and reorganised. This improvement would be required in order to enable accurate costing of development.

5.7 Summary

This chapter has outlined the important physical features of five development programmes carried out by farmers in the Horowhenua district. All of these programmes have information to offer to farmers considering development.

The most important findings from these development programmes are:-

(i) Initial applications of capital fertiliser varied from 4 cwt to 8 cwt per acre. First year totals varied from 10 cwt to 20 cwt per acre.

(ii) High cattle losses (up to 10%) can be expected on this class of country where cattle are used to crush and trample scrub, tauhinu and bush.

(iii) There is increasing competition between sheep and cattle for feed as development proceeds.

(iv) Bought in ewes generally do not thrive on this class of hill country.

(v) Some development farmers have changed to the Perendale breed in order to improve lambing percentages, reduce stock losses and grow bigger sheep.

(vi) A sudden large increase in stocking rate in order to improve pasture production can temporarily affect stock performance.

(vii) More complete utilisation of the available feed will result in higher stocking rates on some farms.

(viii) The cheapest method of development is stock increases on existing productive land and the most expensive is clearing the land of weeds and bush.

(ix) The wool price has a marked influence on the rate and amount of development that can be done out of income.

(x) Careful thought must be given to a development programme and the programme decided upon must be flexible enough to allow modifications to be made as additional information becomes available.

(xi) Development can be hindered by short term financial arrangements because the post tax cash surplus is used to repay the loan rather than being used for worthwhile development.

CHAPTER SIX

THE FEASIBILITY OF FUTURE DEVELOPMENT FOR REPRESENTATIVE FARM F

6.1 Introduction

It is possible to divide Horowhenua hill country farms into four main classes according to the stage of development. These classes are:-

(i) the potentially economic but largely undeveloped hill country unit

(ii) the small sized farm on which the hill country area has been neglected

(iii) medium sized properties on which all the potentially productive land has been cleared so that future production increases are possible only by increasing stock numbers or by improving stock performances

(iv) the large family unit where significant production increases are still possible either through land development[1] or by intensification.[2]

Although the profitability of future development is important with respect to the latter class of farm it is more

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(1) The process of land development involves developing waste land or land only partly farmed. It includes operations such as clearing weeds, scrub, or bush, cultivation, regrassing and oversowing as well as erecting fences, putting in tracks, improving water supplies and applying capital fertiliser.

(2) Intensification can be defined as the addition of extra inputs to promote greater output while the remainder of the inputs are held constant. The additional inputs are likely to be those with high marginal returns such as fertiliser and stock. As a result capital is going into factors of production which will directly increase the output of meat and wool.

important to the preceeding classes. These farms have a lower net income and therefore are more vulnerable to falling prices and rising costs. A profitable increase in production is one method by which this vulnerability can be reduced. The analysis of the profitability of future hill country development was therefore confined to farms representative of these three classes.

For each representative farm development programmes were devised and submitted to the farm owners for comments and criticisms. As a result some development programmes were modified before being financially evaluated.(3)

The initial part of this chapter describes the assumptions made in evaluating the development programmes. Representative farm F is then described and the development programmes devised for it, discussed and evaluated in turn.

6.2 Development Programme Assumptions

The financial analysis of the development programmes involved making a number of assumptions. These assumptions are listed in the following subsections.

6.2.1 Prices

In determining the prices to use in an *ex ante* study it is necessary to choose between one of three procedures. These are:-

(i) use recent prices

(ii) use forecasts of future values

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(3) The development programmes described are those which the representative farm owners would be prepared to implement, given incentives to do so.

(iii) use a range of prices.

Ward (31) has stated:-

"whichever method is used it is acknowledged that the likelihood of error due to uncertainty of the future is large."

The author decided to use the average of three years prices[(4)] received by Horowhenua hill country farmers. Three factors influenced this decision. These were:-

(i) the long term prospect for wool is unfavourable with the existence of stockpiled wool and low priced synthetics.

(ii) recent research (32) indicates it is likely that New Zealand will be able to export most of the expected increase in lamb production over the next ten years at present prices.

(iii) it seems likely that there will be favourable market opportunities for beef in the next decade.

These factors seemed to indicate that present prices were likely to continue into the future. However, in order to remove seasonal fluctuations it was decided to use the average of the past three years' prices. These prices are listed in table 6.1.

6.2.2 Costs

Prices paid by primary producers have risen by 23 per cent in the last ten years (33). If rising input prices are used

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(4) The three years used were 1967/68, 1968/69 and 1969/70.

during development it is necessary to recalculate the base year for each year of development. This procedure allows the analysis to reflect what would have happened in the absence of development. The computational burden is increased by allowing for this but it does indicate the effect of increasing costs on development.

As the computer program[5] used by the author could not handle rising input costs a constant level of costs was used in this study. The costs used were those which applied to Horowhenua hill country farmers in the 1969/70 season.[6]

6.2.3 Taxation

Calculations of taxation were made on the premise that all income accrued to the farm owner. The level of taxable income was calculated as follows:-

Taxable income[7] = Gross income + change in livestock standard value - (tax deductible expenses[8] + personal and family exemptions + life insurance premiums).

The assumptions made concerning factors affecting the level of taxable income are described in the following subsections.

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(5) Used to financially evaluate the feasibility of the development programmes.

(6) A development programme shown to be marginally profitable under these costs could be unprofitable under higher costs.

(7) This term can be defined as that sum of money which is subject to income tax.

(8) These include stock purchases, farm working expenses, interest and certain items of development expenditure.

Table 6.1 Price Assumptions

Product	Nett Prices
	($)
Wool - per pound	0.22.5
Store lambs - ewes	4.00
- wethers	3.80
Fat lambs	5.00
Cull two tooth ewes	5.00
Mixed aged ewes	4.00
Five year ewes	3.20
Fat cull ewes	2.50
Store Cattle	
Weaner steers	35.00
Weaner heifers	33.00
Cull cows	65.00
Cull bulls	125.00

6.2.4 Livestock Standard Values[9]

The livestock standard values used in the development programmes for the purpose of assessing income tax are listed in table 6.2. The use of nil values was not possible because the evaluation program could not utilise them.

6.2.5 Personal Exemptions

It was decided to assume personal exemptions of $785. These exemptions correspond to those of a married man with two children.

6.2.6 Life Insurance Premiums

A figure of $250 was used as the value for life insurance premiums. This figure represents the average annual premium paid by the three representative farmers.

6.2.7 Development Exemptions

New Zealand income tax laws allow certain items of development expenditure to be deducted from taxable income over a number of years. Such a provision enables taxation to be minimised and cash resources to be conserved.[10] However in this study the computerised evaluation program used did not contain provision for the development expenditure to be spread forward. Hence development expenditure was deducted from taxable income in the year in which it occurred.

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(9) See glossary.

(10) Two basic principles are involved viz. the more even the annual taxable incomes the lower the total tax paid over a period and showing negative taxable incomes is rarely a sound practice. These points are explained in detail by W.G. Payne in Discussion Paper No. 34, Department of Agricultural Economics and Farm Management, Massey University.

Table 6.2 Livestock Standard Values

Class of Stock		Standard Value
		$
Sheep - all ages		3.00
Female cattle	- one year	20.00
	- two year and older	50.00
Male cattle	- bulls	100.00

6.2.8 Personal Drawings

In this study personal drawings of $2000[11] were assumed. This sum is greater than the personal drawings of some hill country farmers. However the author believes that this amount of money is required for a satisfactory standard of living.

Some farmers who have undertaken development have diverted money from consumption to development by reducing personal drawings during development. If this procedure is adopted then the development programme is in effect receiving an interest free non repayable loan. For this reason the level of personal drawings is assumed to remain constant throughout the development period.

6.3 Representative Farm F

This farm embodies the problems of farmers who have recently[12] purchased undeveloped Horowhenua hill country

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(11) This sum does not include taxation or life insurance payments. These payments were allowed for as separate items in the development plans.

(12) Within the last five to ten years.

properties.[13] Falling income has reduced not only the ability to service large debt charges but also the amount of surplus income available for future development. For these farmers surplus income is the major source of development capital. Any reduction in this seriously affects the ability to increase production and maintain net income.

On these properties total production can be increased in one of three ways viz. by intensification, by developing unproductive land or by combining intensification with land development. For this reason three development programmes were devised and evaluated.

6.3.1 Description of the Farm

The total area of the farm is 1,260 acres. This is made up of:-

700 acres of native pasture e.g. browntop and danthonia

30 acres of sown pasture

150 acres of manuka

130 acres of fern and sparse scrub

100 acres of rangiora and punga

40 acres of scattered tauhinu

30 acres of scattered gorse

30 acres of native bush

50 acres of waste land e.g. buildings, creeks.

Of the total area, 1,080 acres (86%) is potentially productive.

Most of the farm is between 900 feet and 1,000 feet above

(13) Random survey farm numbers 10, 17 and 18 and case farms B and D are examples of this type of property.

sea level. The highest peak is 1,200 feet and the lowest point 100 feet. The topography of the farm varies from easy hill country to steep broken land with numerous gullies. Despite this all parts of the farm are readily accessible. The main access is either by internal tracks or by road along the southern side of the farm. Of the productive land only 80 acres can be traversed by a wheel tractor.

The annual average rainfall is 48 inches on the lower slopes and 60 inches on the higher slopes. Dry periods of six to eight weeks are common but prolonged droughts as experienced in 1970 are rare. The winters are cold and wet with frosts occurring in May. On the higher peaks snow falls are common in July. The prevailing winds are westerlies.

Inadequate subdivision has prevented the establishment of any organised grazing pattern. Recently grazing rights have been leased in an attempt to improve pasture control. It is hoped that complete pasture utilisation and fertility buildup will result in increased autumn growth and some early winter growth.

Buildings and yards e.g. woolshed, hayshed, sheep yards are generally adequate for their purpose. The addition of another set of sheep yards would, however, facilitate quicker and easier stock work.

Both the cattle and sheep policies involve breeding with the sale of store stock. Sheep sales include store wether lambs, surplus ewe lambs and cull ewes, while cattle sales include weaner steers, surplus weaner heifers and cull cows.

The lambing and calving percentages obtained on this farm correspond to the district averages, being 85 per cent and 80 per cent respectively.

The pasture and stock management practices employed are similar to those used on other hill country farms in the area. A description of these practices is contained in chapter four.

The only permanent labour is the owner himself. Casual labour has been employed for shearing and docking while some contract fencers have been employed. The owner is a married man with two children. He has owned the farm for five years and is a capable and experienced hardworking farmer. During the time he has been on the farm he has erected cattle and sheep yards and built a loading race and a sheep dip. In addition he has ring fenced the property and erected more than 100 chains of internal fencing. Scrub and tauhinu have been cut, bracken fern burnt, gorse sprayed and internal tracks improved.

These improvements have been financed by borrowed money. The ability to repay loans has been severely affected by the decline in the price of wool. In the initial stages of development the gross return from a bale of wool was $112. This was reduced to $58 per bale when the wool price reached its lowest level. At the present time the farmer is consolidating on the development work already completed. Any further development will require further borrowing.

6.3.2 Development Programme One

The development programme initially involves the addition of extra stock to utilise existing pasture growth. This is followed by the development of 280 acres of land covered in fern and manuka. The immediate addition of 100 ewe equivalents (E.E.) not only improves pasture control but also ensures an immediate increase in farm income. Land requiring the least capital for development is cleared first.[14] This area comprises 130 acres of fern and is cleared in two blocks over two years. There are two methods of clearing land infested with bracken fern and water fern.[15] For the representative farm it is considered that burning of the fern would be the most suitable approach. The fern is burnt in the autumn and oversown with four pounds (4 lbs) of clover seed and five hundred weight (5 cwt.) of molybdic superphosphate. In the spring, 3 cwt. of superphosphate is applied and thereafter annually.

In the third and fourth years of development clearing of the manuka is undertaken. The area is cleared in two blocks, each of 75 acres. The first block includes 50 acres which can be cut with a flail chopper. This is the cheapest method of cutting the manuka. However, because of the topography the remaining 100 acres has to be cut by hand; 25 acres in year three and 75 acres in year four. After the manuka has been cut it is burnt and oversown in the autumn with seed and 5 cwt. of molybdic superphosphate. In the spring, 3 cwt. of superphosphate is applied and thereafter annually.

To enable sound pasture management practices to be

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(14) The present cost per acre of clearing weeds on the Horowhenua hill country is outlined in appendix E.

(15) See appendix E.

followed the fern and manuka blocks are fenced. The fencing cost is minimised by erecting the Pearse ten wire fence. Although less elaborate than the traditional seven wire battened fence it satisfies the basic requirements[16] and is cheaper and easier to erect.

Developing the cheapest land first reduces the development cost in the initial years of development and ensures that debt servicing charges are a minimum. This is important where there is uncertainty about future price movements. A reduction in income under these circumstances has a lesser effect than in situations where large interest and principal payments have been incurred.

The rate at which stock numbers are increased can affect the profitability of the development plan.[17] For the development programme apart from the initial year the rate at which stock numbers are increased is limited by two factors. These are the amount of new land brought into production each year and the rate at which the carrying capacity is increased.[18] The development programme results in 280 acres of new land being brought into production over four years. On these areas the stocking rate increases from 1.5 E.E. per acre at the end of year one to 3.5 E.E. per acre at the end of year three.[19]

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(16) The basic requirements for a fence are that it is stock proof, long lasting and needs minimal maintenance.

(17) Holden in his study concluded that high rates of stock increases are a pre-requisite to economically successful hill country development.

(18) This statement implies that stock increases are not limited by capital.

All stock increases are in terms of sheep rather than cattle. This is because:-

(i) less capital is involved.

(ii) sheep give a better financial return than cattle on this area of hill country.[20]

(iii) pasture can be grazed hard all the year round whereas with cattle there is a need to save extra feed.

(iv) ewes in large mobs develop pastures better through increased trampling, fertility buildup and better utilisation..

(v) sheep are less vulnerable to drought than cattle.

(vi) cattle losses are high (5-10%) on this area of hill country.

A rapid buildup in the number of breeding ewes often causes problems because of insufficient ewe hogget replacements. Two courses of action are possible. Either some five year ewes can be retained for another one and perhaps two years, or, breeding ewes can be purchased from other farms. There are disadvantages with both methods. In the first instance wool production deteriorates and stock losses increase. In the latter case bought in ewes may not thrive on this class

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(19) These stocking rate increases are those which Horowhenua hill country farmers believe can be readily achieved. These increases will, however, be affected by climatic conditions. In areas with extremes of climate obtaining these stocking levels in the time period indicated may be difficult. This will be particularly so where the natural soil fertility is low.

(20) See appendix D.

of hill country.[21] Like many other Horowhenua hill country farmers, the representative farmer prefers to retain some five year ewes and buy in any additional ewes from farms on a similar class of country.

The number of breeding ewes and breeding cows a permanent labour unit can manage is an important development factor. Stock numbers in excess of these figures require additional labour inputs. The approach used in this study is to assume that the capacity of a single labour unit is 1,500 breeding ewes and 100 breeding cows.[22] Beyond this point contract and casual labour[23] are employed until it becomes economically feasible to add another labour unit. For this development programme the increase in stock numbers is insufficient to justify this.

To improve the labour productivity a motor bike is purchased in the second year of development and an additional set of sheep yards erected in year three. The use of a motor bike improves labour mobility. The time involved in stock

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(21) One survey farmer maintained that on his farm in its present stage of development he can winter 3 E.E. per acre. However, if these stock were sold and ewes bought in then only 2.0 E.E. per acre could be wintered.

(22) This is a somewhat higher labour productivity than is being achieved at present (965 breeding ewes and 65 breeding cows per labour unit). However, many survey farmers maintained that one permanent labour unit could manage these stock numbers.

(23) The reliance on casual labour could be reduced by allowing for stock increases in wethers rather than breeding ewes. This would also improve the flexibility of the development programme especially in periods of drought. However wool is the only source of income from wethers. With the present low prices for wool it is difficult to justify the inclusion of wethers in a development programme.

operations e.g. drenching, is reduced by building a set of sheep yards adjacent to the newly developed land.

As total sheep numbers rise increasing competition occurs between sheep and cattle for the available feed. This means additional supplementary feed has to be provided for the cattle, or cattle numbers reduced. Allowance is made in the development plan for 20 acres of silage to be harvested annually. Silage is made rather then hay because it can be made earlier in the season. This is an advantage in an area prone to droughts. In addition the silage can be self fed thereby reducing the labour input required for the breeding cows.

Servicing facilities e.g. woolshed and water supply were considered adequate to cope with the increase in stock numbers.

The development programme is summarised in table 6.3 together with annual E.E. increases. The table shows that the largest E.E. increase occurs in year four of development. A more detailed stock reconciliation given in table 6.4 indicates that breeding ewes increase by 830 and ewe hoggets by 322. Similarly total E.E. increase by 1078 which represents an annual increase of 5.9 per cent. Allowance has been made for a reduction in stock performance during development. As the number of breeding ewes per labour unit increases, stock performance, particularly lambing percentage, is likely to decrease. Furthermore the retention of C.F.A. ewes for capital stock during development is likely to result in higher stock losses and lower wool production per head.

Table 6.3 Representative Farm F - Development Programme One

Item	Units	Development Year					
		1	2	3	4	5	6
Fencing	Chains	30	30	39	39	-	-
Capital Fertiliser							
8 cwt. per acre	Acres	65	65	75	75	-	-
3 cwt. per acre	Acres	-	65	130	140	150	75
Increased Maintenance Fertiliser	Acres	-	-	-	65	130	205
Oversowing	Acres	65	65	75	75	-	-
Burning Fern	Acres	65	65	-	-	-	-
Bulldozing	Hours	-	-	10	-	-	-
Chopping & Crushing Manuka	Acres	-	-	50	-	-	-
Cutting Manuka By Hand	Acres	-	-	25	75	-	-
Plant and Buildings	Items	-	Motor Bike	Sheep Yards			
Ewe Equivalent Increase per year	E.E.	197	162	242	252	150	75

Table 6.4 Programme One - Stock Reconciliation

Stock Wintered	Base Year	Development Year 1	2	3	4	5	6	Post Development
Breeding Ewes	1600	1600	1749	1899	2090	2280	2390	2430
Ewe Hoggets	550	550	626	645	700	770	824	872
Sheep Ewe Equivalents	2065	2065	2262	2424	2666	2936	3068	3143
Breeding Cows	80	80	80	80	80	80	80	80
Cattle Ewe Equivalents	561	561	561	561	561	561	561	561
Total Ewe Equivalents	2626	2626	2823	2985	3227	3497	3629	3704
Annual Percentage Increase In Ewe Equivalents	-	N.A.	7.5	5.7	8.1	7.8	4.5	2.0

Note -

N.A. denotes non applicable.

In the computerised evaluation program used stock losses could not be altered during development. However, lambing percentage and wool production could be changed. The production data used in this study reflects the experiences of farmers who have undertaken development in the past. Production data for this development programme is listed in table 6.5. Unless otherwise mentioned this data was also used in the other development programmes.

Development costs are listed in table 6.6. The data in the table reveals that the number of ewes retained in the second, third and fourth years of development falls short of the number required. Two tooth ewes are therefore purchased to make up the shortage.(24)

Fertiliser is an important development item accounting for approximately 51 per cent of the total development expenditure.

Development costs reach a peak in the third and fourth years of development when manuka scrub is cut and additional sheep yards erected. In the last two years of development, capital expenditure is confined to fertiliser application.

6.4 Financial Evaluation

Data from the development programme was punched on cards and financially evaluated by Gardner's computerised program.

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(24) In practice it is likely that breeding ewes would be purchased only in year three. In years two and four the small number of ewes required to meet the target number would be obtained either by retaining more five year ewes or by culling less severely amongst the mixed aged ewes.

Table 6.5 Stock Performance Data

1. Stock Losses	(Per Cent)	
Sheep		
Breeding Ewes	5.0	
Ewe Hoggets	5.0	
Lambs	3.0	
Cattle		
Less Than Six Years	5.0	
Six Years And Older	8.0	
2. Wool Production	(Pounds Per Head)	
Breeding Ewes	8.5	
Two Tooth Ewes	5.5	
Ewe Hoggets	5.0	
Rams	9.0	
3. Lambing Percentage		
Pre And Post Development	85.0	
Development Year Two On	80.0	
4. Calving Percentage	80.0	
5. Culling Rates	Pre And Post Development (Per Cent)	Development (1) (Per Cent)
Ewe Lambs	15.0	5.0
Ewe Hoggets	-	3.0
Two Tooth Ewes	10.0	10.0
Four Tooth Ewes	5.0	3.0
Six Tooth Ewes	2.0	0.0
Four Year Ewes	100.0	50.0
Five Year Ewes	-	100.0

Notes -

(1) These are minimum culling figures. This percentage in each age class must be culled during development. For example three per cent of the ewe hoggets on hand at the beginning of the year must be culled at the end of the year as two tooth ewes. The procedure enables the retention of cull ewes in order to build up the total number of capital stock.

Table 6.6 Programme One - Development Costs

Item	Development Year					
	1	2	3	4	5	6
	$	$	$	$	$	$
Breeding Stock (Purchased)	–	108	450	114	–	–
Capital Fertiliser	884	1204	1660	1692	706	352
Increased Maintenance Fertiliser	–	–	–	214	416	704
Fencing	450	450	525	525	–	–
Seed	325	325	375	375	–	–
Bulldozing	–	–	60	–	–	–
Cutting & Crushing Scrub	–	–	250	–	–	–
Cutting Scrub By Hand	–	–	500	1500	–	–
Plant	–	550	50	50	–	–
Sheepyards	–	–	750	–	–	–
Total Annual Cost	1659	2367	4620	4470	1122	1056

The evaluation was carried out under two sets of conditions. These were:-

(i) a debt free situation,

(ii) various levels of indebtedness.

This procedure was an attempt to show the influence of farm indebtedness on the profitability of development. By reducing farm equity(25) the point at which debt servicing charges(26) make the development programme financially infeasible could be determined.

For simplicity symbols were used to represent various equity levels. These symbols were E10, E9, E8, E7, E6 and E5 which represented 100, 90, 80, 70, 60 and 50 per cent equity respectively. Although E5 was the lowest equity situation analysed there were farms in the survey area with lower equities. These farms included those which had recently changed ownership and some of the case farmers who had recently carried out development programmes. However all development programmes analysed were unprofitable at E5. For this reason lower equity levels were not analysed.

Interest and principal repayments were assessed for the various farm equities as shown in table 6.7. These figures reflect rates being paid by hill country farmers with State Advances Corporation and Marginal Lands Board loans. The results of the financial evaluation can be divided into five

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(25) Farm equity is the ratio of total assets minus total liabilities to total assets. It is usually expressed as a percentage.

(26) That is debt servicing charges existing prior to the commencement of development.

Table 6.7 Interest and Principal Repayments

Source of Finance	Principal Repayments	Interest
	(per cent)	(per cent)
First Mortgage	2.0	5.5
Second Mortgage	3.0	7.5
Bank Overdraft	-	7.0

main parts. These are:-

(i) the pre-development or base year situation.

(ii) physical production data for the development years.

(iii) financial data for each year of development.

(iv) the post development situation

(v) the results of the profitability analysis.

The most important information is contained in the financial data for the physical development years. Data from the pre and post development situation is required for the analysis of profitability using the present value measure.[27] However, the profitability analysis is dependent upon the exact development programme being implemented. In a dynamic agriculture with constantly changing prices, costs and technology, this is unlikely to occur. In addition, there are difficulties involved in accurately determining the base year and post development situations. Consequently doubts can be expressed about the accuracy of any present value figure so determined.

(27) The present value method of evaluating the profitability of a development programme is briefly outlined in appendix F.

The following subsections discuss in some detail the physical production data and the financial details for the six years of development. The base year and post development situations together with the analysis of profitability are briefly discussed. To simplify the discussion it is assumed that the development programme is implemented exactly as planned and all assumptions hold true.

6.4.1 Base Year Data

The important information relating to the pre-development or base year situation is listed in table 6.8.(28) This data is required for profitability calculations using the present value measure. The table lists for various levels of farm indebtedness, gross income, total cash expenditure, taxation, post tax cash surplus and total mortgages. The unrealistic(29) debt free farm situation is included because it provides for a better illustration of the influence of farm indebtedness on the feasibility of development.

The table indicates that gross income totals $12,196 prior to development while total cash expenditure varies from $7,627 to $10,461 depending on the amount of farm debt. The total cash expenditure, includes tax deductible expenditure,

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(28) It should be noted that the base year situation will be the same for the three development programmes devised for this farm as it is the common starting point from which these programmes would be implemented.

(29) Unrealistic in the sense that there is unlikely to be any completely debt free hill country farms in the survey area.

Table 6.8 Programme One - Base Year Data

Farm Equity	Gross Income	Total Expenditure	Taxable Income	Taxation	Post Tax Cash Surplus	Total Debt
(Per Cent)	$	$	$	$	$	$
100 (E10)	12196	7627	4626	828	4569	-
80 (E8)	12196	8729	3568	474	3467	17420
70 (E7)	12196	9279	3066	337	2917	26130
60 (E6)	12196	9919	2513	211	2277	34840
50 (E5)	12196	10461	1960	95	1735	43550

Note -

(1) Total expenditure does not include personal drawings. The post tax cash surplus is available for personal drawings and development.

non tax deductible expenditure,[30] taxation and life insurance premiums. It does not include personal drawings. The post tax cash surplus, obtained by subtracting the total cash expenditure from the gross cash receipts, is assumed to be available for personal drawings and development.

The tax payable in the base year is listed in column five of the table. Although more tax is payable at higher equity levels, the post tax cash surplus is greater than the corresponding figures at lower equity levels. This is because the greater debt servicing charges at lower equity levels offset the reduced tax payments. Consequently for representative farm F the base year cash surplus declines from \$4,569 at E10 to \$1,735 at E5. This means that for E5 farm development will probably have to be financed entirely by borrowed money[31] because the post tax cash surplus will be required for living expenses.

The representative farmer has a level of indebtedness corresponding to that of E5. In order to obtain sufficient money for living expenses and farm development the owner is actually working off the farm.(1969)

6.4.2 Production Data

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(30) These are cash expenses which cannot be deducted from farm income when assessing taxable income. They include principal repayments and the purchase of additional plant and machinery.

(31) For the purpose of this study it is assumed that the off farm capital required for development is provided by means of a bank overdraft.

This data is summarised in table 6.9. A study of the data reveals that wool production increases by 10,923 lb and wool sales by $2,378. Cattle sales remain static throughout development but sheep sales increase by $1,895. In the first four years of development the value of sheep sales is less than those prior to development. This is due to revenue stock being retained in order to increase the total number of capital stock. The reduced sheep sales are responsible for gross income in the first two years being less than in the pre-development situation. In the third and fourth years the increased value of the wool sales offsets the reduction in the value of the wool sales.

As a result of development gross income increases by 35 per cent. Of this increase approximately one half is due to the increased value of wool sales. This reflects the fact that stock increases are in terms of sheep rather than cattle.

6.4.3 The Physical Development Years

Financial details for the six years of physical development(32) are first discussed with respect to the debt free situation. The effect of farm indebtedness on the feasibility of the development programme is then analysed.

6.4.3,1 The Debt Free Situation

Financial details for this situation are shown in

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(32) The term physical development is used to indicate the period of time required to implement the actual development plan. The development process itself is, however, not completed until all the money borrowed for development has been repaid. Usually repayment involves a longer period than the physical development period.

Table 6.9 Programme One - Production Data

	Base Year	Development Year 1	2	3	4	5	6	Post Development
Wool Production (lbs)	22,279	21,910	24,430	26,470	28,660	30,701	32,037	33,202
Wool Sales ($)	5,163	4,990	5,557	6,026	6,519	6,978	7,343	7,541
Sheep Sales ($)	4,533	3,677	3,839	4,160	4,465	5,173	5,911	6,428
Cattle Sales ($)	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Gross Income ($)	12,196	11,167	11,896	12,686	13,484	14,651	15,754	16,469

table 6.10.[33] The data in the table indicates that in year one most development can be financed out of income. This is because emphasis is on completely utilising existing pasture growth and developing the least costly land. In the second, third and fourth years the requirement for off farm capital increases because development involves more costly land clearing. In these years the annual cash deficits are the largest incurred by the development programme. As a result the total overdraft required to finance the development programme reaches a maximum of $3,760 at the end of year four. At a six per cent rate of interest this results in an interest charge of $220 in year five.[34]

The last two years of physical development involve small stock increases and small fertiliser inputs. As a result cash surpluses are generated and taxation becomes a more significant charge. The tax paid in these years is greater than that paid prior to development. The cash surpluses are available to repay the overdraft incurred in the early years of development. Repayment is completed by the end of the physical development period and an additional cash surplus of $1,098 accumulated.

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(33) Note that personal drawings of $2,000 are assumed throughout development.

(34) It is assumed that annual overdrafts are drawn for the whole year. Thus interest charges fall due on the last day of the year in which they are incurred. For the purpose of this study it is assumed that the interest charge is made on the first day of the following year, thus becoming a tax deductible expense in that year.

Table 6.10 Programme One - Financial Data For The Debt Free Situation

Development Year	Gross Income	Total Cash Expenditure(1)	Taxation	Post Tax Cash Surplus	Cumulative Overdraft
	$	$	$	$	$
1	11,167	11,332	66	-165	165
2	11,896	12,492	69	-596	761
3	12,686	14,421	0	-1,735	2,496
4	13,484	14,558	7	-1,174	3,670
5	14,651	12.655	1,128	1,996	1,674
6	15,754	12,822	1,567	2,772	+1,098

Note -

(1) Includes taxation, life insurance ($250) and personal drawings of $2,000 as well as farm working expenses and development expenses.

6.4.3.2 The Influence of Farm Indebtedness

In situations where farm debts are outstanding, debt servicing charges have to be paid in each year of development. This results in less income being available for investment in farm development. The effect is to increase the amount of off farm capital required to finance the development programme. The greater the amount of debt before development, the greater the amount of off farm capital required. As the amount of off farm capital borrowed increases, so does the interest charge and the time required to repay the borrowed money. Hence a development programme which is profitable for a debt free farm situation may be infeasible below a certain level of farm equity.

The effect of farm indebtedness on the financial requirements for this development programme are summarised in table 6.11. As shown in the table personal drawings of $2,000 are assumed for all equity levels except E5.[35] Data in table 6.11 reveals two important points. These are:-

(i) as farm equity decreases the quantity of off farm capital required to finance the development programme substantially increases e.g. for E10 $3,670 is required; for E 5 $19,483.

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(35) For the representative farm the base year post tax cash surplus is $1,735 at a fifty per cent equity. It is likely that a farmer in this situation would attempt to live on this amount of money. If he continued to have personal drawings of $2,000 then his total debt would be increased by $235 per annum during the development programme.

Table 6.11 Programme One - The Effect of Farm Indebtedness on Overdraft Requirements During Development

Equity	Personal Drawings	Maximum Overdraft Incurred During(1) Development	Year	Maximum Overdraft Interest (2)
	$	$		$
E10	2,000	3,670	4	220
E8	2,000	9,877	4	592
E7	2,000	12,8[illegible]	5	773
E6	2,000	17,029	5	1,021
E5	1,735 (3)	19,483	6	1,169

Notes -

(1) Does not include taxation or life insurance. These items are allowed for separately.

(2) At a six per cent interest rate.

(3) Personal drawings here are equal to the pre-development post tax cash surplus.

(4) Detailed financial data for the various equity levels is contained in appendix G.

(ii) interest becomes an important development cost at low equity levels e.g. for E10 a maximum charge of $220 is incurred. This increases to $1,169 if the programme is implemented under E5.

Repayment of borrowed money begins in the fifth year of development for E8 when a cash surplus of $651 occurs. Repayment does not commence until the sixth year of development for E6 and E7. For E5 it is not until after the physical development programme has been completed that repayment of borrowed capital commences. This aspect, together with the greater amount of off farm capital required and the larger interest payments combine to add to the unattractiveness of the programme at low farm equities.

6.4.4 The Post Development Situation

The post development budget assumes that once development has been completed stock numbers will remain constant at 2,430 breeding ewes and 60 breeding cows. The budget indicates that as a result of development gross income rises by $4,276. This rise in gross income is accompanied by increases in both taxation and the post tax cash surplus. The extent of these increases is shown in table 6.12.

Table 6.12 Programme One - Post Development Summary

Equity	Increase In Gross Income From Base Year	Increase In Taxation From Base Year	Increase In Post Tax Cash Surplus From Base Year
	$	$	$
E10	4,276	1,055	844
E8	4,276	992	877
E7	4,276	944	925
E6	4,276	882	989
E5	4,276	800	1,069

6.4.5 The Profitability of the Development Programme

Gardner's program calculates the profitability of development by comparing the post tax cash surpluses during and after development with that of the base year. This measure of profitability results in a present value figure being determined for the programme. The analysis assumes that the base year surplus is equal to the level of personal drawings during development. While this assumption may be correct for evaluation purposes it does not always hold in practice.

Farmers have traditionally developed their farms out of income foregoing present consumption in order to obtain a higher future income. Off farm capital has only been borrowed when the portion of the post tax cash surplus diverted from consumption to development does not meet the development cost.

For this reason the present value of the development programme was determined under two sets of conditions. These were:-

(a) when the level of personal drawings used in evaluating the profitability of the programme is equal to the base year post tax cash surplus[36] e.g. if the base year post tax cash surplus is $3,000 then this is the figure used for personal drawings during development when calculating profitability.

(b) when the base year post tax cash income above that required for personal drawings is made available for development e.g. if the base year post tax cash surplus is $3,000 and only $2,000 is required for

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(36) This calculation is the one which is carried out automatically by Gardner's computerised evaluation program. The personal drawings assumed during development (in this study $2,000) is ignored and the base year post tax cash figure used.

personal drawings then the base year surplus is reduced to this level i.e. $2,000 leaving $1,000 available for development.(37)

The method used to reduce the base year post tax cash surplus, and hence the level of personal drawings used in the present value calculation, is described in appendix C.

The results of these evaluations are discussed in the following subsections.

6.4.5.1 Evaluation Under Condition A

A study of the data in table 6.13 reveals that if personal drawings during development are equal to the base year surplus then the development programme is unprofitable regardless of equity e.g. for E8 if the base year post tax cash surplus of $3,467 is required in each year of development for personal drawings, then a maximum overdraft of $17,702 is incurred. This overdraft cannot be paid back within nineteen years by the additional post tax income generated by development i.e. the post tax income above $3,467. Hence no present value can be calculated and the programme is deemed to be unprofitable.

6.4.5.2 Evaluation Under Condition B

Table 6.14 indicates that if some of the base year post tax cash surplus is invested in development then development becomes financially feasible. The programme is feasible under these conditions for equities equal to or greater than

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(37) It must be emphasised that this procedure is used only in calculating the profitability of the development programme.

Table 6.13 Programme One - Profitability Under Condition A

Equity	Base Year Post Tax Surplus(1)	Present Value (6 per cent rate of interest)	Maximum Overdraft	Payback
	$		$	
E8	3,467	-	17,702	*
E7	2,917	-	18,346	*
E6	2,277	-	18,918	*
E5	1,735	-	19,483	*

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) * Indicates payback is not achieved within 19 years. Gardner's program does not continue the present value calculation past this point. Programmes achieving payback after this time period are deemed to be unprofitable.

E7 and for interest rates up to 7.0 per cent. The greater the amount of income invested the smaller the overdraft required to finance the programme and the quicker payback is achieved. These points are illustrated in figure 6.1 using data for E8.

If the post tax cash surplus of $3,467 is used entirely for personal drawings, the development programme is financed entirely by borrowed money. As a result a maximum overdraft of $17,702 is incurred in year six and this is not repaid by the end of year nineteen. This is because the overdraft is repaid only by the additional cash surplus i.e. the cash surplus over and above the pre-development cash surplus of $3,467.[38]

Figure 6.1 The Effect of Investing Income In Farm Development

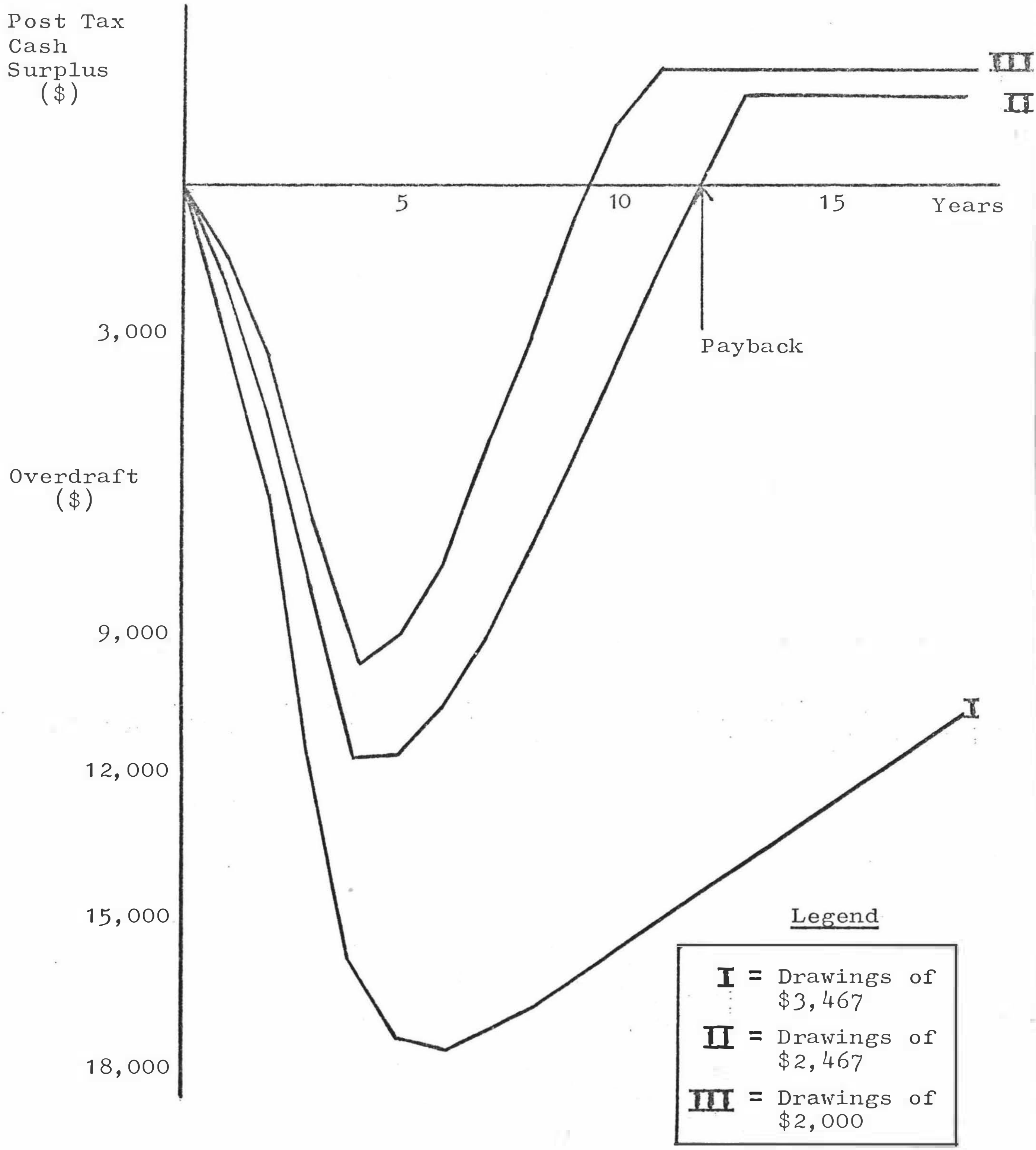

Table 6.14 Programme One - Profitability Under Condition B

Equity	Base Year Post Tax Cash Surplus (1)	Present Value $			Maximum Overdraft $			Payback (Year)			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E8	Reduced from $3,467 to										
	(i) $2,467	13,947	11,380	9,187	11,926	12,004	12,083	12	13	13	877
	(ii) $2,000	22,414	19,302	16,652	9,877	9,940	10,004	10	10	10	877
E7	Reduced from $2,917 to										
	$2,000	12,394	9,842	7,652	12,896	13,032	13.170	13	13	14	925
E6	Reduced from $2,277 to $2,000				17,029			*			
E5	$1,735				19,483			*			

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

(3) * Denotes payback not achieved within nineteen years.

An additional cash surplus does not occur until year seven but from this point on it slowly increases as the overdraft is repaid and the interest charge decreases. The increases, however, are insufficient to repay the overdraft by the end of year nineteen. At this point $10,225 is still outstanding and the maximum possible increase in the post tax cash surplus has not been realised.

If the base year surplus is decreased to $2,467 then only $11,926 (at a 6.0% interest) of off farm capital is required to finance development.

The figure shows that this sum is repaid by the end of year twelve. The additional post tax cash surplus that occurs as a result of development is $877.(39) Similarly if the base year post tax cash surplus is reduced to $2,000 then the amount of off farm capital required decreases to $9,886 (at 6% interest). This loan is repaid by the end of year ten.

Table 6.14 shows that for E6 the reduction of personal drawings to $2,000 and an annual investment of $277 is insufficient to achieve repayment of the borrowed money within nineteen years. Similarly the debt servicing charges for E5 are too great to allow development to be financed entirely

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(38) This statement implies that the farmer continues to have personal drawings of $3,467 after physical development has been completed.

(39) The figure shows an increase of $1,877. However from this figure must be subtracted $1,000. This is the difference between the actual pre-development post tax cash surplus ($3,467) and that used ($2,467) for personal drawings in the present value calculation.

by borrowed money and payback to be achieved within nineteen years.

Farmers who are averse to development tend to reject those programmes which involve heavy borrowing even though the marginal productivity of the capital may be high. For this reason the maximum overdraft required to finance the programme becomes an important criterion in deciding whether the development programme will be implemented. If development is financed partly out of income then for E7 the maximum overdraft required is $12,896 (6.0% interest rate) and for E8 $9,877 and $11,926, for personal drawings during development of $2,000 and $2,467 respectively. Depending upon the individual farmers personality, past experience and future expectations these may or may not be acceptable overdraft levels.

The development programme is relatively insensitive to changes in interest (discount) rate between 6.0 and 7.0 per cent. This aspect is illustrated by data in table 6.14. The effect on the maximum overdraft and the payback period is insignificant for E8 and E7. Although the magnitude of the present value is adversely affected by raising the interest rate, the programme still remains profitable(40) at the higher rate of interest.

The analysis has shown that for the owner of the representative farm this development programme is financially infeasible. The programme would be feasible if his total

(40) In the sense that the evaluation shows a positive present value as a result of investing base year post tax cash surpluses in the development programme.

debt was less than thirty per cent of the value of his assets. However even at this level of indebtedness the owner would still not undertake the development programme. This is because the maximum overdraft required to finance the programme is too high. The programme would only be undertaken by this farmer if his farm equity was eighty per cent. At this level of equity the maximum overdraft incurred is less than $10,000.

6.4.6 The Effect of the Fertiliser Subsidy

The fertiliser subsidy announced in the 1970 budget means that for every ton of fertiliser applied farmers will receive a subsidy of five dollars. However due to taxation the real value of the subsidy will be less than five dollars a ton. Despite this the subsidy is likely to affect the feasibility of development since fertiliser is a major input in many development programmes.

As the price of fertiliser at the farm gate is lowered by the subsidy the total development expenditure in any one year will also be reduced. This will either decrease the amount of off farm capital required to finance development, or increase the cash surplus after tax. In the former case the interest charge on borrowed money will be reduced and in the latter case the amount of tax paid will be increased.

Table 6.15 outlines these aspects for six years of development. The table indicates that for year one of development and for all equity levels except E8, the financial gain from the fertiliser subsidy is equal to the value of the fertiliser subsidy. This is because tax is not paid and overdraft interest is not incurred. In years two to

Table 6.15 Programme One - The Effect of the Fertiliser Subsidy on Annual Overdraft Requirements

	Equity	Base Year	Development Year 1	2	3	4	5	6	Post Development
Value of the Fertiliser subsidy $		365	495	545	615	650	545	525	505
Reduction in Annual overdraft $	E8	N.A.	483	574	678	754	–	–	N.A.
	E7	N.A.	495	575	679	755	14	–	N.A.
	E6	N.A.	495	575	679	755	549	–	N.A.
	E5	N.A.	495	575	680	755	549	515	N.A.
Increase in cash surplus $	E8	246	–	–	–	–	451	417	272
	E7	265	–	–	–	–	458	449	283
	E6	286	–	–	–	–	–	470	286
	E5	288	–	–	–	–	–	–	310
Reduction in overdraft interest $	E8	N.A.	N.A.	29	63	104	148	175	N.A.
	E7	N.A.	N.A.	30	64	105	150	182	N.A.
	E6	N.A.	N.A.	30	64	105	150	181	N.A.
	E5	N.A.	N.A.	30	65	105	150	183	N.A.
Increase in Taxation $	E8	119	12	–	–	–	242	283	233
	E7	100	–	–	–	–	222	255	221
	E6	79	–	–	–	–	180	236	209
	E5	77	–	–	–	–	146	193	195

four when overdraft interest becomes payable the value of the subsidy is equal to the fertiliser subsidy plus the reduction in overdraft interest, i.e. the financial gain from the subsidy is greater than the value of the subsidy. For the last two years of development when cash credits are generated the financial gain from the subsidy is less than the value of the subsidy. This is because the increase in taxation is greater than the reduction in the interest charge.

With regard to the post development situations, the higher the taxable income the lower is the financial gain from the fertiliser subsidy. Prior to development taxation claims thirty-three per cent of the subsidy at E8. After development taxation accounts for forty-six per cent of the subsidy. For E7 the corresponding figures are twenty-eight per cent and forty-three per cent. This means that farmers who have low farm equities will gain per ton the most from the subsidy. However these farmers generally cannot afford to apply large quantities of fertiliser even if it is desirable to do so. Hence farmers in the higher income brackets who annually apply large quantities of fertiliser will in <u>total</u> receive the most benefit from the subsidy.

The fertiliser subsidy reduces the overdraft required to finance development and increases the post tax cash surplus which is available to repay borrowed capital. This means that the time required to repay the borrowed capital will be reduced. In addition, the magnitude of the present value figure will be increased, the maximum overdraft will be reduced and the post tax cash surplus will increase.

These all combine to increase the "attractiveness" of the programme. The data in table 6.16 illustrates these points.(41) The table shows that as a result of the fertiliser subsidy development now becomes feasible at E6. However 16 years are required to repay the borrowed money and the maximum overdraft incurred is approximately $14,000. These two factors, together with the fact that the subsidy has to be kept on, would cause the owner of the case farm to reject the development programme.

6.4.7 Summary

The main points from the analysis of the development programme are:-

(i) carrying capacity increases by 1,078 E.E. or 41 per cent.

(ii) development expenditure total $15,564 or $14.4 per E.E. increase.

(iii) gross income increases by $4,273 or 35 per cent.

(iv) the development programme is infeasible if financed entirely by off farm capital.

(v) if surplus farm income is invested in the development programme the programme becomes feasible for equities greater than E7.

(vi) the fertiliser subsidy enables the development programme to become feasible at E6.

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(41) The table assumes that the fertiliser subsidy will continue indefinitely.

Table 6.16 Programme One - The Effect Of The Fertiliser Subsidy On the Profitability Of Development

Equity	Base Year Post Tax(1) Cash Surplus	Present Value			Maximum Overdraft			Payback			Increase In Post Tax Cash Surplus
		$			$			(Year)			
	$	A	B	C	A	B	C	A	B	C	$
E8											
subsidy	2,000	28,498	25,079	22,169	7,402	7,448	7,497	8	8	8	902
no subsidy	2,000				9,877	9,940	10,004	10	10	10	877
E7											
subsidy	2,000	18,998	16,146	13,714	10,388	10,456	10,522	11	11	11	941
no subsidy	2,000	12,394	9,842	7,656	12,896	13,032	13,182	13	13	14	925
E6											
subsidy	2,000	7,503	5,260	3,337	14,205	14,173	14,321	16	16	16	997
no subsidy	2,000	-			16,029			*			

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

(3) * Denotes payback not achieved within nineteen years.

(vii) as a result of development the post tax cash surplus increases by $877 at E8
$925 at E7
$989 at E6

(viii) this programme is financially infeasible for the representative farmer at his level of equity.

6.5 Development Programme Two

This development programme aims at increasing production by raising the stocking rate from 3.5 E.E. per acre to 4.5 E.E. per acre. In order to do this the existing feed supply must be completely utilised and total pasture production increased.

Discussions with hill country farmers indicated some disagreement on how quickly stocking rates could be raised from 3.5 E.E. to 4.5 E.E. per acre.[42] Influencing factors will be the nature of the existing pasture, the amount of fertiliser applied and the response obtained and the managerial ability of the farmer. For the representative farm it was considered that an increase of 1.0 E.E. per acre could be achieved within two years.

In the first year complete utilisation of the pasture growth is obtained by subdividing and adding more stock. The additional subdivision not only improves pasture control but also stock management. Stock control is improved and the time required for stock operations reduced.

Pasture production is increased by oversowing with clover seed and superphosphate. Prior to oversowing it is necessary

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(42) Estimates ranged from two to five years.

to graze the pasture hard in order to allow the seed to reach the ground. Hence for best results oversowing needs to be undertaken on a block by block basis.

For this reason oversowing is carried out over four years. Two hundred acres are oversown in each of the first three years and one hundred and thirty acres in the fourth year.

The paddocks are oversown with 3 lbs of inoculated white clover seed and 1 lb of subteraneum clover. Oversowing with improved grasses e.g. ryegrass, has generally not been successful on Horowhenua hill country. For this reason no allowance was made in the development programme for oversowing with grass seed. The initial application of fertiliser was 5 cwt of molybdic superphosphate per acre. This was followed by 5 cwt of superphosphate in the second year and another 3 cwt in the third year. Many farmers and farm advisory officers consider that this is the minimum amount of fertiliser required for an intensification process.

As in development programme one improved winter feeding of the breeding cows necessitates making twenty acres of silage. The cattle policy involves selling all weaner steers and surplus weaner heifers. The sheep policy is similar with the sale of wether lambs and surplus ewe lambs. The wether lambs are sold during the period from January to May. In the event of a dry summer these lambs would be sold earlier.

The transition from a predominantly native pasture to an improved pasture is often accompanied by a fall in livestock performance. This has been the experience of hill country farmers in the past.[43] Provision has been made in the development programme for an initial lowering of stock performance. From the second year of development the lambing percentage is reduced from eighty-five per cent to eighty per cent. Similarly wool production is decreased from 8.5 lbs per ewe to 8.3 lbs and from 5.0 lbs to 4.8 lbs per hogget.

The proposed increase in stock numbers did not permit the hiring of a permanent labour unit. As in development programme one the additional labour requirement was satisfied by increasing labour productivity and by using contract and casual labour. Labour mobility was improved by purchasing a motor bike while the erection of another set of sheep yards reduced the time involved in stock operations. Large farm operations e.g. shearing and fencing, were undertaken by contract labour.

Water supplies and other servicing facilities were considered to be adequate to cope with the increase in stock numbers. In situations where these have to be improved or enlarged then the profitability and the feasibility of development may be altered. This would apply particularly at low levels of equity.

The physical development programme together with the annual increase in carrying capacity is shown in table 6.17.

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(43) For example at Whareroa a development programme aimed at increasing total pasture production and hence stocking rate resulted in an initial decrease in lambing percentage of 11% and wool production of 20%, while stock losses increased by 2%.

Table 6.17 Representative Farm F - Development Programme Two

Item	Units	Development Year				
		1	2	3	4	5
Fencing	Chains	71	-	-	-	-
Capital Fertiliser	Tons	50	100	130	113	60
Oversowing	Acres	200	200	200	130	-
Plant and Buildings	Items	-	Motor bike	Sheep yards		
Ewe Equivalent Increase Per Year	E.E.	200	200	200	165	65

The data in the table reveals that the largest increase in stock numbers occurs in the first three years of development. This has three advantages. It increases the amount of surplus income initially available for farm development and reduces the amount of off farm capital required and hence debt servicing charges.

The development programme is more flexible than programme one as the programme can be stopped at any point in time with little loss in benefits from earlier inputs. This flexibility does not apply to programme one. With this programme land clearing can be stopped, but to obtain full benefits from previous clearing, continuing inputs of stock and fertiliser are required.

A detailed stock reconciliation is shown in table 6.18. The table shows that the total number of breeding ewes increases by 656. This represents a forty-one per cent increase in five years. Over the same time period total ewe

Table 6.18 Programme Two - Stock Reconciliation

Stock Wintered	Base Year	Development Year 1	2	3	4	5	Post Development
Breeding Ewes	1,600	1,600	1,789	1,960	2,117	2,217	2,256
Ewe Hoggets	550	550	626	659	722	780	817
Sheep Ewe Equivalents	2,065	2,065	2,300	2,500	2,700	2,865	2,930
Breeding Cows	80	80	80	80	80	80	80
Cattle Ewe Equivalents	561	561	561	561	561	561	561
Total Ewe Equivalents	2,626	2,626	2,861	3,061	3,261	3,426	3,491
Annual Percentage Increase In Ewe Equivalents	-	N.A.	8.9	6.9	6.5	5.0	1.9

Notes -

(1) N.A. denotes non applicable.

equivalents increase by 865 or thirty-two per cent.

Development costs are outlined in table 6.19. The table indicates that development costs are highest in year three and fertiliser is the largest single cash cost in all years. The fertiliser subsidy will therefore profoundly influence the feasibility of this programme.

6.6 Financial Evaluation

The important information from the evaluation is summarised in a series of tables. Additional information is listed in tables in appendix G.

6.6.1 Production Data

Data in table 6.20 shows that as a result of development wool production increases by 7,557 lbs. This leads to an

Table 6.19 Programme Two - Development Costs

Item	Development Year				
	1	2	3	4	5
	$	$	$	$	$
Capital fertiliser	1,700	3,300	4,260	3,682	2,016
Breeding stock purchases	-	312	210	-	-
Fencing	1,065	-	-	.	-
Seed	400	400	400	260	
Motorbike	-	500	-	-	
Sheep yards	-	-	750	-	-
Total Annual Cost	3,165	4,512	5,620	3,942	2,016

increase in the value of wool sales of $1,625. Cattle sales remain constant but sheep sales increase to $6,357 from the base year level of $4,533. Despite this increase sheep sales do not exceed the base year level until year four of development. This is due to the retention of revenue stock for breeding.

As a result of development gross income increases to a new post development equilibrium of $15,645. In the first two years of development the gross income is less than the base year because of lower sheep sales.

6.6.2 The Physical Development Years

Data for the debt free situation is listed in table 6.21. As shown in the table total expenditure exceeds gross income in the first three years of development. This results in a cumulative deficit of $2,671 at the end of year three. From this point on the post tax cash surpluses that occur are insufficient to enable overdraft repayment by the end of the physical development period.

Table 6.20 Programme Two - Production Data

Item		Base Year	Year One	Year Two	Year Three	Year Four	Year Five	Post Development
Wool Production	(lbs)	22,279	22,085	24,681	26,356	27,897	29,039	29,836
Wool Sales	($)	5,163	5,029	5,619	5,995	6,373	6,614	6,788
Sheep Sales	($)	4,533	3,495	3,936	4,271	4,887	5,586	6,357
Cattle Sales	($)	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Gross Income	($)	12,196	11,024	12,055	12,766	13,760	14,700	15,645

Table 6.21 Programme Two - Financial Data For The Debt Free Situation

Development Year	Gross Income	Total Cash Expenditure (1)	Taxation	Post Tax Surplus	Cumulative Overdraft
	$	$	$	$	$
1	11,024	11,922	3	-898	898
2	12,055	12,945	45	-890	1,788
3	12,766	13,649	19	-883	2,671
4	13,760	12,813	469	947	1,724
5	14,700	12,316	1,148	2,384	+660

Note -

(1) Includes taxation, life insurance ($250) and personal drawings of $2,000 as well as farm working expenses and development expenses.

Taxation charges increase from $3 in year one to $1,148 in year five. This latter figure is greater than the corresponding figure ($828) in the pre-development situation.

The affect of farm equity on the capital requirements of the development programme are summarised in table 6.22. The data indicates that the amount of off farm capital required to finance development increases from $2,671 at E10 to $16,182 at E5. Once again the table shows that overdraft interest is an important development cost at low equity levels.

6.6.3 The Post Development Situation

After development has been completed gross income amounts to $15,645. As shown in table 6.23 this is an increase of $3,449 over the base year figure. Associated with this is an increase in the post tax cash surplus of $894 at E10 and $1,181 at E5. These sums are available for additional personal drawings.

Table 6.22 Programme Two - The Effect Of Farm Indebtedness On Overdraft Requirements During Development

Equity	Personal Drawings During (1) Development	Maximum Overdraft Incurred During Development	Year	Maximum Overdraft Interest(2)
	$	$		$
E10	2,000	2,671	3	160
E8	2,000	7,559	4	453
E7	2,000	10,446	4	626
E6	2,000	14,124	5	848
E5	1,735	16,182	5	971

Notes -

(1) Does not include taxation or life insurance premiums. These items are allowed for separately.

(2) At a six per cent interest rate.

(3) Detailed financial data for the various equity levels is contained in appendix G.

Table 6.23 Programme Two - Post Development Summary

Equity	Increase In Gross Income From Base Year	Increase In Taxation From Base Year	Increase In Post Tax Cash Surplus From Base Year
	$	$	$
E10	3,449	1,075	894
E8	3,449	995	974
E7	3,449	940	1,029
E6	3,449	871	1,098
E5	3,449	789	1,181

Note -

Detailed post development data for the various equity situations is contained in appendix G.

6.6.4 The Profitability Of The Development Programme

The results of the analysis of profitability under condition A[44] are shown in table 6.24. The data in the table indicates that the programme is unprofitable under this assumption. Maximum overdrafts range from $13,226 (E10) to $16,210 (E5) and these are not repaid within 19 years. Hence no present value is determined. If some of the post tax cash surplus is invested in development the programme becomes feasible at equities of E7 or greater and for interest rates up to 7.0 per cent. This change occurs because less capital has to be borrowed. Hence debt charges are less and payback is achieved faster. These aspects are illustrated by data contained in table 6.25.

The table also indicates that for E5 where development is financed entirely by borrowing the development programme is unprofitable. Furthermore the programme is infeasible at E6. Consequently for the representative farmer the development programme is financially infeasible.

6.6.5 The Effect Of the Fertiliser Subsidy

Fertiliser is an important input in the development programme accounting for 75 per cent of the total capital expenditure. The fertiliser subsidy will therefore increase the profitability of the programme by reducing total expenditure and hence the overdraft required to finance the programme. Despite this the analysis indicates that the

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(44) That is when the level of personal drawings throughout development equals the base year post tax cash surplus.

Table 6.24 Programme Two - Profitability Under Condition A

Equity	Base Year Post Tax Surplus (1)	Present Value (6.0% interest)	Maximum Overdraft	Payback
	$		$	
E10	4,569	-	13,226	*
E8	3,467	-	14,582	*
E7	2,917	-	15,133	*
E6	2,277	-	15,673	*
E5	1,735	-	16,210	*

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) * Indicates payback is not achieved within nineteen years.

development programme is financially infeasible for the representative farmer.(45)

6.6.6 Summary

The main points to emerge from the analysis of this programme are:-

(i) carrying capacity increases by 830 E.E. or 31 per cent.

(ii) development expenditure amounts to $19,255 or an increase of $23 per E.E.

(iii) gross income rises by $3,449 or 28.2 per cent.

(iv) the programme is unprofitable if all development capital is borrowed.

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(45) Data showing the effect of the fertiliser subsidy on annual overdraft requirements and profitability is contained in appendix G.

Table 6.25 Programme Two - Profitability Under Condition B

Equity	Base Year Post Tax Cash Surplus (1)	Present Value $			Maximum Overdraft $			Payback (Year)			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E8	Reduced from $3,467 to										
	(i) $2,467	15,883	13,339	11,275	9,590	9,670	9,715	11	11	11	974
	(ii) $2,000	24,175	21,136	18,542	7,559	7,635	7,702	8	8	8	974
E7	Reduced from $2,917 to										
	$2,000	14,512	12,045	9,929	10,446	10.548	10,641	11	11	11	1,029
E6	Reduced from $2,277 to										
	$2,000				14,124			*			
E5	$1,735				16,210			*			

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

(3) * Denotes payback not achieved within nineteen years.

(v) the programme is feasible at equities above E7 if surplus farm income is invested in development.

(vi) as a result of development the post tax cash surplus increases by:-

$974 at E8
$1,029 at E7
$1,098 at E6.

(vii) the development programme is financially infeasible for the representative farm owner.

6.7 Development Programme Three

This development plan involves three phases. These are:-

(i) the complete utilisation of the existing pasture.

(ii) intensification of production on 400 acres of the most fertile land.

(iii) clearing of 100 acres of manuka.

The first two stages are concerned with rapidly increasing gross income. This is achieved by adding two inputs viz. subdivision and fertiliser. The extra subdivision is justified because it enables the carrying capacity to be increased by 100 E.E. This results in an immediate increase in gross income.

Production is intensified on 400 acres only. This restriction is because many farmers believe that rapid increases in stocking rate are impossible on some areas of their farms. These areas include land above 1,000 feet and areas on which the vegetation has been frequently burnt. On the Horowhenua hill country, land above 1,000 feet has a shorter growing season and a slower growth rate. Similarly land on which the vegetation has been frequently burnt tends to be of a much lower fertility. This reduces both the rate and the amount of pasture growth. Instead of slowly developing this land many farmers prefer to develop the cheapest nonproductive land. On this area total production increases would be greater that those that could be achieved on the worst productive land.

The development approach involves intensifying production on the best land and then developing some of the nonproductive land. The feasibility of this method of increasing production is analysed in this development programme.

Improved pasture and stock control is achieved in the first year of development by erecting 71 chains of fencing. This enables the stocking rate to be increased by 100 E.E. In the same year 200 acres is oversown with 4 lb of clover seed and 5 cwt of superphosphate. Prior to oversowing the pastures are grazed hard with heavy concentrations of stock. This enables the seed to reach the ground and reduces competition from the grasses. The area is oversown in the autumn and the stocking rate is increased by 0.5 E.E. per acre. In the following autumn another 5 cwt of superphosphate is applied and the stocking rate increased by 0.5 E.E. per acre.

The stock increases are accomplished by keeping some five year ewes for another year and by retaining surplus two tooth ewes. This reduces the incomes from sheep sales but enables the number of capital stock to be increased. Capital expenditure reaches a peak in the second year of development. Two hundred acres are oversown and 50 acres of manuka fenced off and cut with a flail chopper. A bulldozer is employed to clear the fence lines and to put in tracks. As a result of this development the total carrying capacity increases by 275 E.E.

The third year of development involves cutting and crushing the second 50 acre block of manuka. On the first block the stocking rate is increased to 2.5 ewe equivalents per acre.(46) An additional set of sheep yards is built adjacent to the newly developed blocks. This reduces the time involved in stock operations e.g. dagging, docking and drenching. As in the second year gross income is increased by the sale of extra lambs and wool.

The fourth and fifth years of development are consolidation years. The stocking rate on the two manuka blocks is increased to 3.5 E.E. per acre. Total expenditure in these years declines while gross incomes increases from the sale of extra breeding sheep, lambs and wool.

A summary of the development plan is given in table 6.26. A detailed stock reconciliation is found in table 6.27. Data in the table indicates that the carrying capacity increases by 885 E.E. This represents an average annual increase of six per cent. Most of the increase in carrying capacity occurs in the first three years. In the last two years the small stock increases are the result of pasture improvement on the manuka blocks.

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(46) This stocking rate refers to the number of stock wintered. At other times of the year the stocking rate may be much higher in order to control regrowth.

Table 6.26 Representative Farm F - Development Programme Three

Item	Development Year					
	Units	1	2	3	4	5
Fencing	chains	71	25	25	-	-
Oversowing	acres	200	200	-	-	-
Capital Fertiliser						
8 cwt per acre	acres	-	50	50	-	-
5 cwt per acre	acres	200	400	200	-	-
3 cwt per acre	acres	-	-	250	300	50
Cutting and crushing manuka	acres	-	50	-	-	-
Hand cutting manuka	acres	-	-	50	-	-
Plant and Building	items	-	motor bike	sheep yards		
Ewe equivalent Increase per year	E.E.	235	275	225	100	50

The development costs are outlined in table 6.28. The highest annual cost occurs in the second and third year of development. In these years clearing of the manuka is undertaken and fertiliser input reaches a peak. Fertiliser is the only development cost in the fourth and fifth years of development.

6.8 Financial Evaluation

The important data from the financial evaluation is summarised in a series of tables. Additional data can be found in appendix G.

6.8.1 Production Data

Production data for the five years of physical development is listed in table 6.29. The table shows that

Table 6.27 Programme Three - Stock Reconciliation

Stock Wintered	Base Year	Development Year					Post Development
		1	2	3	4	5	
Breeding Ewes	1,600	1,600	1,783	2,020	2,177	2,234	2,268
Ewe Hoggets	550	550	626	657	744	802	823
Sheep Ewe Equivalents	2,065	2,065	2,300	2,575	2,800	2,900	2,950
Breeding Cows	80	80	80	80	80	80	80
Cattle Ewe Equivalents	561	561	561	561	561	561	561
Total Ewe Equivalents	2,626	2,626	2,861	3,136	3,361	3,461	3,511
Annual Percentage Increase In Ewe Equivalents	-	N.A.	8.9	9.6	7.1	2.9	1.4

Note -

N.A. denotes non applicable.

Table 6.28 Programme Three - Development Costs

Item	Development Year				
	1	2	3	4	5
	$	$	$	$	$
Capital Fertiliser	1,700	3,980	3,432	1,440	224
Breeding Stock Purchases	-	696	276	-	-
Fencing	1,065	375	375	-	-
Oversowing	200	450	-	-	-
Cutting & Crushing Manuka	-	250	-	-	-
Hand cutting Manuka	-	-	1,000	-	-
Motorbike	-	500	-	-	-
Sheep yards	-	-	750	-	-
Total Annual Cost	2,965	6,251	5,833	1,440	224

Table 6.29 Programme Three - Production Data

Item	Base Year	Year One	Year Two	Year Three	Year Four	Year Five	Post Development
Wool Production (lbs)	22,279	22,058	25,335	27,654	2[illegible],237	29,964	30,030
Wool Sales ($)	5,163	5,023	5,770	6,282	6,638	6,802	6,815
Sheep Sales ($)	4,533	3,522	3,922	4,388	5,263	5,771	5,818
Cattle Sales ($)	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Gross Sales ($)	12,196	11,045	12,192	13,170	14,401	15,073	15,133

wool production increases by 7,751 lbs and wool sales by $1,652. Cattle sales remain static but sheep sales increase by $1,285 from the pre-development situation. In the first three years of development sheep sales are less than in the pre-development situation due to the retention of five year ewes for breeding stock. The reduction in the sheep sales is responsible for gross income in the first two years being less than the pre-development situation.

As a result of development gross income increases by $2,937 or 24 per cent.

6.8.2 The Physical Development Years

The financial data for the debt free situation is contained in table 6.30. Data in the table shows that total expenditure exceeds income in the first three years of development. In year one this is in part due to the reduction in revenue stock and in part due to expenditure on improved subdivision.

The retention of 50 per cent of the five year ewes and the purchase of 116 two tooth ewes is largely responsible for the cash deficit in year two. At the end of year two the total overdraft incurred as a result of development is $3,085. This is increased to $4,001 in year three as a result of expenditure exceeding income by $916.

The last two years of development involve a period of consolidation. Development is confined to small stock increases and capital fertiliser applications. As a result post tax cash surpluses occur in these years. These surpluses enable the cumulative overdraft to be repaid by the end of the

Table 6.30 Programme Three - Financial Data For The Debt Free Situation

Development Year	Gross Income	Total Cash Expenditure(1)	Taxation	Post Tax Cash Surplus	Cumulative Overdraft
	$	$	$	$	$
1	11,045	11,907	5	-862	862
2	12,192	14,415	-	-2,223	3,085
3	13,170	14,086	18	-916	4,001
4	14,401	12,862	667	1,539	2,462
5	15,073	12,150	1,497	2,923	+460

Note -

(1) Includes taxation, life insurance ($250) and personal drawings of $2,000 as well as farm working expenses and development expenses.

physical development period. A cash surplus of $460 is also generated.

Taxation becomes an important cost in the last two years of development. The amount of taxation paid in the final year ($1,497) exceeds that paid prior to development ($826).

Data in table 6.31 illustrates the affect of farm indebtedness on off farm capital requirements for this programme. The table reveals that the capital requirements of E5 are four times as great as those for E10. This results in interest being an important development cost at E5.

6.8.3 The Post Development Situation

Details of the post development situation are given in table 6.32. The table indicates that post tax cash increases resulting from development, range from $623 at E10 to $836 at E5. Increases in taxation are the greatest for E10 and the

Table 6.31 Programme Three - The Effect Of Farm Indebtedness On Overdraft Requirements During Development

Equity	Personal Drawings During Development	Maximum Overdraft Incurred During Development	Year	Maximum Overdraft Interest
	$	$		$
E10	2,000	4,001	3	240
E8	2,000	8,612	3	516
E7	2,000	11,310	4	678
E6	2,000	14,532	4	872
E5	1,735	17,719	5	1,063

Notes -

(1) Does not include taxation or life insurance premiums.

(2) At a six per cent interest rate.

(3) Detailed financial data for the various equity levels is contained in appendix G.

Table 6.32 Programme Three - Post Development Summary

Equity	Increase In Gross Income From Base Year	Increase In Taxation From Base Year	Increase In Post Tax Cash Surplus From Base Year
	$	$	$
E10	2,937	814	623
E8	2,937	754	673
E7	2,937	723	715
E6	2,937	669	760
E5	2,937	603	836

Note -

Detailed post development data for the various equity situations is contained in appendix G.

least for E5. For equities greater than E7 the increase in taxation is greater than the increase in the post tax cash surplus.

6.8.4 The Profitability Of The Development Programme

As was the case for the previous programmes this programme is unprofitable if it is financed entirely by borrowed money (condition A). This aspect is illustrated by data in table 6.33. However if surplus farm income is invested in the deve..pment programme (condition B) then the programme is feasible for equities equal to or greater than E7. Table 6.34 reveals that for E7 if $917 is invested annually in the development programme than payback is achieved at the end of 13 years. The present value of the programme varies from $10,006 (6% interest) to $6,063 (7% interest). The maximum overdraft incurred is approximately $11,500.

Table 6.33 Programme Three - Profitability Under Condition A

Equity	Base Year Post Tax (1) Cash Surplus	Present Values (6% interest)	Maximum Overdraft	Payback
	$		$	
E10	4,569	-	13,541	*
E8	3,467	-	14,846	*
E7	2,917	-	15,344	*
E6	2,277	-	15,784	*
E5	1,735	-	17,719	*

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) * Indicates payback not achieved within nineteen years.

Table 6.34 Programme Three - Profitability Under Condition B

Equity	Base Year Post Tax(1) Cash Surplus	Present Value $			Maximum Overdraft $			Payback (Year)			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E8	Reduced from $3,467 to										
	(i) $2,467	11,579	9,428	7,583	10,463	10,555	10,648	12	12	12	673
	(ii) $2,000	19,970	17,273	14,967	8,612	8,663	8,706	9	9	9	673
E7	Reduced from $2,917 to										
	$2,000	10,006	7,885	6,063	11,310	11,420	11,520	13	13	13	715
E6	Reduced from $2,277 to										
	$2,000				14,532			*			
E5	$1,735				17,719			*			

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

(3) * Denotes payback not achieved within nineteen years.

The analysis of profitability indicates that this development programme is financially infeasible for the representative farmer. In order to successfully undertake this development programme the owner would require an equity of 80 per cent.

6.8.5 The Effect Of The Fertiliser Subsidy

The fertiliser subsidy enables the development programme to become profitable at E6.[47] Despite this the programme still remains "unattractive" to the representative farm owner.

6.8.6 Summary

The main points that emerged from the evaluation of this development programme were:-

(i) carrying capacity increases by 885 E.E. or by 34 per cent.

(ii) development expenditure totals $16,937 or an increase of $19.1 per E.E.

(iii) gross income rises by $2,937 or 24 per cent.

(iv) the programme is unprofitable if financed entirely by off farm capital.

(v) if development is financed partly by surplus farm income then the programme is feasible for equities above E7.

(vi) as a result of development the post tax cash surplus increases by

$673 at E8
$715 at E7
$760 at E6

(47) Data showing the affects of the fertiliser subsidy on annual overdraft requirements and profitability is contained in appendix G.

(vii) the programme is "unattractive" to the owner of the representative farm.

6.9 Conclusion

The profitability of future development for representative farm F has been examined by analysing three development programmes. The analyses have indicated that for the representative farm future development is unlikely to be practicable. Large debt servicing charges and a low equity means that any development capital has to be borrowed. The analyses indicate that under the present level of resource productivity and economic climate this is infeasible.[48] A major increase in both resource productivity and product prices is required before future development could be contemplated.

In order to maintain his standard of living the representative farmer has been forced to supplement farm income with wage employment. This has led to a decline in farm productivity because of less efficient stock and pasture management. Recent attempts to borrow money for development have been unsuccessful. As a result the farm owner has decided to leave farming for wage employment. However at the present time difficulties in selling his property have forced him to continue farming.

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(48) Assuming that development finance can be borrowed at these low equity levels.

CHAPTER SEVEN

THE FEASIBILITY OF FUTURE DEVELOPMENT FOR REPRESENTATIVE FARM G AND REPRESENTATIVE FARM A

7.1 Representative Farm G

This farm exemplifies the small hill country farm with a large area of ploughable land. In the past emphasis has been on developing the ploughable land. As a result the hill country has been neglected and reversion to weeds has occurred.[1]

Properties of this type tend to have a high equity as the farm has generally been handed down from father to son. Consequently debt commitments are small. This aspect has enabled them to "survive" under economic conditions of falling prices and rising costs.

There is, however, a limit to the cost increases they can continue to absorb. Hence there is a need to increase production in order to maintain their standard of living. On many of these farms a significant increase in production is only possible by hill country development. This development can be partly financed by surplus farm income but the bulk of the required capital has to be borrowed.

7.2 Description Of The Farm

The total area of the farm is 650 acres. This comprises:-

200 acres of sown pasture,

250 acres of native pasture,

150 acres of tauhinu and gorse,

50 acres of waste land.

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(1) Random survey farm numbers 6, 12 and 16 are examples of this type of property.

The topography varies from rolling to hilly. Two hundred and sixty acres of land are ploughable and the farm is divided by a major gorge and several gullies.

The average rainfall of 45 to 50 inches per year is unevenly distributed. A dry period usually occurs from January to March but droughts are uncommon. Although snow falls are rare, frosts and cold southerly winds create unpleasant conditions in the winter. The prevailing wind is westerly.

The rolling country is well subdivided. On the hill block subdivision is inadequate and prevents any organised grazing pattern. At the present time the natural water supply just copes with the requirements of the stock.

The sheep policy has consisted of breeding ewes with the sale of fat lambs. This policy is now being altered to one of selling store lambs because of difficulties experienced in fattening lambs. These difficulties have largely occurred as a result of inadequate feed supplies.

The cattle policy has varied. For the development of the hill country area the owner considers that breeding cows are required. However, once development has been completed the cattle policy will be revised.

In recent years the grazing policy has changed from set stocking, to mobstocking from weaning through to lambing. Because of inadequate subdivision mobstocking has not significantly increased pasture production. As a result supplementary winter feed is required for the breeding ewes. This is provided for by way of a winter crop and hay.

Prior to the decline in wool prices the breeding ewes were shorn three times every two years. Since then this practice has changed to once a year shearing.

The permanent labour force consists solely of the owner. Some casual labour is provided by the farmer's sons. Additional casual labour is obtained for shearing and docking.

The farm is at present carrying the following stock numbers:-

1,300 breeding ewes,
500 ewe hoggets,
26 rams,
14 breeding cows,
1 bull.

This is a total of 1,780 ewe equivalents (E.E.)s or 2.9 E.E. per potentially productive acre.

7.3 The Development Programme

Initially the plan involves improving pastures and increasing stock numbers on the ploughable land. This is followed by development of the hill country block. The initial development increases both the total stock numbers and the gross income. These two factors combine to provide the basis for developing the tauhinu and gorse on the hill country.

Pasture improvement on the ploughable land is achieved in two ways viz. by increased fertiliser application in association with increased stock numbers and by cropping and pasture renewal. In the first year of development six hundred weight (cwt) of superphosphate is applied to 225 acres of ploughable land. The remaining 35 acres is cropped over a period of three years. In each year a winter crop of choumolier is grown. This is utilised by the breeding ewes and the breeding cows, after which the land is resown to pasture.(2)

The heavy application of fertiliser in the first year of development enables stock numbers to be increased by 200 breeding ewes and six breeding cows. In the second and third years of development the number of breeding cows is increased to 40. The slow increase spreads the cost of cattle purchases over a number of years. It is necessary to purchase cattle in order to increase the breeding herd to 40 within three years.(3)

On the ploughable land there is an increase of 100 breeding ewes in the second year of development. In the same year development work begins on the hill country block. This work initially involves the erection of a boundary fence around the native bush. Although not directly productive this fence prevents the loss of stock in the bush and enables more effective pasture control.

Clearing of the tauhinu and gorse begins in year three. The area is divided into two 75 acre paddocks. One of these blocks is then mobstocked with cattle which eat the rough growth and crush some of the tauhinu. The uncrushed tauhinu

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(2) This is a more costly method of pasture renovation than oversowing with clovers. However, it enables a quicker establishment of a quality pasture. For this reason it was used in this development plan.

(3) This number of breeding cows is considered by the owner to be the number required for effective development of the tauhinu block.

is then left to rot[4] and the gorse is sprayed by hand. In the autumn the area is oversown with 4 lbs of white clover seed and 6 cwt of molybdic superphosphate per acre. This heavy application of fertiliser ensures good establishment of the clovers. The area is then stocked with 1.5 E.E. per acre over the winter. In the second and third years of development the stocking rate is increased to 2.5 E.E. per acre and 3.5 E.E. per acre respectively. These stocking rates ensure that the grass grown is completely utilised. In the succeeding two years 3 cwt of superphosphate is applied.

Clearing of the second 75 acre block of gorse and tauhinu begins in year four of development. Development of the 150 acres in two blocks enables the area to be effectively prepared for oversowing and pastures controlled after oversowing. Associated with the development of the tauhinu block is provision for an improved water supply. Subdivision of the block means that water has to be provided for each paddock. This is accomplished by pumping from a creek to a storage tank. From here the water is gravity fed to troughs. The major cost associated with this system is the cost of the alkathene piping.

The back block of 150 acres is subdivided in year five of development. This enables improved pasture control and results in an increase of 90 E.E. In the final year of development fertiliser application and stock numbers are

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(4) The tauhinu is not burnt because reinfestation of tauhinu is a problem on this property. Most of the tauhinu decays within two years.

increased on the tauhinu blocks. By the end of year six breeding ewes total 2,064. Breeding cows remain constant at 40 from the end of year three.

The development programme is outlined in table 7.1 while a detailed stock reconciliation is given in table 7.2.

Table 7.2 reveals that the rate of increase in stock numbers declines from year one to year four but increases from year four to year six. The initial increase is the result of heavy fertiliser application in the first year. The later rise in stock numbers is due to new land being brought into production. Total ewe equivalents increase by 1,070 which represents an average annual increase of 8.2 per cent.

Development costs are listed in table 7.3. This data shows that the greatest annual cost occurs in year three when land clearing commences and the water supply is extended.

7.4 Financial Evaluation

The development programme was evaluated in a similar manner to the development programmes for representative farm F. The results of the evaluation are summarised in the following subsections. Additional evaluation data is contained in appendix H.

7.4.1 Base Year Data

Data for the base year is listed in table 7.4. The data in the table reflects the small size of the farm and the small amount of debt (in money terms) at low levels of equity.

Prior to development gross income amounts to $8,095 while total cash expenditure varies from $5,244 (E10) to $6,271 (E6). The small post tax cash surpluses mean that for E7 and E6

Table 7.1 Representative Farm G - The Development Programme

Item	Units	Development Year					
		1	2	3	4	5	6
Fencing	chains	-	60	70	35	35	-
Capital Fertiliser	tons	36	-	22	22	-	-
Increased Maintenance Fertiliser	tons	-	-	-	11	22	22
Gorse Spraying		-	-	x	x	-	-
Cutting and Crushing Tauhinu	acres	-	-	75	75	-	-
Oversowing	acres	-	-	75	75	-	-
Cropping	acres	12	10	13	-	-	-
New Grass	acres	-	12	10	13	-	-
Water Supply		-	-	x	-	-	-
Ewe Equivalent Increase Per Year	E.E.	205	184	102	194	240	145

Table 7.2 Representative Farm G - Stock Reconciliation

Stock Wintered	Base Year	Development Year						Post Development
		1	2	3	4	5	6	
Breeding Ewes	1,300	1,300	1,500	1,600	1,625	1,775	1,972	2,064
Ewe Hoggets	500	500	479	552	589	598	654	726
Sheep Ewe Equivalents	1,705	1,705	1,880	2,014	2,066	2,260	2,500	2,645
Breeding Cows	14	14	20	30	40	40	40	40
Cattle Ewe Equivalents	75	75	105	155	205	205	205	205
Total Ewe Equivalents	1,780	1,780	1,985	2,169	2,271	2,465	2,705	2,850
Annual Percentage Increase In Ewe Equivalents	-	N.A.	11.6	9.2	4.8	8.7	9.8	5.3

Note -

(1) N.A. denotes non applicable.

Table 7.3 Representative Farm G - Development Costs

Item	Development Costs					
	1	2	3	4	5	6
	$	$	$	$	$	$
Breeding Stock Purchases	684	900	900	-	462	-
Fencing	-	900	1,050	525	525	-
Capital Fertiliser	1,152	-	748	748	-	-
Increased Maintenance Fertiliser	-	-	-	353	706	706
Gorse Spraying	-	-	20	20	15	7
Cutting Tauhinu	-	-	300	300	-	-
Seeds	58	67	434	450	-	-
Water Supply	-	-	1,195	-	-	-
Increased Supplementary Feed	-	150	300	300	300	300
Total Annual Cost	1,894	2,017	4,947	2,696	2,008	1,013

Table 7.4 Representative Farm G - Base Year Data

Equity	Gross Income	Total Cash(1) Expenditure	Taxable Income	Taxation	Post Tax Cash Surplus	Total Debt
	$	$	$	$	$	$
E10	8,095	5,244	3,047	267	2,851	-
E9	8,095	5,472	2,849	225	2,623	3,600
E8	8,095	5,731	2,627	179	2,364	7,200
E7	8,095	6,001	2,397	130	2,094	10,800
E6	8,095	6,271	2,167	82	1,824	14,400

Note -

(1) Includes taxation, farm working expenses and life insurance. It does not include personal drawings. The post tax cash surplus is available for personal drawings and for development.

development has to be financed by borrowed money.[5] At the higher equity levels some income is available for development. In all cases the amount is less than $1,000.

7.4.2 Production Data

Production data for the six years of physical development is listed in table 7.5. The table indicates that as a result of development gross income increases from a pre-development level of $8,095 to a post development level of $13,354. This represents a rise of $5,259 or 65 per cent. The rise is made up of increases in wool sales (44%), sheep sales (38%) and cattle sales (18%).

7.4.3 The Physical Development Years

Annual financial details for the debt free situation are listed in table 7.6. The table shows that total expenditure exceeds gross income in the first five years of development. This results in a cumulative deficit of $10,751 at the end of year five which is reduced to $9,789 by a cash surplus in year six. Taxation is only a significant cost in the final year when $528 is paid.

The influence of farm indebtedness on the capital requirements of the development programme are illustrated in table 7.7. For all equity levels except E6, personal drawings of $2,000 are assumed throughout development.[6]

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(5) This statement assumes that $2,000 is required for personal drawings.

(6) For E6 personal drawings of $1,824 have been assumed. This assumption is logical in that personal drawings above this level would create an annual cash deficit which could not be repaid in the absence of development.

Table 7.5 Representative Farm G - Production Data

Item		Base Year	Year One	Year Two	Year Three	Year Four	Year Five	Year Six	Post Development
Wool Production	(lbs)	17,723	17,825	19,421	20,656	21,595	23,721	25,624	27,897
Wool Sales	($)	4,047	4,067	4,425	4,707	4,924	5,408	5,841	6,352
Sheep Sales	($)	3,389	2,699	3,170	3,899	3,566	3,848	4,400	5,411
Cattle Sales	($)	659	463	674	1,204	1,416	1,541	1,416	1,591
Gross Income	($)	8,095	7,229	8,269	9,810	9,906	10,797	11,657	13,354

Table 7.6 Representative Farm G - Financial Data For The Debt Free Situation

Development Year	Gross Income	Total Cash Expenditure	Taxation	Post Tax Cash Surplus	Cumulative Overdraft
	$	$	$	$	$
1	7,229	8,585	3	-1,356	1,356
2	8,269	10,300	0	-2,031	3,387
3	9,810	14,281	0	-4,471	7,858
4	9,906	12,250	0	-2,344	10,202
5	10,797	11,346	117	- 549	10,751
6	11,657	10,688	528	+ 969	9,782

Notes-

(1) Includes taxation, life insurance ($250), personal drawings ($2,000), farm working expenses and development expenses.

Table 7.7 Representative Farm G - The Effect Of Farm Indebtedness On Overdraft Requirements During Development

Equity	Personal Drawings(1) During Development	Maximum Overdraft Incurred During Development	Year	Maximum Overdraft Interest(2)
	$	$		$
E10	2,000	10,751	5	645
E9	2,000	12,219	5	733
E8	2,000	13,912	5	834
E7	2,000	15,683	5	941
E6	1,824	17,803	6	1,068

Notes -

(1) Does not include taxation or life insurance premiums. These items are allowed for separately.

(2) At a six per cent interest rate.

(3) Detailed financial data for the various equity levels is contained in appendix H.

The table indicates that another $7,000 of capital is required to finance the programme at E6 than is required at E10. This in turn results in the maximum interest charge being $423 higher at E6.

7.4.4 The Post Development Situation

Data for the post development situation is summarised in table 7.8. The data reveals a significant increase at all equity levels in both taxation and post tax cash surplus. Increases in the post tax cash surplus range from $1,084 (E10) to $1,145 (E6). Similar figures for taxation increases are $501 (E10) and $440 (E6).

7.4.5 The Profitability Of The Development Programme

Details of the profitability analysis(7) are listed in table 7.9 and 7.10. The data in table 7.9 indicates that the development programme is unprofitable if financed entirely by off farm capital, as payback is not achieved within 19 years. For the programme to be feasible income has to be diverted from consumption to farm investment. This aspect is illustrated by data in table 7.10. For E10 a maximum overdraft of $15,591 is incurred if all development money is borrowed. If $851 is diverted to development the maximum overdraft incurred is reduced to $10,751. This sum is repaid by the end of year 12 and the post tax cash surplus of $1,084 achieved.

By diverting surplus farm income(8) to development the

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(7) The programme was evaluated under the two conditions outlined in chapter six.

(8) That is the post tax cash surplus over and above the $2,000 required for personal drawings.

Table 7.8 Representative Farm G - Post Development Summary

Equity	Increase In Gross Income From Base Year	Increase In Taxation From Base Year	Increase In Post Tax Cash Surplus From Base Year
	$	$	$
E10	5,259	501	1,084
E9	5,259	485	1,100
E8	5,259	468	1,116
E7	5,259	455	1,130
E6	5,259	440	1,145

Note -

(1) Detailed post development data for the various equity situations is contained in appendix H.

Table 7.9 Representative Farm G - The Profitability Of Development Under Condition A

Equity	Base Year Post Tax(1) Cash Surplus	Present Value (6% interest rate)	Maximum Overdraft	Payback
	$	$	$	
E10	2,851	-	15,591	*
E9	2,623	-	15,795	*
E8	2,364	-	16,047	*
E7	2,094	-	16,314	*

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating profitability in terms of a present value.

(2) * Indicates payback is not achieved within 19 years.

Table 7.10 Representative Farm G - The Profitability Of Development Under Condition B

Equity	Base Year Post Tax(1) Cash Surplus	Present Value $			Maximum Overdraft $			Payback (Year)			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E10	Reduced from $2,851 to $2,000	13,503	11,090	9,028	10,751	10,860	10,969	12	12	13	1,084
E9	Reduced from $2,623 to $2,000	9,145	6,949	5,056	12,220	12,342	12,473	14	15	15	1,100
E8	Reduced from $2,364 to $2,000	3,846	-	-	13,912	14,060	14,206	18	*	*	1,116

Notes -

(1) Used as the level of personal drawings during development in calculating profitability.

(2) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

(3) * Indicates payback is not achieved within 19 years.

programme becomes feasible at E10 and E9. However the owner of the representative farm would not undertake this development programme because the maximum overdraft is too high and because payback does not occur until year 14.

7.4.6 The Effect Of The Fertiliser Subsidy

As a result of the subsidy the programme becomes feasible for all interest rates at E7 as well as at E8. The payback period is reduced by three years at E9 and four years at E8. However, payback is still not achieved within 10 years at E9. For this reason it is unlikely that the development programme would be implemented on this property.[9]

7.4.7 Summary

The analysis of the development programme shows that:-

(i) carrying capacity increases by 1,070 E.E. or 60 per cent.

(ii) development expenditure totals $13,225 or an increase of $13.2 per E.E.

(iii) gross income rises by $5,259 or 65 per cent.

(iv) the programme is unprofitable if financed entirely by off farm capital.

(v) if development is financed partly by surplus farm income the programme is feasible for equities above E8.

(vi) as a result of development the post tax cash surplus increases by $1,100 at E9

(9) For details of the effect of the subsidy on annual overdraft requirements and profitability the reader is referred to appendix H.

$1,116 at E8

$1,130 at E7

(vii) the development programme would not be implemented by the owner of the representative farm.

7.5 Representative Farm A[10]

On some Horowhenua hill country farms all the productive land has been cleared. As a result future significant production increases are only possible through intensification. Representative Farm A is typical of these farms.[11]

The total area of the representative farm is 870 acres. Of this area, 600 acres has been developed to a carrying capacity of 3.3 E.E. per acre. The remaining 270 acres is covered with native bush which is considered uneconomic to develop.

The physical features of the farm together with details of past development practices are outlined in chapter five. The farm is well subdivided and this enables an organised grazing pattern to be adopted. The sheep policy is one of breeding with the sale of both breeding and store stock. The role of cattle on the property has changed with the completion of land development. Cattle are now required for grazing ahead of the lambs rather than for "breaking in" land. Consequently the breeding cows are gradually being reduced and will eventually be replaced by dairy bulls.

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(10) This farm was also included in purposive survey.

(11) Random survey farms numbers 8, 13 and 15 are other examples of this class of farm.

Labour productivity is high. All farm work is undertaken by the owner himself. To achieve this use is made of labour saving devices. These include minimum shepherding at lambing, good access tracks, extra yards and the sale of store stock. Both the farmer and his wife are hard working people. In the past they have been prepared to sacrifice personal expenditure in order to develop the property.

At the present time (1969/70) the following stock numbers are being carried:-

1,500 breeding ewes
460 ewe hoggets
15 breeding cows
1 bull.

This represents a carrying capacity of 3.3 E.E. per acre.

7.6 The Development Programme

The basic aim of the programme is to intensify production. To achieve this expenditure is concentrated mainly on directly productive items e.g. fertiliser and stock. Expenditure on "non-productive" items is restricted to additional sheep yards and to the renewal of fences.

The number of breeding ewes is increased by 200 in the first year of development. In the second, third and fourth years, ewe numbers increase by 100 per year. This gives a total increase of 500 ewes in four years or an average annual increase of eight per cent. In the same period ewe hoggets increase by 277.

Associated with the increase in sheep numbers is a change in the cattle policy. Breeding cows are phased out at the end of year two and replaced by Friesian weaner bulls. Two factors are responsible for this viz. the changed role of cattle and the competition between breeding cows and breeding ewes for late winter and early spring feed.

The additional feed supplies required for the increased stock numbers is provided for by the application of more fertiliser. There is an increase of ten tons of fertiliser in the first year and five tons in the second and subsequent years. These increases are considered to be sufficient to grow the additional grass required for the extra stock.

Two sets of sheep yards are erected in the first two years of development. These extra yards enable the labour force to cope with the higher stock numbers by reducing the time involved in stock operations e.g. dagging, docking and drenching.

The replacement of internal fencing is necessary for improved stock control. In the initial stages of development cheap fencing was erected. This enabled more fencing to be erected for the same cost and consequently led to quicker pasture improvement. However this fencing is no longer stockproof and has to be replaced.

The post development situation reveals a total carrying capacity of 2,579 E.E. This represents a stocking rate of approximately 4.3 E.E. per acre which is an increase of 1.0 E.E. per acre. The owner considers that this stocking rate is close to the potential carrying capacity of the farm.(12)

The development programme is virtually a series of annual

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(12) Given the present level of technology.

plans. Such a programme incorporates a large degree of flexibility as the annual plans can be readily modified according to the prevailing economic conditions. A summary of the development programme is given in table 7.11 and a detailed stock reconciliation in table 7.12. Annual development costs are outlined in table 7.13.

A study of table 7.13 reveals that the annual development expenditure decreases from year one to year four. Breeding stock are purchased in the first two years only. In these years the number of ewe hoggets retained is sufficient to meet the target number of breeding ewes. The total development cost is only $3,936.

Table 7.11 Representative Farm A - The Development Programme

Item	Units	Development Year			
		1	2	3	4
Fencing	Chains				
Capital Fertiliser	Tons	10	5	5	5
Stock yards	Item	sheep yards	sheep yards	-	-
Ewe Equivalent Increase Per Year	E.E.	232	122	137	141

7.7 Financial Evaluation

7.7.1 Base Year Data

The important data for the base year situation is given in table 7.14.

Prior to development gross income totals $9,713 while cash expenditure[13] varies from $6,393 (E10) to $8,481 (E6). As a result the amount of post tax income available for personal

Table 7.12 Representative Farm A - Stock Reconciliation

Stock Wintered	Base Year	Development Year				Post Development
		1	2	3	4	
Breeding Ewes	1,500	1,500	1,700	1,800	1,900	2,000
Ewe Hoggets	460	460	534	605	641	677
Sheep Ewe Equivalents	1,872	1,872	2,129	2,283	2,402	2,543
Breeding Cows	15	15	10	-	-	-
Six Month Friesian Bulls	-	-	-	6	6	6
One Year Friesian Bulls	-	-	-	-	6	6
Cattle Ewe Equivalents	75	75	50	18	36	36
Total Ewe Equivalents	1,947	1,947	2,179	2,301	2,438	2,579
Annual Percentage Increase In Ewe Equivalents	-	N.A	11.9	5.5	5.9	5.7

Note -
(1) N.A. denotes non applicable.

Table 7.13 Representative Farm A - Development Costs

Item	Development Year			
	1	2	3	4
	$	$	$	$
Breeding Stock (Purchases)	948	288	-	-
Fencing *	500	500	600	-
Capital Fertiliser	320	160	160	160
Sheep yards *	150	150	-	-
Total Annual Cost	1,918	1,098	760	160

Note -
(1) * Refers to the cost of materials only. Fencing and sheep yards are to be erected by the owner himself.

Table 7.14 Representative Farm A - Base Year Data

Equity	Gross Income	Total Cash Expenditure(1)	Taxation	Post Tax Cash Surplus	Total Mortgage
	$	$	$	$	$
E10	9,713	6,393	470	3,320	-
E 8	9,713	7,292	259	2,421	14,800
E7	9,713	7,751	177	1,962	20,000
E6	9,713	8,481	49	1,232	29,600

Note -

(1) Does not include personal drawings. The post tax cash surplus is the sum which is available for personal drawings and/or development.

drawings declines from $3,320 at E10 to $1,232 at E6. If $2,000 is required for personal drawings then the representative farm is uneconomic at equities below E7.

The owner has an equity equal to E7. If rising costs continue then he must increase his production in order to maintain his standard of living.

7.7.2 Production Data

Production data for the four years of physical development is listed in table 7.15. A study of the data indicates that gross income increases from a pre-development level of $9,713 to a post development level of $12,887. This represents an increase of $3,174 or 32 per cent.

The increase in income is largely due to increased wool and sheep sales. Wool production increases by 6,083 lb and

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(13) Does not include personal drawings. The post tax cash surplus is available for personal drawings and development.

Table 7.15 Representative Farm A - Production Data

Item	Base Year	Year One	Year Two	Year Three	Year Four	Post Development
Wool Production (lbs)	19,350	19,960	22,067	23,367	24,538	25,433
Wool Sales ($)	4,454	4,551	4,887	5,327	5,596	5,798
Sheep Sales ($)	4,730	4,267	5,035	5,198	5,567	6,341
Cattle Sales ($)	529	1,020	823	408	408	748
Gross Income ($)	9,713	9,838	10,745	10,933	11,571	12,887

wool sales by $1,344. The increase in breeding ewes results in additional C.F.A. ewes and store lambs being sold. This in turn causes sheep sales to rise by $1,611.

Cattle sales account for only $219 of the $3,174 increase in gross income. In the second and third years of development cattle sales reach their peak with the disposal of the breeding herd. The decline in the relative importance of cattle sales increases the vulnerability of the enterprise to falling sheep prices. The limit on cattle numbers means that reduced sheep sales cannot be offset by increased cattle sales.

7.7.3 The Physical Development Years

Financial data for the four years of physical development for E10 is outlined in table 7.16. For the debt free situation total expenditure exceeds gross income in the first year of development only. This initial overdraft is repaid by the end of year two. By the end of year four the additional cash surplus incurred as a result of development has increased to $2,642. Associated with the annual increase in the cash surplus is increased taxation. As a result of development taxation increases from $444 in year one to $860 in year four.

Table 7.16 Representative Farm A - Financial Data For The Debt Free Situation

Development Year	Gross Income	Total Cash(1) Expenditure	Taxation	Post Tax Cash Surplus	Cumulative Credit
	$	$	$	$	$
1	9,838	9,870	444	- 32	- 32
2	10,745	10,220	525	564	532
3	10,933	10,087	610	846	1,379
4	11,571	10,309	860	1,262	2,642

Note -

(1) Includes taxation, life insurance ($250), personal drawings ($2,000), farm working expenses and development expenses.

For the non debt free situations development cannot be financed entirely by surplus income. Data contained in table 7.17 emphasises this point. Capital has to be borrowed and as the equity decreases the amount required increases. For E8 the maximum overdraft reaches a peak in year three of development while for E7 and E6 the capital requirements reach a peak in the final year of development.

The capital requirements of the development programme are small in relation to those incurred by development programmes analysed for other representative farms. Consequently overdraft interest is not such an important development cost.

7.7.4 The Post Development Situation

The important data for the post development situation is shown in the last two columns of table 7.18. These columns indicate the extent of the increases in post tax cash surplus and taxation. The columns show that the post tax cash surplus

Table 7.17 Representative Farm A - The Effect Of Farm Indebtedness On Overdraft Requirements During Development

Equity	Personal Drawings During (1) Development	Maximum Overdraft Incurred During Development	Year	Maximum Overdraft Interest(2)
	$	$		$
E10	2,000	32	1	2
E8	2,000	1,384	3	83
E7	1,962	2,953	4	177
E6	1,232	2,780	4	167

Notes -

(1) Does not include taxation or life insurance premiums. These items are allowed for separately.

(2) At a six per cent interest rate.

(3) Detailed financial data for the various equity levels is contained in appendix I.

Table 7.18 Representative Farm A - Post Development Summary

Equity	Increase In Gross Income From The Base Year	Increase In Taxation From The Base Year	Increase In Post Tax Cash Surplus From The Base Year
	$	$	$
E10	3,174	652	905
E8	3,174	579	978
E7	3,174	545	1,012
E6	3,174	490	1,068

Note -

(1) Detailed post development data for the various equity situations is contained in appendix I.

increases vary from $905 at E10 to $1,068 at E6. Similarly taxation rises by $652 at E10 and $490 at E6.

For E6 the increase in the post tax cash surplus is of particular importance. If the representative farmer had a 60 per cent equity and undertook this development programme he would almost double his personal drawings i.e. personal drawings would rise from $1,232 to $2,300.(14) As is seen in the following section the development programme is both profitable and "attractive" at a 60 per cent equity. Hence development at this level of equity is feasible.

7.7.5 The Profitability Of The Development Programme

Data in table 7.19 indicates that the development programme is profitable at all equity levels analysed. For the unrealistic debt free situation the base year surplus does not have to be reduced to make the programme financially feasible. In other words a farmer could continue to have personal drawings of $3,320 and profitability borrow all the capital required for development. The maximum overdraft incurred is less than $3,000 and this money is repaid by the end of year eight.

The effect of reducing the base year surplus on the profitability of the programme is illustrated by data for E8. If all development capital has to be borrowed a maximum overdraft of approximately $2,800 is incurred. This is repaid by the end of year eight. Depending on the interest rate used the present value figures range from approximately $8,000 to

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(14) This statement implies that it is possible to live on $1,232 per year.

Table 7.19 Representative Farm A - Profitability Of The Development Programme

Equity	Base Year Post Tax(1) Cash Surplus $	Present Value $			Payback (year)			Maximum Overdraft $			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E10	3,320	9,188	8,055	7,087	8	8	8	2,883	2,904	2,926	905
E8	2,421(2)	10,204	8,977	7,927	8	8	8	2,822	2,845	2,869	978
	2,000(3)	17,462	15,712	14,240	5	5	5	1,384	1,392	1,395	
E7	1,962	10,687	9,416	8,330	7	8	8	2,792	2,817	2,842	1,012
E6	1,232	11,420	10,080	8,935	7	7	7	2,791	2,816	2,842	1,068

Notes -

(1) Used as the level of personal drawings during development for the purpose of calculating a present value.

(2) Condition A i.e. the personal drawings during development is equal to the pre-development post tax cash surplus. Hence the development programme is financed by borrowed money.

(3) Condition B i.e. personal drawings during development are less than the base year post tax cash surplus. This enables development to be financed partly by surplus farm income.

(4) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

$10,000.

By reducing personal drawings to $2,000 and diverting $421 per year to development the overdraft incurred is halved. This overdraft is repaid by the end of year five and the present value figures range from $14,000 to $17,000.

The significant point about this development programme is illustrated by the data for E6. The data shows that at this level of equity the programme can be financed entirely by borrowed capital. The end result is to increase the post tax cash surplus from a subsistence level of $1,232 to a more realistic level of $2,300. Capital borrowed to finance the programme is repaid by the end of year seven.

7.7.6 The Effect Of The Fertiliser Subsidy[15]

The fertiliser subsidy increases the "attractiveness" of the development programme to the representative farm owner. The payback period is reduced by one year, the present value increased by approximately $5,000 and the maximum overdraft reduced.

The owner intends to proceed with this development programme. It is likely that even if costs continue to rise this programme will still remain profitable.

7.7.7 Summary

The main points arising from the evaluation of the development programme are:

(i) carrying capacity increases by 632 E.E. or 31 per cent.

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(15) Data showing the effect of the fertiliser subsidy on annual overdraft requirements and profitability is contained in appendix I.

(ii) development expenditure totals $3,936 or an increase of $6.2 per E.E.

(iii) gross income rises by $3,174 or 32 per cent.

(iv) the programme can be financed entirely by off farm capital for equities as low as E6.

(v) the fertiliser subsidy increases the "attractiveness" of the development programme.

(vi) as a result of development the post tax cash surplus increases by $905 at E10

$978 at E8

$1,012 at E7

$1,068 at E6.

(vii) the development programme is profitable to the nation and to the farmer.

(viii) the development programme will be implemented by the farmer.

7.8 Conclusion

This chapter has analysed development programmes for two representative farms. The study has shown that on small Horowhenua hill country farms, where there are only limited opportunities for increased production, future development is unlikely to be profitable. This is because these farms have too few resources which are insufficiently productive in terms of likely future costs and prices.

For representative farm A future intensification of production is likely to be profitable. This profitability results from low operating costs, high labour productivity and the emphasis on directly productive inputs e.g. fertiliser and stock. It is likely that development of this kind will continue to be implemented on farms of this type.

CHAPTER EIGHT

THE POTENTIAL FOR AND FEASIBILITY OF INCREASED PRODUCTION IN THE HOROWHENUA AREA

8.1 Introduction

The profitability of future hill country development has been analysed in the last two chapters. This chapter examines feasible stocking rates for the Horowhenua hill country and the likely potential for production increases. The major inputs required to achieve these increases are then discussed. The results from the previous two chapters are used in examining the feasibility of increasing production. The chapter concludes with a discussion on the likelihood of significant production increases occurring in the near future and the alternatives to hill country farm development.

8.2 Potential Stocking Rates on Horowhenua Hill Country

Data from the random survey indicates that the average carrying capacity on survey farms is 3.3 E.E. per productive acre. Furthermore, the maximum stocking rate does not exceed 4.5 E.E. per productive acre. In relation to stocking rates being achieved on other areas of North Island hill country this represents a low level of production.

Recently high stocking rates have been obtained on areas of hill country throughout the North Island. For example Inglis (25) achieved a carrying capacity of 7.5 E.E. per acre on "easy" Ruahine hill country in 1965. On the harder Wanganui hill country Tripe (37) has reached a stocking rate of 5.0 E.E. per productive acre. At the demonstration farms of Tangoio and Waerenga-o-Kuri[(1)] stocking rates of 6.0 E.E. per acre and 7.5 E.E. per acre respectively have been obtained.

Finally, on a farm scale, a carrying capacity of five ewes per acre has been achieved at the Te Awa hill country research station.

The above evidence suggests that high stocking rates are obtainable on many North Island hill country farms. With respect to the Horowhenua hill country, many survey farmers consider that significant production increases are possible. Despite this, it cannot be firmly stated that high stocking rates are either generally possible or readily obtainable on this area of hill country. Two important factors hinder the attainment of high stocking rates viz. an unfavourable environment and a lack of knowledge.

The physical environment of the Horowhenua hill country is not conducive to high stocking rates. The hill soils are of low natural fertility and the pasture growing season is neither long nor continuous. During the winter growth ceases for three to four months while in the summer droughts influence the stock numbers it is possible to carry. The prevalence of low producting native grasses means that the feed value of autumn saved pasture is seriously affected by frosts. This in turn affects the number of stock it is possible to winter.

The problem of low producing pastures is accentuated on some properties by the topography. Siting of fences is difficult so that subdivision is generally inadequate for good pasture management. Grazing pressure is not sufficient to

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(1) For a description of these farms and a report on stocking rate trials the reader is referred to reference (38).

either improve the pastures or prevent reversion.

Compounding the effect of these physical factors are poor management techniques. These include inadequate pasture utilisation, which on many farms leads to reduced pasture production and reversion. On these farms fertiliser applications are wasted because increased pasture growth is not utilised. In general the results of the Te Awa hill country research station are not being applied to the hill country farms.(2) These factors make it difficult to accurately forecast potential stocking rates for the Horowhenua hill country. While the restricting climatic factors cannot be altered, it could be possible to alter management techniques by an intensive advisory service.

Despite the difficulties involved a number of estimates have been made of feasible stocking rates for the area. Field officers of the Land and Survey department state that a stocking rate of 10 E.E. per acre is possible. This stocking rate is not, however, considered by the writer to be a feasible level of production.(3)

During (3) has stated that the potential of the hill country sheep farms is between four and six ewe equivalents in

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(2) There are exceptions to this general statement e.g. case farm A.

(3) Mitchell (Grasslands) has stated that a ryegrass pasture producing 18,000-20,000 lbs of dry matter per acre has a potential of 10 E.E. if two-thirds of the pasture is utilised by the animals. The highest pasture production recorded on lowland farms in the Horowhenua district is 12,000 lb of dry matter per acre. It is highly improbable that this level of production is being or could be achieved on the hill country. Hence to support 10 E.E. per acre at least 6,000 lbs of dry matter per acre has to be purchased. This would be unprofitable.

the high rainfall areas.(4) In the low rainfall areas exposed to coastal winds the potential stocking rate is likely to be less.

Estimates of potential stocking rates made by survey farmers varied according to locality. In the higher rainfall areas e.g. Shannon and the Otaki Gorge, estimates were as high as 6 E.E. per acre. On the drier more exposed coastal areas of Paekakariki, Waikanae and Te Horo the highest estimate was 5 E.E. per acre.

From his own observations the author considers that a carrying capacity of 4.5 E.E. per acre is possible on all Horowhenua hill country under the present level of technology. In the higher rainfall areas stocking rates of 5.5 E.E. are feasible.

8.2.1 Potential Increases in Stock Numbers

The potential production increase on the Horowhenua hill country was determined in terms of ewe equivalents. In order to do this two assumptions were made. These were:-

(i) land use data from the random survey farms applies to all hill country farms.

(ii) stocking rates of 5.5 E.E. per acre are feasible on 30 per cent of the hill country area.

The total area of the hill country is approximately 70,000 acres. By applying land use data from Table 4.2 this area is seen to consist of:-

54,600 acres of productive land

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(4) This refers to hill country areas with an annual rainfall of greater than 50 inches.

7,700 acres of potentially productive land

7,700 acres of waste land.

The present carrying capacity of the productive land is 3.3 E.E. per acre. Hence the total number of ewe equivalents being farmed at present

$$= 54,600 \text{ acres} \times 3.3 \text{ E.E. per acre} = 180,180 \text{ E.E.}$$

By intensifying production on the existing productive land the potential production increase would be

$$54,600 \times \frac{70}{100} \times 1.2 \text{ E.E.}$$

plus

$$54,600 \times \frac{30}{100} \times 2.2 \text{ E.E.}$$

$$= 81,900 \text{ E.E.}$$

If the potentially productive land was cleared and developed the total increase would equal

$$81,900 + (7,700 \times \frac{70}{100} \times 4.5) + (7,700 \times \frac{30}{100} \times 5.5)$$

$$= 81,900 + 36,960$$

$$= 118,860.$$

Compared to the present carrying capacity of 180,180 E.E. this represents a potential increase of 65.9 per cent.

8.2.2 Inputs Required to Achieve Production Increases

Assuming that hill country farmers had an incentive to develop, then four major inputs would be required to achieve the potential production outlined in the previous section. These inputs are capital, improved labour productivity, improved managerial skill and an intensive advisory service. These inputs are briefly discussed in the following subsections:-

(i) Off farm capital

In the past increases in stock numbers, and therefore production, has largely been the result of reinvestment of farm income.[(5)] Today declining farm income means that the greater proportion of capital has to come from sources outside the farming sector.

The amount of capital required will vary with the type of development and the individual farm situation. However, it is probable that the amount required will be the greatest for low equity and small size farms and for development involving land clearing. This point can be illustrated by referring to the capital requirements of development programmes devised for representative farms.

An examination of these programmes indicates that for representative farm F[(6)] approximately $10,000 of additional capital is required for development. A similar amount is also required for representative farm G.[(7)] For the adequate "income farm" where development is restricted to intensification $3,000 of capital input is required.

At the present time it is unlikely that farmers would be prepared to borrow large sums of money.[(8)] Nor is it likely that the amount of development capital required by some farmers would be forthcoming from lending institutions.[(9)]

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(5) Ross (39) has stated that "examination of changes in farm income and output over the last 45 years shows that investment and output have been closely associated and that investment is largely affected by the level of farmers' incomes."

(6) A low equity undeveloped hill country unit.

(7) An example of a small Horowhenua hill country property.

(8) See section 8.4

Hence additional credit facilities may be required before any worthwhile development could or would be undertaken.

(ii) Improved labour productivity

At the present time there is one labour unit per 1,173 E.E. On this basis another 101 permanent labour units will be required to handle the potential increase of 118,860 E.E. Such an increase would be unlikely to occur. Restricting factors are the lack of suitable labour and the inability and unwillingness of farmers to pay wages which would attract labour from the industrial areas.

Hence labour productivity will have to be improved. Consideration will have to be given to one or more of the following aspects:-[(10)]

(a) increasing the number of stock per labour unit and accepting a slightly lower stock performance.

(b) making more use of contract labour.

(c) making use of labour saving devices.

(d) better work organisation and working in with other farmers.

(e) change to a less labour intensive sheep e.g. Perendale.

(f) substituting capital for labour.

These changes have already been implemented on some farms

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(9) Factors which are likely to restrict the amount of development finance lent by lending institutions are low equities, low resource productivity and declining income. Campbell (40) has stated that the willingness and ability of bankers and other lenders to provide capital is substantially influenced by the amount and trend of the farm income.

(10) These aspects are discussed in some detail in (41).

as rising costs force hill country farmers to improve their efficiency.

(iii) Improved managerial skill

This is required for both production and financial control. As stock numbers rise management becomes of increasing importance. Feed supplies must be utilised to the best advantage so that they meet the stock requirements throughout the year.

Financial control of resources must also be improved. Farmers are generally not cost conscious until a time of financial stress. Today farm income is extremely sensitive to changes in prices and costs. If incomes are to be maintained then farmers must improve the way in which they manage their resources. Resources will have to be directed to where their marginal productivity is the greatest.(11)

In order to do this, managers will have to make more use of services which specialise in planning and budgeting. Success in increasing production will depend upon decisions being tested for their financial feasibility before they are implemented. Decisions implemented without testing are likely to be economically irrational, to lead to inefficiency and hence low income.

(iv) An intensive advisory service

Such an advisory service will be required to give advice on planning, budgeting and evaluation as well as day to day management advice. In order to allow farm managers to make

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(11) For the Horowhenua hill country this is likely to mean that on most farms resources will have to be directed to intensification rather than to land development.

judgements and decisions they must receive the best possible information. Thus there is a need to keep the farm manager abreast of new technology and ideas.

For this reason advisors trained and experienced in giving management and financial advice are required. These advisors in addition to working with the farmer would also be required to maintain close liaison with accountants and lending institutions. They may also be required to supervise the implementation of the actual development plan.(12)

Because of the intensive nature of this sort of advisory service there is a limit to the number of farmers one advisor could service. Hence it is possible that in order to provide this intensive service, the Department of Agriculture would require at least an additional two advisors in the area.(13)

8.3 The Feasibility of Increasing Production

The reaction of Horowhenua hill country farmers to a continuing cost price spiral will vary according to their individual situations. Influencing factors will be the level of debt, size of farm, personal income requirements and the level of fixed costs. For many farmers, increasing production may be the only way of maintaining a viable unit.

This study has analysed the feasibility of increasing production on three representative farms. The results of

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(12) It is conceivable that in the future because of the scarcity of capital, farmers will have to accept some form of financial control in order to ensure that profitable production increases occur. This would in effect be an extension of the Marginal Lands type of loan in which the recipient farmer is placed on a budget for a number of years.

(13) This statement implies that the Department of Agriculture is best equipped to provide such a service.

these analyses were outlined in chapters 6 and 7. The implications of the results are now examined.

In discussing the results of the analyses it must be remembered that:-

(i) the programmes analysed were those which would be implemented by the representative farmers.

(ii) no allowance was made for rising input costs.(14)

(iii) no allowance could be made for changes in technology or government policy.

(iv) analyses of ex ante programmes involve a large degree of uncertainty.

The analyses showed that variation in resource structure and in the method of financing development influences the feasibility of development. For individual farm situations numerous other factors will also be of importance. These factors include the degree of managerial skill, stock performance levels and the rate of development. Hence it is not possible to categorically state that a programme unprofitable for the representative farm will also be unprofitable for similar farms. This statement can only be made if the principles of the development plan are re-budgeted and re-evaluated for the individual farm situation. Consequently only broad statements can be made about the implications of the ex ante analyses.

8.3.1 Undeveloped Hill Country Units

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(14) Since the commencement of this study farm input costs have continued to rise. Between January 1969 and January 1970 costs rose by three per cent (36).

For most of these farms a major factor restricting development is the inability to generate surplus income for development. A large amount of finance has to be borrowed if development is to be undertaken. The analyses have shown that for the representative farm this is unprofitable.

The lack of "ploughback"(15) stems from borrowing done prior to the wool slump and cost price spiral. When viewed in the light of today's prices and costs, these farmers have simply overcommitted themselves. At the time of borrowing their policies may have been perfectly sound. The subsequent fall in prices and rise in costs has altered this and affected their future. This applies especially where the farmer has borrowed to the limit of his farm's capacity or to the limit of his willingness to borrow. Under these circumstances future development will have to consist of improved stock performance. This will be a slow process and is unlikely to be sufficient to keep pace with the present inflationary level. Therefore the outlook for the heavily indebted undeveloped Horowhenua hill country farmer is bleak.

For the undeveloped hill country farmer who has some "ploughback" the emphasis must be on intensification. Expenditure must be concentrated on the directly productive items of stock and fertiliser.

8.3.2 The Small Hill Country Property

Analysis of the development programme for the representative farm has indicated that the programme is unlikely to be

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(15) Ploughback can be defined as the amount of post tax income available for re-investment in the farm.

profitable. This programme did however, include expenditure on indirectly productive items e.g. water supply, as well as the purchase of breeding cows. It is possible that for similar farms if finance was concentrated on intensification profitable production increases could be obtained.

Despite this the basic problem remains. That is that the small Horowhenua hill country farm has too few resources sufficiently productive in terms of todays prices and costs. These farms are unlikely to be able to continue to make an acceptable standard of living under the anticipated cost price regime. Changes in farm structure must take place. These changes may involve amalgamation and consequently a reduction in the number of small farmers.

8.3.3 "Adequate Income" Farms (16)

These farms are at present returning an adequate income to the people engaged in farming them. The feasibility of future development on these farms was analysed using representative farm F as an example. The analysis revealed that under the assumptions made future intensification would be both profitable and worthwhile. More importantly, it indicated that even at low equities borrowing for development is still feasible.

However the continuation of rising costs and low product prices could alter this situation. The amount available for ploughback will decrease and the desire to borrow will

(16) These farms include large income earning farms e.g. random survey farms 13, 14 and 15 and large family units e.g. random survey farms 5 and 19.

diminish.[17] These factors will in turn affect the total production increase achieved.

8.4 The Likelihood of Potential Production Increases Being Achieved

The previous subsection has indicated that for some farmers profitable production increases are still possible. Despite this, the author believes that significant production increases are unlikely to occur because of a general lack of confidence in the future of hill country farming.[18] This lack of confidence means that farmers are unlikely to borrow freely even though development capital may be available. Stewart (42) emphasised this point when he stated

> "....the availability of loan funds does not necessarily mean that they will be used. Even where imaginative lending policies based on potential production increases are in operation, confidence in the future is the necessary stimulus. This is especially so where the present equity ratios are being squeezed...."

Hence it is unlikely that increased incentives, such as the fertiliser subsidy or increased loan funds will lead to substantial production increases on this area of hill country.

The majority of hill country farmers will refrain from

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(17) The wider the gap between the required investment and the farmers ploughback the less propensity there will be to borrow. This applies especially in situations where there is a large degree of uncertainty about the future.

(18) This lack of confidence stems from several factors. These include static prices and rising costs and hence declining ploughback, the inability of the heavily committed farmer to borrow capital, low resource productivity, low wool prices and the dependence on wool for 50 per cent of the income and the uncertainty regarding the effect of Britain joining the E.E.C.

developing until their confidence in the future of hill country farming has been restored. This will probably require improved prices and the control of the cost price spiral and hence government action.

8.5 Alternatives To Development

If production increases are not feasible farmers must look at other methods of maintaining viable units. At the moment Horowhenua hill country farmers are reacting to the likelihood of continuing declining incomes in one of two ways viz. by working off their farms and by attempting to sell their farms.

Since the completion of the surveys, five farmers have accepted wage employment. Working off the farm enables living standards to be maintained but leads to declining productivity due to less efficient stock and pasture management. This is frequently accompanied by a fall in the capital value of the farm as pasture production declines and reversion increases. As a result this measure can only be regarded as a temporary adjustment and not as a long term solution.

For some farmers the most appropriate adjustment is to leave farming. This adjustment is suitable for farmers who have the skills and the capital required to obtain an acceptable income in other industries. The strongest pressure to leave farming is on the small size and heavily committed farmer.

Recently one hill country unit has been sold and eight other farms advertised for sale. At the moment, however, these farmers are experiencing difficulties in selling their farms.[19] This applies particularly to the owners of undeveloped hill country properties. It appears that these farms are "unattractive" to people wishing to invest in farming. If these farmers are unable to sell, then their standard of living and the value of their assets must inevitably decline.

The inability of farmers to sell their properties will reduce the rapidity and the extent to which amalgamation occurs.

It appears that within the Horowhenua hill country region amalgamation is likely to be restricted to a few large farms. These farms have the ability to finance the purchase of additional land and are able to generate capital for future development. For other hill country farms amalgamation is of doubtful value. The addition of undeveloped blocks to low income properties would reduce equities to very low levels and virtually eliminate the ability to borrow. The problem of low resource productivity would be enhanced, debt servicing charges increased and there would be little post tax income available for development. Such properties would be extremely vulnerable to future price falls and/or cost increases.

8.6 Conclusion

This study has indicated that on some Horowhenua hill country farms profitable production increases are still

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(19) For example one farmer has had his farm advertised for sale for two years. During this period he has not received an offer for it. Another farmer who was unable to sell his farm attempted to sell it in blocks, but again could not sell. In general the asking prices are higher ($5 to $15 per acre) than the government valuation.

possible, but on others future development is infeasible. Where future development is unprofitable and amalgamation impossible, adjustment to a continuing situation of static prices and rising costs will be difficult.[20] Failure to adjust will lead to declining farm equities and the emergence of a low income problem.[21] Under these conditions, and because physical factors restrict land use to either pastoral farming or forestry, the question and policy aspects of afforestation need careful consideration. It is conceivable that within the near future forestry could be at least as profitable as sheep farming on many Horowhenua hill country sheep farms.

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(20) This same problem is also occurring on other North Island hill country areas e.g. inland Taranaki. See The Dominion Newspaper, March 5, 1971, p.5.

(21) This problem is already becoming apparent on the Horowhenua hill country. In 1969/70 three of the six case farms had net incomes of less than $2,000 and three net incomes of between $2,000 and $3,000.

GLOSSARY OF TERMS

Calving percentage	is defined as the number of calves weaned divided by the number of breeding cows mated.
Cast-for-age	the culling of animals of a certain age e.g. cast for age five year ewes.
Cattle classes	
calves	called calves from birth until weaning.
weaners	calves after weaning and until 12 months of age.
yearlings	one year olds.
heifers	used to distinguish young female stock from old female stock, e.g. heifer calves, weaner heifers, yearling heifers, two year heifers, three year heifers, four year cows, five year cows, etc.
cull cows	cows removed from the breeding herd at any point in time.
steers	castrated male stock.
bullocks	castrated male stock older than three years.
Crutching	the removal of the belly and/or tail wool of a sheep.
Culling	the removal of unwanted stock from the breeding herd or flock.
Dipping	the removal of external parasites either by spraying (spray dip) or by total immersion (plunge dip).
Docking	the removal of the tail and, in the case of males, the testes of lambs.
Drenching	the dosing of animals to kill internal parasites.
Ewe equivalent	is the ratio of the annual feed requirements of an animal to the annual feed requirements of a 120 lb Romney breeding ewe.
Fecundity	means fertility or the ability to reproduce.
Flushing	is the practice of increasing the feed intake of breeding ewes (usually through saved pasture) immediately before and during the mating period. The aim is to stimulate the ovaries to ripen and shed more eggs.

Lambing percentage	the number of lambs docked divided by the number of ewes mated.
Mixed aged stock	stock of various age groups.
Mobstocking	all stock are confined to one mob and moved from paddock to paddock as the paddocks are grazed out.
Set stocking	the practice of confining stock to certain paddocks.
Shearing	the removal of the wool from sheep.
Sheep classes	
lambs	born in the spring and remain as such until February/March of the following year.
hoggets	lambs older than six months but less than one year.
two tooths	hoggets over one year of age.
four tooths	two years of age.
six tooths	three years of age
rams	entire male sheep
wethers	castrated lambs, hoggets, two tooths etc.
Store stock	stock in good condition, but not fat.
Tupping	the mating of rams and breeding ewes.
Weaning	the separation of the lambs and ewes.

APPENDIX A

LETTER SENT TO SURVEY FARMERS

Dear Sir,

You may or may not have heard of the proposed hill country study which I am about to undertake for a M.Ag.Sc. degree.

The purpose of the study is to:

1. Obtain up-to-date information on the hill country sheep farming situation and to define barriers to increased production.
2. To determine the profitability of future hill country development.

The survey is being sponsored by the Department of Agriculture and will involve visits to a number of farmers in this area. These visits will involve a look over the property and examination of physical and financial records.

Your farm has been selected in the survey and I would be grateful if I could look over your property and discuss management practices with you.

Would you please give this matter some thought during the next few weeks. I will be telephoning you later to make suitable arrangements.

Yours faithfully,

(R.E. Halford)

Farm Advisory Officer, Levin.

APPENDIX B

BREEDING COW RECONCILIATION PROGRAM

This appendix briefly outlines the breeding cow reconciliation program devised by the author.[1] In constructing the program a stock oriented approach was used. The program requires that end of year target breeding cow numbers be specified for (nt2) years of development.

The analysis is restricted to situations where breeding cows first calve as three year olds.[2]

Given a buying policy and a replacement policy the program determines annual income, expenditure, livestock standard value change and taxable income values. This information is both printed on paper and punched on cards. The punched cards are available for incorporation into Gardner's sheep development evaluation program.

A sub program derives similar information[3] for a static pre and post development program. The information from this program is required in evaluating the profitability of a development programme using the present value measure.

Various buying and selling policies can be practised. For example all weaner heifers can be sold and mixed aged cows

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(1) Full details are available from the author.

(2) This restriction is a reflection of the fact that breeding cows first calve as three year olds on the Horowhenua Hill country. It would however be possible to modify the program to allow heifers to calve as two year olds.

(3) The one exception is that there is no figure calculated for the change in the livestock standard value. This is because the opening and closing livestock numbers are the same.

purchased as replacements.(4) The number of replacement breeding stock required in any one year is initially calculated in terms of weaner heifers. This figure is later adjusted according to the various replacement policies being followed. For example if three year heifers are purchased for replacements then the number of replacements in terms of weaner heifers is reduced by the deaths and cullings (if any) allowed for in the weaners in years one and two.

If breeding cows are used to 'break in' land then stock performance will often deteriorate. The program recognises this to some extent by allowing the calving percentage to be changed during development. Stock losses however cannot be altered. Nor can the culling rates for the various classes of stock.

The main details of the program are summarised in the flow chart on the following pages.

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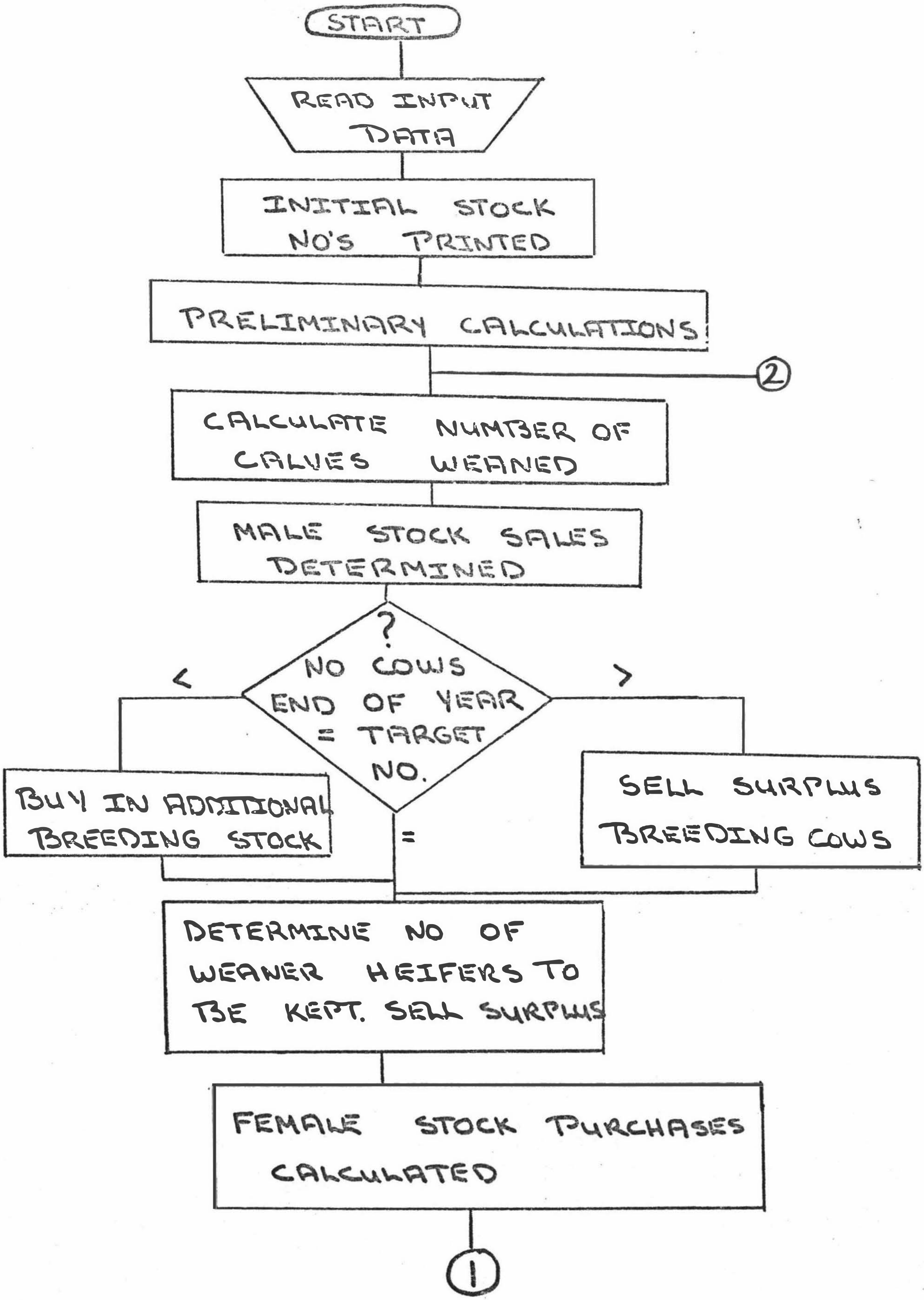
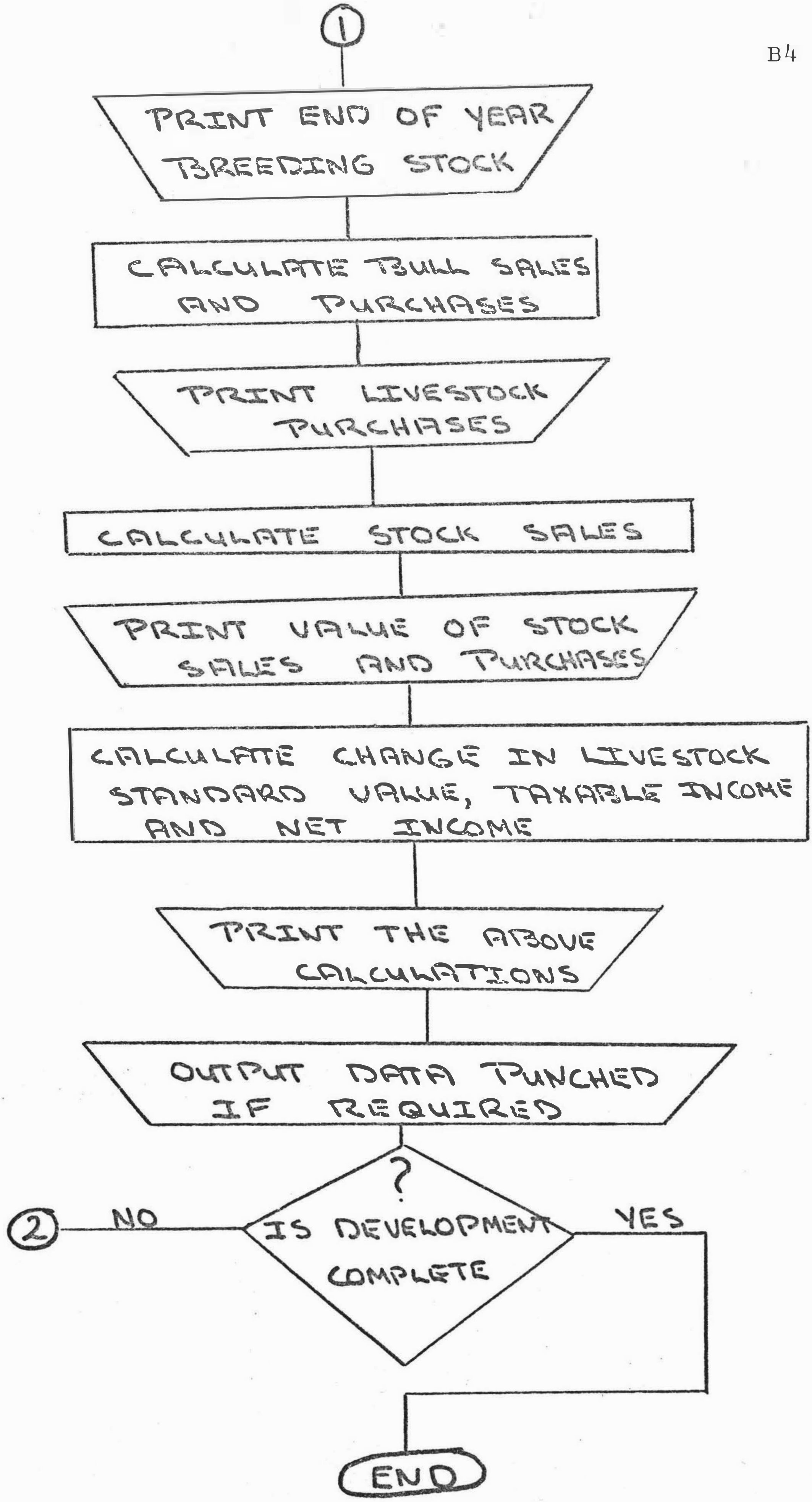
(4) There are three weaner heifer policies. All weaners can be sold, replacements only retained or all heifers retained. Similarly there are four buying policies viz. weaner or rising one year heifers can be bought, two year heifers can be bought, three year heifers bought or mixed aged cows bought.

Flow Diagram




1
PRINT END OF YEAR BREEDING STOCK
CALCULATE BULL SALES AND PURCHASES
PRINT LIVESTOCK PURCHASES
CALCULATE STOCK SALES
PRINT VALUE OF STOCK SALES AND PURCHASES
CALCULATE CHANGE IN LIVESTOCK STANDARD VALUE, TAXABLE INCOME AND NET INCOME
PRINT THE ABOVE CALCULATIONS
OUTPUT DATA PUNCHED IF REQUIRED
?
IS DEVELOPMENT COMPLETE
NO
2
YES
END

APPENDIX C

A METHOD OF REDUCING THE BASE YEAR POST TAX CASH SURPLUS IN GARDNER'S PROGRAM

Gardner's program calculates the profitability of development using the present value measure. In so doing the base year post tax cash surplus is used as the level of personal drawings throughout development. This sum is used irrespective of the figure allowed for (by the adviser or farmer) in the physical development plan.[1] Consequently it assumes that development is financed entirely by borrowed money.[2] For the development programmes analysed this had the effect of rendering them unprofitable.

It was therfore necessary to evaluate the profitability of the programmes under realistic levels of personal drawings. In order to do this a method had to be devised to reduce the base year post tax cash surplus. The method used and the rationale for it is outlined in this appendix.

B1 Reduction of the Base Year Post Tax Cash Surplus

The method used to divert income from consumption to development was to add on additional cost to the base year expenditure. This reduced the base year post tax cash surplus by the added cost less the reduction in taxation e.g. for representative farm F and an 80 per cent equity, adding a cost of $1,893 effectively reduced the base year post tax

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(1) In this study a sum of $2,000 was used as the level of personal drawings during development.

(2) Obviously if the pre-development post tax cash surplus is required for personal drawings and this level is maintained during development then no surplus farm income is being invested in farm development.

cash surplus[3] by $1,467 ($1,893 minus reduced taxation of $426). As a result the amount of off farm capital required to finance the programme was reduced by $1,467 per annum. This is similar to investing $1,467 of surplus farm income in development.

Adding the additional cost does not invalidate the post tax present value figure. The same cash flows are still involved. The effect of increasing the base year expenditure is to reduce the figures for the additional expenditure before tax and the additional expenditure after tax during physical development. This is equivalent to reducing the actual overdraft figure by the amount of the post tax income diverted to development. These aspects are illustrated by tables B1 and B2.

Table B1 is the actual computer printout of the example previously mentioned. The base year surplus has been reduced from $3,467 to $2,000 by adding an additional cost of $1,893 to the base year. The data in table B2 has been hand budgeted using the actual base year surplus i.e. $3,467. The reason for hand budgeting was to allow $1,467 of post tax income to be used each year for financing development. This enables a check to be made on the validity of the post tax present value figure in table B1. Because of different figures for total expenditure and taxation ($10,146 and $48 for B1 and $8,253 and $474 for B2) the figures in column (10) and (11) differ. All other figures are identical.[4]

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(3) And hence the level of personal drawings used in calculating the present value.

In table B1 the additional overdraft figure (column 5) is equal to the added expenditure after tax (column 11) minus the additional gross income (column 8).

i.e. additional overdraft = \$1,181 - (-\$1,171) = \$2,352(5)

In table B2 the additional overdraft figure has been calculated in the same way except that from this figure has been subtracted \$1,467 which is available for financing development.

i.e. additional overdraft = \$2,648 - (-\$1,171) - \$1,467

= \$3,819 - \$1,467

= \$2,352

This is exactly the same figure as in table B1. Since these figures are the same the overdraft interest incurred in year one but which becomes chargeable in year two, is identical for the two situations. Hence the total expenditure figures, the taxable income figures (not shown) and the total tax figures, are the same. This process is repeated throughout the financial evaluation.

The additional overdraft and the additional cash surpluses are the added profits from development. Since these are the same the present values calculated by the computer (table B1) and by hand (table B2) are also the same. Thus adding an additional cost to the base year expenditure, in order to divert post tax income from consumption to development, does

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(4) This is not strictly true. The corresponding figures do vary by one or two due to rounding errors in the computer program.

(5) The actual figure shown is \$2,353. The error of one is a rounding error.

not invalidate the post tax present value calculation.

Adding an artificial cost to the base year expenditure would, however, give an incorrect pre tax present value[(6)] calculation, because the added expenditure before tax would be incorrect.

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(6) This is the profitability of the development programme to the nation.

Table B·1 Actual Computer Printout

Year (1)	Base Year Surplus (2)	Cumulative Overdraft (3)	Cumulative Credit (4)	Additional Overdraft (5)	Additional Cash Surplus (6)	Tax (7)	Additional Gross Income (8)	Total Expenditure (9)	Added Expenditure Before Tax (10)	Added Expenditure After Tax (11)	Overdraft Interest (12)
	$	$	$	$	$	$	$	$	$	$	$
Base	2000					48		10146			
1		2353	-	2353	-	-	-1171	11375	1226	1181	-
2		4694	-	2341	-	-	- 140	12394	2245	2200	141
3		7141	-	2446	-	-	570	13211	3062	3017	281
4		7569	-	428	-	166	1563	12019	1870	1991	428
5		6513	-	-	1055	666	2504	10976	827	1448	454
6		4295	-	-	2218	1299	3449	10126	- 22	1231	390
7		2000	-	-	2294	1356	3449	9993	-150	1155	257
8			372	-	2372	1415	3449	9855	-293	1076	120
9			2811	-	2439	1469	3449	9735	-413	1010	-

Post Tax Present Value $24,175

Payback Year 8

Increase In Post Tax Drawings $ 2,439

Table B2   Hand Budgeted Comparison Of Data In B1

Year (1)	Base Year Surplus (2)	Cumulative Overdraft (3)	Cumulative Credit (4)	Additional Overdraft (5)	Additional Cash Surplus (6)	Additional Gross Income (7)	Tax (8)	Total Expenditure (9)	Added Expenditure Before Tax (10)	Added Expenditure After Tax (11)	Overdraft Interest (12)
	$	$	$	$	$	$	$	$	$	$	$
Base	3467						474	8253			
1		2352	-	2352	-	-1171	-	11375	3122	2648	-
2		4692	-	2340	-	- 140	-	12394	4141	3667	141
3		7139	-	2447	-	570	-	13211	4958	4484	281
4		7567	-	428	-	1563	166	12019	3766	3458	428
5		6511	-	-	1056	2504	666	10976	2723	2915	454
6		4293	-	-	2218	3449	1299	10126	1873	2698	390
7		1999	-	-	2294	3449	1356	9993	1740	2622	257
8			374	-	2373	3449	1415	9855	1602	2543	120
9			2813	-	2439	3449	1469	9735	1482	2477	-

Post Tax Present Value	$24,175
Payback Year	8
Increase In Post Tax Drawings	$ 2,439

APPENDIX D

GROSS MARGINS FOR BREEDING EWES AND BREEDING COWS ON HOROWHENUA HILL COUNTRY

This appendix calculates the likely gross margins for a breeding ewe and breeding cow on the Horowhenua hill country. In determining the gross margins, average stock performances recorded in the two surveys have been used. The result of the calculations indicates that for the given assumptions, breeding ewes are likely to be more profitable than breeding cows. The degree of profitability will vary with individual farms depending upon the stock performance obtained and with the relative cattle and sheep prices. For farmers with high calving percentages and low cattle losses it is possible that breeding cows may be more profitable than breeding ewes. On the majority of hill country farms however, the breeding ewe will yield a greater financial return.

Determination of Gross Margins

Basic Data

(i) Breeding Ewe

Lambing percentage	85 per cent
Wool Production	ewe 8.5 lbs
	lamb 2.0 lbs
Deaths	ewes 5 per cent
Ewe replacement rate	cast-for-age five years
Ewe equivalent	one

(ii) Breeding Cow

Calving percentage	85 per cent
Deaths	cows 6 per cent
Cow replacement rate	cows culled as eight year olds
Ewe equivalent	five

Prices

(i) Breeding Ewe

Wool	\$0.22.5 per pound
C.F.A. ewe	\$3.20
Store shorn lamb	\$4.00
Replacement ewe	\$6.00

(ii) Cattle

Weaners	\$35.00
Cull cows	\$65.00
Replacement cow	\$80.00

Gross Margin

(i) Breeding Ewe

Gross Returns

10.0 lb wool at 22.5c per pound		2.25
.85 lamb at 4.00		3.40
.25 C.F.A. ewe at 3.20		.80
		\$6.45

Variable Costs

Shearing	0.20	
Crutching	0.06	
Animal Health	0.32	
Deaths	0.30	
Depreciation	1.50	
Interest (7%)	0.42	\$2.80
Gross Margin per Breeding Ewe		\$3.65

(ii) Breeding Cow

Gross Returns

.85 Weaner Steer at $35		29.75
.17 Cull cow at $65		11.05
		$40.80

Variable Costs

Supplementary feed (5 bales of hay per cow at 50c per bale)	2.50	
Animal Health	0.80	
Deaths	4.80	
Depreciation	13.66	
Interest (7%)	5.60	$27.36
Gross Margin per Breeding Cow		$13.44
Gross Margin per Ewe Equivalent		$ 2.69

On a per ewe equivalent basis the gross margins are:-

Breeding ewe	$3.65
Breeding cow	$2.69

APPENDIX E

THE COST OF CLEARING WEEDS ON THE HOROWHENUA HILL COUNTRY

The development of unproductive hill country involves clearing the land of one or more major weeds. These weeds include gorse, fern, tauhinu and manuka scrub. Some areas of native bush can also be successfully cleared. It is necessary to know the cost involved in clearing weeds in order to give some priority to the allocation of capital. Capital is one factor which limits land development. It must therefore be allocated to processes which give the greatest return from its use.

This appendix lists land development methods used on the Horowhenua hill country. Costs are assessed on both a per acre and a per ewe equivalent increase basis. The costs given were those ruling in 1969/70.

E1 Dense Tauhinu

The tauhinu can either be cut and then burnt or burnt standing.[1] Both methods have been successfully used. Cutting increases the cost but may be preferable in some areas where tauhinu reinfestation is a problem and in some seasons when poor burns are likely. Burning is carried out in the autumn after which the area is oversown with a suitable seed mixture[2] and six hundred weight (6 cwt) of molybdic

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(1) Up to eighty per cent of the tauhinu is likely to be burnt.

(2) Seed mixtures will vary according to individual farmers preferences. However, a suitable seed mixture should include a high proportion of clovers and some grass seed e.g. crested dogtail, to supplement low fertility natural grasses. Rye grass is the most desirable grass species to have in a new pasture but establishment from oversowing on this class of hill country has not been good.

superphosphate[3] per acre.

In the spring 4 cwt of superphosphate is applied followed by annual applications of maintenance fertiliser. Any regrowth tauhinu is cut or pulled by hand at various intervals.

An initial increase in carrying capacity of 2.5 ewe equivalents (E.E.) per acre is possible.[4]

Development Costs

	Dollars Per Acre
Fencing	8.00
Cutting[5]	2.00
Seed	5.00
Fertiliser	17.00
Stock	15.00
Cost per acre	$47.00
Cost per ewe equivalent increase	$18.80

E2 Manuka Scrub

Depending on the topography the manuka scrub can be either cut by hand or with a flail chopper.[6] The manuka

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(3) The initial fertiliser application should be molybdic superphosphate as the majority of hill country is molybdenum responsive. This is especially true of areas covered with tauhinu.

(4) The increases in stocking rates are those actually obtained in the first two years by hill country farmers in the Horowhenua region. Individual farmers may obtain higher or lower increases because of seasonal influences e.g. drought or managerial ability.

(5) This figure is the cost of cutting unburnt tauhinu.

(6) This tractor drawn machine consists of a series of rotary blades which cut and crush the manuka.

is then burnt and oversown in the autumn with seed and 5 cwt of molybdic superphosphate. In the spring another 3 cwt of superphosphate is applied followed by annual maintenance applications.

Initial stocking rate increases of 2.5 E.E. per acre have been achieved within two years.

Development Costs

Method One - Hand Cutting	Dollars Per Acre
Cutting	20.00
Fencing	8.00
Seed	5.00
Fertiliser	13.60
Stock	15.00
Cost per acre	\$61.60
Cost per ewe equivalent increase	\$24.64

Method Two - Machine Cutting	Dollars Per Acre
Cutting and crushing	5.00
Fencing	8.00
Seed	5.00
Fertiliser	13.00
Stock	15.00
Cost per acre	\$46.60
Cost per ewe equivalent increase	\$18.64

E3 Fern

There are two methods of clearing land infested with bracken fern and water fern.[7] The difference in the two

(7) Sometimes known as hard fern.

approaches is related to the extent to which the vegetation has been burnt in the past. If the vegetation has not previously been burnt the most effective method is burning in the autumn followed by oversowing with seed and 5 cwt of molybdic superphosphate. This is followed by another 3 cwt of superphosphate in the spring. Quicker establishment of pastures occur from this method than from crushing with cattle and then oversowing. However, the latter method is preferred on areas which have been frequently burnt in the past.

Increases of 2.5 E.E. per acre have been achieved in two years.

Development Costs	Dollars Per Acre
Fencing	8.00
Fertiliser	13.00
Seed	5.00
Stock	15.00
Cost per acre	$41.30
Cost per ewe equivalent increase	$16.52

E4 Scattered Bush

The area to be developed is fenced off and cattle used to clear the under growth and break down some of the smaller bush.(8) In the autumn the bush is burnt and oversown with 7 cwt of molybdic superphosphate and a suitable seed mixture.

(8) To be successful it is necessary to graze cattle hard. This can result in high losses. Individual farmers may prefer to cut more bush and graze cattle more leniently.

The unburnt bush can be cut with a slasher or chainsaw. In the spring 3 cwt of superphosphate is applied and thereafter annually.

An initial increase in carrying capacity of 1.5 E.E. per acre is possible after two years.(9)

Development Costs	Dollars Per Acre
Fencing	8.00
Cutting	6.00
Fertiliser	17.00
Seed	5.00
Stock	9.00
Cost per acre	$45.00
Cost per ewe equivalent increase	$30.00

E5 Dense Gorse

The author was unable to obtain detailed financial costs for the clearing of dense gorse in the survey area. Hence the costs shown are estimated costs.

A small area is fenced off and burnt in the autumn. The burn is then oversown with seed and 6 cwt of molybdic superphosphate per acre. In the spring 3 cwt of superphosphate is applied. The area is stocked in a way which allows the clover to establish over the winter. The stocking rate is then increased in the spring in order to control the regrowth gorse.(10) Follow up sprays commencing in the

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(9) This lower initial increase is due to lower natural fertility.

(10) A better result will be obtained with wethers but these are less profitable than ewes. If blocks are small enough and the ewe numbers high enough there may be sufficient dry ewes and hoggets to provide the necessary stock concentrations.

second year are necessary to kill the regrowth not controlled by the stock.

Initial increases of 2.5 E.E. have been recorded within two years.

Development Costs	Dollars Per Acre
Fencing	8.00
Seed(11)	10.00
Fertiliser	15.00
Stock	15.00
Spraying(12)	36.00
Cost per acre	\$84.00
Cost per ewe equivalent increase	\$33.00

Table E1 gives a summary of development costs associated with the removal of weeds on the Horowhenua hill country. The table indicates that land covered in fern is the cheapest land to develop while land covered in dense gorse is the most expensive. Areas of bush and gorse should only be developed after land has been cleared of fern, tauhinu and manuka.

Table E1 Land Development Costs

Development Of	Cost Per Acre	Initial E.E. Increase	Cost Per E.E. Increase
Dense tauhinu	47.00	2.5	18.80
Manuka scrub	(i) 61.60	2.5	24.64
	(ii) 46.60	2.5	18.64
Fern	43.30	2.5	16.52
Bush	45.00	1.5	30.00
Dense gorse	84.00	2.5	33.60

(11) Spraying kills the clover plants and a second oversowing is often required.

(12) This allows for spraying of the gorse over several years.

APPENDIX F

THE PRESENT VALUE MEASURE OF PROFITABILITY

This appendix outlines the present value measure used to determine the profitability of future development. An evaluation of profitability is necessary in order to:

(i) determine whether the combination of inputs comprising the development programme is likely to be profitable.

(ii) determine which of the alternative development programmes is the most profitable.

Farm development can be regarded as a continuous input[(1)] continuous output process. Inputs of capital are followed by cash returns in one or more succeeding years. The flow of benefits usually takes the form of gross output. This commences some time after the initial input and continues for a varying period into the future. The flow of costs generally consists of a heavy initial investment and a flow of operating costs.

The stream of benefits and costs can be brought to a comparable basis by using compound interest techniques.[(2)] All values can either be compounded forward to a certain point

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(1) While many inputs in farm development can be applied in a single time period e.g. fencing, others can be regarded as self generating and capable of improvement to a higher productive capacity with the passage of time. In addition management and biological factors could well dictate an ordered sequence of investment over several time periods.

(2) The rationale for the use of compound interest is that any specific development programme ties up resources which could have been used for alternative investment.

in time or discounted back to the present.[3] Usually the latter method is employed using a selected rate of interest.[4]

Benefits from investment occur in the form of income and capital gains. Allowance has to be made for capital gains and this is usually done by capitalising the post development surplus. The present value measure is then defined as the sum of the discounted additional surpluses during development plus the discounted additional surpluses after development, capitalised at the selected rate of interest.[5]

F1 Calculating Present Value

For calculating the present value of a development programme, a base year[6] (with its fixed relationships between inputs and outputs) is used as a bench mark. The variations from this are imputed as the benefits and costs associated with the development programme.[7]

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(3) Both methods will provide exactly the same answer to such questions as "is the investment a profitable one?."

(4) The rate selected tends to be a value judgement and is usually the current rate of interest. Where a large amount of uncertainty is present the discount rate is often adjusted (i.e. increased) to allow for this in value terms.

(5) An alternative approach is to solve the streams of benefits and costs for the internal rate of return. For a particular investment this is defined as the rate of interest at which the present value of gross revenues and present values of expenditures are equal, i.e. net present value is zero. The investment with the highest internal rate of return is, however, not necessarily the most profitable.

(6) A base year represents the management of the farm immediately prior to development.

(7) The present value method is essentially studying two situations; one in which development has not occurred and one where development has been carried out. The undeveloped situation is used as the base for comparing the developed situation.

There are four major steps in calculating the net present value.(8) These are:-

(i) determining the pre-development cash surplus situation.

(ii) estimating development inputs and costs, the input levels and the profits during the development period..

(iii) calculating the post development cash surplus.

(iv) defining the additional profits due to development.

The method of determining the present value can be illustrated by means of a hypothetical example. Consider a development programme that runs for five years with the post development situation being reached in year six. Assume that prior to development the annual cash surplus is $2,000 and during development cash surpluses of $1,000, $1,000, $1,500, $1,800 and $3,200 are recorded. After development has been completed the cash surplus increases to $3,500.

Given that the pre-development cash surplus is $2,000 then the additional profits(9) that occur during development are -$1,000, -$1,000, -$5,000, -$200 and $1,200. After development has been completed the additional annual profit resulting from development is $1,500 ($3,500 - $2,000).

In order to determine the present value it is necessary

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(8) The present value of an investment can be expressed either as a capital sum, in which case it is known as the net present value, or as an annual payment where it is called the annuity payment from the investment.

(9) The additional profits that occur as a result of development will either be positive or negative depending upon the relative significance of the additional revenue and costs that occur during development.

to bring these profits to a comparable time basis. This is achieved by discounting with a specific interest rate.

The present value (P.V.) formula for profits occurring <u>during development</u> is given by -

$$P.V. = \sum_{i=1}^{n-1} \frac{Vi}{(1+r)^i}$$

where Σ = the sum of

n = number of years of the development programme

r = discount rate expressed as a decimal

Vi = development cash profit in the ith year of development.

For the example given, the present value is:

$$P.V. = \frac{-1,000}{(1\ .06)^1} + \frac{-1,000}{(1\ .06)^2} + \frac{-5,000}{(1\ .06)^3}$$

$$+ \frac{-200}{(1\ .06)^4} + \frac{1,200}{(1\ .06)^5}$$

$$= \$-1,515$$

The present value formula for the <u>post development</u> profits (v)[10] is:-

$$\underset{(n-\infty)}{P.V.} = \frac{V}{r} \times \frac{1}{(1+r)^{n-1}}$$

For the example:-

$$P.V. = \frac{\$1,500}{.06} \times \frac{1}{(1+.06)^5}$$

$$= \$18,680$$

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(10) This formula assumes that the additional profit continues indefinitely and that it remains constant.

In general terms the present value formula for the entire stream of development cash profits is:-

$$\text{Net present value} = \sum_{i=1}^{n-1} \frac{Vi}{(1+r)^i} + \frac{V}{r} \times \frac{1}{(1+r)^{n-1}}$$

For the example given the net present value equals -

-\$1,515 + \$18,680 = \$17,165

Taxation has been ignored in this example. The present value determined indicates the value of the development programme to the nation.(11) The present value obtained when taxation is considered is the present value of the <u>post tax</u> added cash profits. This represents the value of the development programme to the farmer.

F2 Problems Involved In Calculating Present Value

A number of problems arise in using the present value measure. These problems include formulating the correct base year and post development situation, specifying an appropriate discount rate and selecting future costs and prices.(12) The difficulties involved create doubts about the validity of the figures obtained. The present value figure will only be correct if the development programme is implemented exactly as specified and all assumptions hold true. In a dynamic agriculture this is unlikely to happen. Emphasis should

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(11) A development programme which is profitable to the nation can be unprofitable to the farmer. This is because taxation can claim more than 100 per cent of the post tax profits. Holden (6) and Cartwright (9) have given examples of this.

(12) A discussion of these and other problems associated with the present value can be found in (34).

therefore be on the relative magnitude of the figure rather than the exact figure.

Solomon (35) has summarised the inadequacies of the present value as a measure of profitability. He has stated that the theoretically correct measure of present value is so unstable with respect to project life and return of a project that simple measures such as Payback which does allow for obsolescence, technical change and uncertainty of the future may be just as useful in real world investment decisions.

Use of the present value measure does, however, reflect the size of the project and provides a project ranking. Alternative uses for money necessitate the selection of an opportunity cost of capital and the measure recognises the subjective time preference of people for money. The measure also allows for income and expenditure streams which fluctuate over time. For these reasons it is a better measure of profitability than ratio measures, such as Return on Capital, or the Payback measure which fail in respect to one or more of these criteria.

APPENDIX G

SUPPLEMENTARY EVALUATION DATA FOR REPRESENTATIVE FARM F

This appendix contains additional evaluation data from the three development programmes analysed for representative farm F. The data is contained in tables which are self explanatory. Data in tables G.1, G.2, G.3, G.4, G.7 and G.8 augment summary data in chapter six. Data in tables G.5, G.6, G.9 and G.10 indicate the effect of the fertiliser subsidy on development programmes two and three.

Table G-1 Programme One - Annual Overdraft Requirements and Interest Charges For Various Equity Levels

Development Year	Annual Overdraft $				Cumulative Overdraft $				Overdraft Interest $			
	E8	E7	E6	E5	E8	E7	E6	E5	E8	E7	E6	E5
1	1555	2242	3007	3400	1555	2242	3007	3400	-	-	-	-
2	2066	2795	3606	4038	3622	5037	6613	7423	93	134	180	204
3	3362	4134	4994	5468	6985	9172	11607	12858	217	302	396	445
4	2891	3710	4621	5139	9877	12882	16229	18012	419	550	696	771
5	+651	14	800	1219	9225	12896	17029	19166	592	772	973	1081
6	+1441	+772	+1	403	7784	12123	17028	19483	553	773	1021	1149

Table G2 Programme One - Post Development Data

Equity	Gross Income	Total Cash Expenditure[1]	Taxable Income	Taxation	Post Tax Cash Surplus
	$	$	$	$	$
E10	16,469	11,086	7,088	1,883	5,383
E8	16,469	12,125	6,206	1,466	4,344
E7	16,469	12,627	5,780	1,281	3,842
E6	16,469	13,141	5,325	1,093	3,266
E5	16,469	13,665	4,812	897	2,804

Note -

(1) Does not include personal drawings. The post tax cash surplus is the sum which is available for personal drawings.

Table G3 Programme Two - Annual Overdraft Requirements and Interest Charges For Various Equity Levels

Development Year	Annual Overdraft $				Cumulative Overdraft $				Overdraft Interest $			
	E8	E7	E6	E5	E8	E7	E6	E5	E8	E7	E6	E5
1	2350	3037	3802	4195	2350	3037	3802	4195	-	-	-	-
2	2339	3067	3878	4289	4690	6105	7681	8484	141	182	228	251
3	2444	3216	4075	4516	7134	9321	11757	13001	281	366	460	509
4	425	1124	1988	2456	7559	10446	13745	15456	428	559	705	780
5	+1058	+401	379	726	6501	10004	14124	16182	453	626	824	927

Table G4 Programme Two - Post Development Data

Equity	Gross Income	Total Cash Expenditure(1)	Taxable Income	Taxation	Post Tax Cash Surplus
	$	$	$	$	$
E10	15,645	9,932	7,129	1,903	5,463
E8	15,645	10,953	6,212	1,469	4,441
E7	15,645	11,948	5,772	1,277	3,946
E6	15,645	12,018	5,298	1,082	3,375
E5	15,645	12,478	4,777	884	2,916

Note -

(1) Does not include personal drawings. The post tax cash surplus is the sum which is available for personal drawings.

Table G5 Programme Two - The Effect Of The Fertiliser Subsidy on Annual Overdraft Requirements

	Equity	Base Year	Development Year 1	2	3	4	5	Post Development
Value of the Fertiliser Subsidy ($)		365	515	665	715	665	400	400
Reduction In Overdraft ($)	E8	N.A.	515	684	787	425		N.A.
	E7	N.A.	515	696	787	626		N.A.
	E6	N.A.	515	696	787	717	379	N.A.
Increase In Cash Surplus ($)	E8						434	219
	E7						454	227
	E6						120	237
Reduction In Overdraft Interest ($)	E8	N.A.	N.A.	31	72	120	156	N.A.
	E7	N.A.	N.A.	31	72	120	157	N.A.
	E6	N.A.	N.A.	31	72	120	163	N.A.
Increase In Taxation($)	E8	118		12		174	234	180
	E7	98				205	219	174
	E6	78				68	179	163

Note -
(1) N.A. denotes non applicable.

Table G6 Programme Two - The Effect Of The Fertiliser Subsidy On The Profitability Of Development

Equity	Base Year Post Tax(1) Cash Surplus $	Present Value			Maximum Overdraft			Payback (year)			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E8											
Subsidy	2000	29760	26430	23581	5137	5172	5199	7	7	7	1193
No Subsidy	2000	24175	21136	18542	7559	7635	7702	8	8	8	974
E7											
Subsidy	2000	20370	17656	14853	7830	7899	7969	9	9	9	1256
No Subsidy	2000	14512	12045	9929	10446	10548	10641	11	11	12	1029
E6											
Subsidy	2000	9312	7233	5443	11641	11132	11227	13	14	14	1335
No Subsidy	2000	-			14124			*			-

Notes -

(1) Used as the level of personal drawings in calculating profitability.

(2) * Denotes payback not achieved within nineteen years.

(3) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

Table G7 Programme Three - Annual Overdraft Requirements and Interest Charges For Various Equity Levels

Development Year	Annual Overdraft $					Cumulative Overdraft $					Overdraft Interest $				
	E10	E8	E7	E6	E5	E10	E8	E7	E6	E5	E10	E8	E7	E6	E5
1	862	2313	3000	3765	4423	862	2313	3000	3765	4423	-	-	-	-	-
2	2223	3766	4494	5305	6003	30856	6079	7494	9070	10426	51	138	180	225	265
3	916	2533	3305	4165	4904	4001	8612	10799	13235	15331	185	364	449	544	625
4	+1539	+177	511	1297	2038	2462	8435	11310	14532	17369	240	516	648	794	919
5	+2923	+1652	+1071	+ 287	349	461	6783	10239	14245	17719	147	506	678	872	1042

Table G8 Programme Three - Post Development Data

Equity	Gross Income	Total Cash Expenditure(1)	Taxable Income	Taxation	Post Tax Cash Surplus
	$	$	$	$	$
E10	15,133	9,939	6,598	1,642	5,192
E8	15,133	10,991	5,681	1,238	4,140
E7	15,133	11,499	5,241	1,060	3,632
E6	15,133	12,084	4,767	880	3,047
E5	15,133	12,562	4,246	698	2,571

Note -

(1) Does not include personal drawings. The post tax cash surplus is the sum which is available for personal drawings.

Table G9 Programme Three - The Effect of The Fertiliser Subsidy On Annual Overdraft Requirements

	Equity	Base Year	Development Year 1	2	3	4	5	Post Development
Value of the Fertiliser Subsidy ($)		365	565	665	700	490	390	415
Reduction In Overdraft ($)	E8	N.A.	565	699	776	-	-	N.A.
	E7		565	699	776	480	-	
	E6		565	699	776	490	-	
Increase In Cash Surplus ($)	E8	246	-	-	-	450	328	237
	E7	265	-	-	-	-	348	247
	E6	287	-	-	-	-	357	259
Reduction In Overdraft Interest ($)	E8	N.A.		34	76	122	150	N.A.
	E7			34	76	123	151	
	E6			34	76	123	153	
Increase In Taxation ($)	E8	119	-	-	-	162	212	178
	E7	100	-	-	-	133	193	168
	E6	78	-	-	-	115	186	156

Note -
(1) N.A. denotes non applicable.

Table G10 Programme Three - The Effect of the Fertiliser Subsidy on the Profitability Of Development

Equity	Base Year Post Tax (1) Cash Surplus $	Present Value $			Maximum Overdraft $.			Payback (year)			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E8											
Subsidy	2000	25605	22628	20085	6572	6605	6639	7	7	7	
No Subsidy	2000	19970	17273	14967	8620	8663	8706	9	9	9	673
E7											
Subsidy	2000	16089	13709	11672	8702	8812	8961	10	10	10	
No Subsidy	2000	10006	7885	6063	11321	11420	11520	13	13	13	723
E6											
Subsidy	2000	4588	2788	1261	12009	12112	12216	16	17	17	
No Subsidy	2000	-			14539			*			

Notes -

(1) Used as the level of personal drawings during development.

(2) * Denotes payback not achieved within nineteen years.

(3) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

APPENDIX H

SUPPLEMENTARY EVALUATION DATA FOR REPRESENTATIVE FARM G

This appendix contains additional evaluation data which augments data discussed in the first part of chapter seven. The data is contained in tables which require no further explanation.

Table H.1 Representative Farm G - Annual Overdraft Requirements and Interest Charges For Various Equity Levels

Development Year	Annual Overdraft $				Cumulative Overdraft $				Overdraft Interest $			
	E9	E8	E7	E6	E9	E8	E7	E6	E9	E8	E7	E6
1	1623	1929	2247	2565	1623	1929	2247	2565	-	-	-	-
2	2317	2642	2979	3316	3940	4571	5226	5881	97	115	134	153
3	4775	5118	5476	5833	8715	9690	10702	11714	236	274	313	352
4	2666	3030	3409	3787	11381	12720	14111	15502	522	581	642	702
5	836	1192	1571	1961	12219	13912	15683	17463	682	763	846	936
6	+691	+364	+17	340	11572	13548	15666	17803	733	834	941	1047

Table H-2 Representative Farm G - Post Development Data

Equity	Gross Income	Total Cash Expenditure (1)	Taxable Income	Taxation	Post Tax Cash Surplus
	$	$	$	$	$
E10	13,354	9,319	4,722	768	3,935
E9	13,354	9,631	4,551	710	3,723
E8	13,354	9,874	4,367	647	3,480
E7	13,354	10,030	4,178	585	3,224
E6	13,354	10,385	3,990	522	2,969

Note -

(1) Does not include personal drawings. The post tax cash surplus is the sum which is available for personal drawings.

Table H-3 Representative Farm G - The Effect of the Fertiliser Subsidy on the Profitability of Development

	Equity	Base Year	Development Year 1	2	3	4	5	6	Post Development
Value of the Fertiliser Subsidy ($)		160	350	350	460	515	460	460	460
Reduction In Overdraft ($)	E10	N.A.	322	369	502	586	448	-	N.A.
	E9		335	370	503	587	448	-	
	E8		350	371	503	588	477	-	
	E7		350	371	503	589	515	-	
Increase In Cash Surplus ($)	E10	122	-	-	-	-	-	396	295
	E9	126	-	-	-	-	-	406	300
	E8	126	-	-	-	-	-	423	304
	E7	126	-	-	-	-	-	441	306
Increase In Taxation ($)	E10	38	28	-	-	-	119	198	165
	E9	34	15	-	-	-	119	189	160
	E8	34	-	-	-	-	92	174	156
	E7	34	-	-	-	-	54	159	154
Reduction In Overdraft Interest ($)	E10	N.A.	N.A.	19	42	71	107	134	N.A.
	E9			20	42	72	107	135	
	E8			21	43	73	109	137	
	E7			21	43	74	109	140	

Note -
(1) N.A. denotes non applicable.

Table H4 Representative Farm G - The Effect of The Fertiliser Subsidy On The Profitability Of Development

Equity	Base Year Post Tax(1) Cash Surplus $	Present Value			Maximum Overdraft			Payback (year)			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E9											
Subsidy	2000	15422	12911	10766	9977	10080	10184	11	12	12	1274
No Subsidy	2000	9145	6949	5056	12220	12348	12473	14	15	15	1100
E8											
Subsidy	2000	10594	8341	6414	11622	11741	11622	14	14	14	1290
No Subsidy	2000	3846	-	-	13912	14060	14206	18	*	*	1116
E7											
Subsidy	2000	5211	3210	1545	13366	13501	13637	17	17	18	
No Subsidy	2000	-			16314			*			1130

Notes -

(1) Used as the level of personal drawings during development in calculating profitability.
(2) * Payback is not achieved within nineteen years.
(3) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

APPENDIX I

SUPPLEMENTARY EVALUATION DATA FOR REPRESENTATIVE FARM A

This appendix merely contains supplementary evaluation data from the analyses of the development programme devised for representative farm A. The data, contained in tables, augments and substantiates statements made in the second part of chapter seven.

Table I-1 Representative Farm A - Annual Overdraft Requirements and Interest Charges For Various Equity Levels

Development Year	Annual Overdraft $			Cumulative Overdraft $			Overdraft Interest $		
	E8	E7	E6*	E8	E7	E6*	E8	E7	E6*
1	937	1396	1370	937	1396	1370	-	-	-
2	364	845	804	1301	2241	2174	56	83	82
3	83	579	543	1384	2820	2711	78	134	131
4	+358	133	69	1026	2953	2780	83	169	180

Notes -

(1) * Personal drawings for E6 equal $1,232.

Table I·2 Representative Farm A - Post Development Data

Equity	Gross Income	Total Expenditure (1)	Taxation	Post Tax Cash Surplus
	$	$	$	$
E10	12,887	8,662	1,122	4,225
E8	12,887	9,488	838	3,399
E7	12,887	9,912	722	2,975
E6	12,887	10,587	539	2,300

Note -
(1) Does not include personal drawings. The post tax cash surplus is available for personal drawings.

Table I.3 Representative Farm A - The Effect Of The Fertiliser Subsidy on Annual Overdraft Requirements

	Equity	Base Year $	Year One $	Year Two $	Year Three $	Year Four $	Post Development $
Fertiliser Subsidy ($)		325	400	425	450	475	500
Reduction In Annual Overdraft ($)	E8		307	323	83	-	
	E7	N.A.	316	347	370	133	N.A.
	E6		71	80	103	69	
Increase In Cash Credit ($)	E8	247	-	-	266	352	313
	E7	256	-	-	-	235	323
	E6	259	-	-	-	34	334
Reduction In Overdraft Interest ($)	E8			12	32	55	
	E7	N.A.	N.A.	19	40	61	N.A.
	E6			5	9	16	
Increase In Taxation ($)	E8	78	93	114	133	178	187
	E7	69	84	97	120	168	177
	E6	66	70	90	96	128	166

Note -
(1) For E6 personal drawings are allowed to increase by $259 i.e. from $1,232 to $1,491.

Table I4 Representative Farm A - The Effect of the Fertiliser Subsidy on the Profitability of Development

Equity	Base Year Post Tax Cash Surplus (1) $	Present Value			Payback (year)			Maximum Overdraft			Increase In Post Tax Cash Surplus $
		A	B	C	A	B	C	A	B	C	
E8											
Subsidy	2000	22774	20630	18798	4	4	4	667	669	671	
No subsidy	2000	17462	15712	14240	5	5	5	1384	1392	1395	978
E7											
Subsidy	2000	15633	14009	12624	6	6	6	1789	1799	1809	
No Subsidy	2000	10687	9416	8330	7	8	8	2792	2817	2842	1012
E6											
Subsidy	1491	12752	11320	10097	7	7	7	2466	2480	2493	1142
No Subsidy	1232	11420	10080	8935	7	7	7	2791	2816	2842	1068

Notes -

(1) Used as the level of personal drawings during development in calculating profitability in terms of a present value.

(2) A = 6.0 per cent interest.
B = 6.5 per cent interest.
C = 7.0 per cent interest.

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