THE SOCIAL & ECONOMIC IMPLICATIONS OF ALTERNATIVE LAND USES INVOLVING PASTORAL FARMING AND FORESTRY IN NORTHLAND

A thesis presented
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ABSTRACT

This thesis is a scenario study which examines the social and economic impacts of different types of forestry being established in an area of pastoral farmland in Northland, New Zealand.

Detailed production, income, expenditure, employment and demographic data was collected from 57 of the 59 farms in the study area. This included expenditure direction data. Those businesses and schools which supported, and were in turn supported by, the study area farms were interviewed to find out the importance of these farms to their continued operation.

This pastoral farming scenario is then compared with four forestry scenarios - two conventional forestry scenarios, plus a woodlot and finally an agroforestry scenario. In the first conventional forestry scenario all the study area farms (15,000 hectares) are planted in exotics and in the second about 3,000 hectares are planted. With the the two farm forestry scenarios about 1,000 hectares are planted. In the first conventional forestry scenario forestry replaces pastoral farming, while in the second and the farm forestry scenarios pastoral farming and forestry are integrated.

Variable results resulted from the comparison, with expenditure comparisons very sensitive to the time harvesting commences, the amount cut and the time span of the scenarios. (Thirty-five years.) These comparisons were also sensitive to the locality in which farming and forestry expenditure were being compared. Forestry expenditure would be markedly higher than farming expenditure once harvesting commenced. But farming has higher backward linkage multipliers and unless forestry processing plants are established, the conventional forestry developments in the scenarios imply a relative decline in regional incomes and employment. If forestry processing plants are established, an increase in regional incomes and employment is implied. Woodlot and agroforestry generally imply an increase in expenditure and employment without the drop in agricultural spending associated with conventional forestry activities on former pastoral farmland.

Conventional forestry would result in disruption to the existing social structure. It may result in a long term population decline, but it is likely many ex-farm houses would be re-occupied. Woodlot and agroforestry would strengthen the existing social and economic structure.

It is concluded that the Northland United Council's interest and concern about the afforestation of pastoral farmland is justified. However, the rural decline, the corporatisation of government departments, plus the impacts of forestry harvesting and wood processing are considered to be of more importance in the establishment of regional planning priorities.

ACKNOWLEDGEMENTS

The design and completion of this research depended on the help of a large number of people, to whom I offer heartfelt thanks. First, to my supervisor Dr Anton Meister for his advice and comments and to Chris Livesey for the time and effort he put into the research; their relief at seeing the completion of this must be as great as my own!

The research proposal originated from Chris Livesey at the Northland United Council, with considerable input from a number of people. The NZFS, FRI, MAF, Massey University, private forestry interests and the Pastoral and Forestry Advisory Group of the United Council were all involved in the drafting of the research proposal. While this meant it took a considerable amount of time to finalise the proposal, it also meant that key people whose help was needed with the research were involved right from the start. Particular thanks are due to Patrick Aldwell of the FRI for his advice on the research proposal and on the design of the research itself.

The farm questionnaire was drawn up with the help of Joe Hughes at Massey University. Patrick Alspach and Richard Drake of Federated Farmers provided the comments and advice that led to the final questionnaire design and its success was largely the result of their suggestions.

The biggest thank you must go to all the people I interviewed and surveyed in the farming, forestry and business communities.
The co-operation of the farmers was heart warming and I am exceedingly grateful for their willingness to help. The following farms were visited: Aitken, Bamber, Beanland, Buchanan, Carter, Clements, Conn, Cornelius, Corney, Curtis, Davey C., Davey J., Davison, De Boer, Field, Flower, Farrow, Gausel, Hackett, Harper, Hill, Jesson, Johnston, Karaka Station, Kenyon, Lambeth, Leslie, MacDonald, McCarthy, McDermott, McDivitt, Morley, Mossman, Nichols, O'Leary, Pattinson, Pedersen J., Pedersen W., Ross, Rowse, Ruddell, Sharp, Sinclair, Simmons, Sommerville, Stevenson, Taylor R., Taylor T., Tiller N., Van Dijk, Vuletich, Ward, Walker, Wierstra, Younger, and Wilson. The farm interviews were a very rewarding experience and I learnt an awful lot from them.

NZ Forest Products provided information of forestry costs and practices. Particular thanks go to Denis Albert for the amount of help he provided. Not only was I given very detailed information on forestry costs and practices, but NZFP computer facilities were used to simulate the growth and harvest of the conventional forests in the scenarios constructed as part of this research. NZFP also helped design the research.

Maurice Williamson of the NZFS Kaikohe provided data on costs and Russell Dale of the NZFS Auckland office advised on the research proposal.

Jim Currie of MAF also helped design the research and was always willing to answer my questions. John Clark of MAF, Auckland provided the data used to construct the woodlot and agroforestry scenarios.

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Forestry contractors: Colin Bogue, Cliff Chapman, G. Grayson, R. Pickering, E. Roberts, and Gordon Sander.
Transport Operators: Tito's (Wati Tito), Taylor's Transport (Gary Taylor) and Northern Wairoa Transport (Jim Crowbird.)
Fertiliser and Topdressing: Avoca Lime (C. Grantham), Fieldair (H. Cadwaller)and Beatty Aviation (Peter and Helen Beatty).
Shearing: Wayne Brown, the Clement's Gang, Brian Cocks and Terry Passell.
The Northern Wairoa Co-Operative Dairy Company (P. Steere)
Stock and Station Agents/Farm Supply Centres: Elders Pastoral (J. Dry and J. Williamson), Dalgety (A. Smith), Wrightson/NMA (I. Missen and J. Murray) and the Auckland Farmers Union.
Study Area Businesses: Parakao Store, Tangiteroria Store and Tangiteroria Garage.
Schools: Parakao, Tangowahine and Tangiteroria Schools.

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Thanks to my parents for their support and cheerfully allowing me to turn the family home into a research base. It would have been an awful lot harder to carry out the research without their help and support. Over my years of study the Brownlies provided a lot of support and I'll always be grateful for that.

My fellow students in Room 367 Ag./Hort. provided the necessary light relief (especially Lins with the rubber frog in the Chinese restaurant and Gus who hit a groundsman on the golf course. The Steinies are on the way Phil.)

My employers during the writing up phase of this research - Beca Carter Hollings and Ferner Ltd. - did not see all that much of me and I am very grateful for their flexibility.

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ONE - INTRODUCTION

The dramatic increase in the area planted in exotic forests has been the most significant recent change in Northland's land use patterns. By 1976 23,556 hectares had been planted (Census), by 1979 40,000 hectares and by 1982, 64,000 hectares. Currently about 80,000 hectares have been planted. The 1984 annual planting rate of about 7-8,000 hectares was 'expected to continue for 10-12 years to give an exotic forest estate in excess of 150,000 hectares '(P13 Northland United Council 1984). Almost all is in large scale conventional plantings as opposed to either woodlots or agroforestry.

In 1986, while this research was being written up, the Government introduced changes to the primary sector tax system disallowing the deduction of many forestry expenses until trees are harvested. Forestry sources have stated (NZFP pers comm) that the tax law changes are the cause of the planned severe cutbacks in planting; it is too early to say whether or not forestry sector pressure to have this law changed will succeed, or what its long term effect on planting rates will be. Even if the planting rates remain at low levels a signficant forest resource is in place, which has created considerable interest as to the impact of the present and anticipated increase in forestry operations on Northland's socio-economic structure.

More specifically there is interest and some concern in the impact on rural areas of forestry plantings on former pastoral farmland. For example, how will rural districts and agricultural servicing towns like Dargaville be affected by a decrease in the area of pastoral farming in their social and economic hinterland? For a number of years some have argued that planting pine trees on former or potential pastoral farmland has negative impacts, expecially on existing rural communities. These negative impacts are perceived to include a decline in rural economic activity and population, plus the erosion of existing community structures. These concerns have led to conflict, often manifested in Planning Tribunal hearings and sometimes inspired by uncertainty, rather than certainty, about the anticipated impacts.

A number of previous studies on the farming/forestry issue have been carried out. Those relevant to this research include studies by Smith (1981), CNIPS (1982,1983) and Marwick (1981). The CNIPS (1982) report studied different simulated afforestation patterns in the Hawkes Bay, setting out to 'identify the social, environmental and economic costs and benefits of these contrasting patterns of afforestation. The report was concerned particularly with where and when these various costs and benefits would fall, with reference to the national economy, the regional community and the forestry industry.' (CNIPS 1983). This CNIPS (1982) study was extended to include industry and financial considerations in the CNIPS (1983) report. Among the conclusions drawn in the Hawke's Bay context, was that the benefits of locating forests on more productive land closer to ports, for a more efficent export orientated industry, were less than the benefits gained from agricultural production from the same land. That is, the benefits to the nation of locating forestry in more isolated country while continuing agricultural uses on more productive land more than offsets the extra forestry transportation costs and lower forestry productivity. In financial terms there

was 'little to choose between remote lower productivity land for afforestation and more accessible higher productivity land for afforestation, especially for lower stocking rate clearwood regimes' (p iii CNIPS 1983) This study also found that a low stocking clearwood regime greatly improved the return on all sites and had more influence than site location in determining forestry returns.

The social impacts of the simulated forestry developments varied - though rural depopulation was not seen as a likely outcome. Forestry was seen to have 'the potential to be a powerful tool for social development in rural areas, through retention or enhancement of population and services.' (p iv CNIPS1983). But it was also seen as causing conflict through changing land use in existing pastoral farming areas and to forestry workers through isolation or the distance between home and work. In existing pastoral farming areas it could lead to disruption of the existing social structure, with locals not viewing favourably the introduction of non-farming people into the community. Where forestry workers lived in isolated communities, interaction with the longer established farming community could be inhibited, with forestry workers feeling they were not fully accepted in the community. However, if forestry workers lived in urban centres, such as Hastings, the distance between work and home means that long hours would be spent travelling, which imposes strains of home life.

The two CNIPS studies, while looking at overall economic impacts, do not trace expenditure flows within the Hawkes Bay nor do they trace changes in expenditure and employment by location or sector. But the studies clearly demonstrate that there are economic and social conflicts in Hawkes Bay, from the farming/afforestation issue.

Reasons behind these negative attitudes has been studied in research on social impacts of forestry development in rural areas by Smith 1982; Makin and Smith 1982; and Smith and Wilson 1982. Other research findings suggest it would be unwise to assume all rural communities would have the same responses towards forestry development or that forestry development has the same economic implications for all communities (Marwick 1981).

Smith (1981) found that existing rural communities see large scale conventional forestry as 'a threat on four counts.'

1. Because it is usually a large-scale land-user, forestry immediately contravenes a fundamental ethic of property norms bound up in the private ownership of small land holdings. These "property" norms permeate much of New Zealand society and they are not specifically tied to either the rural or the urban setting;
2. Forestry tends to bring into a community a new category of person whose economic interests and social views are seen to conflict with those held by the established local "power elite". This latter group sees a possible undermining of their political security;

3. Forestry introduces a style and form of work that is considered to be incompatible with the local work patterrns. Greater routine and a loss of autonomy are seen to characterise these new job opportunities;
4. Forestry introduces a further element of bureaucracy into rural regions. As this generally implies reduced decision-making at the local level, there is concern about the possibility of local interests being sacrificed to the whims of some externally controlled source. (Smith 1981)

Research by Marwick (1981) demonstrated that the expansion of forestry onto farmland can reverse the social and economic decline of rural communities and therefore be perceived to have positive social impacts. This research studied the impact of an expansion in forestry activity in a predominantly Maori area of Northland. The forestry development taking place included some on Maori land and in a nearby state forest. It should be stressed that the community was involved in the decisions to establish the forest and it was not a case of the state or a company simply beginning planting on land in the community without warning or consultation. Most of this area of Maori land planted was dairy farms established on tribal land, but the productivity of these farms was low and the farms hampered by large debts. The result of forestry development has been an increase in employment and the strengthening of the existing social structure's economic base, which has led to increased population, social cohesion and activity. Many of these benefits have arisen because this forestry development, (which has occured partly as the result of community decisions) and its workforce requirements and characteristics are more aligned to Maori culture than are individual farm enterprises. These benefits would be improved if there were more opportunities for female employment. (This example should not be taken as an indication that any forestry development would be welcomed by Maori people. Indeed there is resentment towards some forestry company actions in the Far North were Maori land is planted in company trees.) This research by Marwick supports the claim that the 'contribution forestry makes depends on the specific physical, biological, economic and cultural conditions that are found' (Smith 1981) in the area. Therefore it is necessary to establish the characteristics of the community before drawing any conclusions as to the likely impact of any change in land use, be it forestry or anything else.

A number of Northlanders have expressed concern about the establishment of forestry on pastoral farmland and the findings of the different research discussed above suggest the impacts of forestry development on pastoral farmland are by no means clear cut and that Northlander's interest and concern about those impacts are understandable. This interest and concern is reflected in the Northland United Councils statement of regional planning issues and priorities (P13 Northland United Council 1984 1). Under the heading "Joint Pastoral Farming, Forestry and Horticulture Issues" the Northland United Council includes:

'The regional or sub-regional economic and social implications of current and likely future changes

in rural production' and states -

"At present significant changes in land use are taking place as a result of exotic afforestation, horticultural development, and the development or reversion of further land for pastoral farming. These, together with any changes in the mix of pastoral farming and its production per hectare, are major factors in determining the overall level and nature of rural production and employment, the demand for rural servicing, and for processing based on rural production. The annual flow of income generated by rural production affects the economy and the level of employment in the urban areas and the townships of the region. This, together with the nature and level of employment in the rural areas, affects the growth or decline of population in particular areas and hence the demand for population based services such as housing, education and health services. Extensive changes in land use may also affect the rating base of local authorities.

The impacts over the next say 10 years of the changes in the rural economy have not been evaluated. An examination of their implications would give the agencies that will have to cope with any consequent changes a basis for their own planning, and could also provide a basis for seeking changes to current trends and policies."

The research presented in this dissertation is a response to these regional planning priorities and concerns. This dissertation describes a project which attempts to quantify the social and economic consequences of major land use changes, with the research being a scenario based case study on the social and economic impacts of alternative land uses involving pastoral farming and forestry.

THE STUDY OBJECTIVES

A. To analyse the social and economic impact of alternative land use scenarios involving forestry on a micro area of the Northland.

B. To extend the findings under (A) to a larger area of Northland to indicate the impact of changes in the micro area on the surrounding region .

C. To develop an analytical approach which can be used elsewhere to study social and economic impacts of alternative land use scenarios.

Four land use scenarios will be developed to evaluate the differential impacts of increases in forestry operations in areas of pastoral farmland, their relative impacts on production, population, employment, income and expenditure flows will be measured. The four scenarios are:

1. Pastoral farming

2. Conventional large scale forestry integrated with existing pastoral farming. (This is the form of the great majority of the exotic afforestation that has taken place in Northland over the last ten years.)

3. Farm woodlots integrated with existing pastoral farmland.

4. Agro-forestry integrated with existing pastoral forestry.

Thesis Outline

Chapter Two presents a description of the study area, it's settlements and it's physical characteristics.

Chapter Three discussses the research methodology, plus the design and administration of the farm questionnaire. It concludes with comments on farm accounts.

In Chapter Four the results of the questionnaire are presented. These results give a detailed picture of the study area farms and represent the Pastoral Farming Scenario. The attitudes of the study area farmers towards forestry and the government's agricultural policy are also presented.

Chapter Five presents the large scale conventional forestry scenario, which details the size of expenditure, employment and timber production impacts the whole study area could produce if it developed as a forest. This is known as the Study Area Conventional Forestry Scenario. The results of a survey which attempted to survey forestry contractor expenditure patterns are also presented.

In Chapter Six the production, expenditure and employment impacts of the forestry scenario constructed in Chapter Four are compared with those of the study area farms. The emphasis is on presenting the differential impacts.

Chapter Seven presents the Sub Area Conventional Forestry Scenario. Here a portion of the study area is developed as a conventional forest and the impacts of this compared with the sub area farm production, income, expenditure and employment forgone. The results of the sub area scenario allow comparision with chapters 4 and 5 to see if a proportionately smaller forestry development has proportionately the same impacts.

In Chapter Eight the woodlot and agroforestry scenarios are constructed and presented.

Chapter Nine considers the multiplier implications of the farming and large scale conventional forestry scenarios. The processing implications of the large scale forestry scenarios are also discussed and the

total impact implications of the farming and forestry scenarios compared.

In Chapter Ten the total impact of all the scenarios are compared, then the summary, implications and conclusions of the research are presented.

TWO - THE STUDY AREA

2.0 Introduction.

This chapter presents a decription of the study area, its settlements and physical characteristics. This description is designed to make the reader aware of the variety of physical conditions existing in the study area and highlight its general physical suitability for both forestry and farming. The description shows the location of the study area and its settlements in relation to the rural servicing centres of Dargaville and Whangarei, it also shows road links.The description of the topography, vegetation and soils is assisted by the use of maps and photographs. An outline of the land classes on the study area completes the description.

2.1 The Study Area.

Map 1 shows the study area in relation to it's surrounding area, Dargaville and Whangarei. The study area covers approximately 17104 hectares - 16168 hectares of which is pastoral farmland. This area was chosen primarily because it extends up to areas recently purchased by forestry interests and is a logical area for forestry to expand into, for a number of reasons.

1. Expansion into the study area would enable contiguous forestry blocks to be established.
2. There are established roads, of varying qualitiy, providing access to all parts of the study area.
3. The Tangowahine Valley road provides access to the already established forests and at the bottom of the Valley close to Tangowahine settlement is a river suitable for barge traffic. Also passing through Tangowahine are the railway line and the main Dargaville - Whangarei road.
4. The bulk of the land is physically suited to forestry.
5. A number of farmers indicated to the author that they would be willing to sell to forestry interests.

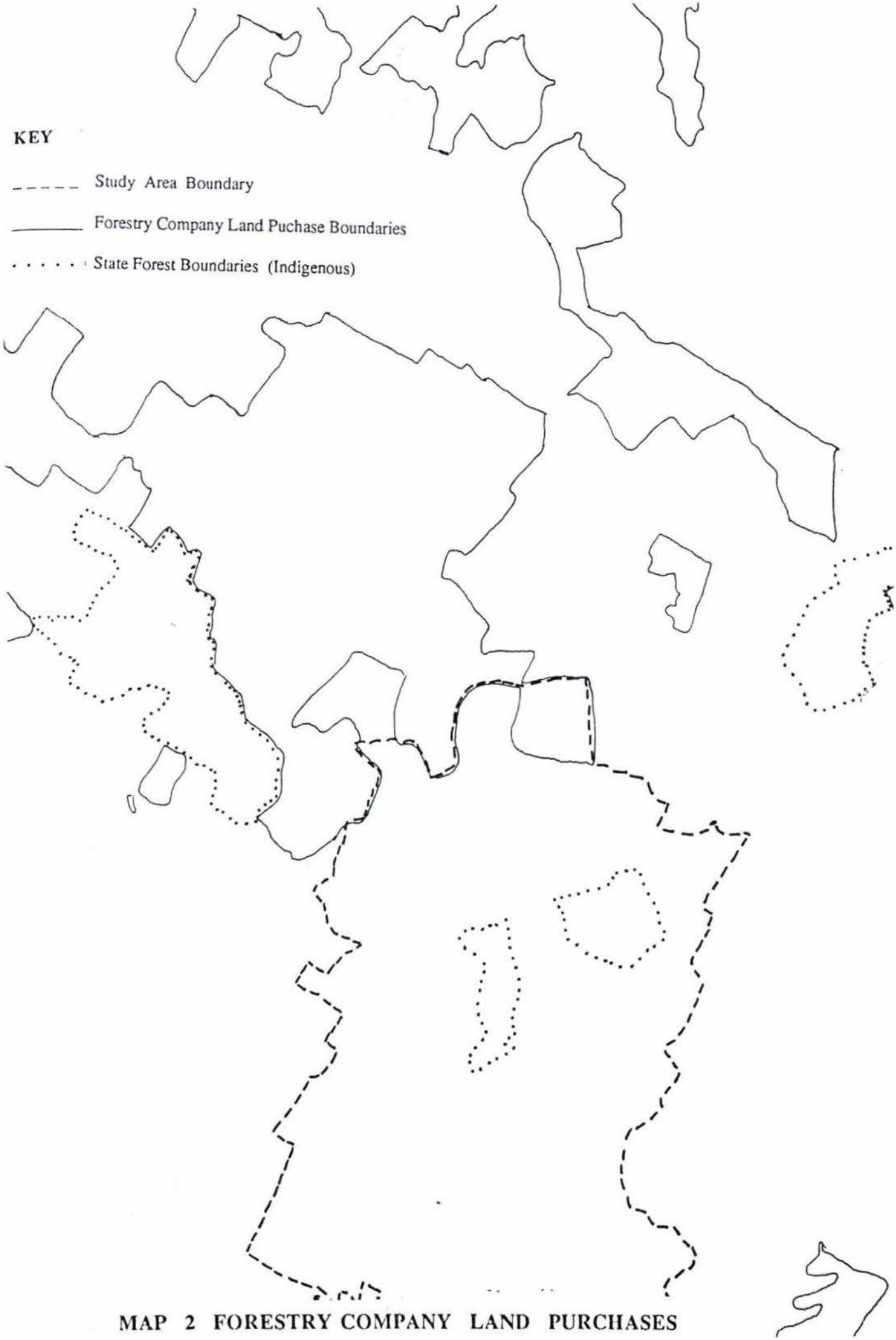
Forestry company purchase of farms in the study area commenced during the field work for the research. This is seen on Map 2, which shows forestry company purchases in and around the study area, it shows that the majority of these purchases are to the north and north west of the study area.

2.2 The Study Area - Settlement and Roads.

The south eastern edge of the survey area is about 1 km west of Tangiteroria settlement, which contains a school, tavern, shop, post office, garage, and Maori meeting hall and is about 30 km along provincial highway 14 from Whangarei. Parakao, on the north eastern edge of the study area is about 44 km from Whangarei and contains a store, post office, school and a playcentre. The store operates a petrol pump and the local post office. There are a number of non farm houses near Parakao as well as a marae. Tangowahine, on the south western edge of the study area, is about 10 km from Dargaville on provincial

MAP 1 STUDY AREA GENERAL LOCATION

Scale 1: 250 000 (Source: NZMS 262 Sheet 3 Dept. of Lands & Survey)



MAP 2 FORESTRY COMPANY LAND PURCHASES

highway 14 and about 47 km from Whangarei along the same route. Tangowahine has a school but no store or post office. The railway line between Dargaville and Whangarei passes through Tangowahine, on the banks of the Northern Wairoa river - in the past a major log and timber transport route which remains suitable for log carrying barges. Avoca settlement has a community hall but the school closed many years ago and there are not any retail outlets. (1)

The number of long established, relatively close European settlements is a reflection of the topography and dense bush which originally covered the area .

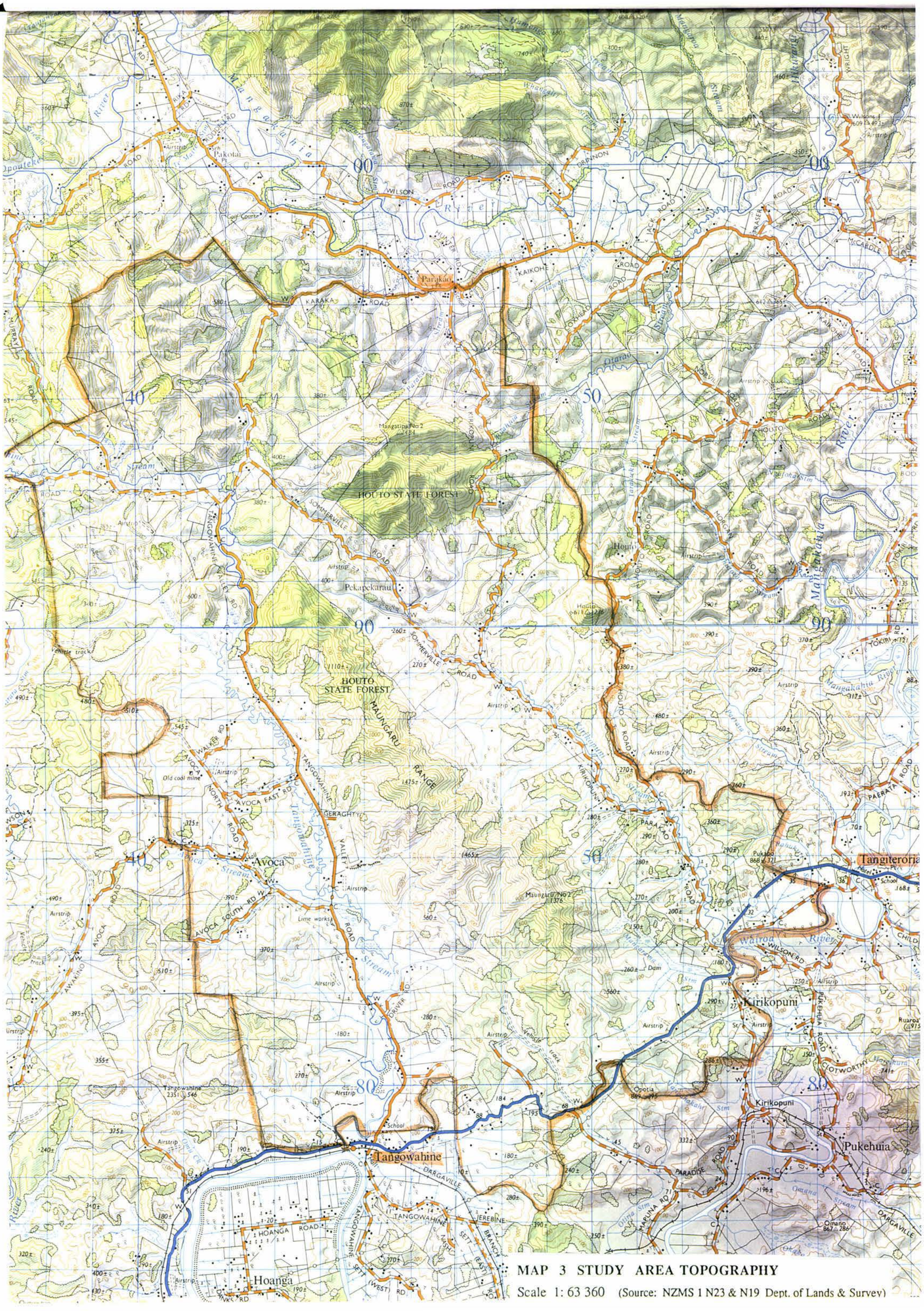
As is typical of many parts of Northland, the roads in the study area vary greatly in quality, from sealed to metalled, potholed roads subject to slumping. The Tangowahine Valley road is sealed to near the Karaka -Sommerville road intersection. The metalled Upper Tangowahine Valley road to Murray road is wide, relatively flat and can easily carry present agricultural traffic. The Tangowahine and Upper Tangowahine Valley roads provide access to the forestry operations currently concentrated to the north of the study area - the sealed and unsealed parts of this road could take a significant increase in at least light traffic .

All the roads in the Avoca area are metalled and narrow with some slumping on Avoca North Road. Parts of the Avoca roads are winding and some could not take a significant increase in light traffic without a noticable deterioration in road quality. Karaka Road is narrow, winding and during the wetter parts of the year troubled by slips and slumpages. The nature of this road is such that it isolates nearby Parakao from the Tangowahine Valley and would be pressed to cope with any increase in traffic. The Sommerville, Kirikopuni and Houto Roads are winding and narrow in many places. Although Kirikopuni Road is quite flat and is being widened south of the Houto - Kirikopuni Road intersection, none of these roads are capable of taking a sustained increase in heavy traffic, especially when they are wet.

2.3 Topography (Refer to Map 3 and the photographs)

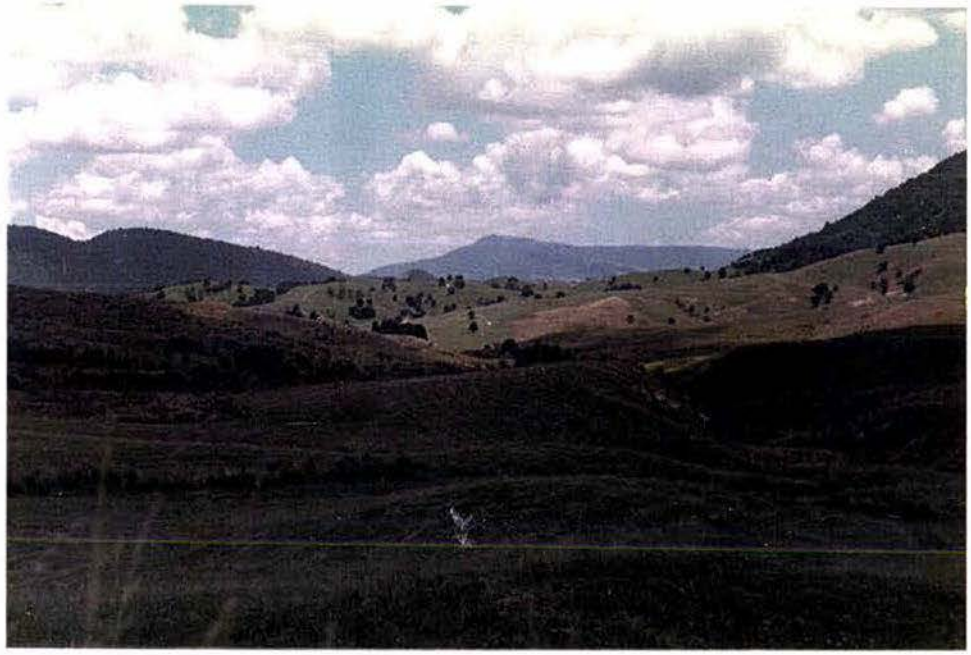
The study area topography varies from swamp to steep hill country, with the dominant landmarks the Mangaru Range and the high feature covered by the Houto State Forest.

The small part of the study area south of highway 14, consists of well developed rolling to hilly pasture, with a small area of flat pasture to the extreme south east along the Wairoa River. North of highway 14, the main topographic feature is the steep Maungaru Range, which rises to 442m (1475 feet), which separates the Tangowahine Valley on the west from the Kirikopuni Valley. The Tangowahine Valley is considerably wider and flatter than the Kirikopuni Valley, (see map and photographs). The Tangowahine stream runs the length of the Valley, it can, and does, flood quickly. Residents state that flooding has become more


Pakotai
Parakao
KAIKOHE
HOUTO STATE FOREST
Houto
Pekapekarau
HOUTO
STATE FOREST
MAUNGARU RANGE
Avoca
Tangowahine
Hoanga
Kirikopuni
Pukehuia
Tangiteroria
Maungatipa No 2
1484
Maungaru No 2
1376
Tangowahine
2351 546
Houto
611 276
Omano
867 286
Pukako
868 321
WILSON
RIVER
KARAKA ROAD
SOMMERVILLE ROAD
TANGOWAHINE VALLEY ROAD
AVOCA NORTH ROAD
AVOCA EAST RD
AVOCA SOUTH RD
AVOCA ROAD
WALKER RD
GERAGHTY
DARGAVILLE
HOANGA ROAD
TANGOWAHINE MARSH SETT (EAST) BRANCH
TANGOWAHINE MARSH SETT (WEST) RD
JEREBINE
DRIVER RD
HUNTER ROAD
JACK ROAD
FRASER ROAD
McCARDLE
CORHEAD ROAD
KAIKOHE ROAD
MORVILLE ROAD
HOUTO ROAD
KIRIKOPUNI ROAD
MORGAN ROAD
WILSON RD
PUKEHUIA ROAD
CLOTWORTHY
PARADISE ROAD
HARUNA RD
PAERATA ROAD
YOKIRA
WRIGHT
OPOUTEKE ROAD
Opouteke Stream
Mangarahara Stream
Wharengaiti Stream
Mangakaha Stream
Tauhara Stream
Otarao Stream
Tarakeha Stream
Kirikopuni Stream
Omana Stream
Mangakahia River
Wairoa River
Golf Course
Airstrip
Old coal mine
Lime works
Vehicle track
School
Hall
Dam
Ruaroa
MAP 3 STUDY AREA TOPOGRAPHY
Scale 1: 63 360 (Source: NZMS 1 N23 & N19 Dept. of Lands & Survey)

Top. Taken from the lower part of Sommerville road looking south-east into the Kirikopuni Valley.

Bottom. Taken from SH 14 looking north-east. Mt Houto at the extreme left and the eastern slopes of the Maungaru Range are at the centre edge of the photo.



Top. Kirikopuni road south of Houto State Forest looking north-east. The bush clad slope in the right belongs to the Houto S.F. (Northern portion). The bush on the left covers the northern slopes of the Maungaru Range.

Bottom. Taken on the Upper Sommerville road looking east towards Mt Tutamoe - see Map 1.

gorse and weeds present. However north and west of the Kirkopuni - Sommerville roads intersection the pasture is of better quality on more open rolling country, with weed and rushes less in evidence. The variable pasture cover is indicative of varying farm management efforts on this side of the range.

On the north and south sides of the Upper Tangowahine Valley road is some of the best pasture in the study area. On either side of the Karaka road to where it turns east the pasture is of lower quality with significant areas of scrub and gorse.

Areas around Houto State Forest north to Parakao, east to the survey area boundary and south consist of moderate to good pasture.

2.5 Soils

The dominant soils are the well to moderately well drained, moderately to strongly leached Waiotira clays. There are also large areas of the Te Kie and Takitu series soils, which are weakly to moderately leached, well to moderately well drained soils. Only a small proportion of the study area has moderately to strongly podzolised soils. There are significant areas of poorly drained soils concentrated on and about the water courses.

The attached soil map and legend shows the types and distribution of soils in the study area. The characteristics of the main soil types are discussed below.

2.5.1 Rendzinas and Related Soils

Koniti Clay loam (KNR) exists in a small area in the Tangowahine Valley. These heavy soils have poor subsoil drainage and tend to dry out in summer, but high producing pastures can be established with suitable applications of super and lime

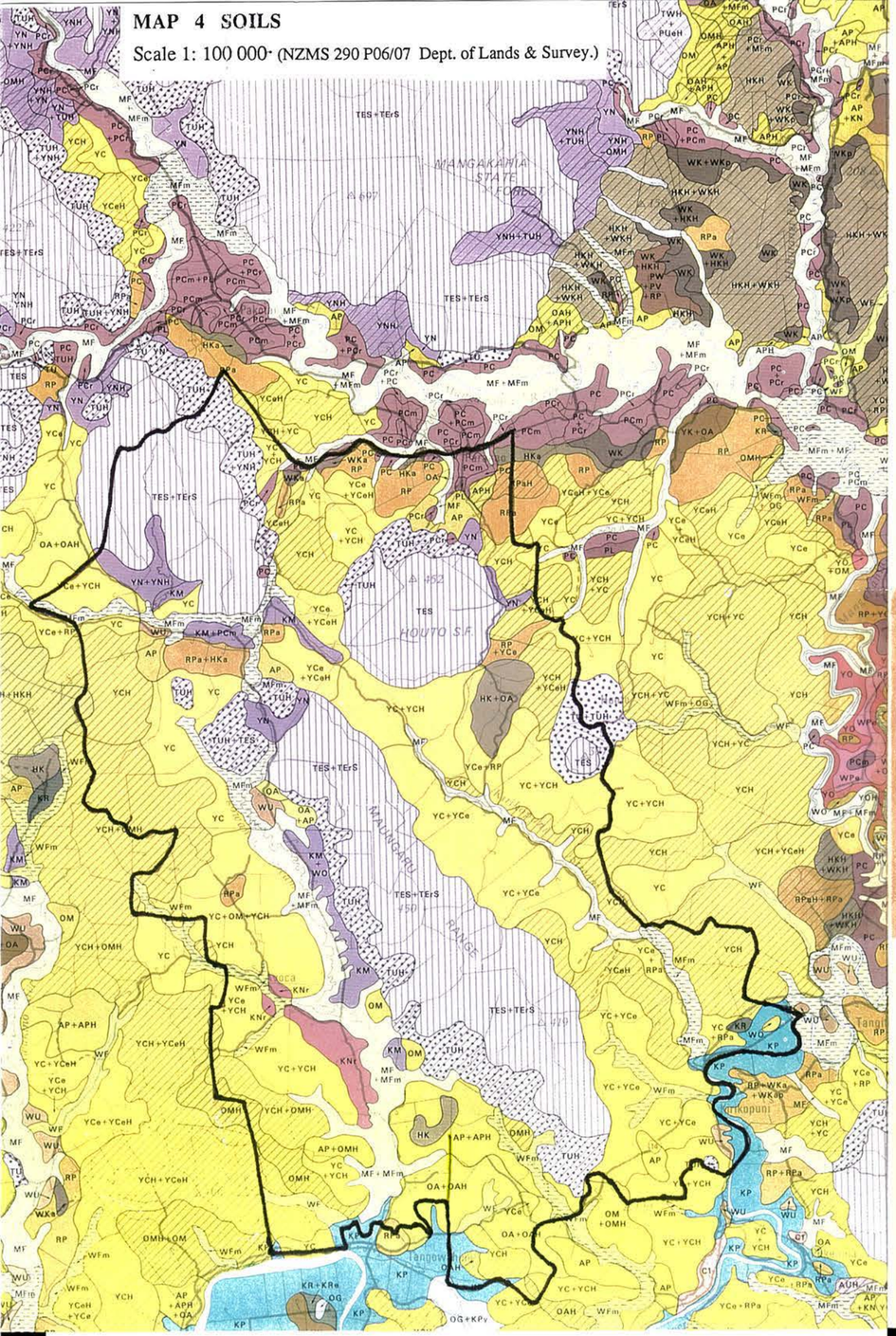
2.5.2 Yellow Brown Earths

Soils of this type cover most of the study area, the most common of the type being Waiotira clays. (YC/YCH and YCE/YCEH) Waiotira clays are moderately to strongly leached and most are well to moderately well drained (YC/YCH). However some Waiotira clays are imperfectly to very poorly drained (YCE/YCEH) these clays being common on the Kirikopuni side of the Maungaru Range.

Other yellow brown earths are: Omu (OMH/OM) and Aponga (APH/AP) which are moderately to strongly leached; and Okaka (OA/OAH) which are strongly leached to weakly podzolised clays. On the south

MAP 4 SOILS

Scale 1: 100 000 (NZMS 290 P06/07 Dept. of Lands & Survey.)



Soils of the Flood Plains

well to moderately well drained

- WF — Whakapara silt loam and clay loam
- MF — Mangakahia silt loam and clay loam

imperfectly to very poorly drained

- WFm — Whakapara mottled clay loam
- MFm — Mangakahia mottled clay loam

Soils of the Estuarine Flats and Former Lake Beds

imperfectly to very poorly drained

- KP — Kaipara clay and clay loam
- KPy — Kaipara peaty clay loam

Soils of the Coastal Sand Dune Complex

excessively to somewhat excessively drained

- PNH — Pinaki sand

well to moderately well drained

- RLa — Red Hill sand
- TTH / TT — Tangitiki sandy loam and sand

imperfectly to very poorly drained

- TEK — Te Kopuru sand
- PZ — Parore peaty sandy loam

Soils of the Undulating Terraces and Lowlands

well to moderately well drained

- PCr — Pakotai brown clay
- KM — Kohumaru clay
- WO — Whareora clay loam
- C1 — Otao-Waitemata-Albany-Coatesville-Otonga complex

imperfectly to very poorly drained

- AB — Albany silt loam
- WE — Waitemata silt loam
- PC — Pakotai clay
- PCm — Pakotai dark grey clay
- PCy — Pakotai peaty clay loam
- KOl — Kamo silt loam
- WU — Waipuna clay
- CV — Coatesville silt loam
- KRa — Kara sandy loam
- KRap — Kara sandy loam with pan
- KR — Kara silt loam
- KRp — Kara silt loam with pan
- KRy — Kara peaty silt loam
- KRe — Kara clay
- OG — Otonga peaty clay loam
- YU — Waipu clay
- YUy — Waipu peaty silt loam and peaty clay

Soils of the Rolling and Hilly Land (cont.)

well to moderately well drained (cont.)

- PUeH — Purua clay loam
- MRuH — Marua light brown clay loam
- AEH — Autea clay loam and silty clay loam
- AW — Awarua clay
- AR — Aranga clay
- C6H / C6 — Waimamaku bouldery complex (series to finalise)
- TO — Tutamoe friable clay
- PPH — Pokapu gravelly silt loam
- PVH / PV — Puketurua sandy clay
- YCH / YC — Waiotira clay loam
- OMH / OM — Omu clay loam
- KUH — Kumurau sandy loam

imperfectly to very poorly drained

- TWH — Tokawhero stony clay
- C8 — Onetai complex (series to finalise)
- YCeH / YCe — Waiotira clay
- AEeH / AEe — Autea clay
- KN — Konoti clay loam
- KNr — Konoti clay
- APH / AP — Aponga clay
- RAH / RA — Rangiora clay, clay loam and silty clay loam
- RPH / RP — Riponui clay and sandy clay
- RPaH / RPa — Riponui sandy clay loam and sandy loam
- PX — Puwera clay
- MA — Mata clay
- PDH / PD — Puketitoi sandy loam
- OAH / OA — Okaka clay and silty clay
- PWH / PW — Pukewaenga sandy loam
- OP — Otaika silt loam
- YKH / YK — Waikare silt loam
- PL — Parakao fine sandy loam
- HKaH / HKa — Hukerenui sandy loam
- HKH / HK — Hukerenui silt loam
- MTH / MT — Motatau clay
- RV — Rockvale clay
- WKa — Wharekohe sandy loam
- WKap — Wharekohe sandy loam with pan
- WKl — Wharekohe fine sandy loam, ash variant
- WKr — Wharekohe silt loam with brown subsoil
- WKH / WK — Wharekohe silt loam
- WKp — Wharekohe silt loam with pan
- Hl — Hihi clay
- AUH / AU — Arapohue clay
- AUd — Arapohue deep clay

Soils of the Rolling and Hilly Land

well to moderately well drained

- HKH / OW — Papakauri silt loam
- OWb — Ohaeawai silt loam
- KB — Ohaeawai shallow bouldery silt loam
- KBe — Kiripaka bouldery silt loam
- WPe — Kiripaka bouldery silt loam with compact subsoil
- OKu — Whakapai friable clay
- YOH / YO — Okaihau gravelly friable clay with dull brown subsoil
- RT — Waiotu friable clay
- TUH / TU — Ruatangata friable clay
- KTH / KT — Takitu gravelly clay loam
- WTH / WT — Katui clay loam
- TMH — Whatoro clay
- YNH / YN — Taumata clay loam
- Waimatenui clay

well to moderately well drained

- TES — Te Kie steepland soils, stony clay loam
- TErS — Te Kie steepland soils, reddish clay loam
- WCS — White Cone steepland soils, sandy clay loam
- TLS — Tautoro steepland soils, clay loam
- Wet swamps (not investigated)
- Hill soils
- Steepland soils
- Mottled soils
- Bouldery soils
- Gravelly soils
- Stony soils
- RLa — Soil boundary

Top. Lower Tangowahine Valley looking north towards the Maungaru Range.

Bottom. Mid Tangowahine Valley looking east towards the Maungaru Range.

Top. Upper Tangowahine Valley looking east.

Bottom. Taken on north-south part of Karaka road looking east into the study area.

eastern side of Houto State Forest there is an area of moderately podzolised low fertility Hukerenui (HK) soil, mixed with Okaka soil. Omu clays are well to moderately well drained, while Aponga and Okaka clays are imperfectly to very poorly drained. To the north of the study area there are pockets of strongly leached to weakly podzolised Riponui series soil, they too are imperfectly to very poorly drained.

With suitable applications of super and lime these soils will support good pasture, though the more strongly leached soils require more fertiliser to achieve the same results.

2.5.3 Brown Granular Loams, Clays and related steepland soils.

The most common of these semi-volcanic soils are the weakly to moderately leached Takitu series (TUH/TU) and Te Kie (TES/TERS) steepland soils.

These soils are well to moderately well drained. The Te Kie soils have "topsoils subject to rapid sheet and slip erosion under pastoral use" and are "excellent soils for forestry and under this use water resources are more adequately controlled (P66 DSIR 1968). The Te Kie series soils dominate on the Maungaru Range, Houto State Forest and an area west of the Karaka road and north of the Upper Tangowahine Valley road. Much of the land already purchased by forestry north west of the study area is on Takitu and Te Kie soils.

Other semi-volcanic soils in the study area include the Kohumaru (Km) and Waimatenui (YNH/YN) brown granular clay/clay loams. These moderately to well drained soils are moderately leached and "require light topdressing to maintain pastures" (P65 DSIR 1968).

2.5.4 Gley Soils

In the south of the study area there are areas of Kaipara clay and clay loam (KP) on the flood plain of the Wairoa river. These areas are imperfectly to very poorly drained soils and drainage works are often necessary to realise the potential of these soils.

2.5.5 Recent Soils

Mangakahia (MF) and Whakapara (WF) silt and clays bands are found along the alluvial 'flats' bordering the Tangowahine and Kirikopuni streams. They are well to moderately well drained. Also present are the Mangakahia and Whakapara mottled clay loams (MFM/WFM) which are imperfectly to very poorly drained.

2.6 Rainfall

There is only one metorological office rainfall station in the study area, situated at Parakao. Rainfall figures for this and 3 other relatively close stations are presented in Tables 2.1 and 2.2. (Waimatenui is to the north west of the study area, Mamaranui to the west of the study area, to the north of Dargaville. See Map 1.)

Table 2.1 Normal Year Annual Rainfall

1. Waimatenui	2049 mm	3. Mamaranui	1336 mm
2. Parakao	1532 mm	4. Dargaville	1249 mm

Distribution of rainfall through the year is shown in Table 2.2 for 1983, which was a drought year.

Table 2.2 Monthly Rainfall Distribution (mm)

	Waimatenui	Parakao	Mamaranui	Dargaville
J	38	37	61	75
F	119	51	63	44
M	55	63	38	37
A	181	126	137	129
M	129	104	92	74
J	330	233	211	160
J	118	95	78	58
A	117	78	65	87
S	174	100	82	73
0	223	175	153	155
N	40	29	12	15
D	175	113	99	87
	1699	1204	1091	994

These rainfall figures exhibit the typical Northland characteristics of a wide variation in rainfall from month to month, and a marked concentration of rainfall. At Parakao for example, 19% of the year's total fell in June. The intensity of the rainfall at different times of the year compounds the wetness limitation and poor drainage of some of the soils in the study area. Additionally this intensity of rainfall increases the potential for erosion, especially when land has been cleared.

2.7 Study Area Land Use Capability and Site Indexes

Land use capability classes indicate the agricultural and horticultural potential of an area, while site

indexes are a measure of tree growth potential. The land use classes present in the study area are shown in the accompanying map and explained in the extended legend contained in Appendix 2.

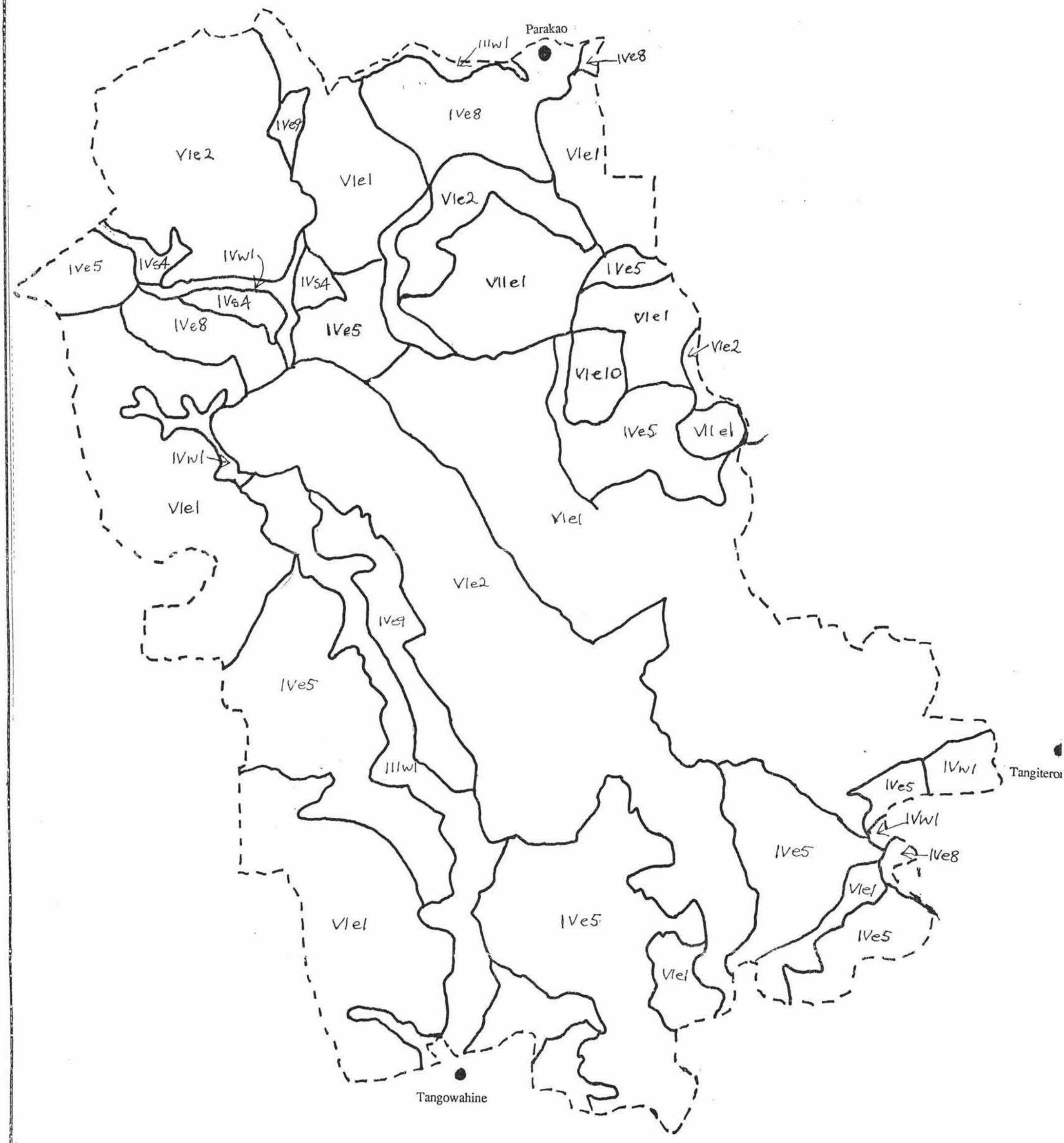
Table 2.3 lists these land use capability classes and the corresponding Northland average stock units per hectare carried on each class. In the third column the average carrying capacity for the study area's three largest land use classes are listed. (For the other classes the areas are either too small or too fragmented across farms to permit any realistic average carrying capacity to be calculated). The fourth column lists top farmer's carrying capacity and the fifth the potential stock carrying capacity, given the application of present technology. All figures apply to Northland farms. The sixth column contains the site index corresponding to each land class, which measures the predominant mean height at 20 years for Pinus Radiata. However, significant variation in tree growth over areas with the same site index and the absence of long term operational experience mean that calculated site indexes are of general interest only to the forestry industry (D Albert, pers comm).

Table 2.3 Northland Land Use Capability

Land Class	Northland SU/ha av	Study Area SU/ha av	Top Farmer	Attainable Potential	Site Index
11w2	14		17	23	28-30
111w1	11		17	23	23-27
1Ve5	10	11	16	18	24-27
1Ve8	12		16	18	22-26
1Ve9	13		17	17	23-27
1Vw1	11		13	15	22-25
1Vs4	10		16	18	23-26
V1e1	10	10	15	16	22-26
V1e2	8	11.5	12	15	24-27
V1e10	9		12	15	24-27
V11e1	6		10	11	22-26

Source: Northland Land Use Capability Maps, Wheeler & Moran 1984.

A higher site index for an area suggests it will also have a higher stock carrying capacity - but this is not always the case. For example, in Table 2.3 Class 1Ve8 land has a higher stock carrying capacity than Class 1Ve9 land but this is not the case when comparing the site indexes applying to these land classes.



MAP 5 STUDY AREA LAND CAPABILITY

Scale 1:100 000

KEY

Study Area Boundary

Land Capability Zone Boundaries

Table 2.4 indicates the respective low, medium and high ranges for stock carrying capacity and site indexes. (From Wheeler and Moran 1984)

Table 2.4 Stock Carrying Capacity and Site Index Ratings

	High	Med	Low
Stock Units /Ha	21-25	11-15	6-10
Site Index	30-35	25-29	20-24

Study of the land use capability map shows that more than one half of the study area is either Class V1e1 or V1e2 land. The extended legend in Appendix 2 states that V1e1 is strongly rolling to moderately steep land currently used for semi-intensive to intensive grazing. Class Ve2 land is strongly rolling to steep and used for semi-intensive to intensive grazing. Both classes have a potential for intensive grazing. However, in the study area these land classes are characterised by semi-intensive grazing only, with a small number of individual farm's carrying capacity being such that 'extensive' would be a more accurate description of their land use.

The next largest area is in class 1Ve5. The legend says this is characterised by undulating to strongly rolling land, presently used for intensive grazing, with a potential for intensive grazing, root and fodder crops. With an average stock carrying capacity of 11 in the study area 'semi-intensive' is a more accurate description of the Class 1Ve5 land use in the study area

.

Class 111w1 land dominates in the Tangowahine Valley. This area of flat river plains and undulating terraces is listed as being used for intensive grazing and cereal cropping with a potential for intensive grazing plus root and fodder cropping. Again, semi-intensive, not intensive grazing takes place in the study area with a small area of horticulture at the southern end of the valley.

There is a significant area of class 1Ve8 land south west of Parakao and in the Upper Tangowahine Valley. This undulating to rolling gumland is listed as being semi-intensively grazed or underdeveloped, with a potential for intensive grazing plus root and fodder cropping . In the study area semi-intensive grazing takes place on this land.

These are the main land use classes in the study area. There are small areas of IVs4, IVe9, IVw1, and VIIe1 class land and in the study area these are all used for semi-intensive grazing.

The data and discussion on the study area's carrying capacity indicates that it is at or slightly above Northland's average which is well below the top farmer and technical potential levels. The study area fits into the low-medium livestock carrying category with 11.2 su per hectare total and 11.8 su per hectare effective. It is best characterised as a semi-intensive grazing area. Similarly the area's site indexes can be categorised in the medium low to medium category. Therefore it can be stated that the study area is a moderately productive farming area with site indexes suggesting that it would be a moderately productive forestry area.

Summary

The study area is basically rectangular in shape with three settlements on its borders and bisected by two main road routes either side of the Mangaru Range. A variety of soils exist in the study area with yellow brown earths dominanting. While low fertility is a limitation in some areas and almost all the study area needs fertiliser, the main limitation is wetness, with both agriculture and forestry preferring free draining soils. The topography is also variable with such a range of topography and soils that while some areas are more suitable for farming than forestry and vice versa, on the basis of physical characteristics the area is moderately suited to both. There is a clearly unrealised physical potential for intensified grazing and cropping in some areas.

(1) The history of Tangowahine, the Tangowahine Valley and Avoca is well presented in: "Tangowahine and Avoca - Schools and Districts", see bibliography .

THREE - METHODOLOGY AND THE FARM SURVEY

3.0 Introduction

This chapter presents the methodology and outlines the purpose and design of the farm questionnaire. A survey was necessary to establish the study farms' population, production, income and expenditure levels. In addition, data on the location and category of farm expenditure was needed to establish the links between the farms, the local and regional economy. With this information the pastoral farming scenario could be constructed and compared with the forestry scenarios. The administration of the questionnaire is discussed and the chapter concludes with some comments on farm accounts.

3.1 Methodology

Within the area there are 59 farms covering 16168 hectares, which were identified from Valuation Department records. A preliminary letter was sent to each farm, introducing the author and explaining the purpose of the research. The next step was the posting out of a farm questionnaire designed to measure the population, production, employment, income and expenditure flows of these 59 farms (The Study Area). Additionally, the questionnaire aimed at identifying the category and location of expenditure flows from each farm. Each of the farms was telephoned and the 57 who agreed to help were visited and interviewed. (See Appendix 3 for a copy of the questionnaire.)

Those businesses which supplied goods and services to the study area were interviewed to establish their size and what proportion of their gross turnover came from the study area. The information from the farm questionnaires was used to construct the pastoral farm scenario while the information from the relevant businesses indicated the importance of the area to the local, Dargaville and Whangarei economies.

The conventional large scale forestry scenario was constructed using information about forestry operations and costs from state and private forestry sources.

The farm woodlot and agro-forestry scenarios were constructed using the recent joint Ministry of Agriculture and Fisheries (MAF) and N.Z Forest Service (NZFS) Northland woodlot/agro-forestry model (MAF/NZFS 1985).

Once the scenarios had been drawn up and compared the impacts of the alternative land uses on production, population, employment, income and expenditure flows could be compared.

3.2 The Farm Questionnaire

To construct of the scenarios outlined in Chapter Two and Appendix 1, the following socio-economic data was needed for the study area:

1. Population data
2. Farm livestock and production statistics
3. The income and expenditure flows between the farms and the local and wider economy.

That is :

a. How much the farms earned and how they earned it.

b. How much the farms spent to run the farms and farm households - what, who and where they spent it.

The research was also aimed at finding out the farmers attitudes to conventional, agro and woodlot forestry, plus their thoughts on the government's agricultural policy.

To gather this information a written questionnaire was constructed, and along with a series of verbal questions, administered to the 57 of the 59 farms in the study area who agreed to take part in the research.

3.2.1 Questionnaire Design

The central question behind the design of the questionnaire was: What does the area contribute to the social and economic structure of the local area, Dargaville and Whangarei that is likely to change and have a significant impact if the farm's activities change to forestry? A great deal of information, most of it financial, was required from the farms and the written questionnaire's success was completely reliant on the farmers' willingness to divulge details of the farms production, income and expenditure flows. As this research was case study, a high response rate was vital to its success.

Initially the questionnaire was drawn up and discussed within the Department of Agricultural Economics and Business, with the agricultural census and standardised farm accounts providing the basis of most questions. Then the questionnaire was tested and discussed with two farmers living close to but not in the study area. These two farmers had been sub provincial chairmen of Federated Farmers for the study area, knew many of the farmers in the study area and were involved in the farming/forestry issue. This showed that the original questionnaire asked for far too much detail and was also far too long. The number of questions and the detail sought had to be cut back significantly, inevitably the result was a compromise between what was wanted and what could reasonably be expected.

While a mixture of mail and personal interviews had been planned the test runs made it quite clear that to get a high response rate and ensure that all questions were answered all farms should be visited. Some questions were not included in the written questionnaire but asked in the farm interviews. The principle

behind what questions to include in the questionnaire was: "if in doubt or if the information could be obtained elsewhere, take it out."

The financial questions were based on the 1983-1984 accounting year because at the time of the surveying this was the latest financial year for which the farms had received their audited accounts.

3..2.3 The Questionnaire Layout and Comment

The questionnaire was divided into six sections and, where relevant, comments are made under each section heading. The six sections were:

A. Basic Farm Statistics
B. Farm Population and Residency Information
C. Farm Employment
D Farm Income for the 1983-1984 Accounting Year
E. Farm Expenditure for the 1983-1984 Accounting Year
F. Personal Drawings 1983-1984

D. Farm Income: Additional questions asked at the time of the interview covered a breakdown of sheep sales and income. (This question was missed out through a typing error which was not picked up during checking). Farmers were also asked to give a breakdown of 'Other income.'

E. Farm Expenditure: Questions were not asked about all areas of farm expenditure. Expenditure classes that would be insignificant in terms of total farm expenditure and/or the local or Dargaville economy were excluded; for example, seed and electricity expenditure. Freight and shearing expenditure information was collected separately from the main questions.

A question on freight expenditure was not included because during the questionnaire trial it was found that, due to subsidies and the method of deducting freight charges from gross income, the farm accounts did not give a true picture of the freight business generated by the farms. Instead those freight firms that received a significant part of their business from the survey area were approached and asked for assistance. They detailed their total turnover and the amount the study area farmers contributed to this total turnover.

To get shearing expenditure figures initially farmers were asked only who did their shearing. The intention was that the shearers, who were to be interviewed in any case, would be asked the total amount they had earned from the study area farms. Unfortunately one of the shearers was overseas and after interviewing the rest it was clear that to get more than general figures on shearing expenditure the farmers would have to be approached again.

Initially getting detailed information on the location of expenditure - such as the actual shops and businesses used and the amount spent in each - was the aim, but getting information at this level proved to be totally impractical. In the end farmers were asked to give an estimate of farm expenditure split between Dargaville and Whangarei. They were also asked to state where major items of expenditure were purchased.

F. Personal Drawings.

There was a very wide range in figures for farm monthly housekeeping budgets, with many farms not really sure what they spent per month on housekeeping.

3.2.4 Questionnaire Administration Procedure

An initial letter was posted out to the 59 farmers in the study area introducing myself, explaining the purpose of the research and explaining why their help was needed. This letter also said that a questionnaire would be sent to them shortly. Ten days to two weeks later the questionnaire was posted out with another letter, again explaining why the farmers help was needed and saying that I would be phoning them to ask for a personal interview. A covering letter from Federated Farmers, signed by the two farmers who had helped with the survey design and who were known to most of the study area farmers, was included.

Of the 59 farmers phoned 57 agreed to help. The main reasons for the high response rate were:

1. That every farm would be visited
2. The covering letter from Federated Farmers
3. The research topic is a highly relevant one that the farmers could relate to.

In the vast majority of cases the farmers answered every question. Some problems were caused by variations in farm accounting procedures which meant that for a small number of farms, the farm expenditure catagories in the questionnaire did not match those in the farm accounts. However, a close look at the farm accounts enabled accurate figures for the questionnaire categories to be obtained in most of these 'problem' cases. Filling out the questionnaire usually took between 30 minutes and an hour. In some cases the farmer waited until the interview to fill out the questionnaire and if the farm accounts were present then by working together the questionnaire could be answered in 20 minutes.

The questions and discussions about the various forms of forestry, forestry company activity, farming and government agricultural policy lasted over two hours in a number of cases, (and included numerous cups of tea, cookies, a delicious spaghetti bolognaise and an excellent home made fruit salad!) Though they were time consuming and expensive, the farm interviews were a thoroughly rewarding, interesting and informative experience. A mail only questionnaire would have brought a mediocre response and the

queries raised by some of the answers would have necesitated much time spent on follow up procedures. A number of farmers stated that they were willing to co-operate because they knew they would be visited. As it worked out, the best way to have the interviews was one each in the morning, afternoon and evening, because when more were arranged one interview would often have to be cut short in the middle of a worthwhile discussion to get to the next.

An alternative to farmer surveys would have been to use MAF representative farm model expenditure and income data to calculate the production, income and expenditure arising from the study area farms. However this would not have given information on the direction of expenditure and would have led to less accurate estimates of the relative importance of different expenditure categories. In Part D Appendix 3, a comparison of MAF farm model and farm questionnaire derived expenditure flows is presented.

3.3 Farmers and Farm Accounts

The interviews brought home the point that almost none of the farmers used farm accounts as a management tool. In a number of cases the filling in of the questionnaire was the first time the farm accounts had been looked at, and for almost all farmers farm accounts were seen as a "for tax purposes only" document. There was a considerable variation in the format of farm accounts. In a number of cases farmers disagreed with at least one figure contained in farm accounts and could not understand how it had been calculated. Any moves to encourage farmers to use their farm accounts as management tools must be supported - especially under the prevailing economic conditions.

A change in former attitudes to farm accounts would be encouraged if farm accounts contained more than just columns of tax orientated figures. Farmers were interested in information given to them by the author in figures and graphs on income per stock unit by livestock class and about expenditure by category in raw and percentage terms. They also expressed interest in income and expenditure trends expressed in real and nominal terms over a number of years. The inclusion of the above information, preferably using charts and graphs, would encourage the use of farm accounts as a management tool.

FOUR - QUESTIONNAIRE RESULTS

4.0 Introduction

In this chapter the results of the farm questionnaire are presented and discussed in two parts. The first part contains statistics from the study area farms on production, employment, income and expenditure, it also presents a breakdown of expenditure by location and category. The income and expenditure flows, population and employment levels measured by the farm questionnaire make up the pastoral farming scenario which is compared with the forestry scenarios. The results are not presented in complete detail in this chapter, but are contained in Appendix 3. In the second part the study area farmers' attitudes towards forestry and government agricultural policy are outlined with the detailed opinions about farm forestry in Appendix 3.

4.1 Questionnaire Results

Table 4.1 contains a statistical summary of the study area farms. The results are presented in more detail after Table 4.2

Table 4.1 Study Area - Statistical Summary

STUDY AREA SIZE		
Study Area Farms Total Area (59 farms)		16168.ha
Area surveyed (57 farms)		15337.ha
On farm more than 1 year (56 farms)		15117.ha
Area regularly grazed		14361.ha
TOTAL LIVESTOCK CARRIED (Head)	June 84	June 85
Sheep	70,114	78,916
Dairy Stock	3,701	3,841
Beef Cattle	11,525	12,113
Breeding Cattle	3,900	3,676
FARM HOUSES AND POPULATION		
Total on farm houses		78
Total on farm population		300
Total number of school pupils		87
FARM EMPLOYMENT	June 84	June 85
Fulltime working owners , managers, shareholders leaseholders	78	81
Unpaid family members	7	6
Permanent Employees	18	16

Table 4.2 presents income and expenditure data collected off the farms, with expenditure being 87% of farm income.

Table 4.2 Study Area Farm Income and Expenditure

Farm Livestock Income (1983/84 $)	
Beef	1,507,622
Dairy	1,212,256
Sheep	1,703,635
Other Livestock	16,351
Total	4,439,864
Farm Expenditure ($) 1983/84	
Farm expenditure	3,360,687
Plus personal drawings	510,666
Total	3,871,353

4.2 Basic Farm Statistics

1. Farm Area

The 57 farms whose owners agreed to help covered 15,337 hectares. One of these farms had been occupied by its present owner for less than one year, so detailed income, expenditure and production data for 56 farms was gained. These 56 farms had an area of 15,117 ha. with 14,361ha (or 95%) regularly grazed.

2. Livestock Statistics

The study area livestock statistics are presented in Tables 4.3, 4.4 and Figure 4.1 . Table 4.3 contains data on livestock numbers while Table 4.4 concerns stock unit numbers. Figure 4.1 illustrates livestock numbers in June 1984 and June 1985 . Complete data was not collected from all farms, so that a partial comparison only of livestock numbers over five years was possible. Sheep numbers on 32 farms could be compared between 1980 and 1985 and on these farms sheep numbers had increased by more than 10.0%. For the 37 farms where beef cattle numbers could be compared between 1980 and 1985 numbers had declined by about 1%. Current indications are that beef numbers are increasing at the expense of sheep numbers.

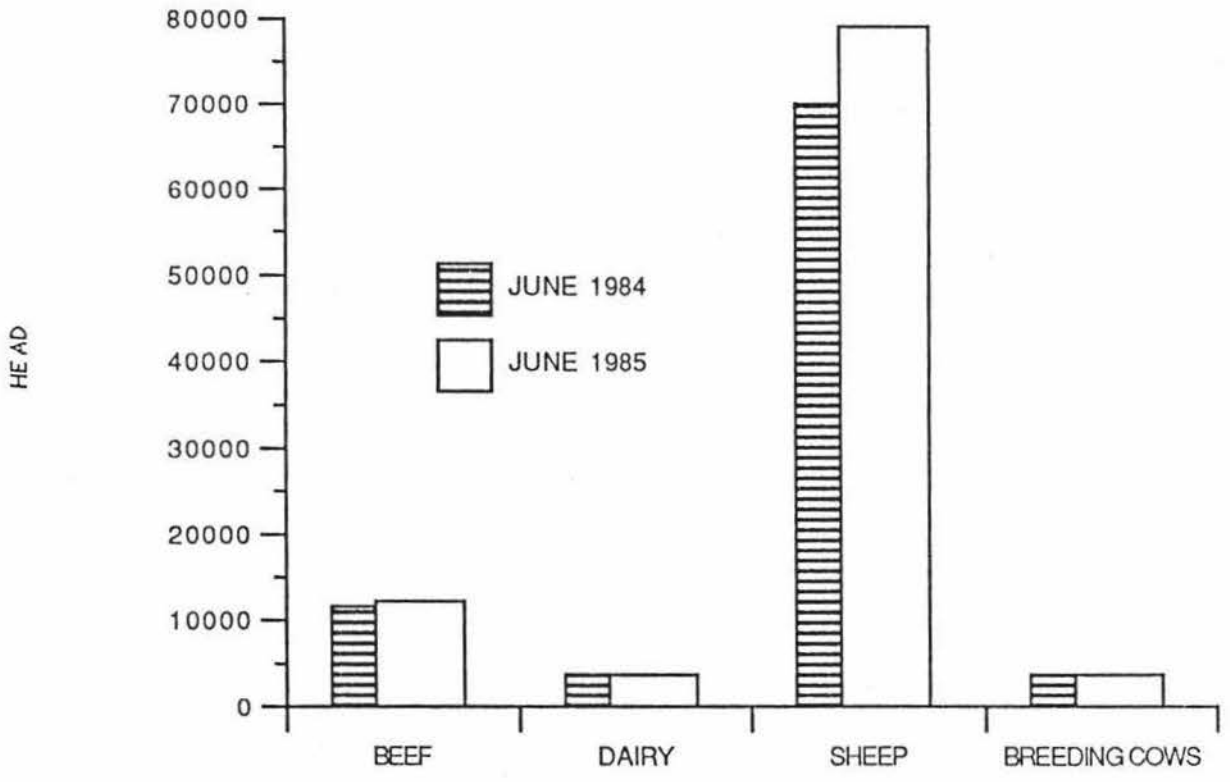
Stock Units Calculations

The following conversion factors were used:

Ewes	=	1.0su;
Other sheep	=	0.7su;
Beef cattle	=	4.5su (average),
Breeding cows	=	6.0su
Dairy stock	=	6.0su (average).

Table 4.3 Livestock Statistics

Livestock Type	June 1980	June 1984	June 1985
Sheep			
Farms with:	38	39	39
Data from:	32	38	38
Ewes:	38,466	54,423	52,930
Total Sheep	58,047	70,114	80,416
Dairy			
Farms with:	23	24	24
Data from:	22	23	24
Non milking:	1	2	3
Total Dairy Stock	3,048	3,701	3,841
Beef			
Farms with:	44	46	46
Data from:	40	45	45
Total Beef Cattle	9,824	11,525	12,113
Breeding Cows			
Farms with:	36	34	35
Data from:	31	33	34
Total Breeding Cows	3,746	3,900	3,676



4.1 STUDY AREA FARMS LIVESTOCK NUMBERS

Table 4.4 Stock Unit Breakdown

	Stock Units	% of Total
Beef	55,746	32
Sheep	71,970	42
Dairy	23,046	13
Breeding Cows	22,056	13
Total	172,318	100

To put these figures in some context, the following figures are presented for Hobson County - 86% of the study area being in Hobson County. (The rest of the study area is in Whangarei County). Table 4.5 shows that , compared with Hobson County as a whole, the study area has a higher proportion of its land in grass. It also carries a higher proportion of beef and sheep, but a much lower proportion of the dairy stock. Discussions with the Northern Wairoa Co-Op Dairy Company indicated that, generally speaking, the study area is comparatively unsuited for dairying when compared with other areas, such as around Ruawai.

Table 4.5 Comparison Table (June 1984)

	Study Area	Hobson C.	%
Sheep	70,114	442,224	15.9
Dairy Stock	3,701	70,115	5.3
Beef Cattle	11,525	75,948	15.7
Breeding Cows	3,900	35,144	11.1
No. of Farms	57	938	6.1
Total Farm Area	15,337	170,626	9.0
Grassland	14,550	127,176	11.4

4.3 Farm Population and Residency Information

The aim of this section of the questionnaire was to identify the total number who lived and were dependent on the farm for their livelihood. That is, the people likely to move if the farm was sold to forestry.

Farms Supplying Data:	57
Number of farms with occupied houses:	53
Total number of occupied houses:	78
Total living in these houses:	300

Houses were divided into 3 categories:
Main farm houses = houses lived in by the farm owner, manager or senior partner and that are on the farm.

Other farm houses = houses where farm employees, share milkers and other partners live and are also dependent on the farm as their main source of income.

Non-farm houses = those houses on the farms surveyed which have no member of the household dependent on the farm for his or her main source of income.

The number of people living in 'Main farm' and 'Other farm' houses indicates the possible population impact of the farms being sold to forestry interests. Table 4.6 shows that of the 78 houses on the study area farms, 64 households, containing 267 people, depend on the farm for their main source of income. That is, about 89% of the study area's on farm residents are dependent on the farms as their households main or only source of income.

Table 4.6 Study Area Farm Households & Population (57 Farms)

Farm Dependent Households	
(I.E "Main Farm" and "Other Farm" households)	64
Residents in these 64 houses	267
Non-Farm dependent households	
(I.E "Non-Farm" Households)	14
Residents in these 14 houses	33

Should all of the study area be sold to forestry interests and none of these farm dependent households be occupied, this figure of 267 represents the maximum population loss from the study area.

A major concern of those living in rural areas is that a declining population will cause their local school to close down, so the questionnaire contained questions about school attendance. The answers to these showed that as at June 1985 there were 105 pre-school or school attending children in the study area. Of the 105, 98 came from households dependent on the farm for their main or only source of income . The other 7 children came from non-farm dependent households.

Tables 4.7 and 4.8 show where the children attend or will attend school and the size of the schools they attend, which indicates the present and future impact of the study area children not attending those schools. (Parakao and Tangowahine primary schools are within the study area,Tangiteroria is just outside the study area boundary but is considered as being 'in' the study area. for the purposes of the research.) Table 4.7 shows that Tangowahine School has the highest proportion (40%) of it's roll made up of pupils from the study area. The study area is also very important to Tangiteroria school (30% of total pupils) and provides a significant percentage (14%) of the Parakao school roll. Schools with small rolls, such as

Parakao, can and are significantly affected by the loss or addition of a small number of pupils because threshold levels for changes in the number of teachers at the schools can be reached with just one family leaving the district. The possible impact of forestry on the schools is discussed in Chapter 6.

Table 4.7 Study Area School Rolls

School	School Roll	Teachers	Pupils from Study Area
Parakao	44	2	6
Tangowahine	55	3	22
Tangiteroria	80	4	24

The following applies to Table 4.8:
KEY: P=Parakao TGT=Tangiteroria T=Tangowahine M=Mangakahia Area School D=Dargaville High School W=Any Whangarei School E=Any School Elsewhere
Note that Mangakahia is a combined primary and high school.

Table 4.8 School Attendance/Intended Attendance

	P	TGT	T	M	D	W	E	Total
Primary School (Intended)								
Main Farm Houses	1	6	6	2				14
Other Farm Houses				3				3
Non Farm House				1				1
Primary School (Actual)								
Main Farm Houses	6	20	13	2		1	1	43
Other Farm Houses		1	6				2	9
Non Farm Houses		3	3					6
Secondary School (Intended)								
Main Farm Houses				6	38	7	2	53
Other Farm Houses				2	10			12
Non Farm Houses						1		1
(Unsure: 4 Main Farm and 2 Other Farm between W and D Unknown: 4 Non farm)								
Secondary School (Actual)								
Main Farm Houses				2	24	1		27
Other Farm Houses					2			2
Non Farm Houses								0

Table 4.8 shows that Tangowahine school would be most affected if all the farm households became empty.

4.4 Farm Employment Information

This section of the questionnaire aimed at finding out the pattern of employment generated by farmwork, not the farm household. Household work would continue if the household was located in a non-farm environment, so is not included here but it is recognized that the many hours per week contributed to farm households by wives and partners are an integral part of the farm operation.

The farms were overwhelmingly family owned and managed concerns. One farm was worked by a manager, and 3 others by owners living off the farms and commuting to them. Of the total 57 farms surveyed, 53 were owned and /or managed within the context of a male/female couple with or without children running the farms. Where wives/partners were stated to work on farm business, their work often included organising the farm accounts.

The tables show that in June 1984 the farms provided on farm employment for 103 people and part time for another 45. In June 1985, full time employment was also provided for 103 people but for 2 fewer full time employees, with the decrease being offset by an increase in female working owners. From the farm interviews this increase in female working owners was for tax reasons rather than because the female partner has increased the number of hours worked on the farm. It is therefore accurate to say that farm employment decreased slightly from June 1984 to June 1985. However, no conclusions can be drawn from this data as to farm employment trends for obvious reasons. There were 16 full time employees in June 1985 and14 of them lived on the farm that employed them.

Tables 4.9 and 4.10 give a breakdown of farm employment, for June 1984 (56 farms) and June 1985 (57 farms).

Key: W= Working owners, managers, leaseholders, shareholders

U= Unpaid family members assisting with farm work

P= Permanent farm employee

Table 4.9 Farm Employment June 1984 (56 Farms)

	30 hours or more per week.		Less than 30 hours per week.		Totals
	Male	Female	Male	Female	
W	59	19	2	6	86
U	0	7	19	17	43
P	17	1	1	0	19
Totals	76	27	22	23	148

Table 4.10 Farm Employment June 1985 (57 Farms)

	30 hours or more per week		Less than 30 hours per week		Totals
	Male	Female	Male	Female	
W	58	23	5	7	93
U	0	6	16	10	32
P	14	2	2	0	18
Totals	72	31	23	17	143

The employment figures for June 1984 are used in this study as it is based on 1983-1984 financial and production data.

The figures in Table 4.9 show that in the 1983-84 year there was one full time permanent employee (as opposed to owners, shareholders, etc.) per 3.1 farms in the study area. For Hobson County the respective figure was 4.1, Hokianga County 8.12 and Northland 4.0. The reasons for the differences are not clear but it could be because, on average, the study area farms are more profitable than other Northland farms and are therefore in a better position to employ farm labour.

Wages and Salaries

Only wages and salaries going to permanent farm employees, sharemilkers, farm managers and family members paid for farm work was included. Wages and salaries paid to owners and partners to themselves were excluded from this section, and included under Personal Drawings. In the 1983-84 year wages and salaries payments totalled $167,503, with the distribution of wages as follows:

Table 4.11 Distribution of Wages and Salaries

Salary bracket ($)	Number Receiving
12,000 +	6
10,000 - 11,999	0
8,000 - 9,999	5
6,000 - 7,999	4
Less than 6,000	3

Note: No information on wages was obtained for 2 full time and 1 part time employees.

Taking out the one sharemilker and one farm manager from the $12000+ catagory indicates that 75% of farm employees for whom salary/wages information was collected earned less than $10,000. These relatively low wages are significantly higher in effective terms because houses and accommodation are

provided free or at low rents to the people working on the farms.

4.5 Farm Income 1983-84 Year.

Complete farm income data was collected from 55 farms, with an accuracy of plus or minus $40,000 over the total 55 farms income. Incomplete data came from one farm and no data from one other farm , which had been occupied by the current operators for less than 1 year at the time of the farm interview.

Table 4.12 Total Income (1983/84$)

Total livestock income	4,439,864
Total other farm related income	41,188
Total wages from non farming jobs	37,040
Other	5,000
Total	4,523,092

'Other farm related income ' included income from leasing grazing land, work on other farms, and in one case, from a horticultural block.

Table 4.12 shows that more than 98% of the areas total income came from livestock sources. Only one of the study area farms received enough non-farm income to enable the farm couple to live without their farm income. Table 4.13 and income graph in Figure 4.2 below (see section 4.6.1) provide a breakdown of livestock income.

Table 4.13 Livestock Income Breakdown

Beef Income		1,507,622
Dairy Income Total		1,212,256
Butter Fat Income	1,047,868	
Dairy Stock	164,388	
Sheep Income Total		1,703,635
Wool Income	899,441	
Store/Fat Income	808,194	

Northland receives a higher proportion of its agricultural income from beef than the rest of N.Z and the study area's income split reflects this. Comparing the livestock income split with the stock unit breakdown in Table 4.4 indicates the differences in income per stock unit generated by different livestock classes (see Table 4.15.)

In the detailed results in Appendix 3 farm income is broken down by source for each farm, which shows how dependency on different income sources varies amongst the individual farmers. These results also give an indication of farmers' vulnerability to changes in agricultural product prices. They show for example, that seven farmers get more than 90% of their total farm income from beef and that 30 farmers

(53%) receive more than 90% of their income from sheep and beef production. While dairy farmers tend to have a more diversified income base, in that more of them have income from beef and sheep than vice versa, the diversification is not sufficent to enable the dairy farmers in the study area to cope with the dramatic drop in milkfat prices without extensive expenditure cuts.

Justified as calls for farmers to diversify their income sources are, with all farm output prices falling or on their way down, diversification amongst traditional sources of income - beef, sheep and dairying will do little, if anything to maintain farm cash flows. The physical characteristics of the study area suggest that some parts could be used for arable farming and that grazing could be intensified over most areas. But either option requires initial increases in expenditure, which is currently not a realistic option for many farmers.

4.5.1 Farm Production and Income Averages.

To earn their income the study area farmers sold livestock, wool and milkfat as laid out in Table 3.14.

Table 4.14 Farm Production

Beef -	Total head sold (no data 1 farm)	4,752
	Fat Stock	2,550
	Store	2,042
	Not Stated	160
Sheep -	Total head sold	43,747
	Fat stock	30,841
	Store	8,048
	Not Stated	4,858
	Total Wool Sold (kgs)	334,155
Dairy -	Milkfat (kgs)	295,460
	Dairy stock sold (head)	972

Note: Data on the fat stock/store stock split and the amount of wool produced is approximate, to within plus or minus 10% , for five farms.

Average overall gross income was $314 per ha over the grazed area and $297 per ha over the total area, with average prices as in Table 4.15

Table 4.15 Average Prices for Study Area Farm Output (1983/84 $)

Beef -	per head	317.00	per stock unit	27.00
Sheep -	per head	19.00		
Wool -	per kg	2.65	per stock unit	23.80
Dairy -	per kg	3.55	per stock unit	52.60

Note: Dairy income per stock unit income includes dairy stock income.

Over the whole study area average income per stock unit was $26.

4.5.2 Price Changes and Their Impact

A number of price changes have occured since the 1983/84 year. Notably, the supplementary minimum price scheme has ended and milkfat prices have dropped dramatically. The SMP scheme contributed approximately 33% of sheep store and fat income in the 1983/84 year. Adjusting incomes for the removal of SMP's reduces sheep income from $808,194 to $539,065 and reduces total livestock income to $4,170,735. This is equivalent to a 16% drop in sheep income and a 6.5% drop in total livestock income.

A decline in milkfat prices from $3.55 to $3.00 implies that milkfat income would drop from $1,047,868 to $886,380; a drop of $161,488 or 15%. This would mean that overall study area livestock income would drop from $4,439,864 to $4,278,376, a drop of 3.6%. The combined effect of the removal of SMP's and a drop in milkfat price to $3.00 a kilogram would mean a decrease in the 1983/84 study area gross income from $4,439864 to $4,009,247. This decrease of $430,617 represents 9.7% of the overall 1983/84 study area livestock income.

4.6 Farm Expenditure

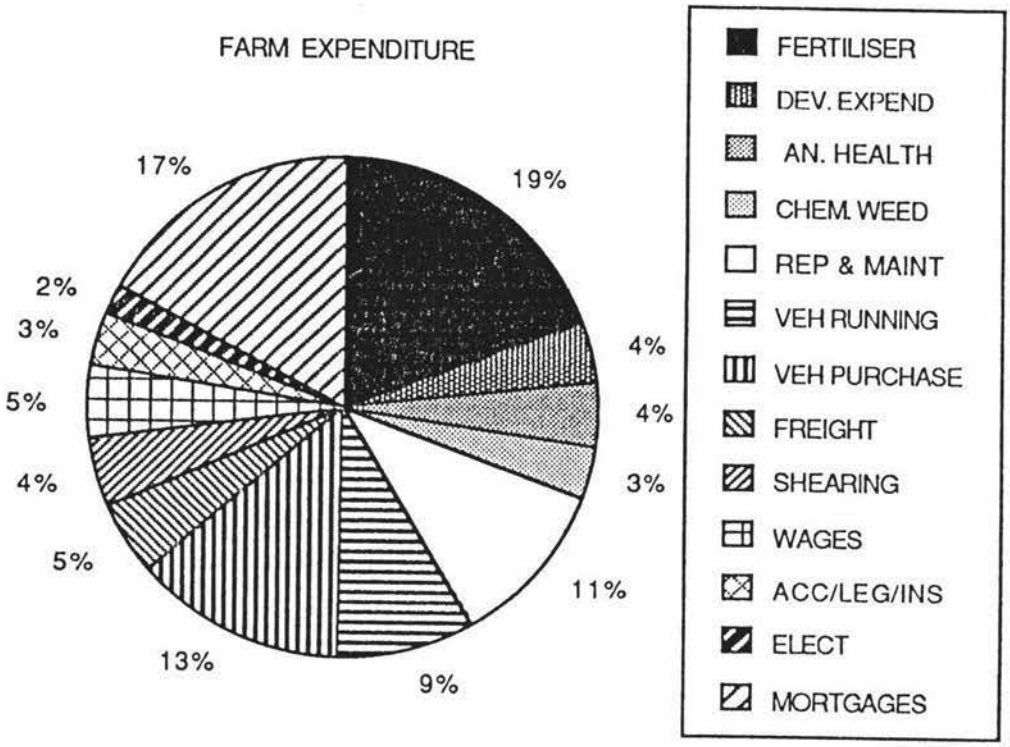
4.6.1 Expenditure Summary

Table 4.16 summarises study area farm expenditure by category. Following this, the direction and size of expenditure flows are outlined. Some figures were not obtained from the farm questionnaire; this is indicated on the table and in Appendix 3 a detailed breakdown of expenditure is presented and commented upon. The table contains information from 56 farms, though not all farms answered all questions or supplied accurate data for all expenditure catagories. The completeness of the data and its accuracy is discussed, where appropriate, under each expenditure catagory in Appendix 3. Figure 4.2 contains a graph illustrating the relative importance of the different expenditure categories and it highlights the importance of fertiliser and mortgage payments to total farm expenditure.

Table 4.16 Farm Expenditure by Category

Category	Amount Spent	How Calculated
Fertiliser	647,992	Survey
Development	126,712	"
Animal Health	141,835	"
Chemical Weed & Pest Control	111,392	"
Farm Repairs and Maintenance	361,593	"
Vehicle Running Expenses	290,702	"
Vehicle Purchase	445,757	"
Freight	165,000	Freight Op/MAF
Shearing	141,200	"
Wages	167,503	"
Accounting	43,014	"
Legal Fees	13,877	"
Insurance	55,539	"
Electricity	65,023	MAF
Loans & Mortgages	563,730	Survey
Sub Total	3,340,869	
Personal Drawings	510,660	Survey
TOTAL	3,851,535	

Total traced and estimated expenditure, including personal drawings, was approximately 87% of total study area income. While the expenditure traced is significantly lower than total income, using total income as the farm expenditure level does not lead to any significant changes in the findings of the research.



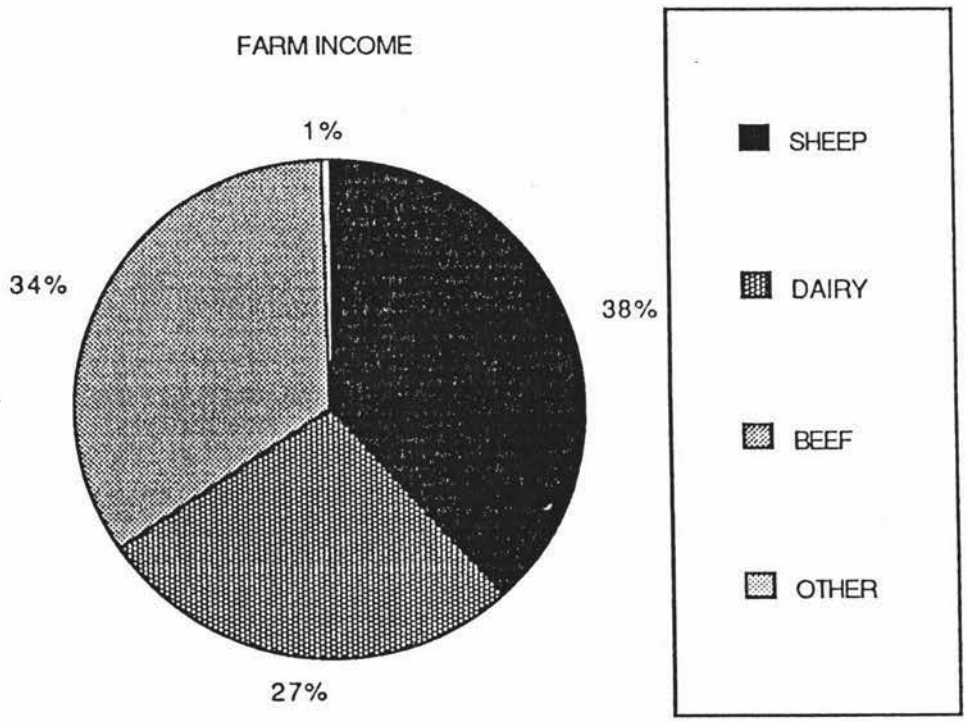


FIG. 4.2 FARM INCOME and EXPENDITURE

Fertiliser

Table 4.17 breaks down fertiliser use by tonnages, type and the method of application.

Table 4.17 Fertiliser and Lime Use (Tonnes)

Type	Air Spread	Ground Spread	Totals
Phosphatic	1,785	1,761	3,546
Lime	366	3,555	3,921
Others		13	13
Unclear		15	15
	2,151	5,344	7,495
Air Spreading Breakdown			
Fixed Wing	1,861		
Helicopter	290		

The study area farms spread 43 kg of fertiliser and lime per stock unit, which compares unfavourably with the Hobson County average of 56 kg per stock unit. A significant number of farms (seven) had not spread fertiliser and five of these would "probably not apply next year."

4.7 The Impact of Changes in Farm Income.

With the financial data collected from the farms their ability to absorb increased farm input costs and/or decreased income can be outlined, which gives an indication of the impact of current market conditions on the farms. In Table 4.18 farms are grouped according to their surveyed cash surplus or deficit.

Table 4.18 Farm Financial Surplus

	Percentage Farm Income Surplus					
	0 or less	1-10	11-20	21-30	31-40	40+
Number of Farms	12	3	6	10	9	13

Note: Income surplus not clear for 4 farms

Table 4.18 shows that 12 farms had a cash deficit in 1983/84 on their farm's income - (non-farm income earned, for example, by an off farm job is not included.) The expenditure used in the compilation of this table was collected from the farm survey and did not include all expenditure items, (such as freight). It therefore portrays an overly optimistic picture of the study area farms' ability to absorb decreases in income or increases in farm input costs.

Prices and income moves since 1983/84 have been significant and are likely to have worsened the above situation. Since 1983/84, farm input costs have increased in excess of 25% and gross farm incomes have declined in varying degrees. Beef and sheep incomes rose an average of 12% on Northland farms from the 1983/84 to the 1984/85 season, (p3 MAF 1985), while dairy incomes increased an average of 21% over this period. Between the 1984/85 and 1985/86 season, sheep incomes declined by at least 30% and beef incomes by about 8% (p26 MAF 1986). Although dairy incomes changed little between these seasons the current milkfat payout will mean a major decline in dairy incomes and the final payout could be less than the 1983/84 payout in nominal terms.

For all farms the changes in farm incomes and the costs of farm inputs will have a signifcant impact. Those farms with a 1983/84 cash surplus of 20% or less are unlikely to have sufficent scope to cope with current market conditions without major cuts in farm expenditure, and on some farms severe cuts would have to be made. For some farms, the situation is similar to having an 1983/84 income to pay 1986/87 input prices.

4.8 The Direction of Farm Expenditure.

The next step was to work out the contribution the farms make to the local, Dargaville, Whangarei and other economies. Farmers were asked to estimate the percentage split of their farm expenditure between Dargaville and Whangarei. In addition, farmers were asked to state where their expenditure on major categories, such as vehicle purchases and fertiliser, took place. It was important to be able to identify expenditure that would not occur every year so that basic farm working expenditure could be calculated.

Tables 4.19 and 4.20 show the size and direction of direct expenditure flows arising from the study area, in Appendix 3 there is a detailed breakdown of the location of farm expenditure by category. The tables do not show the total contribution made to the Northland economy by farm expenditure, which can be calculated using multipliers derived from, for example, input - output models. (In Chapter Nine multipliers are used to calculate the total impact of farming and forestry expenditure changes.).

In Table 4.19 wages and personal drawings are not included. In the next table wages and personal drawings expenditure is allocated on the same percentage split as farm expenditure, this split being adjusted to allow for major "one off" purchases. That is, if the farm gave a 70/30 split between Dargaville and Whangarei for farm expenditure, then major household purchases were deducted from the 'Personal Drawings' figure and this subtotal was allocated 70/30. The major expenditure on 'one off' items was then added back according to where it was spent. Allocating the direction of personal drawing and wages expenditure on the basis of the farm expenditure directional split is an approximation, which is the main reason why it is presented separately from the other expenditure coming from the farms. While in the case of individual farms such an approach may be inaccurate, over the whole study area it is considered to give an accurate picture of the direction of personal and household expenditure flows.

The results show that Dargaville receives the highest proportion of the expenditure coming from the study area farms, receiving about twice as much as Whangarei. Direct payments outside Northland, mainly in the

form of mortgage payments to the Rural Bank, accounted for 19% of farm expenditure and 16% of farm and farm household expenditure. These direct payments outside the regional economy are referred to as leakages. With interest rates rising and other farm expenditure declining, leakages will become an increasing proportion of total farm expenditure. Note that these leakages refer to direct leakages and do not include second or third round leakages. Total leakages are incorporated into input-output multipliers, which are used in Chapter Nine to compare the total impacts of forestry and farming.

Disaggregating farm and farm household expenditure cannot be done in a completely accurate manner. However the split presented in Tables 4.19, 4.20, Figure 4.3 1and in Appendix 3 provides an accurate picture of the direction of expenditure. All major items of expenditure have been separately identified by the amount and direction of expenditure flow and this allowed checking of farmer estimates of overall percentage expenditure split between Whangarei, Dargaville and the local area.

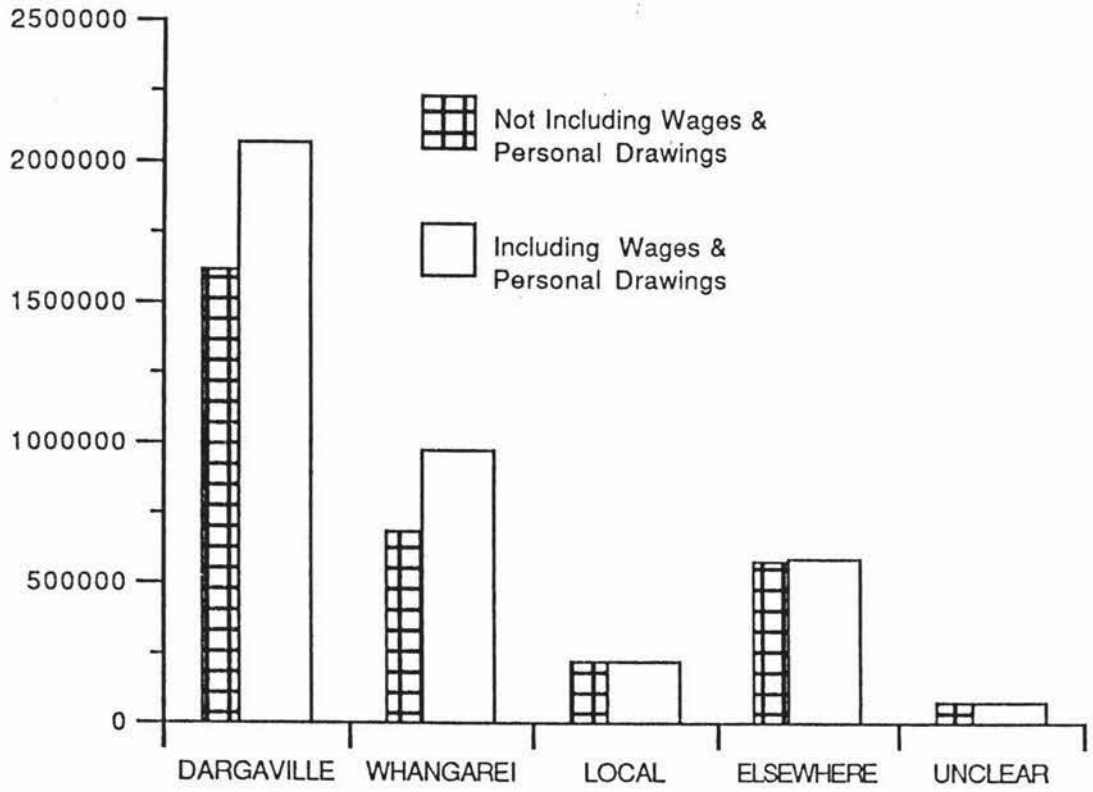
Table 4.19 Farm Expenditure by Direction

Expenditure Catagory	Expenditure Direction Dargarville	Whangarei	Local	Elsewhere	Unclear	Total Expend
TOTALS	1,615,418	684,254	221,750	580,473	75,539	3,177,434
% (Rounded)	51	22	7	18	2.4	

Table 4.20 Farm Expenditure by Direction - Including Wages and Personal Drawings

	Dargaville	Whangarei	Local	Elsewhere	Not Clear	Total
Totals	1,615,418	684,254	221,750	580,473	75,539	3,177,434
Wages	115,951	51,552	0	0	0	167,503
Pers. Draw.	338,790	168,776	0	3,100	0	510,666
Totals	2,070,159	969,605	221,750	583,573	75,539	3,855,603
% (Rounded)	54	23	6	15	2	

The details are presented and commented upon in Appendix 3 - usually by category heading.



STUDY AREA FARMS EXPENDITURE LOCATION.

4.9 Farmer Attitudes Toward Conventional Forestry and Government Agricultural Policy

4.9.1 On Farm Forestry

Farmers were asked questions about exotic forestry on their farm and about their attitudes towards large scale conventional forestry and their answers showed that the majority are not interested in having trees grown for timber production on their farms.

When asked "Are you considering planting trees for timber production at some future date?" the 57 farmers answered:

Yes	14
No	37
Not Sure	6

The reasons farmers gave for answering as they did are contained in the full results in Appendix 3.

A general lack of enthusiasm for planting trees for timber production exists. Of the 14 farmers who were considering planting trees for timber production, only two gave "Timber Production" as the main reason for doing so and these two farmers were the only ones that could be described as being enthusiastic about forestry. Speeding up the financial returns (through a joint venture with a forestry company for example) and a clear demonstration of an adequate return would still leave the majority of farmers unenthusiastic about forestry. Most of the reasons given for not planting exotics were non-financial. What was clear from the discussions with farmers is that the majority of them see a conflict of interest between growing trees for

timber production and pastoral farming.

Whether the current financial situation facing farmers will result in more joint venture agreements, where a rent is paid for land on the farm planted in exotic trees, remains to be seen. Shortly after this years lamb schedule was announced, many farms in Northland felled their woodlots to assist the farm cashflow situation. This caused a temporary oversupply of timber in some areas of Northland (D Albert pers comm) and highlights the inherent flexibility of a wood resource, in that given it has reached a certain age, harvesting can be delayed or brought forward as circumstances dictate.

For those farmers who said 'Yes' or 'Not sure' to the question concerning the growing of trees for timber production, woodlot forestry is heavily favoured over agroforestry for a number of reasons. Farmers expressed doubt over pasture loss, stock management among the trees and the amount of work involved in agroforestry. Additionally, agroforestry is more of an unknown for those thinking about planting exotics; for example, farmers had not heard of the new elite tree stocks which significantly reduce pasture loss and tree management effort and the majority showed interest in this development.

A significant change in attitudes is needed before widespread adoption of farm based forestry will occur in the study area. Knowledge about the latest agroforestry methods and their farm management implications would help. The results would suggest that to encourage timber production on farms, the planting of exotic trees should be pushed as part of an overall farm use concept. The non timber benefits and uses of exotic trees such as shelter and ground stabilisation, should be emphasised as much as timber production.

4.9.2 Attitudes Towards Large Scale Conventional Forestry

Many of the farmer attitudes towards forestry fit in with the research findings of Barry Smith and others (see introduction) which suggests that the attitudes held towards large scale conventional forestry would be reasonably similar in different locations. (Assuming that similar land ownership patterns and communities are being compared.)

The study area farmers replies could be summarised under seven headings.

1. Land more suited to farming should not be planted in forests.
   Farmers tended to judge suitability in terms of the farms productive potential rather than its present production. A number of farmers stated that bad farmers encouraged forestry purchases because forestry companies bought land according to its present condition and use, not its potential.

2. Forestry has its place in Northland and large areas of Northland are more suited to forestry than farming - including the areas north and north west of the study area.
   Most farmers whose views fell within this category felt that there were many areas in Northland that were suitable for forestry rather than farming, mainly rough hill country and/or areas that should never have been cleared in the first place. Only two farmers were against forestry as such.

3. The purchase of large blocks of land by a large company, especially if overseas ownership is involved, for any purpose is opposed.

   A number of farmers specifically stated that corporate ownership was not good, for a number of reasons. Farmers felt that corporate ownership meant that profits left the district. It was seen as preferable for land to remain in family ownership, because family farms were seen to be the backbone of the country's economy. Some farmers commented that with present individual ownership patterns any matters could be discussed 'over the fence' and decisions could be made on the spot. With corporate forestry, this process was no longer possible, with the corporate offices located off farm and matters having to be referred up the corporate chain

4. Forestry threatens and undermines existing rural communities.

   Forestry was seen to result in rural depopulation, which would lead to the decline off rural services and the dimunition of the existing rural structure. The introduction of new people into the district was also seen as a dimunition of the existing social structure, for a number of reasons. For example, new non farming people were perceived to have values that would not fit in with the values of present residents. Some farmers stated that their land was their livelihood; they believed that non-farming people who moved into the district and worked elsewhere would not have the same committment to the area's social, physical or economic structure.

5. Farmers should be free to sell their farms to whoever they want.

   Despite the fact that most farmers did not want to see farms sold to forestry, they believed that farmers should be free to sell land to whoever they wanted. Most farmers could see that there was a conflict between their desire to restrict forestry expansion on pastoral farmland their belief in freedom of sale to whoever the farmer wanted.

6. Farmers cannot compete equally with forestry for land.

   Farmers felt that the large capital base of forestry companies meant that they had an unfair advantage over farmers, because most farmers could not write a cheque "on the spot" for a whole farm. Most farmers felt that only government departments, such as Lands and Survey, had the resources to compete with forestry companies for land. When asked iff Lands and Survey should enter into the farm buying market and settle young, competent farmers on the land all but three farmers said "Yes." The dissenters believed that if this happened it would keep land prices artifically high.

7. Forestry should not be permitted on farms that have had large amounts of development money spent on them.

   Farmers felt that the sale of farms to forestry that had had a large amount of development money poured into them, (especially Rural Bank money) and were in good condition, was money down the drain. This had happened with a large property in the study area and farmers had strong feelings about this "waste of money."

Some farmers stated that their attitude towards forestry had moderated over the last two years. The

practice of swapping land between forestry companies and farmers was liked, as it was seen to result in more suitable land use and provide farmers with an opportunity to improve their farm productivity. The interviews with the farmers gave the impression that one forestry representative had been responsible for a disportionate amount of antagonism towards a forestry company, largely because of the manner in which he conducted farm buying operations.

There was a great variation in the ease with which farmers expressed opinions about forestry. Some farmers were very articulate and enthusiastic speakers and others not. The latter often had an opinion about forestry which was sometimes only expressed in answer to specific questions such as: "Do you think forestry should be able to buy any kind of farmland? and "Do you think farmers and forestry companies compete on an equal basis for farmland?" In other cases the farmer would have a general response initially to the question about forestry, but after a few minutes conversation would volunteer more detailed opinions about forestry. In yet other cases the farmer would volunteer their opinions about forestry without being asked any questions about forestry at all.

While farmers believe that good farmland and land currently badly farmed but with a good potential should not be planted in forests it was not clear how "good" and "good potential" should be defined. But land carrying or with a potential to carrying 10 stock units per hectare or more was seen as a good general indication.

4.9.3 Farmer Attitudes About the Agricultural Sector and Government Agricultural Policy.

Thirty four farmers agreed with the removal of subsides, six more agreed with the removal but with qualifications. Three gave some support to subsidies and three more were definitely opposed to the removal of subsidies. Those who had qualifications felt that their removal was occuring too quickly (two) or that other sectors should have their subsidies cut as well (four). Eleven farmers were not sure or gave no opinion. Interest rates and inflation were a matter of concern to many farmers, with 24 expressing concern over interest rates and 11 over inflation.

These opinions should be read in light of them being given before the extent of the drop in meat dand airy prices become apparent and before interest rates reached their highest point.

Summary.

In the 1983/84 year 56 study area farms wintered about 172,000 stock units and produced an income of about $4.4 million (1983/84 $). This income supported about 270 people in 64 households and employed 148 people directly, 103 of them full time. About 87% of this income ($3.85 million) has been traced as direct expenditure, with about 50% going direct to Dargaville. Whangarei received about 25% and about 16% went directly outside Northland, mainly as payments to the Rural Bank.

The information collected from the farms indicates the impact of current farm economic conditions on the farms and farm expenditure, which in turn indicates the likely magnitude of spending cuts to Dargaville.

More than 25% of the study area farms would find it difficult to adjust to current farm input costs and product prices without major spending cuts. If overall farm expenditure was cut by 30% from the study area farms, about $400,000 per year (1983/84 $) less would flow to Dargaville from these 56 farms.

The majority of farmers had at least some negative feelings towards large scale conventional forestry, with their views coinciding with previous research findings. However, they could see that forestry had its place and approved of land swapping between forestry companies and farmers.

While farmers expressed concern about interest rates and inflation, most gave at least some degree of support to the governments agricultural policy, but felt it was unfair that others sectors were not being treated in the same way.

FIVE - THE STUDY AREA CONVENTIONAL FORESTRY SCENARIO

5.0 Introduction

In this chapter, the study area conventional forestry scenario is constructed. The comparison between this scenario and the pastoral farming scenario is made in Chapter 6. Firstly, forestry development in Northland and around the study area is outlined. The results of a survey which attempted to find out the expenditure patterns of forestry contractors and their employees are also presented. Then, using operational forestry costs and practices, the entire study area is developed as a conventional forest to allow comparison of forestry production, employment and expenditure flows with those generated by the study area farms. A breakdown of total expenditure and labour requirements of developing such a forest is presented by year, category and location. This scenario of the whole area being planted in trees is not considered as likely to occur, but it will highlight the differential impacts of conventional forestry and pastoral farming over a specific area for which we have very detailed information. It will also allow comparison with the results from the more likely conventional forest development scenario presented in Chapter Seven . The scenario covers 35 years.

5.1 Exotic Forestry Development in Northland.

New Zealand's exotic forests are concentrated in the central north island where large forests were planted in the 1930's. While there was a mini exotic afforestation boom in Northland during the depression, it was on a much smaller scale than that which occured in the central north island. When a dramatic expansion in the exotic forest planting programme occured during the 1960's, Northland's planting programme followed suit. This expansion in plantings was lead by the State, partly to supply Northland's own timber requirements but also to provide employment and to stabilise sand dune country on the northern west coast of Northland, where the regions largest forest - Aupouri - has been established.

The current expansion in plantings is of a much greater magnitude than that which occured in the mid 1960's and while in N.Z as a whole state planting exceeds that of private planting the reverse is true in Northland, as the graph from Wheeler and Moran shows (See Figure 5.1). The main factor behind this increase in exotic planting in Northland has been the forestry industry's decision to dramatically increase the national area planted.

At the 1981 Forestry Conference, national and regional planting targets were set, with Northland's target of 100,000 hectares reflecting the region's large area of potential forest land. Calculations by the N.Z Forest Service (NZFS), using Ministry of Works and Development (MOWD) land use capablity survey data, gave a potential exotic afforestation area of 334,000 ha. in Northland. While this area does not include native bush or grazed farmland, it does include reverting pasture. A 40% write off was allowed for to take account of land that would not be procurable, which left a total of 200,000 ha. (P147-148 Northland Regional Development Council/Northland Regional Planning Authority 1980). By May 1983 over 70,000 ha. of land had been acquired by private companies in Northland (P17 Wheeler and Moran 1985) and by

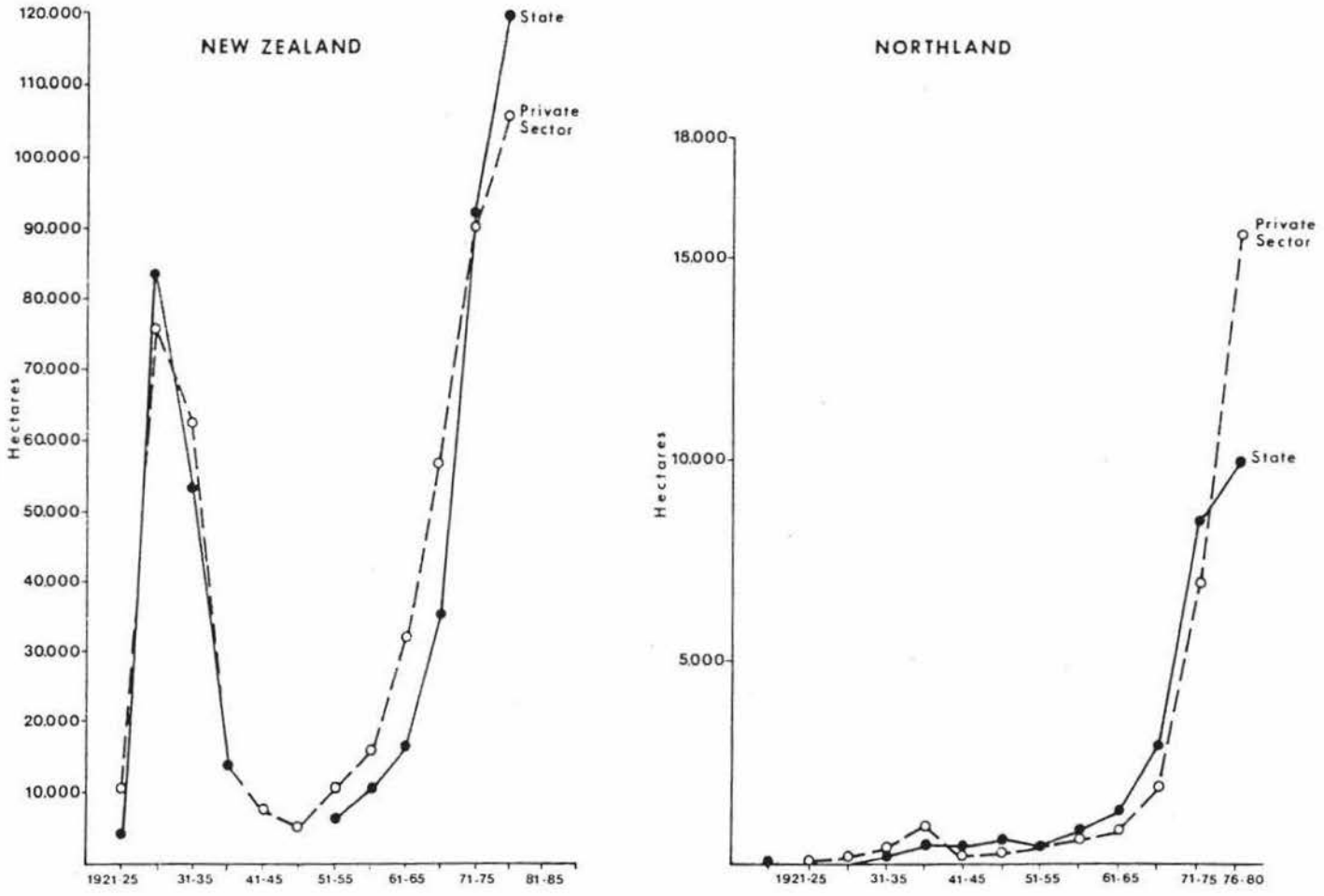


FIG. 4.1 STATE & COPORATE FIVE YEARLY PLANTING RATES IN NORTHLAND & NZ.

(Taken directly from Wheeler and Moran p.6 1985)

December 1985 the area acquired was close to 100,000 ha. About 80,000 hectares in total had been planted by 1985.

Because of the young age class of the majority of plantings, (about one half of Northland's exotic trees are 6 years old or younger), it will not be until the mid 1990's that forest output could support a large processing industry. The largest area of older exotic trees is at Aupouri and the thinnings and harvest from this forest will, by the end of the 1980's, support a composite triboard mill near Kaitaia with a roundwood input of about 200,000 m3 per year. A refiner groundwood or thermomechanical pulp mill (TMP) would need a minimum of about 170,000 m3 of wood per year. Assuming 600 m3 of wood per hectare recoverable at year 30 this equates to an annual harvest area of about 284 ha of 30 year old trees.

5.2 Forestry Operations Around The Study Area

Although a number of forestry companies are operating in Northland, operations in and around the study area are mainly conducted by one company whose aim was to have a forest resource of 50,000 ha, with up to 25,000 ha of this resource in joint venture or lease agreements. By December 1985 approximately 11,000 of the planned 50,000 ha. had been planted and a planting rate of about 4500 ha. per year was planned. However, the change in the tax law applying to forestry has resulted in the planned area being reduced to about 25,000 hectares.

Forestry operations are concentrated to the north of the study area down to and across the study area borders (see Map 2, Chapter Two). These forestry operations are organised and controlled from a district office in Dargaville which employs the equivalent of 9.5 wage and salary staff, with a regional office in Whangarei directing this company's operations throughout Northland. Dargaville is the forestry operational base and contract labour moves from this base to the forest area each working day, with all forest work carried out by contract labour. Although the number working for this company around the study area varies, on average about 24 prime contractors employing an additional 100 people are used. Planting is carried out for three to four months a year and this temporarily increases the contract workforce by about 30%.

In the 1984-85 year the Dargaville office paid $245,000 to its own staff and about $2,600,000 to contractors. As payments to contractors are so significant, it was decided to establish the expenditure patterns of forestry contractors and their employees. This would, for example, enable comparison of forestry and farming household expenditure patterns. Although the prime contractors are spread out over a number of towns, most are located in or about Dargaville, as are the majority of their employees .

5.3 The Forestry Contractors Survey

The survey was designed to collect information about forestry contractors and employee age structure, household size, and expenditure flows. Unfortunately an inadequate response rate was achieved, so the results provided little information.

Eleven forestry contractors out of the 24 were contacted and asked to help by answering a questionnaire and passing a similar questionnaire to each of their employees. Ten contractors employing 66 people agreed to help. Unfortunately only six of the ten contractors and three of the 66 employees returned their questionnaires. The results are presented below.

The work carried out by the forestry contractors was as follows (Three contractors carried out more than one type of work.)

Table 5.1 Forestry Contractor Activity

Activity	Contractors Engaged in Activity
Silviculture	3
Clearfelling/Scrubcutting	3
Fencing	1
Planting	1
Machinery Maintenance	1

The table shows that the contractors who replied covered most types of forestry work.

Forestry Contractors Income Source.

The percentage of the surveyed contractors total income that came from forestry contracts was: 100, 100, 100, 65, 40 (One not stated). Discussion with the forestry company employing the contractors indicated that a number of the contractors used by them were already in business and engaged in agricultural work when forestry operations commenced. A typical pattern amongst the contractors was that as forestry development expanded, the proportion of total contractor income gained from agriculture decreased and new staff were taken on.

Forestry Contractors Expenditure

Wage payments made up most of forestry contractor business expenditure with the percentage of gross forestry income paid out as wages by the contractors in the survey being 60, 75, 60 and 60 (Two not stated.) These percentages do not include proprietor income. The contractors who replied employed 27 fulltime and 2 part time employees and the 'Not Stated' employed 5 people.

A detailed percentage breakdown of forestry contractors expenditure was provided by a forestry company. This was calculated from the actual expenditure of a number of contractors and is presented below. A 60km distance from base to the forestry operations is assumed and expenditure for two groups of forestry operations is presented.

Table 5.2 Forestry Contractor Expenditure Breakdown

Expenditure Category	Forestry Operation: Thinning to Waste/ Scrubcutting (%)	Planting/Spot Spraying/ Hand Fertilisation/ Pruning(%)
Labour	57	66
Saws	11	0
Machinery	2	2
Transport	9	10
Administration	20	21
Misc.	0.3	0.3

The figures show that the majority of expenditure in forestry operations is paid out as wages, which contrasts with farming where the majority of expenditure is spent on agricultural services and supplies. About 20% of expenditure from the farming area were wages and personal drawings. An implication of this is that, for a given level of expenditure, the retail sector will benefit at the expense of the agricultural servicing sector as farmland changes to forest. (The breakdown above does not include retained profits or forestry contractor household expenditure.)

Forestry Contractor Household Age Structure and Expenditure

Table 5.3 Forestry Contractor and Main Farm Household Age Structure

Age Group	% In Each Age Group: Farming	Forestry
0-4	7.0	14.3
5-9	8.9	7.1
10-14	16.0	28.6
15-19	10.8	7.1
20-24	6.1	10.7
25-29	2.4	10.7
30-34	7.5	7.1
35-39	7.5	3.6
40-44	10.3	3.6
45-49	8.5	3.6
50-54	6.1	3.6
55-59	4.2	0
60-64	3.3	0
65+	1.4	0

Table 5.3 shows that while 78.5% of the forestry sample was under 30, 51.2% of the farming population was under 30. This suggests, for example, that there will be more school aged children in the forestry contractor families surveyed.

The six forestry contracting businesses were owned by married individuals and can be classified as household based businesses (as the farms are) because the contractors operated from the family home. All of the forestry contractors households had children. While the sample was too small to make any general comparision between forestry and farming household size, farm household average age was higher in the study area.

Average Monthly Forestry Contractor Household Expenditure

Average monthly expenditure was $483. This is somewhat higher than the farming figure of $422, but that is to be expected as farm households would have a lower expenditure on meat and vegetables.

Table 5.4 Forestry Contractors & Farming Household Major Household Expenditure Location

	Forestry Households		Farming Households	
	($)	%	($)	%
Dargaville	5,603	43	38,185	69
Whangarei	6,300	48	13,919	25
Elsewhere	1,200	9	3,100	6
Total	13,130	100	55,204	100
Av. per Household	3,282		1,903	

While the forestry sample was too small to draw definite conclusions from, the following statements hold: Forestry contractors bought a much higher percentage of their household 'major items' in Whangarei. This was so even though for 3 of the 4 forestry contractors Whangarei was at least an extra 45 minutes drive away than Dargaville. Whangarei is seen as having a better choice of goods at lower prices than Dargaville, but the farmers had a tendency to buy households appliances in the same town as they purchased farm inputs.

Forestry expenditure on major household items could be markedly higher than farm expenditure on these items for a number of reasons:

1. Farm households already have these major items and they are modern enough to not need replacing.
2. Forestry contractors have, over the last 3 years, received an increasing work load and income from expanding forestry operations, which enable them to purchase these items or upgrade them.
3. Farming incomes are such that farm households cannot support such expenditure.

Consideration of the economic circumstances applying to the farmers and forestry contractors in this study suggests that number two is the most reasonable explanation.

Forestry Contractors Employees

The attempt to get similar information from forestry employees failed. Only three of the sixty six employees returned their questionnaires. This was despite follow up phone calls to the contractors and a covering letter from the forestry company the contractors worked for. Fortunately some information on forestry contractor employees was gained from the forestry contractors which indicated their employees were young, male and single. Of the 30 forestry employees for whom age and martial status was gathered , 28 were under 30 and all were single. These findings are similar to those of Crothers and McPherson (1984) who carried out research on forestry and logging employee demographic characteristics. They found that the average age of those working in the forestry and logging occupations was 29.7 years, including managers and foremen. As the forests around the study area are still in the establishment phase the workforce is younger than that measured by Crothers and McPherson. Once the forests are large enough to support processing plants, the average age will increase as a more senior and skilled forestry processing workforce is needed.

With the return rate to the survey being so low, it is not possible to draw meaningful conclusions on forestry contractor employee expenditure patterns. However, Gold and Houghton (1985) provide data on forestry expenditure patterns, which when combined with the above results, provide a useful guide to the likely impact of an increase in forestry employment in and about Dargaville. The work carried out by Gold and Houghton was a case study based in Bruce County, Otago comparing the expenditure patterns of forestry and non-forestry households.

The surveys were carried out in a rural based economy with increasing forestry activity. They surveyed 48 forestry and 46 non-forestry households, 21 of the non-forestry households were farming ones but only household expenditure was included. Most of those surveyed (60%) lived in or close to one settlement - Milton. Although it is not clear in the survey, it appears the forestry households interviewed were forestry employee, rather than forestry contractor, households.

Gold and Houghton found:

1. Forestry household income was lower than the other households surveyed, as was forestry household expenditure. (Note: Their survey was carried out before the current rural recession began.)

If this pattern is repeated in Northland as forestry activity increases, then as more people are employed in the forests around Dargaville, expenditure would increase but not by as much as if the non-forestry workforce had increased. This could be largely explained by forestry work being largely unskilled and for some operations, seasonal in nature.

2. Forestry households spent more in Milton, the closer urban settlement, on many expenditure catagories than did the non-forestry households. The non-forestry households tended to spread their expenditure over a wider area.

If the same holds for forestry employees living in and about Dargaville, then they would spend more in

Dargaville than the farmers who would tend to spread expenditure more between Dargaville and Whangarei. This seems realistic for non-major purchases. Many forestry workers are single, limiting time available for shopping, when compared with a married household where one person has no full time job. This encourages shopping at the nearest retail centre. Forestry work often takes place in isolated areas far from any retail outlets, so forestry workers are more likely to shop were they live. Farming households have longer but more flexible work hours and can combine household with farm expenditure trips. While forestry households had a lower income than non-forestry households, single forestry workers will tend to have higher discretionary expenditure. This will increase retail sales, but what the net effect would be cannot be accurately predicted.

In summary, the results from the forestry contractors and employees survey, plus the work by Gold and Houghton indicate that forestry employees based in and about Dargaville would spend a higher proportion of their week to week household expenditure there than farmers located close to that town. For major items, the survey results plus the limited choice and higher prices in Dargaville indicate Whangarei will be favoured. (Though it is stressed that the present purchasing place of major items by forestry employees living in and about Dargaville is not known.)

5.4 Construction Of The Conventional Forestry Scenario

In this scenario, the change of the 15,337 hectares of farmland in the study area to a conventional pinus radiata forest is simulated. This is not considered likely to happen under current circumstances but it will indicate the impacts of a large contiguous forest being established on pastoral farmland. It will also enable us to see if a proportionally smaller afforestation development, such as that simulated in Chapter Seven, has proportionally the same impact. In this scenario, the study area is planted over four years, which means planting proceeds at about the 1984-85 rate of 3300 ha per year for the forest on the study area borders. The hypothetical forest established here is planted, managed and harvested using operational costs and practices actually experienced and used by forestry interests just north of the study area. Where necessary costs were adjusted to allow for differences between the study area and the areas already planted.

A 35 year span for the scenario was chosen as it allows consideration of all phases of forestry activity, including replanting of the forest.

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5.4.1 Assumptions and Costs (All costs are expressed in 1985/86 dollars)

The land has already been bought and the money paid does not circulate in the local area, Dargaville or Whangarei. That is, the farmers leave the area when their farms are sold to forestry.

The Study Area covers 15,337 hectares. Allowing for a 15% loss of the potential forest area due to firebreaks, roads, streams and power lines leaves 13,036 ha for planting.

Table 5.5 Establishment Costs (1985/86 $)

	$ Cost/Hectare	Labour Hours/Hectare
Roads - roads are rebuilt at an overall average cost of:	300	-
Establishment		
(These costs and labour requirements are overall averages per established hectare)		
Land clearing	170	6.5
Firebreaks	22	-
Dessicant Spraying (Burn Preparation)	52	-
Burning	29	1.2
Ground Preparation	31.5	-
Preparation Spraying (Preplant)	100	-
Blanking	4	0.2
Planting (not including trees)	228	9.8
Hand Fertilisation	116	5.5
Spotspraying Grass	90	3.0
Releasing (all methods)	59	2.2
Sub Total	901.5	28.4
Trees	66	
Totals	967.5	30.0

The dash in the labour hours column means that the labour requirement per hectare is very low or not clear and the labour hours are rounded up to 30 to take account of this.

Stems Planted

1100 stems per hectare are planted and all trees are fertilised at planting.

Silviculture

These costs and labour requirements are per hectare treated. It is assumed that 30% of the pine stands are pruned three times. Thinning to waste is carried out on pruned and unpruned stands. On the pruned stands thinning occurs after the 6m pruning to a residual of 350 stems per hectare and on unpruned stands thinning is to 500 stems per hectare. It is assumed that production thinning does not take place, because topography and other factors mean that production thinning would be more expensive than it is at Kinleith and therefore of doubtful economic worth.

Table 5.6 Siliviculture Costs and Labour Requirements (1985/86 $)

Pruning	Year	Stems Lifted	$/Ha	Labour hours/ha
2 metre pruning	3-4	500	290	18.0
2-4 m "	4-5	350	235	14.8
6 m	6-7	250	227	14.1
Thinning to Waste	**Year**	**Residual Stand**	**$/Ha**	**Labour hours/ha**
	7-8	350-500	225	12.9

Aerial Topdressing

The need for fertiliser is indicated by a foliar phosphorous level of 0.10ppm or less. The soils in the study area are such that it is assumed that one application of fertiliser over half the area takes place in year 8 or 9. Current prescriptions are for 0.9 tonne per hectare to be applied by helicopter, normally using Decca navigation for more accurate spreading.

Table 5.7 Aerial Topdressing (1985/86 $)

	Year	$/ha	Labour hours/ha
Aerial Topdressing	8-9	232	0.4

Harvesting

The usual harvesting assumption in forestry studies is that the trees are grown to around age 30 and felled in the blocks they were planted. This assumption is more realistic if the trees are being grown to be sold as trees, which is what the NZFS has tended to do, and reflects a horizontal integration approach to the industry. In a vertically integrated forestry company, trees are not an end in themselves but part of a forestry process which produces timber, composites, pulp and paper. So while the size and age of the forest resource available to the forestry company sets the parameters within which any forestry processing takes place, a forest resource will be harvested as the economics of product sales indicate, within these parameters. For example, a significant increase in world demand for pulp could encourage an earlier, heavier and more compressed cut of a forest resource.

In this scenario two harvesting options are considered: one with harvesting beginning in year 23, the other in year 29. (That is , when the oldest tree is 23 or 29 years old.) Two harvesting options were chosen to emphasise the flexibility attached to use of the resource and the implications of this flexibility for expenditure levels and labour demand. As the roundwood yield of any forest increases annually, starting

harvest of a specified forest resource at different ages has implications for the amount of roundwood that can be cut. Foresters have computer programmes, such as the NZFP 'Resource, Maturity and General Management Simulator' programme which calculate the amount of timber that can be cut from any forest, given the necessary input of data about the forest. This data includes the size of the resource, the rate at which it was planted, and the expected yield per hectare at any one year. Given this data, the programme can calculate the sustainable yield of the forest, assuming harvesting begins when the oldest trees are 30. Different harvesting commencement times, such as years 23 and 29, and different time spans in which it is planned to cut over the entire forest, can be entered and the programme can calculate the corresponding annual yield and the area that must be harvested to provide that yield.

In our example there is a forest of 13,036 hectares, with 3,259 ha planted each year for 4 years. With an assumed recoverable yield of 600 m3 per hectare at age 30 and harvesting commencing at year 30, the sustainable yield cut would be 242,346 m3 of roundwood, which would be provided by cutting 403.91 ha in year 30. The area cut each year would be replanted the year after harvesting, and with a sustainable yield cut the first replanted area would be ready for harvesting as the last of the initially planted forest was harvested. Commencing harvesting in year 23 and allowing about 14 years to cut over the entire forest means 506,486 m3 could be cut annually, but the oldest replanted trees would only be 15 years old when the last of the initially planted area was being harvested. Or, to put it another way, cutting about 500,000 m3 annually from year 23 would cut over all the initial forest in about 14 years. This harvesting option results in almost all of the 13,036 ha forest resource being harvesting in the 35 year time frame of the scenario. It therefore indicates close to the total expenditure needed to plant, manage and harvest the 13,036 ha forest resource. Such a heavy, early cut scenario could arise if, for example, the market price of pulp rose and other forest resources would be available in 14 years. The need for an early contribution to a firms cash flow could also dictate such an early, heavy cut.

Beginning harvesting of the 13,036 ha forest resource in year 29 and aiming to cut over the entire initial forest in about 28 years means that 337,654 m3 could be cut annually. Replanting the year after harvesting, the oldest replanted trees would be 27 when the last of the initial forest was harvested. This suggests that expenditure flows will vary greatly according to the time and size of the harvest, which is confirmed by the results of the scenario presented below.

The point to remember is that a forest is a flexible resource. The volume of timber produced and time taken to cut a forest can be adjusted to suit the demands of the process plants, which reflects the type of plant, plus present and expected market conditions.

Harvesting Costs

Approximately 80% of the study area could be harvested by tractor and 20% by hauler. With harvesting costs as laid out in Table 5.8, this gives an average harvesting cost of $16m3. It is assumed that roads have to be rebuilt during harvesting at $300
per hectare.

Table 5.8 Harvesting Costs (1985/86 $)

	Method	$/m3	Labour hours per / m3
Per cubic metre on truck	Tractor	15.00	0.5
	Hauler	20.00	0.5

Transportation

Transportation costs are measured in cents per tonne kilometre and are sensitive to the distance covered as fixed costs become a decreasing proportion of total costs. In this scenario it is assumed that the logs are carried an average of 25 kilometres at $0.25 cents per tonne kilometre. It is also assumed that each round trip, including loading, takes 1.5 hours and 20 m3 of round wood are carried per load.

Re-establishment Costs

The area harvested is replanted in trees one year after harvesting.

Table 5.9 Re-establishment Costs (1985/86 $)

Activity	$/ha	Labour hours/ha
Ground Preparation (Cultivation)	31.5	-
Preparation Spraying (Preplant)	100	-
Blanking	4	0.2
Planting	228	9.8
Hand Fertilisation	116	5.5
Releasing	59	2.2
Trees	66	-
Totals	602.5	18.0

The same silviculture regime is applied to the re-established area as would be to the original plantings.

Having established the costs and assumptions to be used in calculating expenditure levels necessary to establish, manage and harvest the forest, the next step is to calculate the proportion of the forestry expenditure that would go to the Dargaville economy, other places in Northland and outside Northland. The direction of expenditure is based on the current direction of forestry expenditure for forestry operations around the study area, though some assumptions are made as to how the direction of expenditure may change as the simulated forestry development proceeds.

5.4.2 Expenditure Direction Assumptions.

Roading

All roading expenditure goes to contractors based in Northland, with 23% going to contractors in and about Dargaville. (See 5.6)

Establishment

Chemicals are bought outside Northland by the forestry company and delivered to the contractors. Fertiliser is bought in Dargaville, trees are bought from nurseries within Northland but outside Dargaville or Whangarei. The amount of establishment expenditure spent in Northland is $698.50 per hectare, with 77% of this ($537.85) going to contracters in and about Dargaville (See section 5.6.)

Silviculture

All silviculture and and aerial topdressing expenditure is paid to contractors in and about Dargaville.

Harvesting

All harvesting is carried out by contractors in and about Dargaville. (Referred to as Local Contractors from now on.)

Transportation

Logs are carried out by trucks based with local contractors.

Re-establishment Costs

Of the total $602.50, the amount assumed to go to local contractors is $424.

Overhead Costs

A major component of forestry costs are overhead costs, which consist of operational overheads plus district and regional office overhead costs.

Operational overheads are of three types:

1. Protection of growing stock (PGS) - $5.00/ha/yr on established hectares to prevent or reduce fire, fungal disease and noxious animal damage.
2. Land Owners Obligations (LOO) - $5.00/ha/yr on all hectares owned on fence maintenance, noxious weeds and recreation areas etc
3. Care and maintenance of assets (CMA) - $14.50/ha/yr on established hectares on road maintenance, road signs, gates, airstrips and slip stabilization work.

It is assumed that all this expenditure would go to local contractors.

District and Regional Office Overheads

District and regional office overheads add a loading of 17% and 8% on operational costs respectively. District overheads are made up as follows:

Wages staff costs	7%
Salary staff costs	49%
Office costs	8%
Vehicle costs	13%
Rates	13%
Land tax	6%
Miscellaneous	4%
	100%

(Miscellaneous includes forest owners subscriptions, forest fire insurance, consultant services etc)

The percentage loading on operational cost and the breakdown of district office overheads varies with the age and size of the forest. For example, at Kinleith overheads place a loading of 47% on operational costs, with 69% of this due to land tax and 12% due to rates.

District overheads added to operational costs in this research are reduced as follows:

1. Part of vehicle costs are standing charges and are acccounting entries, not money flows. Additionally, vehicles are purchased outside Northland. This reduces the vehicle costs used in the scenario by 30%.

2. Rates would be paid to the local counties whether or not forestry owned the land.

3. Land taxes are paid to central government and do not circulate in the local economy.

4. Miscellaneous costs are paid outside the local economy.

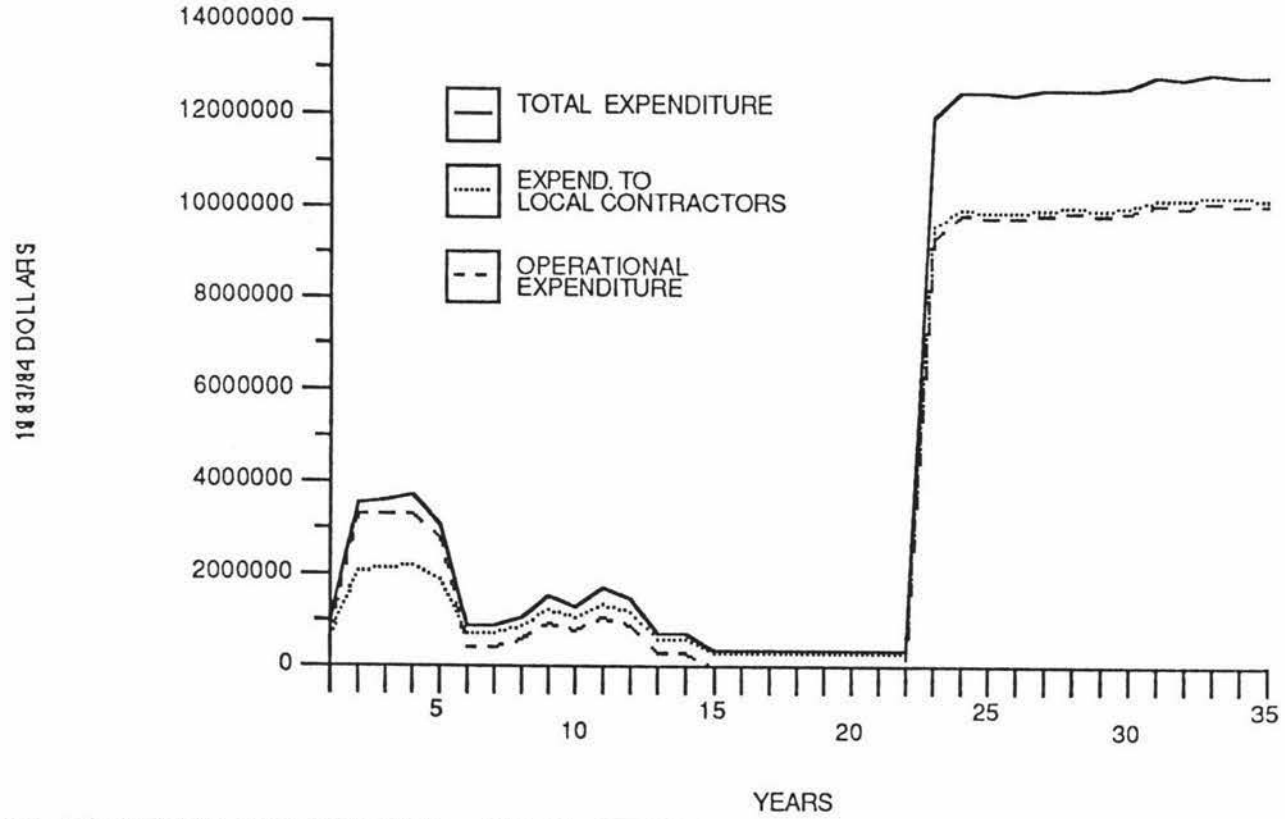
This reduces District Office overheads to 12.4%, which is rounded to a 12% loading on operational costs which goes to the Dargaville economy. In the case of regional office overheads, forestry operations impose office, salary and vehicle costs on the regional office. Extraction of vehicle standing charges reduces these costs by less than 1%, therefore, the 8% figure is used.

5.5 The Study Area Conventional Forest Scenario

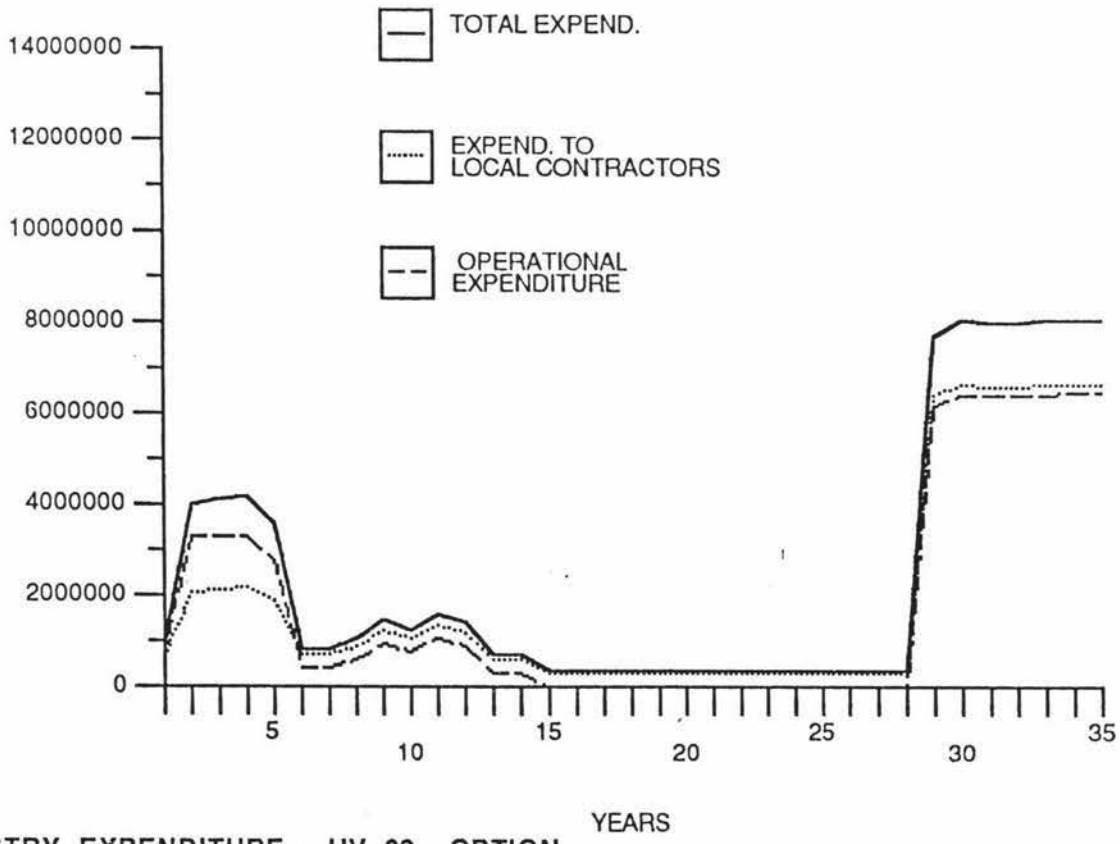
Based on the assumptions and costs detailed above, expenditure incurred to develop, manage, maintain and harvest part of the forest is as set out in the scenario spread sheets by year and category. The first spreadsheet details expenditure by year and category for harvesting beginning in year 23 and is referred to as the HV 23 option. Similarly the second spreadsheet details expenditure for the HV 29 option. Figures 5.2 and 5.3 graph forestry expenditure for the two harvesting options in 1983/84 dollars.

5.5.1 Spreadsheet Explanation (Using the HV 23 option as the example.)

In rows 1 and 2 the years, areas planted or harvested and forestry activities are listed . For example in year



5.2 FORESTRY EXPENDITURE - HV 23 OPTION.



FORESTRY EXPENDITURE - HV 29 OPTION

	A	B	C	D	E	F	G	H
1								
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	TREES	LOCAL	PRUNING 1
3		PLANTED		OVERHEADS	COSTS		CONTRACTOR	
4			300		901.5	66	537.845	87
5								
6	1	3259	977700	22487				
7	2	3259	977700	44974	2937988.5	215094	1752836.85	
8	3	3259	977700	131011	2937988.5	215094	1752836.85	
9	4	3259	977700	217048	2937988.5	215094	1752836.85	
10	5	0	0	280598	2937988.5	215094	1752836.85	283533
11	6	0	0	344150	0	0	0	283533
12	7	0	0	344150	0	0	0	283533
13	8		0	344150	0	0	0	0
14	9		0	344150	0	0	0	0
15	10		0	344150	0	0	0	0
16	11		0	344150	0	0	0	0
17	12		0	344150	0	0	0	0
18	13		0	344150	0	0	0	0
19	14		0	344150	0	0	0	0
20	15		0	344150	0	0	0	0
21	16		0	344150	0	0	0	0
22	17		0	344150	0	0	0	0
23	18		0	344150	0	0	0	0
24	19		0	344150	0	0	0	0
25	20		0	344150	0	0	0	0
26	21		0	344150	0	0	0	0
27	22		0	344150	0	0	0	0
28	23	1140.23	342069	344150			75255.18	0
29	24	1083.17	324951	344150			71489.22	0
30	25	1031.54	309462	344150			68081.64	0
31	26	1031.36	309408	344150			68069.76	99200.01
32	27	987.69	296307	344150			65187.54	94235.79
33	28	947.42	284226	344150			62529.72	89743.98
34	29	935.32	280596	344150			61731.12	89728.32
35	30	910.29	273087	344150			60079.14	85929.03
36	31	875.97	262791	344150			57814.02	82425.54
37	32	844.53	253359	344150			55738.98	81372.84
38	33	844.15	253245	344150			55713.9	79195.23
39	34	819.03	245709	344150			54055.98	76209.39
40	35	795.36	238608	344150				
41								
42		25282.06	7584618	11020618	11751954	1616122.2	7011347.42	1912172.13
43								
44								
45								778040.13
46								

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I	J	K	L	M	N	O	P	Q	R
PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRANSPORT	RESTABLISH.	RESTAB. TO	TOTAL	TOTAL OP. &
			TOPDRESSING	506488	9		LOCAL CONTR.	OPERATIONAL	OP. OVERHEAD
70.5	68.1	225	116	16	6.25	538.5	424.5		
								977700	1000187
								4130782.5	4175756.5
								4130782.5	4261793.5
								4130782.5	4347830.5
								3436615.5	3717213.5
229759.5								513292.5	857442.5
229759.5								513292.5	857442.5
229759.5	221937.9							735230.4	1079380.4
229759.5	221937.9	733275						1184972.4	1529122.4
0	221937.9	733275						955212.9	1299362.9
0	221937.9	733275	378044					1333256.9	1677406.9
0	0	733275	378044					1111319	1455469
0	0	0	378044					378044	722194
0	0	0	378044					378044	722194
0	0	0	0					0	344150
0	0	0	0					0	344150
0	0	0	0					0	344150
0	0	0	0					0	344150
0	0	0	0					0	344150
0	0	0	0					0	344150
0	0	0	0					0	344150
0	0	0	0	8103808	3165550			11611427	11955577
0	0	0	0	8103808	3165550	614013.855	484027.635	12283578.035	12627728.035
0	0	0	0	8103808	3165550	583287.045	459805.665	12233596.265	12577746.265
0	0	0	0	8103808	3165550	555484.29	437888.73	12202331.93	12546481.93
0	0	0	0	8103808	3165550	555387.36	437812.32	12288322.13	12632472.13
80386.215	0	0	0	8103808	3165550	531871.065	419274.405	12325264.61	12669414.61
76363.485	0	0	0	8103808	3165550	510185.67	402179.79	12288776.855	12632926.855
72723.57	77649.663	0	0	8103808	3165550	503669.82	397043.34	12347947.493	12692097.493
72710.88	73763.877	256551.75	0	8103808	3165550	490191.165	386416.105	12571374.842	12915524.842
69632.145	70247.874	243713.25	0	8103808	3165550	471709.845	371849.265	12518259.674	12862409.674
66793.11	70235.616	232096.5	132266.68	8103808	3165550	454779.405	355502.985	12615886.131	12960036.131
65940.06	67261.689	232056	125647.72	8103808	3165550	454574.775	355341.675	12595456.374	12939606.374
64175.445	64519.302	222230.25	119658.64	8103808	3165550	441047.655	347678.235	12549862.662	12894012.662
1487762.91	1311429.62	4119747.75	1889749.04	105349504	41152150	6166201.95	4850822.15	184341411.60	195362029.60
568724.91	423678.021	1186647.75							
			2957090.811						

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S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
ST. OFFICE	REG. OFFICE	TOTAL	TOT. OP. EXP	TOTAL TO LOC.	TOTAL TO	DEFLATED	DEFL. OP. &	DFL. DIST.	DFL REG	DEFL TOTAL	DFL TO	DFL TO	CUMULATIVE				
VERHEAD	OVERHEADS	EXPENDITURE	TO LOC. CONT.	CONTRACTORS	NORTHLAND	OP. EXPEND.	OP. OVHDS	OFF. OVHHDS	OFF. OVHDS	EXPEND.	LOC. CONTR.	NORTHLAND	OP. & OP.		DARGAVILLE	NORTHLAND	TOTAL
0.12	0.08					0.8	0.8	0.8	0.8	0.8	0.8	0.8	OVERHEADS		FARM EXP.	FARM EXP.	FARM EXP.
120022.44	80014.96	1200224.4	752829	775316	1000187	782160	800149.6	96017.952	64011.968	960179.52	620252.8	800149.6	800149.6		1874717	3111654	3663641
501090.78	334060.52	5010907.8	2505665.855	2550639.855	3514179.5	3304626	3340605.2	400872.624	267248.416	4008726.24	2040511.884	2811343.6	4140754.8		1874717	3111654	3663641
511415.22	340943.48	5114152.2	2505665.855	2636676.855	3600216.5	3304626	3409434.8	409132.176	272754.784	4091321.76	2109341.484	2880173.2	7550189.6		1874717	3111654	3663641
521739.66	347826.44	5217396.6	2505665.855	2722713.855	3686253.5	3304626	3478264.4	417391.728	278261.152	4173917.28	2176171.084	2949002.8	11028454		1874717	3111654	3663641
446065.62	297377.08	4460656.2	2036369.855	2316967.855	3055636.5	2749292.4	2973770.8	356852.496	237901.664	3568524.96	1853574.284	2444509.2	14002224.8	5	1874717	3111654	3663641
102893.1	68595.4	1028931	513292.5	857442.5	857442.5	410634	685954	82314.48	54876.32	823144.8	685954	685954	14688178.8		1874717	3111654	3663641
102893.1	68595.4	1028931	513292.5	857442.5	857442.5	410634	685954	82314.48	54876.32	823144.8	685954	685954	15374132.8		1874717	3111654	3663641
29525.648	86350.432	1295256.48	735230.4	1079380.4	1079380.4	588184.32	863504.32	103620.5184	69080.3456	1036205.18	863504.32	863504.32	16237637.1		1874717	3111654	3663641
83494.688	122329.792	1834946.88	1184972.4	1529122.4	1529122.4	947977.92	1223297.92	146795.7504	97863.8336	1467957.50	1223297.92	1223297.92	17460935.0		1874717	3111654	3663641
55923.548	103949.032	1559235.48	955212.9	1299362.9	1299362.9	764170.32	1039490.32	124738.8384	83159.2256	1247388.38	1039490.32	1039490.32	18500425.4	10	1874717	3111654	3663641
01288.828	134192.552	2012888.28	1333256.9	1677406.9	1677406.9	1066605.52	1341925.52	161031.0624	107354.042	1610310.62	1341925.52	1341925.52	19842350.9		1874717	3111654	3663641
174656.28	116437.52	1746562.8	1111319	1455469	1455469	889055.2	1164375.2	139725.024	93150.016	1397250.24	1164375.2	1164375.2	21006726.1		1874717	3111654	3663641
86663.28	57775.52	866632.8	378044	722194	722194	302435.2	577755.2	69330.624	46220.416	693306.24	577755.2	577755.2	21584481.3		1874717	3111654	3663641
86663.28	57775.52	866632.8	378044	722194	722194	302435.2	577755.2	69330.624	46220.416	693306.24	577755.2	577755.2	22162236.5		1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	22437556.5	15	1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	22712876.5		1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	22988196.5		1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	23263516.5		1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	23538836.5		1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	23814156.5	20	1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	24089476.5		1874717	3111654	3663641
41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	24364796.5		1874717	3111654	3663641
434669.24	956446.16	1456892.4	11611427	11955577	11955577	9289141.6	9564461.6	1147735.392	765156.928	11477353.9	9564461.6	9564461.6	33929258.1		1874717	3111654	3663641
515327.36	1010218.24	15153273.64	12078336.635	12422486.635	12497741.8	9826862.43	10102182.4	1212261.891	808174.594	12122618.9	9937989.308	9998193.45	44031440.5		1874717	3111654	3663641
509329.55	1006219.70	15093295.52	12038625.665	12382775.665	12454264.9	9786877.01	10062197.0	1207463.641	804975.761	12074636.4	9906220.532	9963411.91	54093637.5	25	1874717	3111654	3663641
505577.83	1003718.55	15055778.32	12016654.73	12360804.73	12428886.4	9761865.54	10037185.5	1204462.265	802974.844	12044622.7	9888643.784	9943109.10	64130823.1		1874717	3111654	3663641
515896.66	1010597.77	15158966.56	12102677.33	12446827.33	12514897.1	9830657.70	10105977.7	1212717.324	808478.216	12127173.2	9957461.864	10011917.7	74236800.8		1874717	3111654	3663641
520329.75	1013553.17	15203297.53	12147480.41	12491630.41	12556817.9	9860211.69	10135531.7	1216263.803	810842.535	12162638.0	9993304.328	10045454.4	84372332.5		1874717	3111654	3663641
515951.22	1010634.15	15159512.23	12118241.255	12462391.255	12524921.0	9831021.48	10106341.5	1212760.978	808507.319	12127609.8	9969913.004	10019936.8	94478673.9		1874717	3111654	3663641
523051.70	1015367.80	15230516.99	12179589.893	12523739.893	12585471.0	9878357.99	10153678.0	1218441.359	812294.240	12184413.6	10018991.91	10068378.6	104632352	30	1874717	3111654	3663641
549862.98	1033241.99	15498629.81	12407522.642	12751672.642	12811751.8	10057099.9	10332419.9	1239890.385	826593.590	12398903.8	10201338.11	10249401.4	114964772		1874717	3111654	3663641
543489.16	1028992.77	15434891.61	12360585.074	12704735.074	12762549.1	10014607.7	10289927.7	1234791.329	823194.219	12347913.3	10163788.06	10210039.3	125254700		1874717	3111654	3663641
555204.34	1036802.89	15552043.36	12463870.731	12808020.731	12863759.7	10092708.9	10368028.9	1244163.469	829442.312	12441634.7	10246416.58	10291007.8	135622728		1874717	3111654	3663641
552752.76	1035168.51	15527527.65	12443509.374	12787659.374	12843373.3	10076365.1	10351685.1	1242202.212	828134.808	12422022.1	10230127.50	10274698.6	145974414		1874717	3111654	3663641
547281.52	1031521.01	15472815.19	12402437.262	12746587.262	12800643.2	10039890.1	10315210.1	1237825.216	825216.810	12378252.2	10197269.81	10240514.6	156289624	35	1874717	3111654	3663641
3443443.6	15628962.4	234434435.5	175779819.02	186800437.02	191410342	147473129	156289624	18754754.84	12503169.9	187547548	149440349.6	153128273					

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1																																
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	TREES	LOCAL	PRUNING 1	PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRAN	SPORT	RESTABLISH.	RESTAB. TO	TOTAL	TOTAL OP. &	DIST. OFFICE	REG. OFFICE	TOTAL	TOT. OP. EXP	TOTAL TO LOC.	TOTAL TO	DEFLATED	DEFL. OP. &	DFL. DIST.	DFL. REG	DEFL. TOTAL	DFL TO	DFL TO	
3		PLANTED		OVERHEADS	COSTS		CONTRACTOR					TOPDRESSING	337660				LOCAL CONTR.	OPERATIONAL	OP. OVERHEAD	OVERHEAD	OVERHEADS	EXPENDITURE	TO LOC. CONT.	CONTRACTORS	NORTHLAND	OP. EXPEND.	OP. OVHDS	OFF. OVHDS	OFF. OVHDS	EXPEND.	LOC. CONTR.	NORTHLAND	
4			300		901.5	66	537.845	87	70.5	68.1	225	116	16		6.25	538.5	424.5			0.12	0.08						0.8	0.8	0.8	0.8	0.8	0.8	0.8	
5																																
6	1	3259	977700	22487													977700	1000187	120022.44	80014.96	1200224.4	752829	775316	1000187	782160	800149.6	96017.952	64011.968	960179.52	620252.8	800149.6	
7	2	3259	977700	44974	2937988.5	215094	1752836.85										4130782.5	4175756.5	501090.78	334060.52	5010907.8	2505665.855	2550639.855	3514179.5	3304626	3340605.2	400872.62	267248.42	4008726.24	2040511.88	2811343.6	
8	3	3259	977700	131011	2937988.5	215094	1752836.85										4130782.5	4261793.5	511415.22	340943.48	5114152.2	2505665.855	2636676.855	3600216.5	3304626	3409434.8	409132.18	272754.78	4091321.76	2109341.48	2880179.2	
9	4	3259	977700	217048	2937988.5	215094	1752836.85										4130782.5	4347830.5	521739.66	347826.44	5217396.6	2505665.855	2722713.855	3686253.5	3304626	3478264.4	417391.73	278261.15	4173917.28	2178171.08	2949002.8	
10	5	0	0	280598	2937988.5	215094	1752836.85	283533									3436615.5	3717213.5	446065.62	297377.08	4460656.2	2036369.855	2316967.855	3055636.5	2749292.4	2973770.8	356852.50	237901.66	3568524.96	1853574.28	2444509.2	5
11	6	0	0	344150	0	0	0	283533	229759.5								513292.5	857442.5	102893.1	68595.4	1028931	513292.5	857442.5	857442.5	410634	685954	82314.48	54876.32	823144.8	685954	685954	
12	7	0	0	344150	0	0	0	283533	229759.5								513292.5	857442.5	102893.1	68595.4	1028931	513292.5	857442.5	857442.5	410634	685954	82314.48	54876.32	823144.8	685954	685954	
13	8		0	344150	0	0	0	283533	229759.5	221937.9							735230.4	1079380.4	129525.648	86350.432	1295256.48	735230.4	1079380.4	1079380.4	588184.32	863504.32	103620.52	69080.346	1036205.18	863504.32	863504.32	
14	9		0	344150	0	0	0	0	229759.5	221937.9	733275						1184972.4	1529122.4	183494.688	122329.79	1834946.88	1184972.4	1529122.4	1529122.4	947977.92	1223297.9	146795.75	97863.834	1467957.50	1223297.92	1223297.92	
15	10		0	344150	0	0	0	0	0	221937.9	733275						955212.9	1299362.9	155923.548	103949.03	1559235.48	955212.9	1299362.9	1299362.9	764170.32	1039490.3	124738.84	83159.226	1247388.38	1039490.32	1039490.32	10
16	11		0	344150	0	0	0	0	0	221937.9	733275	378044					1333256.9	1677406.9	201288.828	134192.55	2012888.28	1333256.9	1677406.9	1677406.9	1066605.52	1341925.5	161031.06	107354.04	1610310.62	1341925.52	1341925.52	
17	12		0	344150	0	0	0	0	0	0	733275	378044					1111319	1455469	174656.28	116437.52	1746562.8	1111319	1455469	1455469	889055.2	1164375.2	139725.02	93150.016	1397250.24	1164375.2	1164375.2	
18	13		0	344150	0	0	0	0	0	0	0	378044					378044	722194	86663.28	57775.52	866632.8	378044	722194	722194	302435.2	577755.2	69330.624	46220.416	693306.24	577755.2	577755.2	
19	14		0	344150	0	0	0	0	0	0	0	378044					378044	722194	86663.28	57775.52	866632.8	378044	722194	722194	302435.2	577755.2	69330.624	46220.416	693306.24	577755.2	577755.2	
20	15		0	344150	0	0	0	0	0	0	0	0					0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	15
21	16		0	344150	0	0	0	0	0	0	0	0					0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
22	17		0	344150	0	0	0	0	0	0	0	0					0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
23	18		0	344150	0	0	0	0	0	0	0	0					0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
24	19		0	344150	0	0	0	0	0	0	0	0					0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
25	20		0	344150	0	0	0	0	0	0	0	0					0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	20
26	21		0	344150	0	0	0	0	0	0	0	0	0				0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
27	22		0	344150	0	0	0	0	0	0	0	0	0				0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
28	23	0	0	344150	0	0	0	0	0	0	0	0	0		0		0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
29	24	0	0	344150		0		0	0	0	0	0	0		0	0	0	0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
30	25	0	0	344150		0		0	0	0	0	0	0		0	0	0	0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	25
31	26	0	0	344150		0		0	0	0	0	0	0		0	0	0	0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
32	27	0	0	344150		0		0	0	0	0	0	0		0	0	0	0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
33	28	0	0	344150		0		0	0	0	0	0	0		0	0	0	0	344150	41298	27532	412980	0	344150	344150	0	275320	33038.4	22025.6	330384	275320	275320	
34	29	583.98	175194	344150		0		0	0	0	0	0	5402560	21	0375	0	0	7688129	8032279	963873.48	642582.32	9638734.8	7688129	8032279	8032279	6150503.2	6425823.2	771098.78	514065.86	7710987.84	6425823.2	6425823.2	
35	30	562.76	168828	344150		38542.68		0	0	0	0	0	5402560	21	0375	314473.23	247899.51	8034778.91	8378928.91	1005471.47	670314.31	10054714.7	7929662.51	8273812.51	8312355.19	6427823.13	6703143.1	804377.18	536251.45	8043771.75	6619050.01	6649884.15	30
36	31	546.02	163806	344150		37142.16		0	0		0	0	5402560	21	0375	303046.26	238891.62	8016929.42	8361079.42	1003329.53	668886.35	10033295.3	7915632.62	8259782.62	8296924.78	6413543.54	6688863.5	802663.62	535109.08	8026636.24	6607826.10	6637539.82	
37	32	530.24	159072	344150		36037.32		0	0		0	0	5402560	21	0375	294031.77	231785.49	8002076.09	8346226.09	1001547.13	667698.09	10015471.3	7903792.49	8247942.49	8283979.81	6401660.87	6676980.9	801237.70	534158.47	8012377.05	6598353.99	6627183.85	
38	33	515.35	154605	344150		34995.84		50806.26	0		0	0	5402560	21	0375	285534.24	225086.88	8038876.34	8383026.34	1005963.16	670642.11	10059631.6	7943433.14	8287583.14	8322578.98	6431101.07	6706421.1	804770.53	536513.69	8047705.29	6630066.51	6658063.18	
39	34	501.27	150381	344150		34013.1		48960.12	41170.59		0	0	5402560	21	0375	277515.975	218766.075	8064975.785	8409125.785	1009095.09	672730.06	10090950.9	7972212.785	8316362.785	8350375.88	6451980.63	6727300.6	807276.08	538184.05	8072760.75	6653090.23	6680300.71	
40	35	500.75	150225	344150		33083.82		47503.74	39674.58		0	0	5402560	21	0375	269933.895	212789.115	8053356.035	8397506.035	1007700.72	671800.48	10077007.2	7963127.435	8307277.435	8340361.25	6442684.83	6718004.8	806160.58	537440.39	8061605.79	6645821.95	6672289.00	35
41																																
42			5032911	11020618	11751954	1074190.92	7011347.42	1281402.12	999883.17	887751.6	2933100	1512176	37817920	147	2625	1744535.37	1375218.69	79808449.18	90829067.18	10899488.1	7266325.4	108994881	72724851	83745469	87813442.5	63846759.3	72663254	8719590.4	5813060.3	87195904.5	66996375.2	70250754	

2, 3259 hectares are planted. The third row lists the values spent on each activity, with these costs usually expressed on a per hectare basis. (Harvesting costs are expressed on a cubic metre basis and for transportation the cost is for transporting 1 m3 25 km.) Therefore in year 3, $2,937,988.50 is spent on establishment and another $215,094 on trees. Columns G and P indicate the amount of establishment and restablishment expenditure paid to local contractors. Columns S and T contain district and regional office overheads. Column Q lists total operational expenditure and column R adds operational overhead expenditure to this total. In column U, 'Total Expenditure' equals the sum of operational , operational overhead, plus district and regional office overhead expenditure. The 'Total to Local Contractors' column consists of column V added to column D - 'Operational Overheads'. In columns A to X data is expressed in 1985/86 dollars, while in columns Y to AC this data is deflated by 25% to express it in 1983/84 dollars. Along the bottom of the spreadsheet in row 42 are the total expenditures by category and direction. For example, row 43 column D shows that $11,751,954 would be spent on establishing the 13,036 hectares of forest and row 43 column 0 shows that $6,166,201.90 would be spent on reestablishing forest on the areas harvested. The total operational and operated overhead expenditure over the 35 year span of the scenario would be $195,362,030. (See row 42 column R in 1983/84 $ this is equivalent to $156,289,624). In the last three columns annual farm expenditure in Dargaville, Northland and Whangarei are listed for comparative purposes (See Chapter 6.)

Study of the year by year expenditure flows in each column illustrates the very wide range in expenditure that would take place. For example, total operational and operational overhead expenditure varies from $344,154 to $12,960,036 The variable nature of forestry scenario expenditure is clearly illustrated in Figures 5.2 and 5.3, the implications of this are considered to be more important than the total amount of expenditure over the 35 year span of the scenario. The discussion on total expenditures below is presented to highlight the impacts of different harvesting options and the relative contribution of different forestry activities. It is not until harvesting commences that forestry expenditure reaches a consistent level, if the amount harvested changes from year to year then expenditure levels would also be variable. Expenditure data for both the HV 23 and HV 29 harvesting options of this scenario are summarised in the tables below.

Table 5.10 35 Year Expenditure, Conventional Forestry Scenario

	HV 29	HV 23	(1983/84 $)
1. Total Expenditure	87,195,904	187,547,548	
2. Total Northland - less District & Regional Office Overheads	70,250,754	153,128,273	
3. Expenditure to local Contractors	66,996,375	149,440,350	

1. Total expenditure equals operational, plus operational, district and regional office overhead expenditure on the two scenario spreadsheets.

2. Total Northland expenditure is total expenditure less that paid outside Northland for such items as

chemicals and vehicles. It includes all operational expenditure to local contractors, expenditure on trees and operational overheads. District and regional office overheads are not included.

3. This is the level of expenditure that goes to contractors working in the forest. It includes operational overhead expenditure (Further details on expenditure flows to contractors are in Section 5.4).

As can be seen from comparing expenditure in the two forestry scenarios, the overall expenditure levels are extremely sensitive to when harvesting is started, the rate of harvesting and the time span of the scenario. Study of Figures 5.2 and 5.3 shows that forestry expenditure is about $13 m per year with the HV 23 option and $8 m with the HV 29 option. Once harvesting commences, assuming a recoverable volume of 600 m3 per hectare at age 30, then harvesting one hectare at age 30 incurs nearly ten times as much expenditure as the establishment of the same area. ($967.50 versus $9,600.)

In Tables 5.10 and 5.11 forestry expenditure by category is presented - these tables emphasise the contribution of harvesting to total expenditure.

Table 5.11 Expenditure Categories - Relative Contribution HV.29 Option

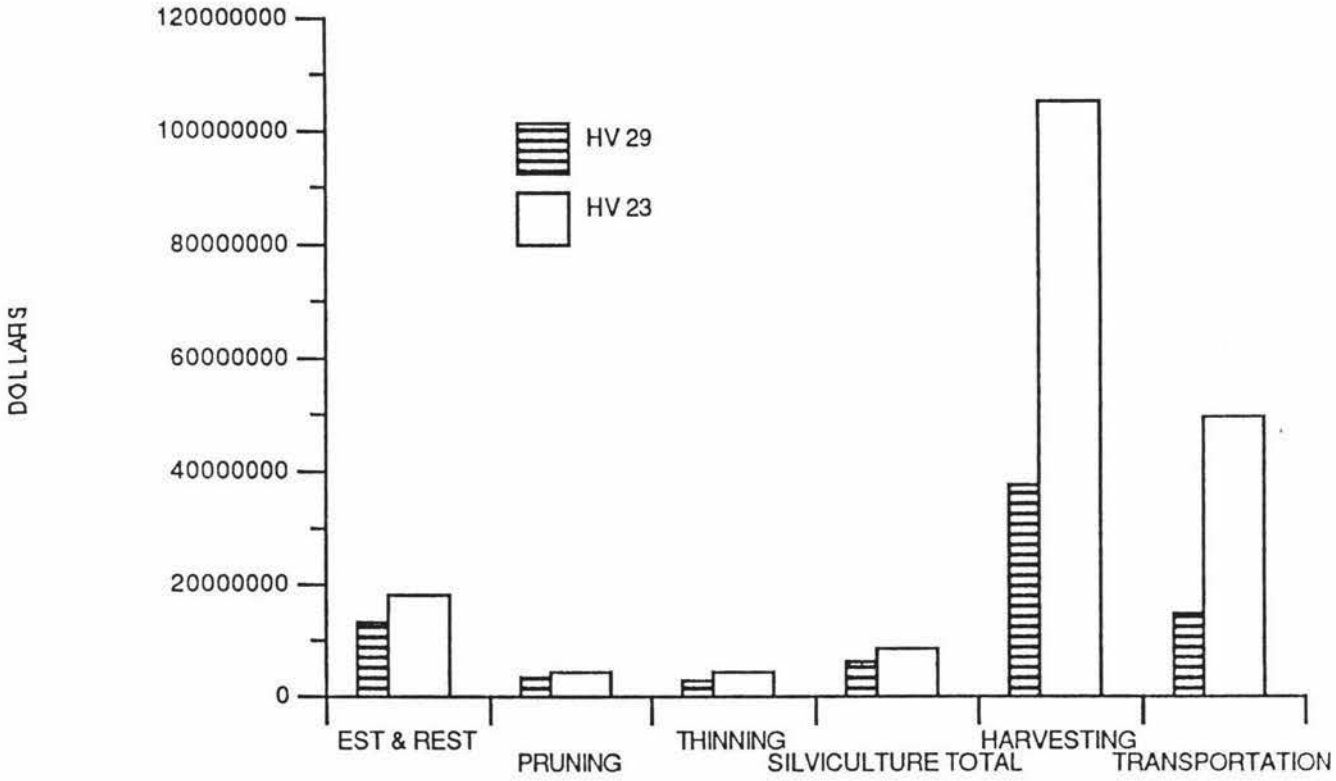
Expenditure Category	Amount 1985/86 $	Percentage of: Total Expenditure	Total Operational Expenditure
Harvesting	37,817,920	35	47
Transportation	14,772,625	14	19
Est & Rest	13,496,489	12	16
Pruning	3,169,036	2.9	3.9
Thinning	2,933,100	2.9	3.6

Table 5.11 shows that while a 10% increase in harvesting costs would add 3.5% to total expenditure, a 10% increase in pruning expenditure would add about 0.3%. The next table presents the same information for the HV 23 option, here harvesting represents 57% of operational expenditure.

Table 5.12 Expenditure Categories - Relative Contribution HV23 Option

Expenditure Category	Amount 1985/86 $	Percentage of Total: Expenditure	Operational Expenditure
Harvesting	105,349,504	45	57
Transportation	41,152,150	18	24
Est & Rest	17,918,156	7.3	9.3
Pruning	4,365,336	1.8	2.3
Thinning	4,119,748	1.7	2.1

Figure 5.4 highlights the importance of harvesting to total forestry expenditure.



5.4 STUDY AREA FORESTRY EXPENDITURE CATEGORIES

The impact of harvesting on total forestry expenditure can be highlighted another way: Total traced and estimated farm expenditure (not including personal drawings) totalled $3,346,869 from 15,117 hectares - harvesting just 436 hectares of 30 year old trees incurs the same level of expenditure in 1983/84 prices. The sustainable annual yield for this forest of 13,036 ha is 242,346 m3 - which would cost $3,877,536 in 1985/86 prices and $3,102,029 in 1983/84 prices to harvest, slightly less than farm expenditure. Transporting this amount of roundwood 25 kilometres at 25 cents a tonne kilometres would add $1, 514,662 (1985/86$) and the forestry expenditure total would be considerably higher than annual farming expenditure. One of the most important implications of the above discussion is that it is when harvesting commences that the impacts of forestry become most apparant.

The next step is to indicate the location of direct forestry expenditure.

5.6 The Direction of Forestry Expenditure

The majority of forestry expenditure flows from the forestry companies through contractors into the local and regional economy. While less than 5% of the study area's farm expenditure was paid out as wages, between 55 and 65% of forestry contractors expenditure is paid out as wages. (The total labour cost component is higher than this. For example, the total labour cost component of siliviculture is close to 90%. Moore 1981) . Therefore the assumptions made regarding where contractors and their employees live have important implications for the direction of forestry expenditure.

As forestry operations near Dargaville expand, with the forests growing in age and size, it is anticipated that people, including contractors, will be attracted to Dargaville for forestry work. It is also anticipated that those contracting firms currently getting some of their work from forestry will get a higher proportion from forestry in the future, which will encourage them to locate in and about Dargaville. It would be illogical for new forestry contractors to start operating far from Dargaville if they wish to work the forests around that town. With 8,200 ha. of a planned total of 25,000 ha. planted around the study area, there is a long way to go before the full size of the forest is reached and the sustainable expenditure and employments levels are reached: It is these levels that will determine the number of contractors the forest resource will support. As yet there is a relatively modest demand for silviculture labour and no demand for harvesting labour around the study area.

Tables 5.14 and 5.15 present a summary of where direct forestry operational and operational overhead expenditure would take place, given the assumptions made. (In Appendix 4 detailed expenditure location results are presented.) There are two tables because there are two harvesting options and the assumptions behind expenditure direction, not covered in Section 5.4.2, are outlined below .

It is assumed that 23% of the initial roading and establishment expenditure going to Northland contractors goes to contractors living outside Dargaville and the study area. This assumption is made because in the 1984-1985 year, 23% of payments to all contractors were paid to those outside Dargaville and the study area.

Table 5.13 HV 23 Option - Expenditure Direction

	Total Northland	Dargaville	Outside Northland
Total	191,410,342 (153,128,274)	186,800,437 (149,440,350)	3,951,688 (3,161,688)

Table 5.14 HV29 Option - Expenditure Direction

	Total Northland	Dargaville	Outside Northland
Total	87,813,443 (70,250,754)	83,745,469 (66,996,375)	3,015,625 (2,412,500)

(The figures in brackets are in 1983/84 $)

These expenditure totals indicate the 35 year forestry expenditure impact on various areas, but give no indication of the year by year amounts, which are highly variable, as demonstrated by study of the spreadsheets and graphs. On the scenario spreadsheets and the graphs, expenditure in and around

Dargaville is illustrated by the 'Deflated Expenditure to Local Contractors' column. In Chapter Six these expenditure levels are compared with the farming expenditure levels.

5 .7 Employment.

The labour requirements of the two harvesting options of this conventional forestry scenario are detailed by year and category in the two attached spreadsheets. Using the labour hour requirements listed earlier in this chapter, the HV23 option would generate 4,419,291 hours of employment and the HV 29 option 1,998,650 hours. These hours include the activity needed to establish, manage and harvest the trees. Overhead labour requirements are not included. Assuming 40 hour weeks and 46 working weeks per year, this is equivalent to an average of 69 and 31 persons respectively employed per year over the span of the scenarios. If transportation labour demand is included the total employment generated would be 4,913,117 and 2,175,918 hours respectively. Again assuming 40 hour weeks and 46 working weeks per year, this is equivalent to 76 and 34 persons respectively employed per year over the span of the scenarios. As with forestry expenditure, it is stressed that forestry employment demands are highly variable. The attached labour use graphs and spreadsheets demonstrate this, highlighting the impact of harvesting on total labour demand. Note that these figures apply to the time needed to carry out the tasks described and do not include down time, such as vehicle servicing and travel to and from the work site. It is not known how much down time there would be for all forestry activities.

Table 5.15 details the labour requirements for each phase of the forestry development and the percentage of the total taken by each phase.

Table 5.15 Employment Generated - Including Transport

Activity	Harvesting Option			
	HV 29		HV 23	
	Person Years	%	Person Years	%
Establishment & Restablishment	243.7	20.6	322.7	12.1
Pruning	107.4	9.1	159.7	6.0
Thinning	91.4	7.7	128.4	4.8
Aerial Topdressing	1.4	0.1	1.8	0.1
Harvesting	642.3	54.3	1789.2	67.0
Log Transport	96.3	8.2	268.4	10.1
Total	1182.6		2670.2	

The table shows how the different forestry activities have very different employment demands. The table shows, for example, that pruning all of the original resource would increase the HV 29 total labour demand by about 23%. Total employment is more sensitive to the amount of pruning carried out than total expenditure is (see Table 4.10). The labour requirements for each forestry activity is the time needed to

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	PRUNING 1	PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRANSPORT	RESTABLISH.	TOTAL		PERSON	
3		PLANTED		OVERHEADS	LABOUR					TOPDRESSING	506488.00			OPERATIONAL		YEARS	
4			UNCLEAR	UNCLEAR	30.00	5.40	4.44	4.23	12.90	0.20	0.50	0.07	18.00				
5																	
6	1	3259.00												0.00		0.00	
7	2	3259.00			97770.00									97770.00		53.14	
8	3	3259.00			97770.00									97770.00		53.14	
9	4	3259.00			97770.00									97770.00		53.14	
10	5	0.00			97770.00	17598.60								115368.60		62.70	
11	6	0.00			0.00	17598.60	14469.96							32068.56		17.43	
12	7	0.00			0.00	17598.60	14469.96							32068.56		17.43	
13	8				0.00	17598.60	14469.96	13785.57						45854.13		24.92	
14	9					0.00	14469.96	13785.57	42041.10	651.80				70948.43		38.56	
15	10					0.00	0.00	13785.57	42041.10	651.80				56478.47		30.69	
16	11					0.00	0.00	13785.57	42041.10	651.80				56478.47		30.69	
17	12					0.00	0.00	0.00	42041.10	651.80				42692.90		23.20	
18	13					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
19	14					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
20	15					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
21	16					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
22	17					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
23	18					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
24	19					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
25	20					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
26	21					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
27	22					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
28	23	1140.23				0.00	0.00	0.00	0.00	0.00	253244.00	37986.60		291230.60		158.28	
29	24	1083.17				0.00	0.00	0.00	0.00	0.00	253244.00	37986.60	20524.14	311754.74		169.43	
30	25	1031.54				0.00	0.00	0.00	0.00	0.00	253244.00	37986.60	19497.06	310727.66		168.87	
31	26	1031.36				0.00	0.00	0.00	0.00	0.00	253244.00	37986.60	18567.72	309798.32		168.37	
32	27	987.69				6157.24	0.00	0.00	0.00	0.00	253244.00	37986.60	18564.48	315952.32		171.71	
33	28	947.42				5849.12	5062.62	0.00	0.00	0.00	253244.00	37986.60	17778.42	319920.76		173.87	
34	29	935.32				5570.32	4809.27	0.00	0.00	0.00	253244.00	37986.60	17053.56	318663.75		173.19	
35	30	910.29				5569.34	4580.04	4823.17	0.00	0.00	253244.00	37986.60	16835.76	323038.91		175.56	
36	31	875.97				5333.53	4579.24	4581.81	14708.97	228.05	253244.00	37986.60	16385.22	337047.41		183.18	
37	32	844.53				5116.07	4385.34	4363.41	13972.89	216.63	253244.00	37986.60	15767.46	335052.41		182.09	
38	33	844.15				5050.73	4206.54	4362.65	13306.87	206.31	253244.00	37986.60	15201.54	333565.24		181.29	
39	34	819.03				4915.57	4152.82	4177.93	13304.54	206.27	253244.00	37986.60	15194.70	333182.43		181.08	
40	35	795.36				4730.24	4041.69	4007.59	12741.20	197.54	253244.00	37986.60	14742.54	331691.39		180.27	
41																0.00	
42		25282.06	0.00	0.00	391080.00	118686.55	93697.41	81458.84	236198.87	3662.00	3292172.00	493825.80	206112.60	4916894.07		2672.23	
43																	
44	PERSON																
45	YEARS		0.00	0.00	212.54	64.50	50.92	44.27	128.37	1.99	1789.22	268.38	112.02	2672.23			

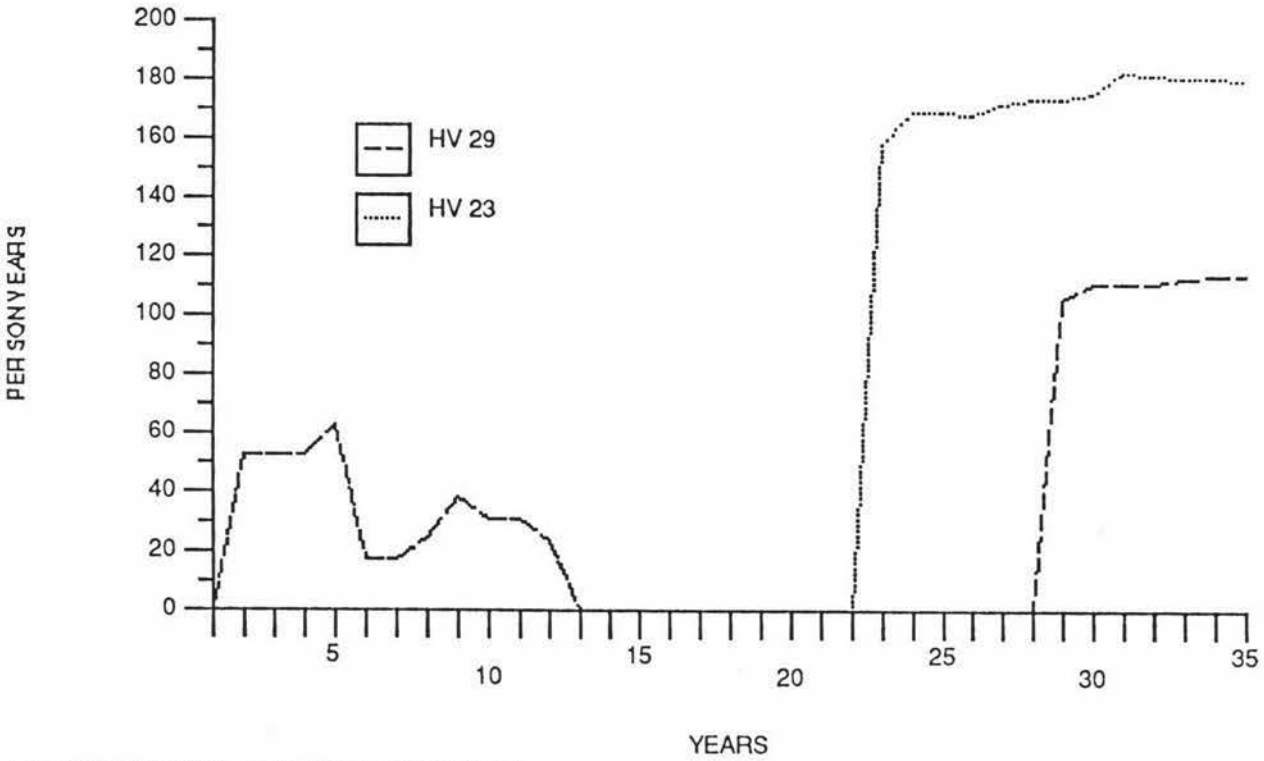
STUDY AREA FORESTRY LABOUR DEMAND HV 23 OPTION

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	PRUNING 1	PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRANSPORT	RESTABLISH.	TOTAL		PERSON
3		PLANTED		OVERHEADS	LABOUR					TOPDRESSING	337660.00			OPERATIONAL		YEARS
4			UNCLEAR	UNCLEAR	30.00	5.40	4.44	4.23	12.90	0.20	0.50	0.07	18.00			
5																
6	1	3259.00												0.00		0.00
7	2	3259.00			97770.00									97770.00		53.14
8	3	3259.00			97770.00									97770.00		53.14
9	4	3259.00			97770.00									97770.00		53.14
10	5	0.00			97770.00	17598.60								115368.60		62.70
11	6	0.00			0.00	17598.60	14469.96							32068.56		17.43
12	7	0.00			0.00	17598.60	14469.96							32068.56		17.43
13	8	0.00			0.00	17598.60	14469.96	13785.57						45854.13		24.92
14	9					0.00	14469.96	13785.57	42041.10	651.80				70948.43		38.56
15	10					0.00	0.00	13785.57	42041.10	651.80				56478.47		30.69
16	11					0.00	0.00	13785.57	42041.10	651.80				56478.47		30.69
17	12					0.00	0.00	0.00	42041.10	651.80				42692.90		23.20
18	13					0.00	0.00	0.00	0.00	0.00				0.00		0.00
19	14					0.00	0.00	0.00	0.00	0.00				0.00		0.00
20	15					0.00	0.00	0.00	0.00	0.00				0.00		0.00
21	16					0.00	0.00	0.00	0.00	0.00				0.00		0.00
22	17					0.00	0.00	0.00	0.00	0.00				0.00		0.00
23	18					0.00	0.00	0.00	0.00	0.00				0.00		0.00
24	19					0.00	0.00	0.00	0.00	0.00				0.00		0.00
25	20					0.00	0.00	0.00	0.00	0.00				0.00		0.00
26	21					0.00	0.00	0.00	0.00	0.00				0.00		0.00
27	22					0.00	0.00	0.00	0.00	0.00				0.00		0.00
28	23	0.00				0.00	0.00	0.00	0.00	0.00				0.00		0.00
29	24	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00
30	25	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00
31	26	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00
32	27	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00
33	28	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00
34	29	583.98				0.00	0.00	0.00	0.00	0.00	168830.00	25324.50	0.00	194154.50		105.52
35	30	562.76				0.00	0.00	0.00	0.00	0.00	168830.00	25324.50	10511.64	204666.14		111.23
36	31	546.02				0.00	0.00	0.00	0.00	0.00	168830.00	25324.50	10129.68	204284.18		111.02
37	32	530.24				0.00	0.00	0.00	0.00	0.00	168830.00	25324.50	9828.36	203982.86		110.86
38	33	515.35				3153.49	0.00	0.00	0.00	0.00	168830.00	25324.50	9544.32	206852.31		112.42
39	34	501.75				3038.90	2592.87	0.00	0.00	0.00	168830.00	25324.50	9276.30	209062.58		113.62
40	35	500.75500.75				2948.51	2498.65	0.00	0.00	0.00	168830.00	25324.50	9031.50	208633.16		113.39
41																0.00
42		16276.10	0.00	0.00	391080.00	79535.30	62971.37	55142.28	168164.40	2607.20	1181810.00	177271.50	58321.80	2176903.85		1183.10
43																
44	PERSON															
45	YEARS		0.00	0.00	212.54	43.23	34.22	29.97	91.39	1.42	642.29	96.34	31.70	1183.10		

STUDY AREA FORESTRY LABOUR DEMAND HV 29 OPTION

carry out the task and does not include the time spent servicing machinery or travelling between forestry blocks. If a 20% " down" time is assumed then the respective person year equivalant employment generation would be 1,419 and 3,204.

Figure 5.5 shows that during the establishment phase employment would average the equivalent of about 50 people per year. During the pruning phase employment would not exceed the equivalent of 40 people but once the harvesting/restablishment cycle started employment would rise sharply. The HV 23 option would generate the equivalent of 160 - 185 person years employment annually and the HV 29 option 108 to 115 person years annually.



5.5 FORESTRY LABOUR DEMAND

Summary

In the forestry scenario presented, the entire study area is developed as a conventional forest, using private company operational forestry costs and practices. Before outlining the results of the scenario, some information on likely forestry contractor and forestry worker household expenditure patterns was presented. This information suggested that large scale conventional forestry development in the study area is likely to lead to a shift in household expenditure to Dargaville.

The results of two harvesting options for a 13,036 hectare forest development are presented, which show that total forestry expenditure is extremely sensitive to the year harvesting starts, the amount harvested and the span of the scenario. Total operational and operational overhead expenditure equals $195,362,029 for the HV23 option and $90,829,067 for the HV 29 option. The most important point

about this total expenditure is that it varies greatly over the 35 year span of the scenario, from $344,150 to $12,960,036 in the case of the HV 23 option and from $344,150 to $8,409,126 in the HV 29 option. A consistent level of expenditure is not reached until harvesting commences and if the amount harvested varies then this expenditure will also vary.

The majority of the scenario forestry expenditure takes place in Dargaville and over 95% of all forestry scenario expenditure takes place inside Northland.

The HV 29 option of the scenario generates the equivalent of an average of 34 person years of employment over the 35 years of the scenario and the HV 23 option the equivalent of an average of 76 person years. As with forestry expenditure, employment generation varies markedly by year and forestry activity. This establishment and harvesting employment would tend to be dominated by young single males, if present forestry worker characteristics continue.

In Chapter 6 the forestry and farming scenario impacts are compared.

SIX - THE IMPACT OF THE STUDY AREA CONVENTIONAL FORESTRY SCENARIO

6.0 Introduction

This chapter outlines the impact of changing the study area farms to forestry on the social and economic structure the study area farms help support. First the farming/forestry expenditure levels and flows are compared, including a comparison of the location and timing of expenditure flows. The impact on production, expenditure and employment in different sectors, such as transportation and fertiliser, are outlined. The impact on schools, population and other social parameters are also discussed.

6.1 Expenditure Levels

Tables 6.1 and 6.2 compare 35 year forestry expenditure totals with those generated by farming. (The farming expenditure total has been adjusted to allow for the removal of SMP payments.) While the year by year expenditure flows are considered more important than the total spent over the 35 years, this discussion will highlight the impact of different harvesting options on the farming-forestry expenditure comparison. It will also highlight differences in regional leakages and show that, whatever the harvesting option, a significant shift in the direction of expenditure occurs. For example, Table 6.1 shows that a regional leakages are higher with farming. In Table 6.1 forestry expenditure includes operational, operational overhead and non-operational overhead expenditure, while Table 6.2 excludes district and regional office overheads. This split is presented because district and regional overhead costs are not direct operational costs, some proportion of them would be fixed, and they would not increase exactly in line with operational expenditure. But it is not possible to give an accurate indication of the fixed/variable cost split. Forestry expenditure is presented in 1985/86 and 1983/84 dollars. If current farm expenditure is indicative of the long term sustainable expenditure levels of Northland's farming industry, then comparing 1983/84 farming expenditure with forestry expenditure in 1985/86 $ is valid.

Tables 6.1 and 6.2 show that in terms of overall 35 year expenditure, the results of an expenditure comparison between farming and forestry are dependent on the year harvesting starts, the amount cut per year and the span of the scenarios. The results are also very sensitive to the cost of harvesting.

Table 6.1 35 Year Farming + Forestry Operational & Non Operational Expenditure

	Farming	Forestry HV 23		Forestry HV 29	
	(SMP Adj)	1985/86 $	1983/84 $	1985/86 $	1983/84 $
Dargaville	65,615,095	210,243,881	168,195,105	94,644,957	75,715,966
Whangarei	32,416,090	16,628,962	13,303,167	8,266,325	6,257,185
Study Area	7,235830				
Other North.	3,640,875	3,609,905	2,887,924	3,067,974	2,454,379
Total North.	108,907,890	230,482,747	184,386,198	105,979,255	84,783,404
Outside North.	19,319,545	3,951,688	3,161,350	3,015,625	2,412,500
TOTALS	128,227,435	234,434,436	187,547,549	108,994,881	87,195,905

Table 6.2 35 Year Farming and Operational Forestry Expenditure Comparison ($)

	Farming	Forestry HV 23		Forestry HV 29	
	(SMP Adj)	1985/86 $	1983/84 $	1985/86 $	1983/84 $
Dargaville	65,615,095	186,800,437	149,440,350	83,745,469	66,996,375
Whangarei	32,416,090	1,000,000	750,000	1,000,000	750,000
Study Area	7,235830				
Other North.	3,640,875	3,609,905	2,887,924	3,067,974	2,454,379
Total North.	108,907,890	191,419,342	153,128,273	87,813,442	70,250,754
Outside North.	19,319,545	3,951,688	3,161,350	3,015,625	2,412,500
TOTALS	128,227,435	195,362,029	156,289,623	90,829,067	72,663,254
Office Overhead Costs:					
District (Dargaville)		23,443,443	18,754,755	10,899,488	8,719,590
Regional (Whangarei)		15,628,962	12,503,170	7,266,325	5,813,060

While total expenditure is very sensitive to harvesting parameters, under both harvesting options significant changes in the direction of existing expenditure flows would occur. Whether or not non-operational overheads (that is district or regional office overheads) are included, there would be a dramatic cut in expenditure flowing to the study area and to Whangarei. Farm expenditure in the study area would drop to zero. While some of the expenditure going to 'Other Northland' may go to Whangarei,

in the context of overall expenditure it would be an insignificant amount. The evidence to support this statement is taken from the level of expenditure, $328,000, that went to contractors currently based in and about Whangarei for the 1984/85 year. Of this $328,000, $272,596 went to machinery operators who clear bush and prepare grounds for planting. As the study area has few areas of bush, less machinery time will be required, so this figure is likely to drop. Therefore, while some expenditure could be expected to go to Whangarei during the establishment phase, it is unlikely it would reach more than about $250,000 per year for the 4 years over which the forest is planted.

While 51% of farming expenditure would go to Dargaville, a much higher proportion of forestry expenditure would go to Dargaville under either of the harvesting options and whether or not non-operational overheads were included in the expenditure total. This is to be expected as the forestry development is closer to Dargaville than Whangarei and Dargaville is the operational base of the forestry development around the study area. In the HV 23 option 91% of total operational and operational overhead expenditure would go to Dargaville and in the HV 29 option 82%. Once harvesting commenced, annual forestry expenditure in Dargaville would be significantly higher than study area farming expenditure in that town. While annual farming expenditure totalled $1,874,717, harvesting 337,660 m3 per year would mean $4,322,048 (1983/84 $) in harvesting expenditure being spent in Dargaville per year. When transportation, replanting and operational overhead costs are added total expenditure would be about $7 M per year (1983/84 $). The sustained yield cut of the forest would result in $3,102,029 in harvesting expenditure being spent annually in that town, assuming all was spent in and about Dargaville. If the annual cut from the forest dropped below around165,639 m3 harvesting expenditure in Dargaville would be less than farming expenditure.

In the farm scenario, 85% of all farm expenditure takes place within Northland. With the forestry scenarios a higher percentage of total expenditure would be spent inside Northland: With the HV 23 option, 97% of all operational and non-operational expenditure and with the HV 29 option 96%. It is important to remember that these are first round expenditures and in Chapter Nine multiplier analysis will be applied to estimate the total effect of the forestry and farming expenditures on the regional economy.

It is commonly asserted that forestry expenditure has higher regional leakages than farming. The farming and conventional forestry scenarios show that this is not always the case where the establishment, growth and harvesting of a forest resource is concerned. The major source of regional leakages from forestry operational expenditure in this scenario would be the purchase of chemicals. Should a forestry processing plant be established then regional leakages would be a much higher proportion of total forestry expenditure - but forestry expenditure would also be much higher. The most important factor regarding the comparative regional leakages impact in the farming and forestry scenarios is the amount of debt servicing farmers are faced with. Under the current economic climate the level of farm debt servicing is increasing and thus farming regional leakages will also be increasing as a proportion of farm expenditure. In these scenarios, if debt servicing dropped by about 25% on the study area farms and the money saved was spent in Northland, the regional leakages of forestry and farming would be about the same.

6.2 The Timing of Farming and Forestry Expenditure Flows

The tables do not show the significant differences in the timing of forestry and farming expenditure. Figure 6.1 illustrates the difference between forestry and farming expenditure flows over the 35 years of the scenarios, with total forestry expenditure, plus operational and operational overhead (O&OH) expenditure being graphed. Study of the spreadsheets also indicates the year by year expenditure flows. The HV 23 option spreadsheet also has year by year farm expenditures by location for comparative purposes. While O & OH expenditure are close to total farm expenditure during the establishment phase, the decline in expenditure until harvesting begins is dramatic. An implication of this is that the forestry development contained in the scenario would result in a relatively lower level of regional economic activity until harvesting commenced.

Figures 6.2 and 6.3 compare forestry and farming expenditure within Northland and in the Dargaville area for the HV 23 and HV 29 options. Along with the information in Tables 6.1 and 6.2, they illustrate that pre-harvesting expenditure in and about Dargaville would not drop by as much as a total expenditure comparison would suggest. This is because a higher proportion of forestry expenditure goes to Dargaville and because a higher proportion of farming expenditure goes outside Dargaville and Northland. During the establishment phase, expenditure to Dargaville would increase when compared with farming expenditure, but would be less even during the height of the silviculture phase. If all the planted area was pruned then forestry expenditure in Dargaville would be higher than farming expenditure for some of years between year 7 and 11. The graph does not show that expenditure to the study area and Whangarei would drop as soon as forestry operations replaced farming ones and remain much lower than pre - forestry development levels.

6.3 The Impact on the Business Sector

The impact on businesses, such as those selling fertiliser and shearing gangs is looked at in two parts: study area businesses and those outside the study area.

6.3.1 Study Area Business Activity

The local businesses all supplied financial information on their total turnover and the importance of the study area farms to their turnover. This financial information was given in confidence and cannot be reproduced here on an individual business basis. But the percentage of each business's turnover coming from the study area can be presented and this is enough to give an accurate indication of the impact of the sale of the study area farms to forestry interests.

Parakao Store and Post Office

This store is owned and run by a husband and wife team . Also living in the house is a son working for a forestry contractor and a daughter attending Dargaville High School.

Forty-three percent of the store's 170 account holders are farmers and 5% work for forestry, but the contribution of the study area farms to the store's income is only about 5% of total turnover. The store's owners are not concerned about the development of forestry in the area because forestry activity is

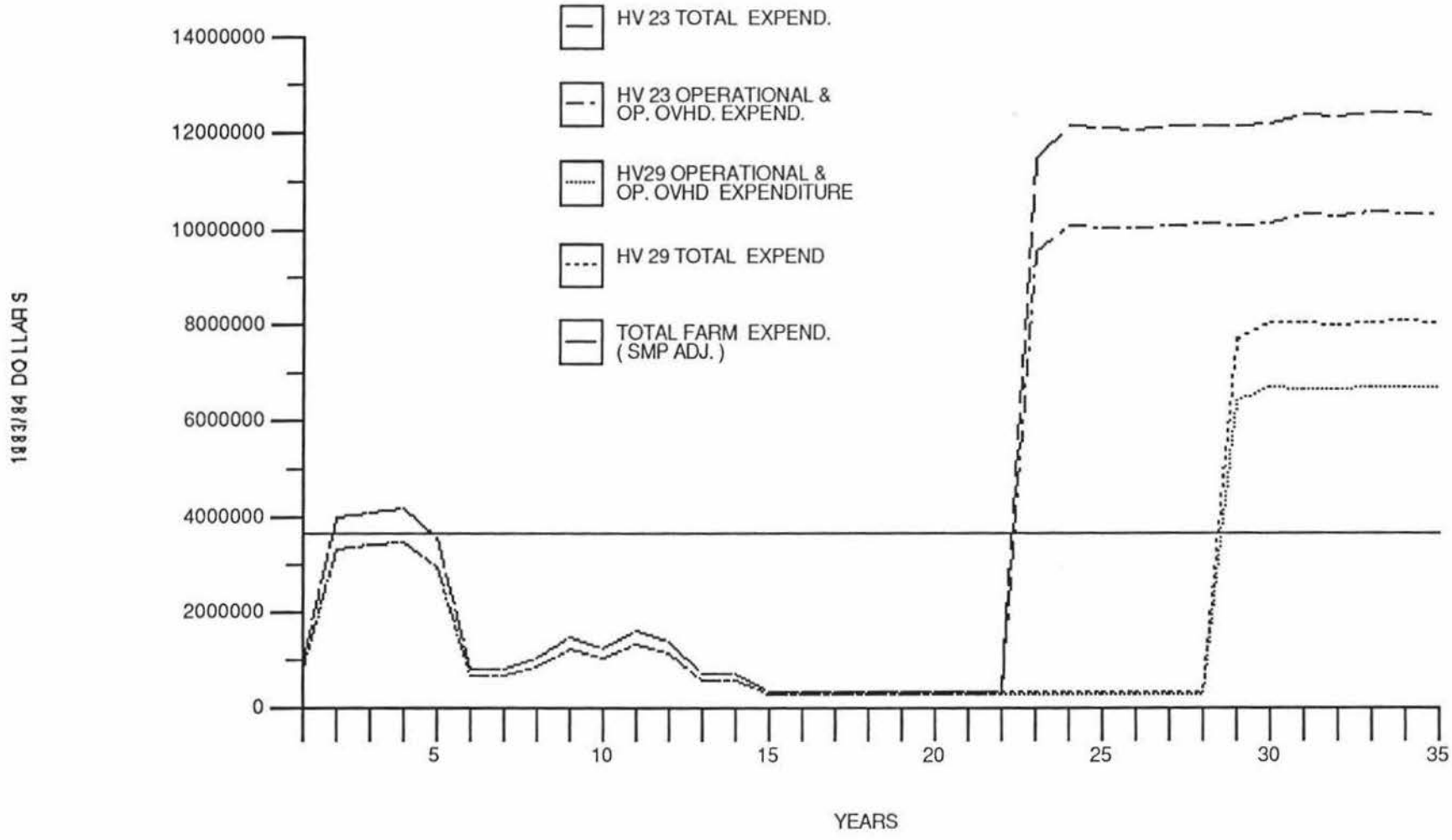


FIG 6.1 EXPENDITURE: HV 29 & H23 / FARMING COMPARISON

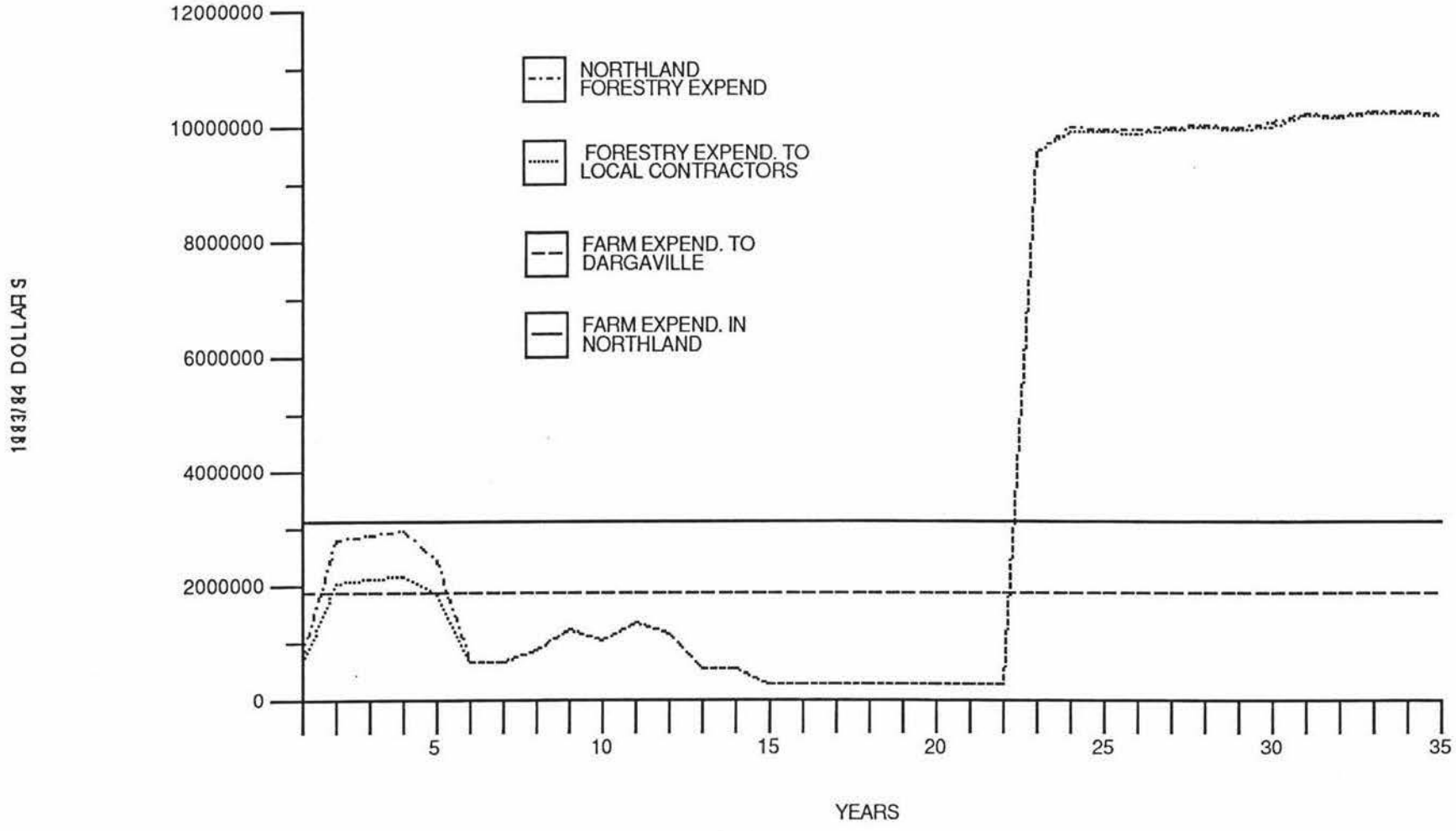


FIG 6.2 NORTH. & DARG. EXPEND. HV 23 / FARMING COMPARISON

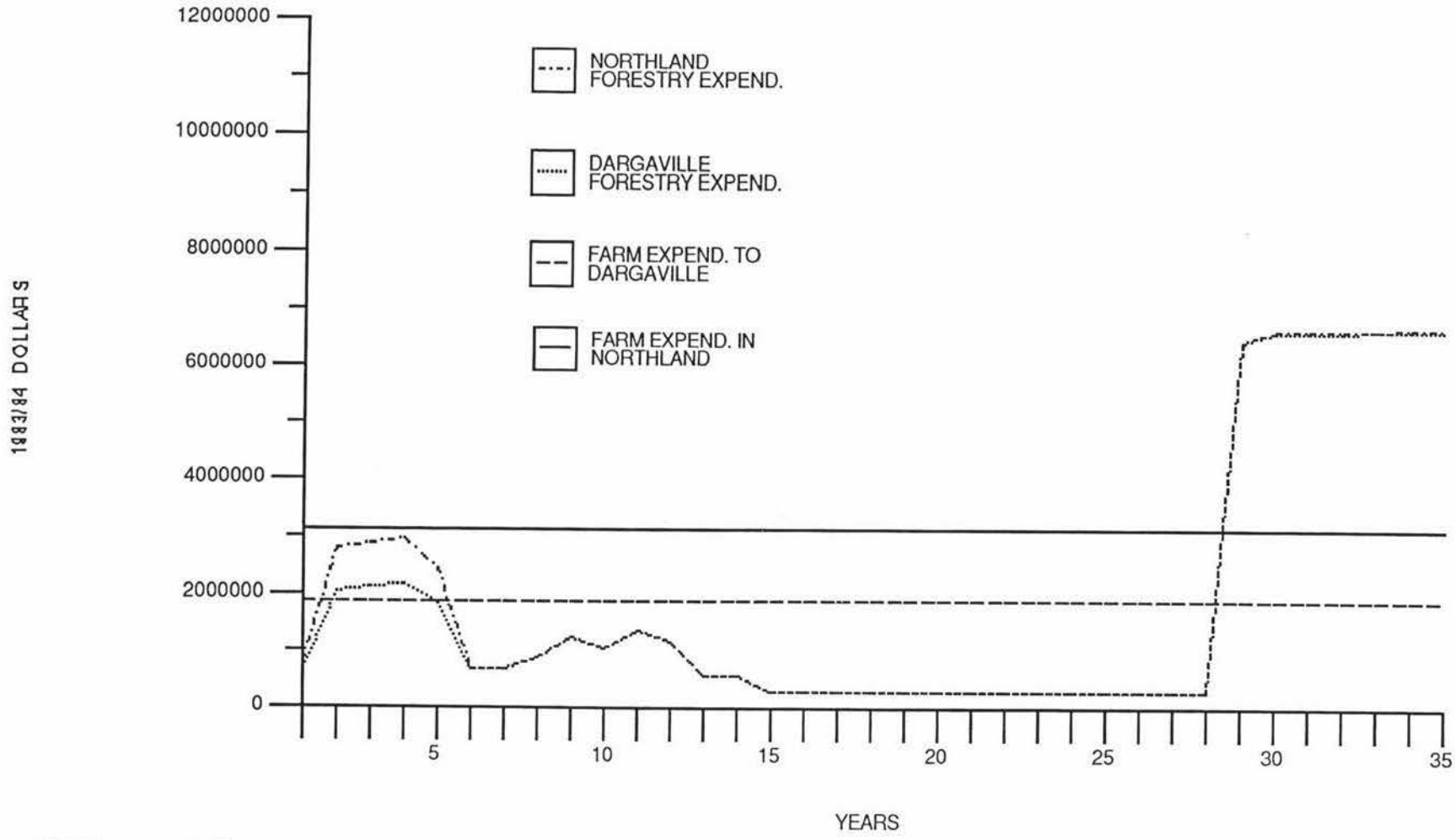


FIG 6.3 NORTH. & DARG. EXPEND. HV29 / FARMING COMPARISON

benefiting the Parakao store by increasing sales generally, and cash sales in particular. The store owner feels that forestry activity "can only be for the good" of the community. The case of a farm that had a large area in scrub, which was being sold off to forestry, was presented as evidence that forestry could lead to more productive land use.

Even if the whole of the study area changed from pastoral farming to forestry, it would not have a detrimental impact on the Parakao Store for three reasons. Firstly, a small number of study area farmers use the store - those living at the top end of the Kirikopuni Road and along the Karaka Road. Secondly, most of the stores turnover does not come from farmers and thirdly, an increase in forestry activity means an increase in sales.

Tangiteroria Store and Post Office

This store is located on the main road between Dargaville and Whangarei and it has a much lower turnover than the Parakao store, with the owners also running a farm. Farmers from the study area make up 14% of account holders and purchase bread, milk, papers and in some cases, small grocery items from the store. Eighty-four percent of the stores account holders are farmers, therefore this store is much more dependent on farmers than the Parakao Store. If all of the study area was sold to forestry and the houses remained empty, then the store would lose 14% of its regular turnover. With the store owners having a farm, the loss of sales would have less impact than at first appears. Additionally, it is felt that sufficent houses would be occupied by people moving into the district so that sales would be minimally affected and the rural delivery service would not be threatened.

The Tangiteroria Garage.

In this garage two mechanics work fulltime and one person part time to deal with the garage accounts. There are 60 account holders, with farmers in the study area contributing less than half of the total turnover. Non-farm residents, teachers and the school bus service provide more than one third of total turnover, with the rest of the garage's turnover coming from farmers outside the study area. The owner was unsure what the impact of forestry development on his business and the locality in general, would be as this would depend on how many farm houses were occupied after the farms had been sold. Non-farmers moving into the farm houses would have fewer vehicles to service than farmers do, leading to a decrease in business. As a counter to this, petrol sales would probably increase as non-farmers would not have fuel tanks on the farm.

The net impact is difficult to predict, ibecause of its dependence on the number of ex-farm houses reoccupied and unknown potential vehicle servicing and running expenditure patterns.

Transport Operators.

Transport operators were contacted to find those who received a significant part of their turnover from the study area. Four did; two based in Tangiteroria, one in Tangowahine and one in Dargaville (The Avoca Lime Company). The three local firms were Gary Taylor and Northern Wairoa Transport of Tangiteroria plus Tito's Transport of Tangowahine. The three local transport firms had a combined gross annual turnover of

$386,000 for the 1983-84 financial year. About $145,000 (37%) of that came from the study area. The size of the firms varies, as does the proportion of turnover coming from the study area farms.

One of the firms runs two trucks and employs one truck driver beside the owner. This firm carries fertiliser and lime and receives about 30% of its transport turnover from about 16 of the study area farmers. However, as transport operations provide 50% of total turnover, 15% of total income would be lost if the study area was sold to forestry. This could mean that there would not be enough work to employ the driver full time.

Another of the firms is a one truck, one driver, livestock transport firm and gains about 40% of its total turnover from the 14 or so farmers in the study area. If the entire study area was planted in trees then this firm would have to make up the lost business elsewhere if it was to keep operating.

The largest firm runs three stock trucks and employs 3 people, including the owner. It is a family concern with the two other drivers being sons of the owner. Though it is a stock transport firm, a recently purchased dual purpose truck will allow fertiliser to be carried as well. About 43 farmers in the study area use this firm, providing a little less than 50% of total turnover. Should all the current business from the study area be lost, there may not be enough work for all three trucks and drivers, unless the fall in business was made up elsewhere.

While forestry development such as that described in the forestry scenario would have a negative impact on the transport operators, and they were concerned about future forestry development, as yet forestry has not had a noticable impact on any of the transport firms. Two of the firms commented that they had lost business to horticultural development, which is unlikely to occur on any scale in the study area.

The attitudes of the transport operators towards forestry were similar to those held by the farmers. If forestry does move in, one owner believes that the clay based roads in the Kirikopuni Valley would need "massive upgrading" to deal with heavy forestry traffic. The owner also sees the social fabric of the community being weakened through the loss of families and falling school rolls. Another of the owners believed that a lot of the areas that have so far been bought by forestry are better suited to trees than pastoral farming. Where farms are bought by forestry and parts are sold to adjoining farms this is seen as good as productivity is increased, which provides business for transport firms. One rotation joint venture agreements are seen as a good idea, as the land ownership remained with the farmers. The rural lifestyle is seen as important and large scale conventional forestry is seen to threaten that rural lifestyle.

6.3.2 Impact on Businesses outside the Study Area.

Fertiliser and Lime Sales

The Avoca Lime Company, which supplied over 93% of the fertiliser and lime spread on the study area farms is a diversified company, with fertiliser and lime sales, cartage and spreading making up 50% or slightly less of the firms total gross turnover. Other income comes from the sand barge, digger, metal crushing, silage and general cartage operations. The firm is also moving into horticulture, having set up a horticultural coolstore in the Bay of Islands. Avoca employs six works drivers and six owner drivers and has

a bulk store in the Tangowahine Valley. Information on tonnages sold was supplied in confidence so no details on actual tonnages sold can be presented here.

The trend in sales over the last six years has been down. Table 6.3 lists the percentage change in fertiliser and lime sales over a number of years.

Table 6.3 Percentage Trends In Fertiliser and Lime Sales

Years	80-81	81-82	82-83	83-84	84-85	79-85
Percentage Change in Sales	-11	0	-22	+38	-26	-29

The years referred to are financial years. For example, 80-81 measures the changes from the 1979-80 financial year to the 1980-81 financial year. As can be seen, there has been a wide variation in fertiliser and lime sales, but a general downwards trend exists. At June 1986 Northland fertiliser sales were, on average, down about 40% on the previous years.

The Avoca Lime Company is already feeling the impact of farms changing to forestry . For example, the sale of two large farms north west of the study area to forestry meant annual sales of 1400 tonnes of fertiliser and lime were lost. Last year Avoca sold 560-600 tonne of fertiliser to forestry, which was an insignificant proportion of total sales. However, the fertiliser used by forestry costs more than twice the price of super, so a simple comparison of tonnages sold would give an inaccurate picture. The exact percentage of the company's total sales going to the study area cannot be given because of commercial confidentiality; but in the 1983-84 year the study area took significantly more than 15% of Avoca's total fertiliser and lime sales. Therefore the change in the study area to forestry would be significant impact, though it is not clear what impact it would have on the number of employed by Avoca.

As fertiliser sales are declining because of the gradual removal of the fertiliser subsidy and the present recession in the farming sector, any further loss of fertiliser and lime sales through the sale of farms to forestry would accelerate this decline.

Aerial Topdressing Firms

Three firms operate over the study area - Beatty Aviation, Fieldair and Marine Helicopters. The first two are fixed wing operators who accounted for over 87% of the 2151 tonnes aerial topdressed over the study area farms and both are Dargaville based.

Any impact of the loss of turnover caused by the sale of farms to forestry must be viewed in the context of the aerial topdressing industry's long period of decline. In 1978 there were six aircraft flying in Dargaville, now there are two. Until 1982 Fieldair had 2 aircraft and 5 pilots. By the middle of 1985 it had 1.5 pilots and one aircraft. There were 7.5 other permanent staff employed at the airfield. As of the latter half of 1985 it was down to one pilot, three other permanent and one part time staff. Beatty Aviation is a relatively

new owner-operator firm run by a husband and wife team employing one loader-driver on a labour only basis.

This decline has resulted from the removal of fertiliser subsidies, external price rises and the farming recession. In June 1985 one of the operators budgetted for a 22% decrease in business because of the removal of subsidies and the increase in fertiliser and lime prices. With an actual 40% drop in fertiliser sales throughout Northland occuring in the 1985-86 season, the situation is far worse than anticipated. Although 15-20% of both operators' turnover is from spraying the current recession will cause a downturn in this activity as well. Neither Beatty Aviation nor Fieldair get any business from forestry, as helicopters are used to spread fertiliser. Forestry has only recently begun to have an impact on the industry, but specific losses have occurred because of sales of farms to forestry, 600 tonne less in one year, for example.

The 1,761 tonnes of fertiliser and lime spread by Beatty Aviation and Fieldair over the study area represents over 10% of their combined total tonnage spread in the 1983-84 financial year. This is a significant amount in itself and assumes more importance due to continuing decline in fertiliser sales and aerial topdressing. The loss of study area business would add to existing trends, hastening redundancies.

There are some positive developments on the way. Among these are methanol powered aircraft, which will be cheaper to run; and a new spreader, which greatly increases the spread of fertiliser as it leaves the aircraft. This will lower the cost of aerial topdressing a given area, but has little relevance if farms are changing to forestry.

Stock and Station Agents and Farm Supply Centres.

The impact on stock and station agents is outlined in two parts:

(1) the impact on stock sales and

(2) the impact on farm supply centres.

(1). There are three stock and station agents operating in Dargaville and Whangarei - Elders, Dalgety-Crown and Wrightson NMA. (The last two are now the same company.) There has been a long term decline in sales through the Dargaville yards, while sales through the Kauri, Paparoa and Wellsford yards have been increasing. In Dargaville some agents have left and not been replaced. Any downturn caused by the sales of farms to forestry will exaggerate the existing trend in sales from the Dargaville yards.

Table 6.4 Stock Sales from the Study Area (1983/84)

Beef Cattle:	Store	2,042	Sheep:	Store	8,048
	Fat	2,550		Fat	30,841
	Not Stated	160		Not Stated	4,858
Total		4,752			43,747

Total sales through Dargaville and Kauri (Whangarei) Sales yards 1983-84 were as in the table below.

Table 6.5 Stock Sales Through Kauri and Dargaville 1983-84

	Dargaville	Kauri	All Northland
Beef Cattle	22,649	38,299	255,000
Dairy Cattle	2,046	1,970	
Sheep	38,670	100,347	1,002,000
Pigs	218	2,409	

Sales from Kauri and Dargaville have a declining share of total Northland sales. In 1979/80 Kauri and Dargaville handled 19.6% and 7.5% of total Northland sheep sales, by 1984-85 these figures had dropped to 8.8% and 4.1% respectively. Beef cattle sales through the Dargaville stock yards represented about 5.7% of total Northland beef sales, but a detailed breakdown of the store sheep sales split between Dargaville and Whangarei was not obtained. If store sheep sales are split on the same basis as beef cattle store sales and the 'not stated' are split in the same way, then the study area accounts for approximately 14% of total Dargaville stock yard sales, and for a negligible percentage of Kauri Sales. Although this is a significant amount, the actual impact would depend on how the loss of sales was distributed amongst the three stock and station agents.

(2) Farm Supply Outlets.

The three stock and station agents run farm supply centres in Dargaville and Whangarei. The Auckland Farmers Union also runs farm supply centres in Dargaville and Whangarei. Exact financial data from the three stock and station agents and approximate data from the Auckland Farmers Union gives a total turnover for the 1983-84 financial year of approximately $2,310,000 for the Dargaville farm supply centres. This figure is accurate to within 10% and does not include fertiliser sales. With data collected in the farm survey it is possible to indicate the magnitude of the contribution the study area farms make to the farm supply centres. It is impossible to do more than this: Initially the farmers where going to be asked to supply details on the amount paid to each firm supply outlet, but the test run of the questionnaire proved that it was quite unrealistic to ask for such detailed information.

An approximation of the impact of the sale of the farms to forestry on the farm supply centres, was worked out as follows. Only certain types of farm inputs would be purchased from the farm supply centres. Assuming that the maximum amount that would be purchased from farm supply centres was represented by expenditure on chemical weed and pest control, plus farm repairs and maintenance, the total arrived at was $473,706. This was broken down as follows:

Chemical weed and pest control	$111,392
Repairs and Maintenance	$361,314
(Fencing $108,242; Water supply and drainage $58,478)	
	$473,706

It was assumed that all animal health and stock feed expenditure went through the dairy company. Then, taking the farm working account split between Dargaville and Whangarei of 67% to 33%, Dargaville expenditure of $317,383 and Whangarei expenditure of $156,323 was calculated. These amounts are taken as a "ballpark" estimate of the maximum amounts that would go to the four farm supply centres. The Whangarei expenditure represents an insignificant proportion of Whangarei farm supply sales in the 1983-84 year of over $3,000,000. The figure of $317,383 is about 14% of the combined turnover of the four Dargaville farm supply outlets. While these figures give a general picture only of the amount the study area farms could spent in farm supply centres in Dargaville, they do suggest that the sale of these farms to forestry would have a significant impact on turnover. This would compound the effects of the existing downturn in farm centre turnover. The impact on individual farm supply centres would depend on how any decline in sales was distributed between them.

Sales from the non-farm retail merchanise departments of the stock and station agents, plus the Auckland Farmers Union, would also be negatively effected by the sale of farms; but to a lesser extent. This is because sales to non-farmers are an important part of sales from these retail outlets. For example non-farm customers bought 40% of one retail outlets total sales.

The stock and station agents stated they had yet to feel a significant impact from the increase in exotic forestry activity. Horticultural development has increased sales but the most significant impact has resulted from the agricultural recession. One stock and station manager said that in some cases the sale of farms to forestry has had a beneficial impact on the stock and station agents. Those selling tend to be in financial difficulties and sales to forestry have reduced the number of poorer earning accounts. Forestry purchase of farms is a way out for some people in serious financial trouble, as without forestry companies buying farms there would be no purchase of farms. There is no economic benefit in forestry for stock and station agents, but it was felt that to be rid of a bad debt is better than having a farm stay in farming when it is in serious financial strife. As forestry purchase of farms continue then the Stock and Station Agents will feel the impact on their farm supply turnover, an impact that will exaggerate existing trends.

The Northern Wairoa Co-Op Dairy Company (NWDC)

This Company has its factory in Dargaville and 19 of the 21 milking dairy farms in the study area supply this factory. As this is a co-op company financial details are freely available.

The NWDC had 405 suppliers in the 1983-84 season, so the study area contains 4.7% of total suppliers. In that year 7,333,510kg of milkfat was received, the highest ever figure. The study area supplied 265,640kg of that or 3.6% . This indicaties that the study area farms are below average milkfat producers. The total amount supplied averaged out at 18,107 kgs per farm while the average from the study area was 13,981kgs per farm to the NWDC. These figures would suggest that the impact of the loss of study area dairy farms would be minimal. However, the NWDC emphasised that any drop in the quantity of milkfat supplied is detrimental, as each year the amount of milkfat input needed to cover costs rises. The factory has a capacity to handle 10 million kilograms of milkfat a year, but there is a moratorium on increasing the number of suppliers due to the current world market for dairy products.

The Veterinary Club and Trading Society make an important contribution to total NWDC turnover. The Veterinary Club accounts show that in the 1983-84 financial year veterinary fees totalled $197,189 while the surplus on the sale of veterinary supplies totalled $182,016. The total turnover of the veterinary supply centre was not stated. An indication of the contribution study area farmers make to the Veterinary Club can be calculated, as all but two farms use this club. Animal Health expenditure from the dairy farms and the sheep and beef farms who used the club totalled $130,158 and this represents the maximum figure the study area would contribute to Veterinary Club. However it is not possible to indicate how important this is because of the lack of information on gross turnover.

The Trading Society, which also runs a petrol station, had a gross turnover of $5.7 million in 1983-84 and turnover has been increasing. The impact of the study area changing to forestry would be minor because of the low percentage of total suppliers coming from the study area and because non-farm customers use the trading society's retail facilities.

Shearing Gangs

Seven shearing gangs operated in the study area farm, though only four of these gangs sheared on more than two farms. Three of these gangs are based in or about Dargaville and one in the study area. The proportion of their total business coming from study area varies significantly: 15%, 2%, 20% and more than 50%. The total number of shearers employed in all of these gangs averaged 28. In addition to running a shearing gang one person also runs Northland's only dag crushing plant, with the study area supplying an insignificant amount of wool to the plant.

The shearing gang that gets most of its business from the study area employs people from three study area farms. If the study area did change to forestry then this shearing gang could not continue to employ as many people unless it could gain shearing contracts on other farms. Two more of the gangs would lose a significant proportion of their business and, unless this could be replaced, some members of the gang would not be needed or the whole gang would share a drop in income. But replacing shearing lost due to forestry would deprive other shearers of work.

One of the gang organisers calculated that for every 17,500 sheep lost (assuming two shears a year), one shearer would be out of work and an additional four labour units would be lost from the gang. Should the study area be sold to forestry there would be 78,000 less sheep, which means that between four and five less shearers would be needed and 16 to 20 other labour units would no longer find seasonal work with the gangs. As yet the shearers operating in the study area have not been significantly affected by the increase in forestry activity, although one gang has lost some business because of forestry operations just north of the study area. Inevitably, as forestry operations expand competition amongst shearing gangs will increase. Presently some shearers also work in Australia and this source of income could become more important as sheep numbers decline in Northland.

Vehicles And Machinery Sales

Gold and Houghton (1985) found that forestry people spend less on new private vehicles than non-forestry people. These findings suggest that private new vehicle sales could drop if the study area goes

into forestry and if all the farm houses are reoccupied by non-farming people. The net impact on work vehicle sales is difficult to estimate. While sales of tractors and other farm specific machinery will obviously drop, forestry contractors also need specialised vehicles and machinery. The net impact will depend on the expenditure patterns of contractors plus the will and ability of existing vehicle, machine and engineering firms to diversify their range of products and servicing.

6.4 Employment

Study area farming and forestry employment over the 35 year span of the scenario are compared in Fig 6.4. Direct employment on the farms totalled 103 full time and 45 part time positions, with paid employment totalling 96 full time and 14 part time positions. (Paid employment was calculated by deducting work by unpaid family members from the total.) Assuming two part time positions is equivalent to one full time, the study area farms supports 103 on farm full time paid equivalents . In addition, farm production would generate work for the equivalent of about1.5 drivers.

Study of Figure 6.4 shows that the direct employment level generated by forestry is significantly lower and much more uneven than direct farming employment generation until harvesting commences, when forestry employment would exceed direct paid farm employment. While forestry expenditure markedly exceeds farming expenditure once harvesting commences with both the HV 23 and HV 29 options, forestry employment is slightly higher than paid farming employment in the case of the HV 29 option. (This includes replanting labour.) Harvesting, replanting and silviculture would employ about 160 to 180 per year with the HV 23 option and 108 with the HV 29 option.

Unlike forestry expenditure, the sustained yield harvest of 242,000 m3 per year from the study area forest would generate rather less paid employment than farms, at the equivalent of about 66 people per year.

Transport employment generation would be higher with forestry, once harvesting had started. While the study area farms generate enough freight turnover to support the equivalent of about 1.5 drivers, the HV 29 and HV 23 options would support the equivalent of about 14 and 21 drivers respectively, on the transportation assumptions made. The sustained yield would support about 10 drivers.

As with forestry expenditure these results demonstrate how sensitive forestry employment generation is to the time harvesting starts, the size of the cut and the span of the scenario. Whether or not forestry harvesting generates the same level of employment as the study area, there will be significant changes in the location and characteristics of the workforce. It has been assumed that the loggers would live in Dargaville, therefore the change in land use would mean an increase in Dargaville based employment. The demographic characteristics of the workforce would be different from those of the farming community. Work by Crothers and Mcpherson suggests it would be more likely to be younger, single and male. This implies a number of things: For example, an increased demand for rental accommodation and different expenditure patterns, such as an increase in retail sales. It also implies increased employment opportunities for one half of those most affected by unemployment young unskilled males. There may be increased opportunities for young unskilled females who would like forestry work as well. Forestry

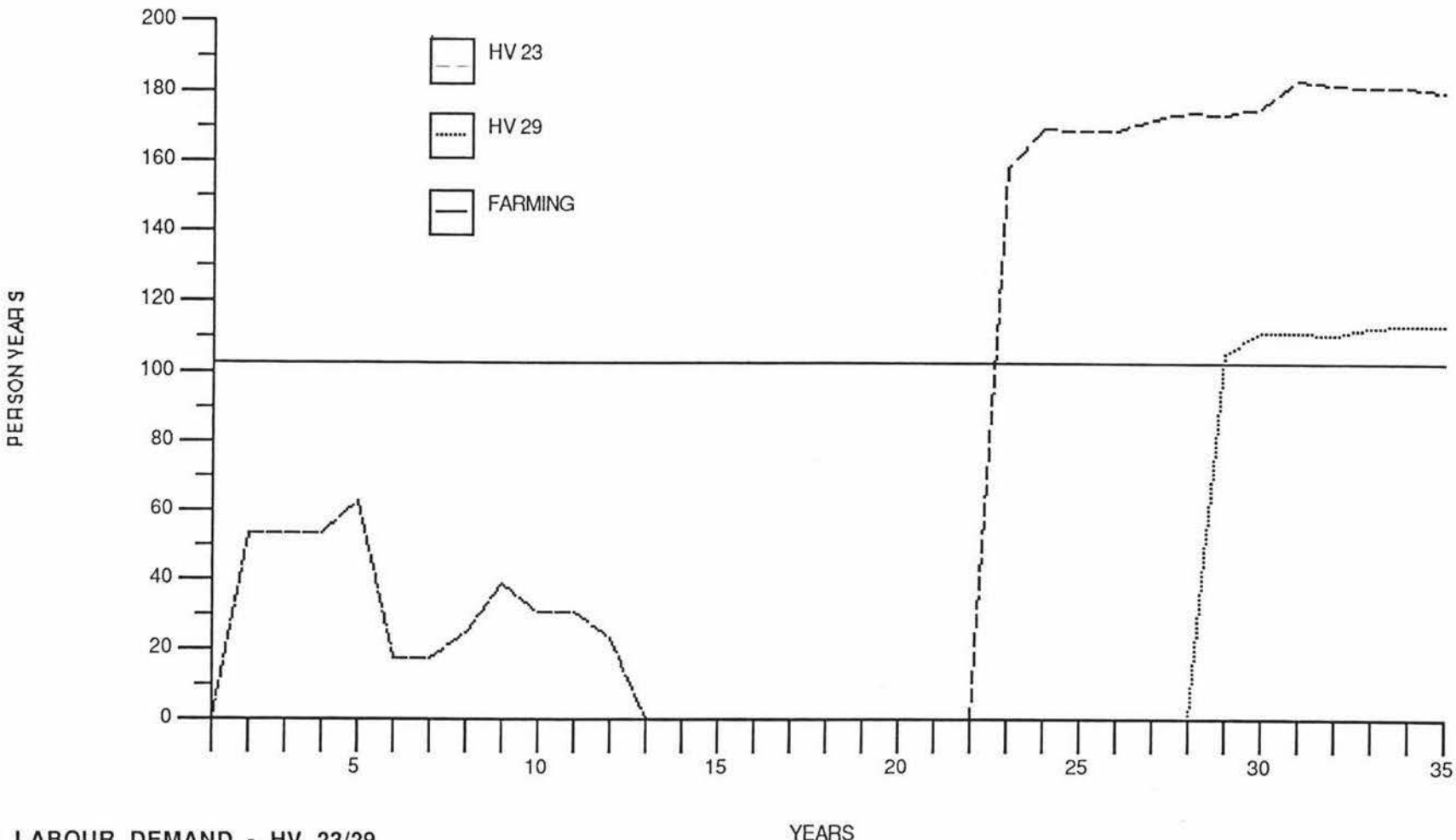


FIG 6.4 LABOUR DEMAND - HV 23/29
FARMING COMPARISON

employment is likely to be more attractive to young people than working on the farms for a number of reasons. Forestry work would mean working with a similar age group and not being as socially isolated as single farm workers living on farms.

6.5 Schools

The most obvious, and in many farmers minds, most important part of the study area social structure is represented by the three primary schools: Tangiteroria, Parakao and Tangowahine. Table 6.6 contains school vital statistics and shows that Tangowahine has the highest proportion of pupils from the study area farms.

Table 6.6 Study Area Schools

	Parakao	Tangiteroria	Tangowahine
Total Pupils	44	80	55
Pupils from the Study Area	6	24	22
% of Total Pupils	14	30	40
No. of Teachers	2	4	3

If all the study area farms were sold to forestry and no children moved into the ex-farm houses, then the "Pupils from Study Area" show how much school rolls would drop by. If the pupils were lost from the study area, Tangiteroria and Tangowahine schools would each lose one teacher.

The impacts of present and possible land use changes were discussed at each school.

Parakao School

So far forestry has had a minor impact on Parakao school. Parakao's headmaster believed that the school would not be greatly affected by forestry because farming in the Parakao catchment area is largely dairy based. Changes in the Parakao school roll were due to changes in farm ownership and to Maori people returning to marae areas. With elders dying, younger Maori people were returning to the area. Most Maori land around Parakao is leased to farmers on a long term basis and Mr Soar, the headmaster, could not see that land going to forestry.

If the Parakao school did lose the six children that attend it from the study area it would be unlikely to lose either of its two teachers.

Tangiteroria

Forestry has not had any significant effect on this school and the headmaster, Mr Prefect, felt that it was too early to make any predictions as to the possible impacts of forestry on the school roll. General population trends were perceived to have more relevance to the school than the expansion of forestry into

the schools catchment area. Tangiteroria's school roll of 80 is expected to remain reasonably constant until the beginning of 1988, when it will drop significantly as the "bulge" currently in standards three and four leaves the school. There is a large turnover of children in any one year, partly due to farm workers and contractors moving into and out of the area. This turnover currently averages 20 admissions and withdrawals per year.

If all the children attending Tangiteroria school from the study area left and were not replaced then one teacher would be lost. It is likely that when the 'bulge' has moved through the school one less teacher will be required.

Tangowahine School

This school lost one teacher at the end of 1984 when the roll dropped from 64 to 55. The principal, Mr Teddy, stated that forestry at the top of the Tangowahine Valley was not the reason for the decline, rather it was a reflection of national and local demographic characteristics. This decline in the school roll is expected to continue, because in 1986 there were 2 replacements for 9 leaving and in 1987 there will be 5 replacements for 12 leaving. Farms in the area are not selling, so farming familes with young children are not moving in. A number of non-farming families have moved into the district and the non-farming children were seen to have attitudes and values different from those held by farming children. These values and attitudes were seen to detract from established rural values and from the character of the school.

If all the children from the study area attending Tangowahine School left and were not replaced, the school would lose at least one teacher.

Tangowahine School is the most vulnerable of the three schools in that it is has a declining roll and the loss of pupils, for whatever reason, on top of the existing trends will have marked impact on the school roll. In small schools the loss of one or two families can cause a reduction in teaching staff, so that the concerns over the possible impact of forestry are justified - but it is important to establish existing trends before passing judgement as to the impact of any land use change on school rolls.

The possible impact of a drop in school rolls goes beyond the educational impact, because schools are the focal point of various community activities outside school hours. For example, the swimming pool at Tangowahine and the tennis courts at Tangiteroria are used by the community after hours.

6.6 Population Impact

If the entire study area was sold to forestry and all the farmers left the area it is difficult to predict what the net population impact would be. At least some, and possibly all, of the ex-farm houses would be occupied by other people if they were left intact on site. Evidence from areas where forestry has bought into farm land provides pointers as to what is likely to happen if the study area was bought by forestry interests - in terms of population and social conflict.

The Pakotai School Committee has stated (Pakotai School Committee 1984) that forestry purchase of

farms has caused a significant net decline of 13 in the school roll. However, study of house occupancy data produced in reply to the Pakotai School Committee by NZFP suggests that the net decline in school members is three, when pupils who would have left anyway due to age or other reasons are accounted for. While there has been this loss of school pupils the adult population has increased since forestry bought the 16 farms that are the focus of this concern over school roll decline. At the time of purchase, the 16 farms carried 16 occupied and 7 empty houses, shortly after the purchase of the last farm all 23 houses were occupied. On the seven farms closest to Pakotai, the number of adults had increased from 19 to 34.

In other words, it is inaccurate to say that the sale of farms to forestry will automatically result in a decline in population and school rolls corresponding to the number of people previously living on the farms.

In the case of the study area, because it is significantly closer to Dargaville and Whangarei than the farms sold around Pakotai, there is a greater chance that the ex-farm houses will be occupied. It is impossible to say what the demographic characteristics of the new occupants would be. Bearing in mind the existing population structure of the study area, an influx of young married couples with children would reverse the current decline in the numbers of preschool and school aged children. But they will be different people and many present residents do not see different people in a positive light. Some living in the study area felt that even if the farming people leaving the district were replaced there would be a negative impact on the community. This was because people felt that the long established community network would be disrupted by people leaving and newcomers, with non farming attitudes, would not fit in.

6.7 Social Impact

The conventional forestry scenario would alter the economic base of the study area, the relationship between ownership and production and lead to the replacement of the existing social structure. If all farmers left and were replaced by non farming people then a new social structure would be established, the characteristics of which obviously cannot yet be defined. The new residents would tend to work elsewhere, while some may run cottage industries or have small holding based productive units. There are likely to be a wider range of values present, if a range of people move in. In Chapter Four the negative attitudes of present study area residents to the social impacts of conventional forestry in farming areas were presented. Those reasons reinforce the findings of Smith outlined in the Introduction and they suggest social conflict arises when forestry buys pastoral farmland and non farming people move into such an area. But replacing one social structure with another over a short period of time is not the same thing as new residents with different values setting up within an established social structure. There is not, for example, the same potential for ongoing conflict within the study area. Any social conflict that arose would be between the study area and the surrounding farming areas.

6.8 Roads

In 1983-84 the wool, livestock and fertiliser carried on and off the farms was the equivalent to 645 truck and trailer loads and 1299 truck loads. Milk tanker movements added 1460 loaded or partly loaded tanker trip on top of this, giving a total of between 2105 and 2759 trips. These figures were calculated

applying the truck carring assumptions in Table 6.7 to the items moved listed in Table 6.8.

The figures in this table were collected from transport operators and represent an average. It is assumed a three deck livestock trucks are used, as these are the trucks owned by livestock carriers in the study area. In Table 6.7 beef cattle are assumed to be 18 months old on average, which means each truck and trailer unit can carry 40. Wool is assumed to be packed in bales at an average of 180kg per bale.

Table 6.7 Truck Carrying Capacity Assumptions

Item Carried	Truck	Truck and Trailer
Fertiliser/Lime (tonnes)	10	18
Lambs (Head)	250	600
Sheep	225	500
Boner Cows	15	36
Beef-Bullocks	12	27
18 month	16	40
12 month	19	48
Wool (bales)	48	120

Table 6.8 Truck Journeys Equivalents

Item Moved	Quantity	Total Loads Truck	Truck & Trailer
Lambs (hd)	31,770	127	53
Sheep	12,977	58	30
Boner Cows	437	29	12
Beef (All)	4,752	297	119
Fertiliser (Tonne)	7495	749	416
Wool (Bales)	1856	39	15
Total		1299	645

Assuming one tanker served the Tangowahine Valley and one the Kirikopuri Valley, then there are 1460 loaded or partially loaded tanker trips per year.

It is difficult to estimate the actual number of truck journeys that take place without data on the average number of stock or tonnes of fertiliser carried per trip. Observation of truck movement in the study area indicates that the number of journeys would be above the 2759 trips as many journeys involved partially loaded trucks. When these figures are compared with those implied by the forestry scenario the differences are marked.

The establishment and management of the forests will generate a minimal amount of traffic,but harvesting will generate a large increase in traffic. Assuming an average of 20m3 per truck then the HV29 scenaro of 337,659 m3 cut per year means 16,883 truck journeys per year. The HV23 scenario of 506,488 m3 cut per year means 25,324 truck journeys per year. At this stage processing options and sites have not been finalised, therefore how far the logs would be transported is unknown. The magnitude of the increase in road wear implied by these figures is such that many roads in the study area could need extensive rebuilding.

Summary

It is most unlikely that the forestry development described in this scenario (the entire area being developed as a forest over four years) will occur. What the scenario does do is, given the assumptions made, indicate the magnitude of the impact of the 57 farms being planted as an exotic forest.

Forestry development as contained in this conventional forestry scenario would result in significant changes in the level, time, direction and sectoral characteristics of expenditure flows. Total 35 year forestry expenditure is more than the farming scenario's for the HV 23 option, but less in the case of the HV 29 option. But operational forestry expenditure only exceeds total farming expenditure once harvesting commences and therefore implies a relative decline in the regional economy until harvesting begins. The expenditure impact would vary by location, with most of the forestry expenditure going to and about Dargaville.

The most important sectoral expenditure impacts would occur to fertiliser, transport and shearing and agricultural supply firms plus stock and station agents, with forestry development worsening the existing pastoral farming decline effects. Firms which sell a diverse range of goods and services with applications other than farming, or those able to diversify, are in a better position to cope with the downturn in farming as well as increased forestry operations. But they will have to wait until harvesting for forestry expenditure to exceed that of farming. Businesses that receive their turnover from a restricted area, such as the study area based shearing gang, will be affected more than those with a wide geographical base. For Whangarei stock and station agents and other farm supply outlets, the impact would not be significant in terms of livestock sales or farm centre turnover. For Dargaville, there would be a noticable impact. Whether or not it would mean layoffs would depend on how the drop on sales and farm centre turnover was spread amongst the stock and station agents and other farm supply centres.

The proportion of expenditure going to labour inputs would increase and there would also be significant changes in the characteristics of the workforce. As with forestry expenditure, direct employment would be lower until harvesting commenced.

The ownership of the production system would change from family to companies, and in the case of the whole study area being planted in trees, a completely new social structure could emerge. This social structure is likely to have different values, work patterns and socio-economic profiles. The population impacts on the study area cannot be detailed at this stage, but it would be incorrect to say that population and school rolls will automatically decline. While the majority of farmers expressed concern over the impact

of forestry development on the study area schools, the school headmasters felt that national and local demographic characteristics will have more impact on the school rolls than forestry.

Once harvesting starts forestry development is likely to lead to an increase in Dargaville's population and along with the workforce characteristics, this suggests that consumer retail outlets in Dargaville will increase their turnover. A number of both farmers and non-farmers interviewed, commented adversely on the range of goods, the prices and service in Dargaville shops. To obtain the maximum benefit from the increased spending potential, Dargaville shops would have to meet customers needs.

SEVEN - THE SUB AREA CONVENTIONAL FORESTRY & PASTORAL FARMING SCENARIO

7.0 Introduction

This chapter presents the sub area conventional forestry, which integrates conventional forestry and pastoral farming, with conventional exotic forestry development taking place on 12 of the study area farms. This is a more realistic forestry development on the study area farms than the large scale conventional scenario constructed in Chapter 5, where all land in the study area was developed as a forest. As with the study area conventional forestry scenario, total expenditure and labour requirements are presented by year, category and location. These are then compared with those generated by the sub area farms and the impact on different locations and sectors outlined.

7.1 Scenario Construction

The scenario is constructed using exactly the same expenditure data and assumptions as used for the study area conventional forestry scenario. A total area of 3622ha of farmland is used to develop a forest resource of 3079 hectares and this scenario is referred to as the Sub Area scenario. The area was chosen following discussion with a forestry company, who were asked to calculate a realistic area for forestry development over the initial study area and estimated a figure of 3300 ha. Separately to this, through farmer interviews, a figure of 3622 ha was calculated over the final study area, an area slightly larger than that looked at by the forestry company. With the downturn in the farming sector this 3622 ha was considered a lower bound estimate of a realistically sized forestry development in the study area, but the new tax regulations have caused a cutback in planting. It is not clear whether this is a temporary or long term cutback, with forestry companies continuing to seek changes to the law. The long term implications of the tax law changes for this scenario are therefore unclear.

Areas were choosen as likely sales to forestry interests for two reasons, with both reasons applying to some farms:

1. Farmer statements that they would sell to forestry if a realistic offer was made for their farm.

2. The financial state of the farm in late 1985 made it was unlikely that the farm could cope with the anticipated market conditions, with interest rates and farm output prices being the two most important variables.

Table 7.1 sets out the planting programme for the sub area forestry scenario.

Table 7.1 Area Planted Per Year

Year	1	2	3	4	5	6	7	Total
Area planted (Ha)	487	445	388	498	460	467	334	3079

(Remember that an average of 15% of any land acquired for forestry will be taken up by firebreaks, roads, streams, clearways for powerlines etc)

All cost, forest establishment and management assumptions are the same as the large scale conventional forestry scenario constructed in Chapter Five. As with that scenario, two harvesting options are considered here. In option one harvesting commences when the oldest trees are 23 years old and the entire initial forest is harvested in 14 years. A total of 114,948 m3 would be cut per year. With option 2, harvesting commences when the oldest trees are 29 years old and the entire initial forest of 3079ha is cut over in about 28 years. This means 76,632 m3 would be cut per year. The sustainable yield of this forest would be about 58,000 m3, assuming harvesting started in year 30.

7.2 Farming Area-Statistical Profile

Before constructing this sub area forestry scenario, the profile of the farming area that would be displaced is presented and compared with that for all the study area farms. Where parts of a farm are developed as a forestry resource and this part is in pasture, expenditure and income are allocated on a proportional basis. All the figures presented represent what would be lost if the farms changed to forestry. If part of a farm was sold then it is assumed that the household would remain and that the money received would be used to pay off the farm mortgage first. This means those farms are then in a stronger financial position and are likely to spend more in Dargaville and /or Whangarei.

Table 7.2 contains a summary of the sub area farm statistics with a detailed breakdown of these statistics being contained in Appendix 5. It shows that 80% of the sub area is regularly grazed and that 9.4 su/ha are carried over the total area and 11.7 su/ha on the grazed area, in comparison the study area carried 10.8 su/ha over the total area and 11.3 su/ha over the grazed area. Table 7.2 also shows that if the sub area was sold to forestry and the farm dependent houses became empty the study area population would drop by 22, with 5 of those being preschool or school aged children. Thirteen full time paid jobs would be lost if the sub area was planted in trees. An additional 2 paid part time positions and 2 full time unpaid positions would also be lost.

Table 7.2 Sub Area: Statistical Summary 1984

Total Area (Ha)	3,622
Area Regularly Grazed (Ha)	2,919
Total Stock Units carried	34,124
Total Resident Population	22
School & Preschool Children	5
Full-time paid jobs	13
Part-time paid jobs	2
Total Income ($)	853,154
Total Expenditure ($)	
(not incl. personal drawings)	674,708
(incl. personal drawings)	751,437
Fertiliser Use (tonnes)	1,329

Table 7.3 Comparision of the Study Area and Sub Area

	Study Area		Sub Area	
	Total	Effective	Total	Effective.
Loans and Mortgage (%)	17		37	
Fertiliser (%)	19		15	
Vehicle Purchase (%)	13		6	
Development (%)	4		1	
Av. Income/ha ($)	251	281	289	305
Av. Income/su ($)	25.23		27.49	

In the sub area one third of farm expenditure goes to loans and mortgage repayments. There is, therefore, less flexibility to adapt to changes in income and less to spend on increasing farm production. While study area debt servicing averaged $3.49 per stock unit, in the sub area it averaged $5.97. As interest rates have increased significantly since 1984, debt servicing will be a higher proportion of total farm expenditure.

The sub area spends a significantly lower proportion of farm expenditure on fertiliser, vehicle purchases and development. While the study area spread 0.51 tonne of fertiliser and lime per grazed hectare, the sub area spread 0.42 tonne. Table 7.3 also indicates that the sub area is less productive than the study area, with average sub area income below that of the study area's.

These statistics show that those farms seen as likely to change to forestry tend to be less productive and faced with a high and increasing debt servicing burden. The stock carrying statistics show that this farmland, on an effective hectare basis, has the potential to produce as least as much as the study area average. That the sub area is not doing so is a reflection of a heavy debt burden and farm management practices, not land capability. It is impossible to calculate the relative importance of the two.

7.3 The Sub Area Farming Expenditure Direction

Table 7.4 below indicates where sub area farm expenditure was spent, with a detailed breakdown by farm expenditure category being contained in Appendix 5.

Table 7.4 Sub Area Farm Expenditure Location

Expenditure Catagory	Dargaville	Whangarei	Expenditure Direction Local	Elsewhere	Unclear	Total Expenditure
Total Op. Expend.	275928	76,661	44,315	242,010	14,109	653,023
Wages	16,094	5,852	0	0	0	21,946
Personal Drawings	56,265	20,461	0	0	0	76,726
Totals	348,287	102,974	44,315	242,010	14,109	751,695
%	46	14	6	32	2	
Totals (SMP Adj)	295,736	82,790	44,315	242,010	14,109	678,960
%	42	13	6	36	2	

At the base of Table 7.4 are presented expenditure levels reduced to reflect the removal of SMP payments. The removal of these payments lowers sheep store and fat income by approxmately 30%, to $164,662, a drop of $82,578. Eighty-eight percent of gross income has been traced as expenditure so the SMP adjusted drop in expenditure has been calculated as $82,578 x .88 = $72,735. This amount is deducted from the expenditure in the different locations in proportion to expenditure flows, except in the case of catagories assumed to be fixed. These are: loans and mortgages, administration charges, shearing, vehicle repairs, freight and electricity. Expenditure in these categories is assumed to remain constant so that the reduction in expenditure must be accomodated, for example, within fertiliser, development, repairs and maintenance. One of the effects of removing SMP payments is to increase regional leakages as a percentage of total expenditure.

Table 7.4 shows that Dargaville receives the highest share of sub area farm expenditure, which was the case with the study area farms. The 'Elsewhere' category being the second largest expenditure location category because of the high level of debt servicing. An effect of the high level of debt repayments is that direct regional leakages are over 30% of all sub area farm expenditure, in the study area the respective figure was about 16%.

Table 7.5 shows what total expenditure would be over the 35 year span of the scenario.

Table 7.5 Expenditure Over 35 Years By Location ($)

Dargaville	Whangarei	Local	Elsewhere	Not Clear	Total
10,350,760	2,897,650	1,502,480	8,470,350	493,815	23,763,600

7.4 Expenditure From the Forestry Scenario

Having established the level and direction of expenditure from the sub-area farms, the expenditure resulting from the establishment, management and harvesting of a sub area forest resource can be presented. The spreadsheets detail expenditure for the two harvesting options by activity and year. They are laid out exactly as the study area forestry spreadsheets are. (See discussion on the spreadsheets in Chapter Five.) The accompanying graphs clearly demonstrate the variable spending levels that characterise forestry until harvesting commences. As detailed in section 7.1 two harvesting options are considered in this scenario.

A comparison of the expenditure flows generated by the two harvesting options of this scenario (See Tables 7.6, 7.7, and 7.8) confirms the findings of the study area conventional forestry scenario that the results are extremely sensitive to the time harvesting starts, the size of the cut and the span of the scenario. For example, in the HV29 case, 76,632 m3 is cut per year and if his amount was cut from year 23 then total expenditure would be $25,512,271, in 1983/84$. If the span of the scenario was longer then expenditure from the two harvesting options would be closer, as expenditure with the HV 29 option would continue at the year 35 level for about another 21 years. In contrast, the year 35 level of expenditure for the HV 23 option would only continue for about two more years.

Table 7.6 Expenditure, Sub Area Forest Scenario

	HV 29	1983/84 $ HV 23
1. Total Expenditure	20,011,693	42,913,695
3. Total Northland less District and Regional Office Overheads	16,108,680	35,013,058
4. Expenditure to Contractors	15,341,227	34,141,034

(A table explanation follows the spreadsheets and graph.)

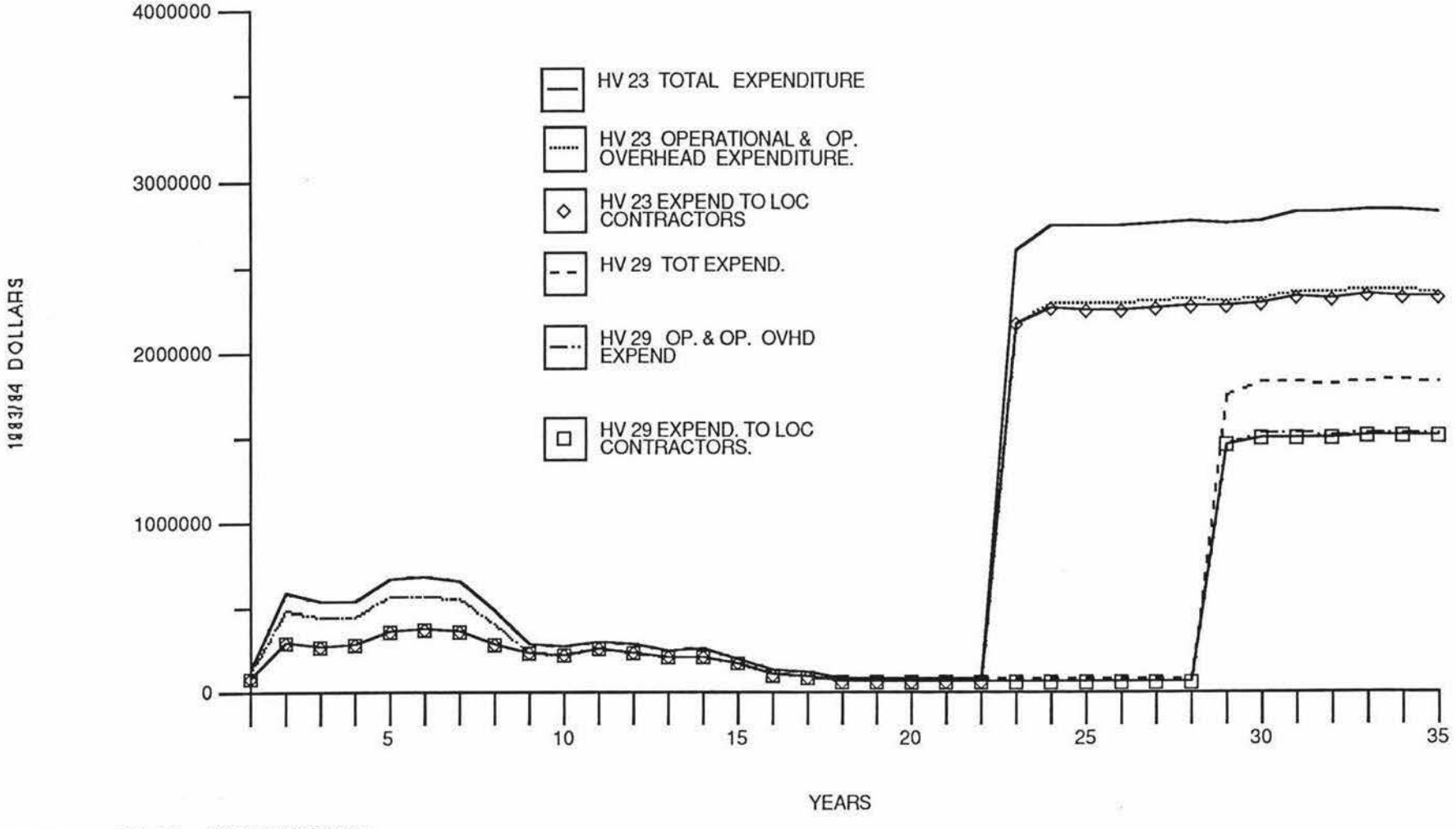


FIG 7.1 HV23 & HV 29 EXPENDITURE

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AG	AH	AI	AJ
1																																			
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	TREES	LOCAL	PRUNING 1	PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRANSPORT	RESTABLISH.	RESTAB. TO	TOTAL	TOTAL OP. &	DIST. OFFICE	REG.OFFICE	TOTAL	TOT. OP. EXP	TOTAL TO LOC.	TOTAL TO	DEFLATED	DEFL. OP. & OP	DFL DIST.	DFL REG	DEFL. TOTAL	DFL TO	DEFL TO		DARGAVILLE	NORTHLAND	TOTAL
3		PLANTED		OVERHEADS	COSTS		CONTRACTOR					TOPDRESSING	114948			LOCAL CONTR.	OPERATIONAL	OP. OVERHEAD	OVERHEAD	OVERHEADS	EXPENDITURE	TO LOC. CONT.	CONTRACTORS	NORTHLAND	OP. EXPEND.	OVERHEADS	OFF. OVRHDS	OFF. OVHDS	EXPEND.	LOC. CONTR.	NORTHLAND		EXPENDITURE	FRM EXPEND	FARM EXPEND.
4			300		901.5	66	537.845	87	70.5	68.1	225	116	16	6.25	538.5	424.5			0.12	0.08					0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8				
5																																			
6	1	487	146100	3438													146100	149538	17944.56	11963.04	179445.6	112497	115935	149538	116880	119630.4	14355.648	9570.432	143556.48	92748	119630.4		295736	422841	678960
7	2	445	133500	6576	439030.5	32142	261930.515										604672.5	611248.5	73349.82	48899.88	733498.2	364725.515	371301.515	512387.5	483738	488998.8	58679.856	39119.904	586798.56	297041.212	409910		295736	422841	678960
8	3	388	116400	18808	401167.5	29370	239341.025										546937.5	565745.5	67889.46	45259.64	678894.6	328969.025	347777.025	475410.5	437550	452596.4	54311.568	36207.712	543115.68	278221.62	380328.4		295736	422841	678960
9	4	498	149400	31002	349782	25608	208683.86										524790	555792	66695.04	44463.36	666950.4	323721.86	354723.86	477028	419832	444633.6	53356.032	35570.688	533560.32	283779.088	381622.4		295736	422841	678960
10	5	460	138000	41814	448947	32868	267846.81	42369									662184	703998	84479.76	56319.84	844797.6	416475.81	458289.81	602904	529747.2	563198.4	67583.808	45055.872	675638.08	366631.848	482323.2		295736	422841	678960
11	6	467	140100	54819	414690	30360	247408.7	38715	34333.5								658198.5	713017.5	85562.1	57041.4	855621	428334.2	483153.2	619637.5	526558.8	570414	68449.68	45633.12	684496.8	386522.56	495710		295736	422841	678960
12	7	334	100200	66147	421000.5	30822	251173.615	33756	31372.5								617157	683298	81995.76	54663.84	819957.6	393456.115	459603.115	588497	493720.8	546638.4	65596.608	43731.072	655966.08	367682.492	470797.6		295736	422841	678960
13	8		0	75253	301101	22044	179640.23	43326	27354	33164.7							426989.7	502242.7	60269.124	40179.416	602691.24	283484.93	358737.93	434440.7	341591.76	401794.16	48215.2992	32143.5328	482152.992	286990.344	347552.56		295736	422841	678960
14	9		0	81766	0	0	0	40020	35109	30304.5	109575						215008.5	296774.5	35612.94	23741.96	356129.4	215008.5	296774.5	296774.5	172006.8	237419.6	28490.352	18993.568	284903.52	237419.6	237419.6		295736	422841	678960
15	10		0	81766	0	0	0	40629	32430	26422.8	100125						199606.8	281372.8	33764.736	22509.824	337647.36	199606.8	281372.8	281372.8	159685.44	225098.24	27011.7888	18007.8592	270117.888	225098.24	225098.24		295736	422841	678960
16	11		0	81766	0	0	0	29058	32923.5	33913.8	87300	56492					239687.3	321453.3	38574.396	25716.264	385743.96	239687.3	321453.3	321453.3	191749.84	257162.64	30859.5168	20573.0112	308595.168	257162.64	257162.64		295736	422841	678960
17	12		0	81766	0	0	0	0	23547	31326	112050	51620					218547	300309	36037.08	24024.72	360370.8	218543	300309	300309	174834.4	240247.2	28829.664	19219.776	288296.64	240247.2	240247.2		295736	422841	678960
18	13		0	81766	0	0	0	0	0	31802.7	103500	45008					180310.7	262076.7	31449.204	20966.136	314492.04	180310.7	262076.7	262076.7	144248.56	209661.36	25159.3632	16772.9088	251593.632	209661.36	209661.36		295736	422841	678960
19	14		0	81766	0	0	0	0	0	22745.4	105075	57768					185588.4	267354.4	32082.528	21388.352	320825.28	185588.4	267354.4	267354.4	148470.72	213883.52	25666.0224	17110.6816	256660.224	213883.52	213883.52		295736	422841	678960
20	15		0	81766	0	0	0	0	0	0	75150	53360					128510	210276	25233.12	16822.08	252331.2	128510	210276	210276	102808	168220.8	20186.496	13457.664	201864.96	168220.8	168220.8		295736	422841	678960
21	16		0	81766	0	0	0	0	0	0	0	54172					54172	135938	16312.56	10875.04	163125.6	54172	135938	135938	43337.6	108750.4	13050.048	8700.032	130500.48	108750.4	108750.4		295736	422841	678960
22	17		0	81766	0	0	0	0	0	0	0	38744					38744	120510	14461.2	9640.8	144612	38744	120510	120510	30995.2	96408	11568.96	7712.64	115689.6	96408	96408		295736	422841	678960
23	18		0	81766	0	0	0	0	0	0	0	0					0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		295736	422841	678960
24	19		0	81766	0	0	0	0	0	0	0	0					0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		295736	422841	678960
25	20		0	81766	0	0	0	0	0	0	0	0					0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		295736	422841	678960
26	21		0	81766	0	0	0	0	0	0	0	0					0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		295736	422841	678960
27	22		0	81766	0	0	0	0	0	0	0	0					0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		295736	422841	678960
28	23	258.77	77631	81766	0	0	0	0	0	0	0	0	1839168	718425			263522	2716990	326038.8	217359.2	3260388	2635224	2716990	2716990	2108179.2	2173592	260831.04	173887.36	2608310.4	2173592	2173592		295736	422841	678960
29	24	246.75	74025	81766			17078.82		0	0	0	0	1839168	718425	139347.645	109847.865	2788044.46	2869810.465	344377.256	229584.84	3443772.56	2741465.865	2823231.865	2840310.68	2230435.57	2295848.372	275501.805	183667.870	2755018.05	2258585.49	2272248.55		295736	422841	678960
30	25	245.83	73749	81766			16285.5		0	0	0	0	1839168	718425	132874.875	104745.375	2780502.37	2862268.375	343472.205	228981.47	3434722.05	2736087.375	2817853.375	2834138.88	2224401.9	2289814.7	274777.764	183185.176	2747777.64	2254282.7	2267311.1		295736	422841	678960
31	26	236.79	71037	81766			16224.78		0	0	0	0	1839168	718425	132379.455	104354.835	2777234.23	2859000.235	343080.028	228720.02	3430800.28	2732984.835	2814750.835	2830975.62	2221787.39	2287200.188	274464.023	182976.015	2744640.23	2251800.67	2264780.49		295736	422841	678960
32	27	234.11	70233	81766			15628.14		22512.99	0	0	0	1839168	718425	127511.415	100517.355	2793478.54	2875244.545	345029.345	230019.56	3450293.45	2750856.345	2832622.345	2848250.49	2234782.84	2300195.636	276023.476	184015.651	2760234.76	2266097.88	2278600.39		295736	422841	678960
33	28	229.77	68931	81766			15451.26		21467.25	18243.285	0	0	1839168	718425	126068.235	99379.695	2807754.0	2889520.03	346742.404	231161.60	3467424.04	2765614.23	2847380.23	2862831.49	2246203.22	2311616.024	277393.923	184929.282	2773939.23	2277904.18	2290265.19		295736	422841	678960
34	29	224.16	67248	81766			15164.82		21387.21	17395.875	0	0	1839168	718425	123731.145	97537.365	2802520.0	2884286.05	346114.326	230742.88	3461143.26	2761161.45	2842927.45	2858092.27	2242016.04	2307428.84	276891.461	184594.307	2768914.61	2274341.96	2286473.82		295736	422841	678960
35	30	218.13	65439	81766			14794.56		20600.73	17331.015	17622.237	0	0	1839168	718425	120710.16	95155.92	2814090.70	2895856.702	347502.804	231668.54	3475028.04	2773741.902	2855507.902	2870302.46	2251272.56	2316685.3616	278002.243	185334.829	2780022.43	2284406.32	2296241.97		295736	422841	678960
36	31	215.02	64506	81766			14396.58		20367.57	16693.695	16803.675	58223.25	0	1839168	718425	117463.005	92596.185	2866046.77	2947812.775	353737.533	235825.02	3537375.33	2826783.375	2908549.375	2922945.95	2292837.42	2358250.22	282990.026	188660.018	2829900.26	2326839.5	2338356.76		295736	422841	678960
37	32	208.14	62442	81766			14191.32		19989.99	16504.755	16741.023	55518.75	0	1839168	718425	115788.27	91275.99	2858769.10	2940535.108	352864.213	235242.81	3528642.13	2820065.508	2901831.508	2916022.83	2287015.29	2352428.0864	282291.370	188194.247	2822913.70	2321465.21	2332818.26		295736	422841	678960
38	33	206.59	61977	81766			13737.24		19501.92	16198.785	16125.399	55311.75	30017.32	1839168	718425	112083.39	88355.43	2882545.80	2964311.804	355717.416	237144.94	3557174.16	2845080.604	2926846.604	2940583.84	2306036.64	2371449.4432	284573.933	189715.955	2845739.33	2341477.28	2352467.08		295736	422841	678960
39	34	198.8	59640	81766			13634.94		18977.31	15803.28	15942.891	53277.75	28623	1839168	718425	111248.715	87697.455	2874740.88	2956506.886	354780.826	236520.55	3547808.26	2837554.686	2919320.686	2932955.63	2299792.71	2365205.5088	283824.661	189216.441	2838246.61	2335456.55	2346364.50		295736	422841	678960
40	35	197.97	59391	81766			13120.8		18706.74	15378.165	15647.337	52674.75	28516.28	1839168	718425	107053.8	84390.6	2868081.87	2949847.872	353981.745	235987.83	3539817.45	2832297.872	2914063.872	2927184.67	2294465.50	2359878.2976	283185.396	188790.264	2831853.96	2331251.10	2341747.74		295736	422841	678960
41																																		
42		5999.83	1799949	2505539	2775718.5	382922.76	1656024.755	451384.71	350618.355	308562.462	967781.25	444320.6	23909184	9339525	1466260.11	1155854.07	42196226.7	44701765.747	5364211.89	3576141.3	53642118.9	40170753.20	42676292.202	43766322.7	33756981.4	35761412.598	4291369.51	2860913.01	42913695.1	34141033.8	35013058.2		10350760	14799435	23763600

SUB AREA FORESTRY SCENARIO HV 23 OPTION

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RESTRY SCENARIO HV 23 OPTION

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	TREES	LOCAL	PRUNING 1	PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRANSPORT	RESTABLISH.
3		PLANTED		OVERHEADS	COSTS		CONTRACTOR					TOPDRESSING	76632		
4			300		901.5	66	. 537.845	87	70.5	68.1	225	116	16	6.25	538.5
5															
6	1	487	146100	3438											
7	2	445	133500	6576	439030.5	32142	261930.515								
8	3	388	116400	18808	401167.5	29370	239341.025								
9	4	498	149400	31002	349782	25608	208683.86								
10	5	460	138000	41814	448947	32868	267846.81	42369							
11	6	467	140100	54819	414690	30360	247408.7	38715	34333.5						
12	7	334	100200	66147	421000.5	30822	251173.615	33756	31372.5						
13	8		0	75253	301101	22044	179640.23	43326	27354	33164.7					
14	9		0	81766	0	0	0	40020	35109	30304.5	109575				
15	10		0	81766	0	0	0	40629	32430	26422.8	100125				
16	11		0	81766	0	0	0	29058	32923.5	33913.8	87300	56492			
17	12		0	81766	0	0	0	0	23547	31326	112050	51620			
18	13		0	81766	0	0	0	0	0	31802.7	103500	45008			
19	14		0	81766	0	0	0	0	0	22745.4	105075	57768			
20	15		0	81766	0	0	0	0	0	0	75150	53360			
21	16		0	81766	0	0	0	0	0	0	0	54172			
22	17		0	81766	0	0	0	0	0	0	0	38744			
23	18		0	81766	0	0	0	0	0	0	0	0			
24	19		0	81766	0	0	0	0	0	0	0	0			
25	20		0	81766	0	0	0	0	0	0	0	0			
26	21		0	81766	0	0	0	0	0	0	0	0			
27	22		0	81766	0	0	0	0	0	0	0	0			
28	23	0	0	81766	0	0	0	0	0	0	0	0	0	0	
29	24	0	0	81766		0		0	0	0	0	0	0	0	0
30	25	0	0	81766		0		0	0	0	0	0	0	0	0
31	26	0	0	81766		0		0	0	0	0	0	0	0	0
32	27	0	0	81766		0		0	0	0	0	0	0	0	0
33	28	0	0	81766		0		0	0	0	0	0	0	0	0
34	29	132.54	39762	81766		0		0	0	0	0	0	1226112	478950	0
35	30	127.72	38316	81766		8747.64		0	0	0	0	0	1226112	478950	71372.79
36	31	123.92	37176	81766		8429.52		0	0		0	0	1226112	478950	68777.22
37	32	120.86	36258	81766		8178.72		0	0		0	0	1226112	478950	66730.92
38	33	120.34	36102	81766		7976.76		11530.98	0		0	0	1226112	478950	65083.11
39	34	116.96	35088	81766		7942.44		11111.64	9344.07		0	0	1226112	478950	64803.09
40	35	113.76	34128	81766		7719.36		10781.04	9004.26		0	0	1226112	478950	62982.96
41															
42		3935.1	1180530	2505539	2775718.5	252208.44	1656024.75	301296.66	235417.83	209679.9	692775	357164	8582784	3352650	399750.09

	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1																		
2	RESTAB. TO	TOTAL	TOTAL OP. &	DIST. OFFICE	REG. OFFICE	TOTAL	TOT. OP. EXP	TOTAL TO LOC.	TOTAL TO	DEFLATED	DEFL. OP. & OP	DFL. DIST.	DFL REG	DEFL. TOTAL	DFL. TO	DEFL TO		
3	LOCAL CONTR.	OPERATIONAL	OP. OVERHEAD	OVERHEAD	OVERHEADS	EXPENDITURE	TO LOC. CONT.	CONTRACTORS	NORTHLAND	OP. EXPEND.	OVERHEADS	OFF. OVRHDS	OFF. OVHDS	EXPEND.	LOC. CONTR.	NORTHLAND		
4	424.5			0.12	0.08					0.8	0.8	0.8	0.8	0.8	0.8	0.8		
5																		
6		146100	149538	17944.56	11963.04	179445.6	112497	115935	149538	116880	119630.4	14355.648	9570.432	143556.48	92748	119630.4		
7		604672.5	611248.5	73349.82	48899.88	733498.2	364725.515	371301.515	512387.5	483738	488998.8	58679.856	39119.904	586798.56	297041.212	409910		
8		546937.5	565745.5	67889.46	45259.64	678894.6	328969.025	347777.025	475410.5	437550	452596.4	54311.568	36207.712	543115.68	278221.62	380328.4		
9		524790	555792	66695.04	44463.36	666950.4	323721.86	354723.86	477028	419832	444633.6	53356.032	35570.688	533560.32	283779.088	381622.4		
10		662184	703998	84479.76	56319.84	844797.6	416475.81	458289.81	602904	529747.2	563198.4	67583.808	45055.872	675838.08	366631.848	482323.2	5	
11		658198.5	713017.5	85562.1	57041.4	855621	428334.2	483153.2	619637.5	526558.8	570414	68449.68	45633.12	684496.8	386522.56	495710		
12		617151	683298	81995.76	54663.84	819957.6	393456.115	459603.115	588497	493720.8	546638.4	65596.608	43731.072	655966.08	367682.492	470797.6		
13		426989.7	502242.7	60269.124	40179.416	602691.24	283484.93	358737.93	434440.7	341591.76	401794.16	48215.2992	32143.5328	482152.992	286990.344	347552.56		
14		215008.5	296774.5	35612.94	23741.96	356129.4	215008.5	296774.5	296774.5	172006.8	237419.6	28490.352	18993.568	284903.52	237419.6	237419.6		
15		199606.8	281372.8	33764.736	22509.824	337647.36	199606.8	281372.8	281372.8	159685.44	225098.24	27011.7888	18007.8592	270117.888	225098.24	225098.24	10	
16		239687.3	321453.3	38574.396	25716.264	385743.96	239687.3	321453.3	321453.3	191749.84	257162.64	30859.5168	20573.0112	308595.168	257162.64	257162.64		
17		218543	300309	36037.08	24024.72	360370.8	218543	300309	300309	174834.4	240247.2	28829.664	19219.776	288296.64	240247.2	240247.2		
18		180310.7	262076.7	31449.204	20966.136	314492.04	180310.7	262076.7	262076.7	144248.56	209661.36	25159.3632	16772.9088	251593.632	209661.36	209661.36		
19		185588.4	267354.4	32082.528	21388.352	320825.28	185588.4	267354.4	267354.4	148470.72	213883.52	25666.0224	17110.6816	256660.224	213883.52	213883.52		
20		128510	210276	25233.12	16822.08	252331.2	128510	210276	210276	102808	168220.8	20186.496	13457.664	201864.96	168220.8	168220.8	15	
21		54172	135938	16312.56	10875.04	163125.6	54172	135938	135938	43337.6	108750.4	13050.048	8700.032	130500.48	108750.4	108750.4		
22		38744	120510	14461.2	9640.8	144612	38744	120510	120510	30995.2	96408	11568.96	7712.64	115689.6	96408	96408		
23		0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
24		0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
25		0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8	20	
26		0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
27		0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
28		0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
29	0	0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
30	0	0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8	25	
31	0	0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
32	0	0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
33	0	0	81766	9811.92	6541.28	98119.2	0	81766	81766	0	65412.8	7849.536	5233.024	78495.36	65412.8	65412.8		
34	0	1744824	1826590	219190.8	146127.2	2191908	1744824	1826590	1826590	1395859.2	1461272	175352.64	116901.76	1753526.4	1461272	1461272		
35	56263.23	1823498.43	1905264.43	228631.732	152421.15	2286317.32	1799641.23	1881407.23	1890154.87	1458798.74	1524211.544	182905.385	121936.924	1829053.85	1505125.78	1512123.90	30	
36	54217.14	1819444.74	1901210.74	228145.289	152096.86	2281452.89	1796455.14	1878221.14	1886650.66	1455555.79	1520968.592	182516.231	121677.487	1825162.31	1502576.91	1509320.53		
37	52604.04	1816229.64	1897995.64	227759.477	151839.65	2277594.77	1793924.04	1875690.04	1883868.76	1452983.71	1518396.512	182207.581	121471.721	1822075.81	1500552.03	1507095.01		
38	51305.07	1825754.85	1907520.85	228902.502	152601.67	2289025.02	1804000.05	1885766.05	1893742.81	1460603.88	1526016.68	183122.002	122081.334	1831220.02	1508612.84	1514994.25		
39	51084.33	1833351.24	1915117.24	229814.069	153209.38	2298140.69	1811690.04	1893456.04	1901398.48	1466680.99	1532093.792	183851.255	122567.503	1838512.55	1514764.83	1521118.78		
40	49649.52	1829677.62	1911443.62	229373.234	152915.49	2293732.34	1808624.82	1890390.82	1898110.18	1463742.10	1529154.896	183498.588	122332.392	1834985.88	1512312.66	1518488.14	35	
41																		
42	315123.33	18339974.42	20845513.42	2501461.61	1667641.1	25014616.1	16670994.47	19176533.475	20135849.7	14671979.5	16676410.736	2001169.29	1334112.86	20011692.9	15341226.8	16108679.7		

1. Total expenditure includes operational overheads, district and regional office overheads.

2. Total Northland Expenditure is total expenditure less that paid outside Northland for such items as chemicals and vehicles. It includes all operational expenditure to local contractors plus expenditure on trees and operational over heads. District and regional office overheads are not included.

3. This is the level of expenditure that goes to contractors working in the forest. It includes operational overhead expenditure. (Further details on expenditure flows to contractors are in section 4.4)

Tables 7.7 and 7.8 present forestry expenditure by category. As in the study area forestry scenario, harvesting is the largest expenditure category . Note that 'Op' means operational and 'Exp' expenditure. 'Est' and 'Rest' stand for establishment and restablishment.

Table 7.7 Expenditure Categories - HV29 Option

Expenditure Category	Amount	Percentage of: Total Exp	Operational Exp
Harvesting	8,582,784	34	47
Transport	3,352,650	13	18
Est + Rest	3,175,468	13	17
Pruning	746,609	3	4.1
Thinning	692,775	2.8	3.8

In this scenarios, it is assumed that 30% of the forest is pruned. If all the forest was pruned, that is the area pruned was 3.3 times larger, operational expenditure would increase by about 9%. In other words, operational forestry expenditure is not very sensitive to the pruning regime adopted. But because pruning occurs many years before harvesting, and costs must be carried for these years, the economics of forestry operations are more sensitive to pruning costs than the table above would suggest.
Table 7.8 presents the same breakdown for the HV23 Scenario.

Table 7.8 Expenditure Categories - HV23 Option

Expenditure Category	Amount	Percentage of: Total Exp	Operational Exp
Harvesting	23,909,184	45	57
Transport	9,339,525	17	22
Est + Rest	4,241,978	8	10
Pruning	1,110,565	2.1	2.6
Thinning	967,781	1.8	2.3

To highlight the level of expenditure resulting from harvesting, the cutting of 173 hectares of 30 year old trees, assuming 600 m3 recoverable per hectare, incurs the same level of expenditure as from all the sub area farms in 1983/84. The sustainable annual yield of this forest is 57,961 m3. This would cost $927,376 to harvest in 1985/86 prices and $741,901 in 1983/84 prices. That is more than the 1983/84 expenditure from the sub area farms.

As with the study area conventional forestry scenario, the next step is to illustrate the direction of forestry expenditure.

7.5 The Location of Forestry Expenditure

The same assumptions regarding the location of expenditure are made as in the study area conventional forestry scenario. Tables 7.9 and 7.10 show that the majority of forestry expenditure would take place in Dargaville. Detailed tables in Appendix 5 provide a breakdown of the data in Tables 7.9 and 7.10 by forestry activity. (The figures in brackets are 1983/84 $.)

Table 7.9 HV29 Expenditure By Location ($)

	Total Northland	Dargaville	Outside Northland
Total	20,135,850 (16,108,680.)	19,176,533 (15,341,227.)	709,664 (567,731.)

Table 7.10 HV23 Expenditure by Location

	Total Northland	Dargaville	Outside Northland
Total	43,766,323 (35,013,058.)	42,676,392 (34,141,034.)	935,436 (748,349.)

While the tables give the total spent over the 35 year span of the scenario, they give no indication of year by year forestry expenditure, which is considered to be more important than total 35 year expenditure. The variable nature of forestry expenditure can be seen on the scenario spreadsheets and graphs, with expenditure in and around Dargaville illustrated by the 'Deflated Expenditure to Local Contractors' column. Later on in this chapter, these expenditure levels are compared with those generated by the sub area farms.

7.6 Employment.

The labour requirements of forestry operations are listed in Chapter Five. Using these figures the sub area HV23 option would generate 1,013,397 hours of employment and the HV 29 option 460,774 hours. These hours include the activity needed to establish, manage and harvest the trees. No overhead labour requirements are included. Assuming 40 hour weeks and 46 working weeks per year, this is equivalent to 551 and 250 person years work - an average of 14.4 and 7.2 per year over the span of the scenarios. If transportation labour demand is included the total employment generated would be 1,125,470 and 501,006 hours respectively. Again assuming 40 hour weeks and 46 working weeks per year, this is equivalent to an average of 17.5 and 7.8 person years annual employment over the span of the scenarios.

The spreadsheets, one for each harvesting option, detail labour demand by year and category and the graph highlights the variable nature of the forestry labour demand. Table 7.11 details the labour requirements for each phase of the forestry development and the percentage of the total taken by each phase.

Table 7.11 Employment Generated - Including Transport

Activity	HV 29		HV 23	
	Person/Years	%	Person/Years	%
Establishment & Restablishment	57.4	21.1	76.8	13.0
Pruning	25.3	9.3	37.6	6.0
Thinning	21.6	7.9	30.2	4.9
Aerial Topdressing	0.3	0.1	0.5	0.1
Harvesting	145.8	53.6	406.0	66.0
Log Transport	21.9	8.0	60.9	10.0
Total	272.0		612.7	

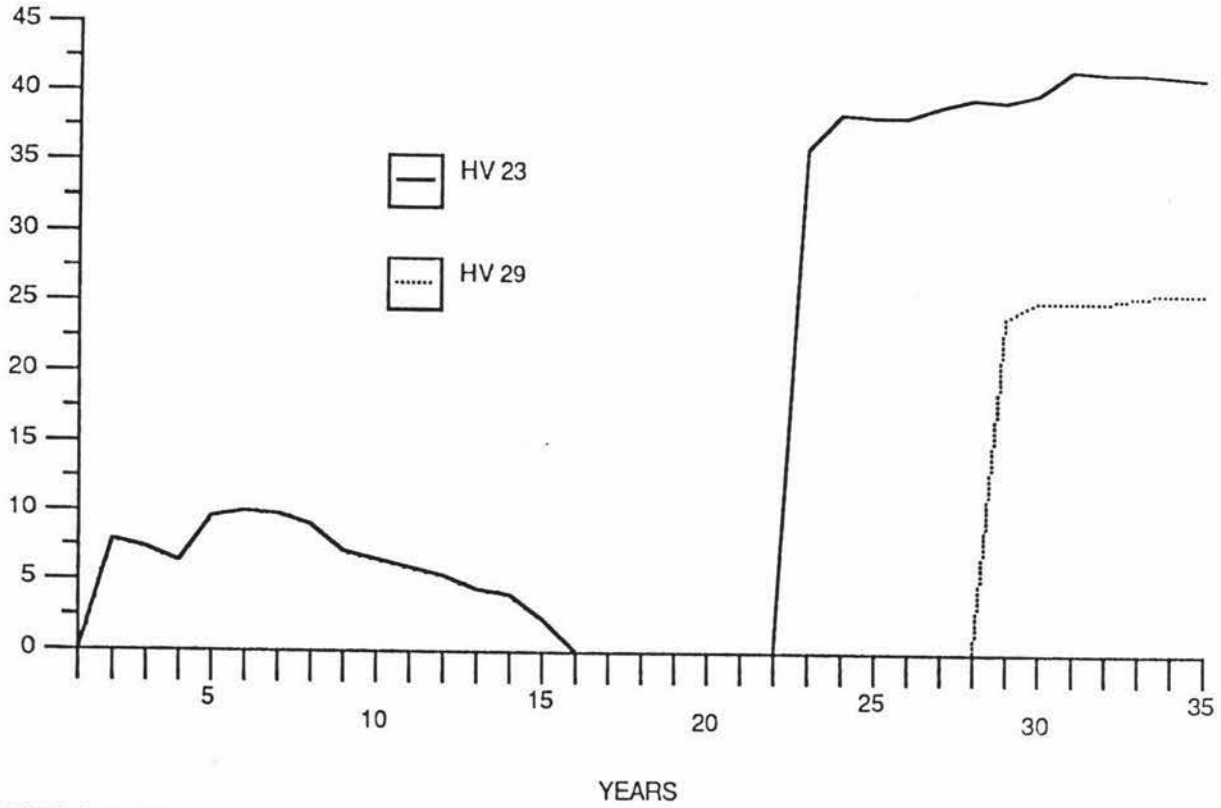
The percentage split in Table 7.11 practically mirrors that for the employment generated in the study area conventional forestry scenario and detailed comments are therefore not necessary. It is sufficent to say that harvesting dominates labour demand, which is reflected in the labour demand graph, which follows the labour demand spreadsheets.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	PRUNING 1	PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRANSPORT	RESTABLISH.	TOTAL		PERSON	
3		PLANTED		OVERHEADS	LABOUR					TOPDRESSING	114948.00			OPERATIONAL		YEARS	
4			UNCLEAR	UNCLEAR	30.00	5.40	4.44	4.23	12.90	0.20	0.50	0.07	18.00				
5																	
6	1	487.00												0.00		0.00	
7	2	445.00			14610.00									14610.00		7.94	
8	3	388.00			13350.00									13350.00		7.26	
9	4	498.00			11640.00									11640.00		6.33	
10	5	460.00			14940.00	2629.80								17569.80		9.55	
11	6	467.00			13800.00	2403.00	2162.28							18365.28		9.98	
12	7	334.00			14010.00	2095.20	1975.80							18081.00		9.83	
13	8				10020.00	2689.20	1722.72	2060.01						16491.93		8.96	
14	9					2484.00	2211.12	1882.35	6282.30	97.40				12957.17		7.04	
15	10					2521.80	2042.40	1641.24	5740.50	89.00				12034.94		6.54	
16	11					1803.60	2073.48	2106.54	5005.20	77.60				11066.42		6.01	
17	12					0.00	1482.96	1945.80	6424.20	99.60				9952.56		5.41	
18	13					0.00	0.00	1975.41	5934.00	92.00				8001.41		4.35	
19	14					0.00	0.00	1412.82	6024.30	93.40				7530.52		4.09	
20	15					0.00	0.00	0.00	4308.60	66.80				4375.40		2.38	
21	16					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
22	17					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
23	18					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
24	19					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
25	20					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
26	21					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
27	22					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
28	23	258.77				0.00	0.00	0.00	0.00	0.00	57474.00	8621.10		66095.10		35.92	
29	24	246.75				0.00	0.00	0.00	0.00	0.00	57474.00	8621.10	4657.86	70752.96		38.45	
30	25	245.83				0.00	0.00	0.00	0.00	0.00	57474.00	8621.10	4441.50	70536.60		38.34	
31	26	236.79				0.00	0.00	0.00	0.00	0.00	57474.00	8621.10	4424.94	70520.04		38.33	
32	27	234.11				1397.36	0.00	0.00	0.00	0.00	57474.00	8621.10	4262.22	71754.68		39.00	
33	28	229.77				1332.45	1148.94	0.00	0.00	0.00	57474.00	8621.10	4213.98	72790.47		39.56	
34	29	224.16				1327.48	1095.57	0.00	0.00	0.00	57474.00	8621.10	4135.86	72654.01		39.49	
35	30	218.13				1278.67	1091.49	1094.60	0.00	0.00	57474.00	8621.10	4034.88	73594.73		40.00	
36	31	215.02				1264.19	1051.35	1043.75	3338.13	51.75	57474.00	8621.10	3926.34	76770.62		41.72	
37	32	208.14				1240.76	1039.45	1039.86	3183.07	49.35	57474.00	8621.10	3870.36	76517.95		41.59	
38	33	206.59				1210.46	1020.18	1001.62	3171.21	49.17	57474.00	8621.10	3746.52	76294.26		41.46	
39	34	198.80				1177.90	995.27	990.29	3054.59	47.36	57474.00	8621.10	3718.62	76079.13		41.35	
40	35	197.97				1161.11	968.50	971.93	3020.02	46.82	57474.00	8621.10	3578.40	75841.87		41.22	
41																0.00	
42		5999.83	0.00	0.00	92370.00	28016.98	22081.50	19166.21	55486.12	860.25	747162.00	112074.30	49011.48	1126228.85		612.08	
43																	
44	PERSON																
45	YEARS		0.00	0.00	50.20	15.23	12.00	10.42	30.16	0.47	406.07	60.91	26.64	612.08			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2	YEARS	HECTARES	ROADING	OPERATIONAL	ESTABLISHMENT	PRUNING 1	PRUNING 2	PRUNING 3	THINNING	AERIAL	HARVESTING	TRANSPORT	RESTABLISH.	TOTAL		PERSON	
3		PLANTED		OVERHEADS	LABOUR					TOPDRESSING	76632.00			OPERATIONAL		YEARS	
4			UNCLEAR	UNCLEAR	30.00	5.40	4.44	4.23	12.90	0.20	0.50	0.07	18.00				
5																	
6	1	487.00												0.00		0.00	
7	2	445.00			14610.00									14610.00		7.94	
8	3	388.00			13350.00									13350.00		7.26	
9	4	498.00			11640.00									11640.00		6.33	
10	5	460.00			14940.00	2629.80								17569.80		9.55	
11	6	467.00			13800.00	2403.00	2162.28							18365.28		9.98	
12	7	334.00			14010.00	2095.20	1975.80							18081.00		9.83	
13	8				10020.00	2689.20	1722.72	2060.01						16491.93		8.96	
14	9					2484.00	2211.12	1882.35	6282.30	97.40				12957.17		7.04	
15	10					2521.80	2042.40	1641.24	5740.50	89.00				12034.94		6.54	
16	11					1803.60	2073.48	2106.54	5005.20	77.60				11066.42		6.01	
17	12					0.00	1482.96	1945.80	6424.20	99.60				9952.56		5.41	
18	13					0.00	0.00	1975.41	5934.00	92.00				8001.41		4.35	
19	14					0.00	0.00	1412.82	6024.30	93.40				7530.52		4.09	
20	15					0.00	0.00	0.00	4308.60	66.80				4375.40		2.38	
21	16					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
22	17					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
23	18					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
24	19					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
25	20					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
26	21					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
27	22					0.00	0.00	0.00	0.00	0.00				0.00		0.00	
28	23	0.00				0.00	0.00	0.00	0.00	0.00				0.00		0.00	
29	24	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00	
30	25	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00	
31	26	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00	
32	27	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00	
33	28	0.00				0.00	0.00	0.00	0.00	0.00			0.00	0.00		0.00	
34	29	132.54				0.00	0.00	0.00	0.00	0.00	38316.00	5747.40	0.00	44063.40		23.95	
35	30	127.72				0.00	0.00	0.00	0.00	0.00	38316.00	5747.40	2385.72	46449.12		25.24	
36	31	123.92				0.00	0.00	0.00	0.00	0.00	38316.00	5747.40	2298.96	46362.36		25.20	
37	32	120.86				0.00	0.00	0.00	0.00	0.00	38316.00	5747.40	2230.56	46293.96		25.16	
38	33	120.34				715.72	0.00	0.00	0.00	0.00	38316.00	5747.40	2175.48	46954.60		25.52	
39	34	116.96				689.69	588.48	0.00	0.00	0.00	38316.00	5747.40	2166.12	47507.69		25.82	
40	35	113.76				669.17	567.08	0.00	0.00	0.00	38316.00	5747.40	2105.28	47404.92		25.76	
41																0.00	
42		3935.10	0.00	0.00	92370.00	18701.17	14826.31	13024.17	39719.10	615.80	268212.00	40231.80	13362.12	501062.48		272.32	
43																	
44	PERSON																
45	YEARS		0.00	0.00	50.20	10.16	8.06	7.08	21.59	0.33	145.77	21.87	7.26	272.32			

LABOUR DEMAND SUB AREA FORESTRY HV 29 OPTION

As with the expenditure figures - the total labour demand is extremely sensitive to the time and size of harvest. However, total labour demand is significantly more sensitive to increases in the area pruned than total expenditure is.



FORESTRY LABOUR

7.7 Forestry - Farming Comparison

7.7.1 Total Expenditure

The next two tables compare farming and forestry expenditure by location, with farm expenditure adjusted to allow for the impact of the removal of SMP payments. In the first table forestry expenditure includes operational and operational overhead expenditure, while in the second, district and regional overheads are included. Forestry expenditure is presented in 1985/86 and 1983/84 dollars. If present farm income and expenditure levels are indicative of the long term income and expenditure levels, then comparing farming with the 1985/86 forestry expenditure is valid.

In terms of overall expenditure, the tables show that farming expenditure over 35 years is less than forestry expenditure in the HV 23 case, but more than in the HV 29 case. This confirms the findings of the study area conventional forestry scenario that the results are extremely sensitive to the time harvesting starts, the size of the harvest and the time span of the scenarios. The operational expenditure (not including operational overheads) needed to establish, grow and harvest the entire 3079 hectare forest resource

Table 7.12 35 Year Farming - Total Forestry Expenditure Comparison

	Farming	Forestry HV23		Forestry HV29	
	(SMP adj)	1985/86 $	1983/84 $	1985/86 $	1983/84 $
Dargaville	10,350,760	48,040,504	38,432,403	21,677,994	17,342,395
Whangarei	2,897,650	3,826,141	3,060,913	1,917,641	1,534,113
Study Area	1,551,025				
Other Northland		840,031	672,025	709,317	567,454
Total North.	14,781,235	52,706,676	42,165,341	24,304,952	19,443,962
Outside North.	8,470,350	935,442	748,349	709,664	567,731
TOTAL	23,763,600	53,642,118	42,913,694	25,014,616	20,011,693

Table 7.13 35 Year Farming and Operational Forestry Expenditure Comparison ($)

	Farming	Forestry HV23		Forestry HV29	
	(SMP adj)	1985/86 $	1983/84 $	1985/86 $	1983/84 $
Dargaville	10,350,760	42,676,292	34,141,034	19,176,533	15,341,226
Whangarei	2,897,650	250,000	200,000	250,000	200,000
Study Area	1,551,025				
Other Northland		840,031	672,025	709,317	567,454
Total North.	14,781,235	43,766,323	35,013,058	20,135,849	16,108,680
Outside North.	8,470,350	935,442	748,349	709,664	567,731
TOTAL	23,763,600	44,701,766	35,761,413	20,845,513	16,676,411
Office Overhead Costs:					
District (Dargaville)		5,364,212	4,291,369	2,501,462	2,004,431
Regional (Whangarei)		3,576,141	2,860,913	1,667,641	1,334,113

totals $42,956,539. This is considerably more than farming expenditure of $23,251,585 over 35 years. (This forestry figure does not include any overheads.) In other words, whether or not farming or forestry results in more expenditure depends on the time frame within which the forest resource is harvested.

Figures 7.3 and 7.4 show that there is great variation in the year by year forestry expenditure until harvesting begins, and it is not until then that operational forestry expenditure consistently exceeds farming expenditure levels. Once harvesting commences, harvesting approximately 96 ha of 30 year old trees per annum incurs the same level of expenditure as the 3622 ha of farmland (1983/84 prices). Figure 7.3 compares farm and forestry expenditure, with total farm expenditure compared with two classes of forestry expenditure. It shows that operational and operational overhead forestry expenditure is only higher than total farm expenditure once harvesting has begun, which was also the case with the study area forestry scenario. Figure 7.4 compares forestry and farming expenditure within Dargaville and Northland, showing that establishment phase forestry expenditure is higher than farming's in both cases. This is different from the study area forestry scenario, where farming expenditure within Northland is higher than that from forestry, because a higher proportion of study area farm spending takes place inside the region.

During some years of the pruning phase of the sub area forestry scenario, forestry expenditure in Dargaville is close to farmings. This is not the case with the study area forestry scenario, because the study area farms spend a higher proportion of their farm expenditure in that town. These differences between the study and sub area forestry scenarios have implications for the transferability of results from one farming area to another and are discussed below.

With the forestry scenario significant changes in the location of expenditure occur. Expenditure to Dargaville would increase over the 35 year span of the forestry scenario while expenditure to the study area and Whangarei would drop dramatically. Even when regional office overheads are included (See Table 7.12) expenditure to Whangarei under the forestry scenario is much lower than with the pastoral farming scenario. As explained for the study area forestry scenario (See Section 5.4.1) an insignificant amount of the "Other Northland" expenditure is likely to go to Whangarei. Currently most of the forestry expenditure going to Whangarei from forestry activity around the study area is paid to machinery operators. As the study area is relatively clear pasture with few areas of bush and scrub, less will be spent on land clearing and thus less will go to Whangarei.

While 42% of farming expenditure goes to Dargaville, a much higher proportion of forestry expenditure in both harvesting options goes to Dargaville. Once harvesting has commenced, Dargaville would receive a dramatic increase in annual expenditure. An average of about $280,345 per year (SMP adjusted 1983/84 $) is spent by the sub area farms in Dargaville. Under the HV 29 option $1,226,112 ($980,889 in 1983/84 $) in harvesting expenditure would be spent annually in Dargaville and under the HV 23 option $1,839,168 ($1,471,334 in 1983/84 $). Harvesting the sustained yield of 57,961 m3 would result in an annual harvesting expenditure in Dargaville of $927,376 ($741,900 in 1983/84 $). In the case of the HV 23 option, 91% of forestry operational and operational overhead expenditure would be spent in

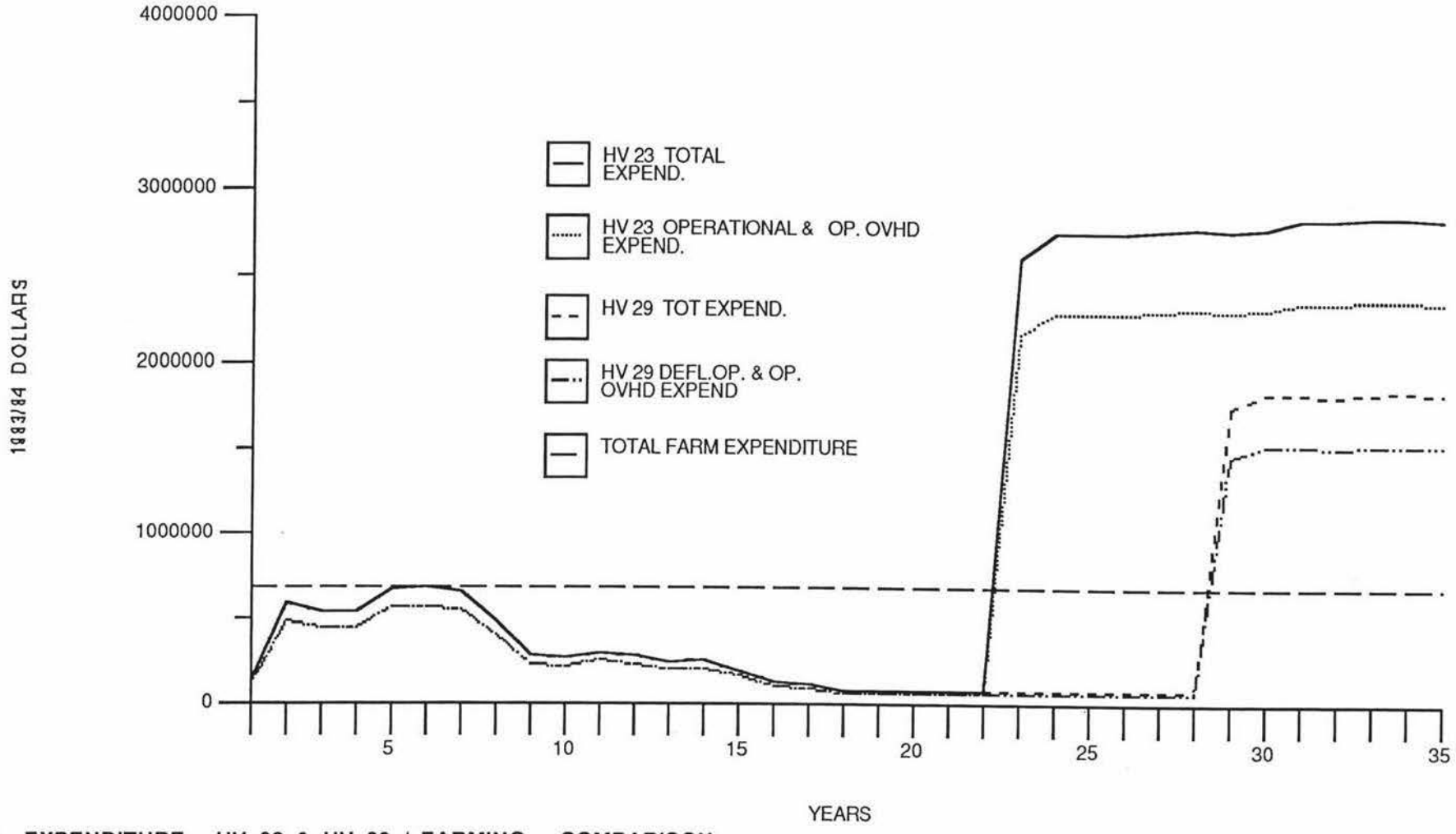


FIG 7.3 EXPENDITURE: HV 23 & HV 29 / FARMING COMPARISON

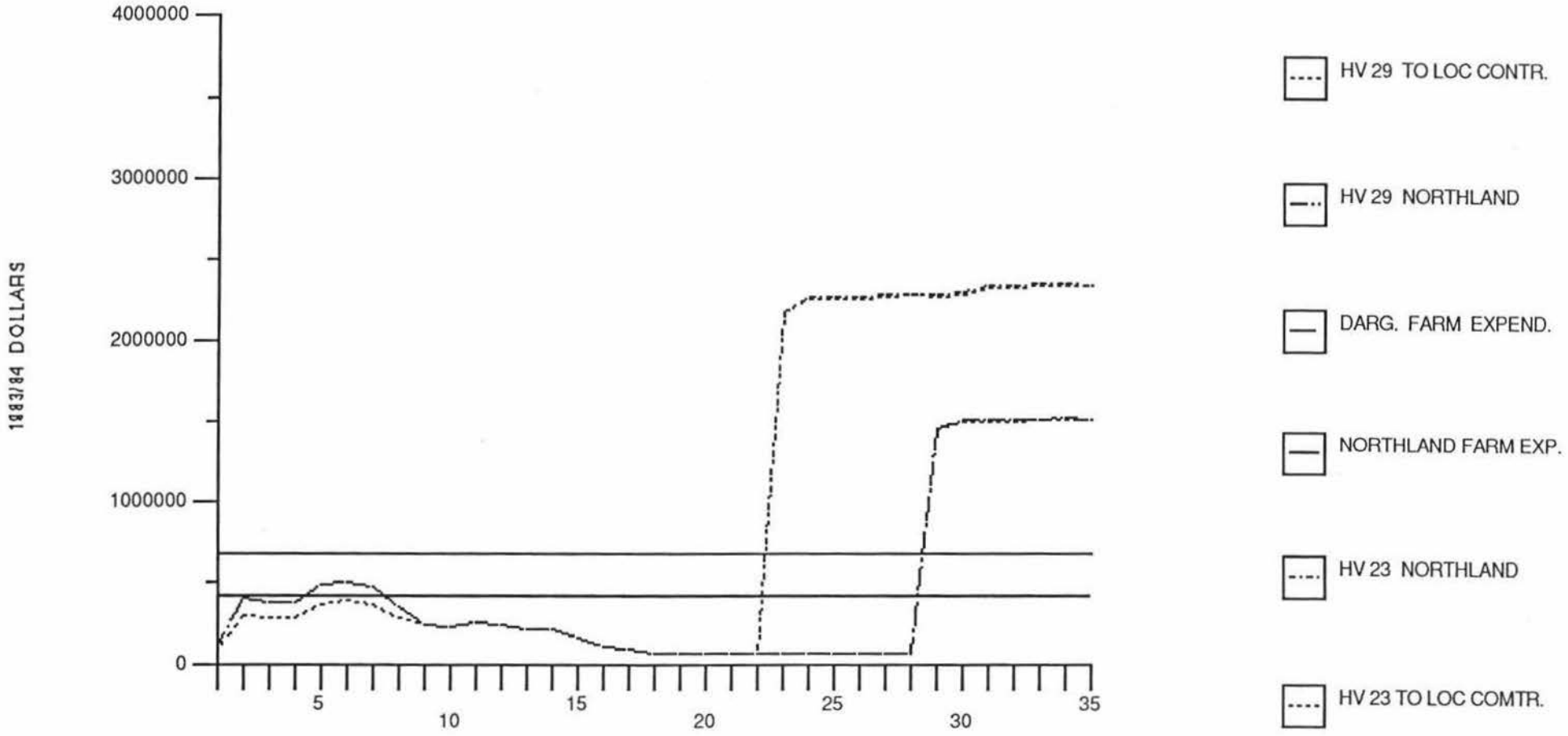


FIG 7.4 DARG. & NORTHLAND EXPEND: FORESTRY FARMING COMPARISON

Dargaville, and with the HV 29 option 87% .

A higher proportion of forestry expenditure takes place inside Northland than farming expenditure, because a large proportion of farm expenditure leaves Northland directly as debt repayment and the main forestry expenditure outside outside Northland is on chemicals. While 64% of all direct farm expenditure was inside Northland, 98% of HV23 expenditure and 97% of HV29 forestry expenditure would be spent inside Northland. In the study area forestry scenario, 85% of all farm expenditure from the study area took place inside Northland, but in the sub area case the figure was 65%.

Under the study area conventional forestry scenario, less was spent in Dargaville under the HV 29 option, using the deflated forestry expenditure figures. The opposite occurs with this scenario because a smaller proportion of total farm expenditure in the sub area farms is spent in Dargaville.

A number of points arise from the above discussion and from a comparison of the results from the study area and sub area forestry scenarios. It is not automatically valid to take the results of a comparison of overall farming and forestry levels from one area and apply these results elsewhere. While both farming and forestry expenditure levels may be the same there is no guarantee that this will be the case. In the case of forestry expenditure, the most important variables are vegetation and topography. If two different areas have similar vegetation and topography then establishment, silviculture and harvesting costs will be similar, if similar silviculture management practices are used and a similar travelling distances are involved. When comparing farm expenditure between two areas of similar vegetation and topography, there is likely to be a wider variation in farm expenditure, due to differences in farm management and farm economics.

If forestry and farming expenditure within Northland is compared, then applying the results of a comparison from one area to another is less likely to lead to valid conclusions. While for major forestry companies the expenditure split within/without Northland is likely to remain relatively constant from area to area, this is not necessarily the case with farming. Comparing the within/without Northland expenditure of the whole study area with that from the sub area shows that the within/without Northland split can very significantly, with debt servicing being the most important variable.

When expenditure by location is broken down further and compared without further analysis, the application of results from one area to another becomes even less valid. The economic impact on a rural servicing town of changing an area from farming to forestry can vary according to farmer's expenditure location patterns as much as their overall level of expenditure. In some areas there will only be one rural servicing town that can realistically be used by farmers. In that case the impacts of a land use change are likely to be easier to estimate than with these scenarios where farmers have two rural servicing centres to choose between. If, for example, the sub-area farmers' spent almost all farm expenditure in Dargaville, then the change of the sub-area to forestry in the HV 29 option would not mean an increase in total expenditure to Dargaville over the 35 years. ($23,252,585 versus $17,342,950)

Therefore, when considering transferring the results of this research to different areas, it is necessary to establish the direction and size of farming expenditure flows for that area. In particular, it is important to

establish the level of debt servicing and the expenditure split between competing rural servicing towns. It is also necessary to establish the location of forestry expenditure flows within Northland. But it is much simpler to do this than it is for farming because this information will be held in a much more aggregate form; that is, in one or two forestry company offices.

Having discussed the impact of changing from farming to forestry on money flows to various locations, the the impact on different businesses can be analysed.

7.8 Sub Area Impact Details

Most of the impacts on businesses, schools and employment are scaled down versions of the impacts outlined in Chapter 5. Rather than repeating information, this section's emphasis will be on highlighting significant differences .

7.8.1 Study Area Businesses.

As a relatively small proportion of the study area farms are involved, the impact on the stores and garage are unlikely to be significant. For example, the garage would lose farm custom equal to less than 5% of total turnover, which is likely to be at least partially offset if some of the ex-farm houses are reoccupied.

The figure calculated for freight expenditure from the sub area farms in this scenario represents about 30% of the turnover the three local transport operators get from the study area. Should this turnover be lost, the impact would be unevenly spread between the three operators. One operator would lose beween 10-15% of total annual gross turnover, the other two less than 5% each. The 10-15% is a significant amount, especially with high interest rates and the decline in the agricultural sector. But by itself it is unlikely to be enough to cause the transport firm to fail. There will be no compensatory increase in business from the sub area through forestry operations unless the firms buy logging trucks, and they would not be needed for well over 20 years.

7.8.2 Businesses Outside the Study Area

Generally, the impacts would be noticable but minor, at less than 5% of total turnover, and unlikely to lead to redundancies in themselves.

Of the total 1329 tonne of fertiliser and lime sold in the study area, 1066 tonne were bought from the Avoca Lime Company and the rest (263 tonne) from Whangarei. This 263 tonne is an insignificant percentage of Whangarei fertiliser sales. For Avoca the loss in sales would have a noticable impact on total fertiliser and lime sales but as it receives about 50% of its gross turnover from other activities, the net impact would be minimal by itself, being significantly less than 2.5% of turnover. It would, however, worsen the present dramatic decline in fertiliser sales. This comment also applies to the aerial topdressing firms, where the 243 tonnes airspread represents between 1 and 2% of total sales.

A minimal impact on farm supply centres would result from the farms being sold to forestry. Taking combined repairs and maintainence plus chemical weed and pest control as a maximum that would go to

farm supply centres, this total of $59,000 is insignificant when divided between the farm supply centres in Dargaville and Whangarei. It would be significant if it was concentrated on one farm supply outlet, but the distribution of sub area farm purchases between farm supply outlets is not know.

Livestock sales from the sub area totalled 615 beef cattle and 2,029 sheep. Beef sales from the sub area through the Dargaville yards represented 1.7% of total Dargaville yardings. The exact number of sheep sold through the Dargaville yards is not clear. Assuming store sheep were sold in the same percentage split between Dargaville and Whangarei as beef sales, then the sheep from the sub area would have represented approximately 4% of Dargaville's store sheep sales. This is a significant amount, especially in light of the general decline in sales through the Dargaville yards, but the specific implications are not clear.

The loss of the 31,695 kg of milkfat supplied to the Northern Wairoa Dairy Company by the sub area dairy farms represents only 0.5% of total input for 1983/84. But the Chief Executive of the NWDC stated that the Company did not wish to lose a single supplier as with rising costs, any drop in input makes it more difficult to maintain profitability. The impact on the Veterinary Club and Trading Society would be minimal.

Assuming the loss of 35,000 sheep shorn per year (17,500 sheep), then the total decrease in shearing business would be equivalent to work for about one shearer and four other units. This loss in business would be spread over three shearing gangs, with the locally based shearing gang losing approximately 15% of the sheep shorn in the 1983/84 year. The local gang would be unlikely to lay off a shearer as a result of this drop, but the gang would suffer a noticable drop in income unless business is gained elsewhere.

The sub area farms purchased two cars, one utility and two farm motorcycles from Dargaville. The loss of these sales would not be significant and any new residents could at least partially offset these lost sales.

7.9 Employment

The direct employment level generated by forestry is significantly lower and much more uneven than direct farming employment generation until harvesting commences, when forestry employment would exceed farm employment for both harvesting options (See graph below). While in the study area forestry scenario, harvesting the sustained yield would support less paid employment than the farms. The opposite is the case with the sub area scenario. This is because of the lower average per farm paid employment of the sub area farms and it means that employment generation comparisons should not automatically be transferred from one group of farms to the next. The proportional difference between harvesting and farming employment is higher than with the study area scenario also because of the lower on farm paid employment.

If the sub area changed to forestry, 13 fulltime and two part time on farm paid positions would be lost. If it is assumed the sub area freight expenditure of $33,000 is enough to support one third of a full time job, and that shearing expenditure would support one shearer and four others for three months of the year, direct paid employment generation is equivalent to about 16 full time jobs in or about the study area.

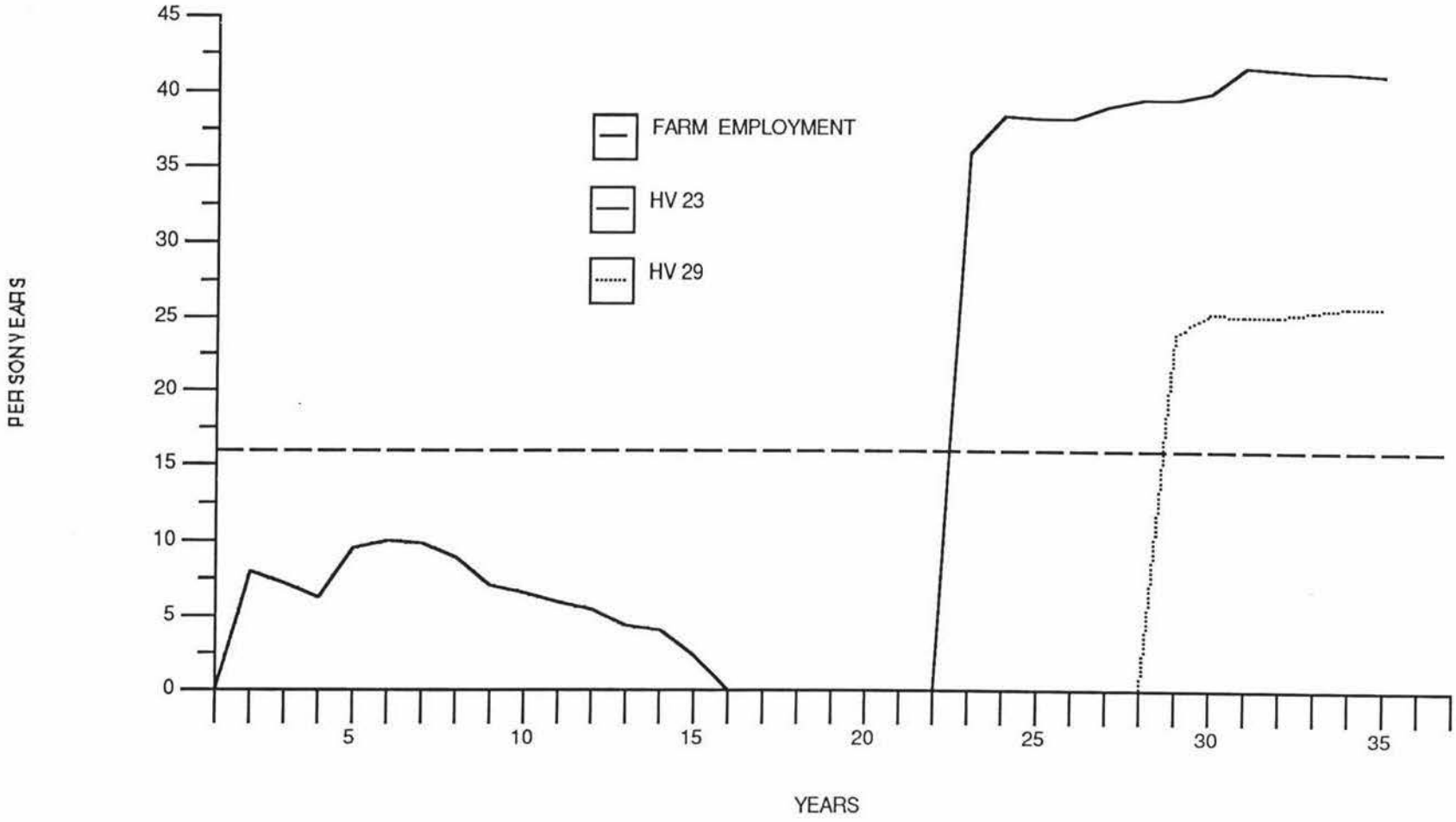


FIG 7.5 LABOUR DEMAND: FORESTRY / FARMING COMPARISON

With the HV 29 option, harvesting would employ the equivalent of 20.8, while harvesting and restablishment would employ about 22 per year. Harvesting would employ the equivalent of 31 per year in the HV 23 scenario, while harvesting and restablishment would employ the equivalent of about 34 per year. The sustained yield harvest of 57,961 m3 per year from the study area forest would employ the equivalent of 16 people per year. If it is assumed 30 year old trees are being harvested with a recoverable volume of 600 m3 per hectare, then harvesting 89 hectares (53,360 m3) would create the same level of paid employment as on the sub area farms.

While the study area farms generate enough freight turnover to support the equivalent of about 0.33 of a driver, transporting the roundwood produced by the HV 29 and HV 23 options would take the equivalent of 3.1 and 4.7 person years respectively, on the transportation assumptions made. The sustained yield figure would be about 2.4 person years.

As discussed in Chapter Six, the forestry labour force would have different characteristics when compared with those working on the farms.

7.10 School and Population Impacts.

The population impact is likely to be minor, in that at least some of the 22 people living in the farm houses would be replaced by new residents. Three of the four school children attend Tangiteroria School and the other attends school outside the study area. The impact on the Tangiteroria School, with its roll of 80, would be minor.

If all the farm houses did remain unoccupied, then there would be a noticable impact on part of the study area's social structure, as most of the farms in the sub area scenario come from one part of the study area. The rural delivery service would continue even if all the sub area houses remained empty as enough farms would remain to keep the service viable, according to the relevant rural delivery driver.

If the farm houses were occupied by new residents then there would be a change in the social structure of the community. But it is difficult to predict even tangible changes, such as changes in age stucture, or the introduction of small holdings, let alone intangible impacts such as a less well knit community. Unlike the study area scenario where the existing social structure would be replaced, this scenario implies changes to the existing structure as most of the study area farm households would remain. If new people moved into the area then the famers comments (Chapter Four) and other research (Chapter One) indicate that this change is unlikely to be viewed positively, at least initially.

7.11 The Roading Impact

Taking the assumptions on truck carrying capacity outlined in chapter Six (see table 6.7) the following truck journeys arise from the sub area:

Table 7.13 Sub Area Truck Journeys

Item	Total Moved	Loads Truck	Loads Truck and Trailer
Lambs - hd	8902	36	15
Sheep "	4086	18	8
Beef "	1042	65	26
Fertiliser - tonne	1329	133	74
Wool - bales	492	10	4
Total		262	127

The total in the table above assumes that all fertiliser flown onto the sub area farms was trucked to airstrips within the study area. This, plus one milk tanker trip per day, means a total of 992 truck loads and 857 truck and trailer loads are generated. As stated in Chapter Six, observation of truck movements within the study area shows that many of the livestock truck journeys involved partially loaded vehicles, so the number of vehicle journeys actually generated by the sub area will be higher than the above numbers. Once harvesting commences the HV 29 option would generate the equivalent of 3,831 annual 20 tonne trips and the HV23 option 5,747 trips.

Many of the unsealed roads in the sub area and throughout the study area are unlikely to cope with the magnitude of the increase implied by either of the sub area harvesting options, unless substantial reconstruction work is carried out.

Summary

While the sub area farms spend about $660,000 per year, sub area forestry expenditure would range from $94,408 to $1,605,787 with the HV 29 option and $94,408 to $2,486,397 with the HV 23 option.

During the establishment phase expenditure in Dargaville and within Northland would be higher than sub area farm expenditure, while with the study area farming-forestry comparison the opposite applies. The high level of sub area farm debt servicing is the main reason why this is the case. This suggests that the results from one group of farms should not automatically be used in reference to another group of farms. The impact on the business community would generally be minor, with one transport operator and one shearing gang likely to lose about 15% of present turnover. The impacts to other businesses would generally be equivalent to less than 5% of total turnover. But the loss would worsen the existing rural downturn and so assumes a greater importance than it would on a rising market. However this loss would be much more than offset once harvesting commences. With forestry expenditure flowing to different businesses and locations important sectoral and locational shifts are implied.

Direct employment would also be lower until harvesting started. Because of the lower level of paid employment on the sub area farms compared with the study area farms as a whole, harvesting employment

would be much higher than farm employment. In addition the employment generated by forestry would be taken up by different people, young single males who live away from the forests and commute to work.

If all of the farm houses remained empty after the farms were sold, then the population loss represents less than 10% of the study area total. The introduction of new non- farming people would not be entirely welcomed by the existing residents and would modify the existing social structure and power base. Different values and work patterns could lead to a less cohesive interactive community.

EIGHT - THE WOODLOT and AGROFORESTRY SCENARIOS

8.0 Introduction

This chapter presents two 35 year farm forestry scenarios, one being an agroforestry scenario and the other a woodlot scenario. These two scenarios are not presented as likely forestry developments in the study area, rather they indicate the comparative impact of the same sized agroforestry and woodlot developments. As with the previous scenarios, the impact of the two scenarios on expenditure and employment will be presented, along with comment on their likely social implications. Also included is a description of a whole farm tree design approach which integrates pasture and trees with the productive and environmental characteristics of the farm.

8.1 The Woodlot and Agroforestry Scenarios

The farmer survey indicated that few farmers were interested in woodlot forestry and fewer still in agroforestry, so the plantings described in the woodlot and agroforestry scenarios would not occur unless farmers attitudes to farm based forestry changed significantly. Therefore, these two scenarios show the comparative impact of the same sized woodlot and agroforestry plantings introduced into a pastoral farming area. It should also be noted that these scenarios are not a study of the relative economics of agro and woodlot forestry. Rather, they demonstrate the impact of different forms of forestry as the previous scenarios did. A significant difference between the conventional forestry scenarios and these scenarios is that in the woodlot and agroforestry scenarios income from the sale of trees accrues to the local area, because the trees are owned by the farmers.

A number of studies into the economics of woodlot and agroforestry from the individual farmer point of view have been carried out. (See Stewart (1985) and Clark and Cawston (1985). Also see the paper on the financial implications of woodlot and agroforestry development by Clark, plus the MAF information handout on agroforestry contained in Appendix 6.

A joint Ministry of Agriculture and Fisheries/N.Z Forest Service study (Clark and Cawston 1985) into agro and woodlot forestry, constructed to evaluate the two from the individual farmer's point of view , is particularly relevant to this research. This is because, firstly, the MAF/NZFS study is based on the MAF Northland Hill Country model farm, which is very similar to the study area sheep and beef units. (This MAF hypothetical farm is "located" close to the study area with similar soil types and stocking rates. One of the study area farms is in the farm sample from which it is constructed.) Secondly, the MAF/NZFS woodlot/agroforestry model uses costs that would apply to study area farms.

These costs and practices are therefore adopted as the basis for the scenario's presented below. Revingtons study (1985) 'Small Scale Forestry in Northland' provided information and data on farm forestry in Northland which were also incorporated into the assumptions behind the scenario construction.

8.2 Assumptions

The central assumption is that the major motivation for planting any woodlot/agroforestry blocks is economic and that the trees are tended to maximise the economic return.

It is assumed that contractors will carry out forestry establishment, siliviculture and harvesting, and that these contractors would be based in and around Dargaville. Revington (1985) found that many farm woodlots were small and not tended for optimum production, partly because there were often other reasons besides wood production for planting trees. Revington reports that "the most important constraint indicated by forest owners in Northland was their lack of time to do forestry work" (P.162.) Of the total forestry owner group surveyed by Revington, 57.9% of them listed "Lack of time to do forestry work as busy with farm activities" as being of above average importance as a constraint in forestry management. If farm based forestry is to achieve its potential return then trees must be tended. Where the prime motivation for growing trees was economic the trees were tended and contractors were usually hired to do this.

In these scenarios thirty two farms were assumed to plant woodlot and agroforestry blocks. Those not doing so were farms receiving a significant part of their income from dairying and small part time farms. An area equivalant to 10% of each of the 32 farm's effective area was planted over five years, which meant a total of 1,106 hectares were planted in each scenario. If there was bush and scrub on the farm, it was cleared first for woodlot establishment. Not all the 32 farms commenced planting in year 1. It is assumed that each year for eight years four farms begin planting their woodlot or agroforestry blocks and at this adoption rate it takes 12 years for the complete area to be planted. From the individual farmer's point of view the progressive planting minimises the dislocation of stock and spreads expenditure. Should farmers in the study area start planting woodlot and/or agroforestry blocks, this rate of adoption is considered to be realistic, with innovation leading to diffusion.

The potential impact of woodlot and agroforestry operations on stock carrying is a disadvantage of farm forestry. However, the actual impact is likely to be less than farmers believe, due to progressive planting and, with agroforestry, the use of elite tree stocks. With the woodlot scenario, while the progressive planting regime will minimise stock dislocation, it is assumed that there will be a drop in overall stock numbers, such that livestock income would drop by 5% with 10% of the farm planted in woodlot forestry. The impact on the area's livestock income was measured by calculating the average income per effective hectare for the total area planted and multiplying this figure by the number of effective hectares planted. While this does not give an accurate measure of the income effect from an individual farmers point of view, it does give an accurate picture for the whole area planted over the 35 years of the woodlot scenario. It was assumed that this 5% drop in income would lead to a 4.25 % cut in farm expenditure. (This was calculated by multiplying 5% by 0 .85.)

In the woodlot scenario it is assumed that farm non-forestry expenditure does not change beyond this. It could be argued that, given todays economic climate, it would be realistic to assume other farm expenditure would drop the equivalent of woodlot costs. However, the woodlot and agroforestry scenarios are not presented as likely to occur, due to the farmers' attitudes to on farm forestry. It farmers

are considering investment in on farm forestry it is not likely they would do so if they had to cut back on non-tree farm expenditure to do so. It is assumed that agroforestry expenditure occurs in addition to other farm expenditure.

In the case of the agroforestry scenario it is assumed that there will be no significant impact on stock carrying capacity or livestock income because of the use of elite tree stocks and progressive planting. The Department of Lands and Survey experimental agroforestry block at Te Kuri (near Te Kopuru south of Dargaville) has demonstrated that a minimal impact on stock carrying capacity is a realistic assumption. Elite tree stocks are planted at on initial density of 300spha, in groups of three. The groups of three are planted in rows 10 metres apart and a low electric fence is run down either side of the row. The use of elite tree stocks coupled with the innovative use of electric fencing means that planted areas can be grazed within a relatively short period after planting. Just how quickly depends on a number of factors including how familiar the stock are with trees. But Staff at the Te Kuri experimental agroforestry blocks felt six weeks was a realistic period, though it should be emphasised that established practice is to keep stock clear of the trees for one year. With planting taking place over a number of years, it is assumed the initial displacement of stock can be absorbed within the remaining effective farm area for this one year.

The wide spacing of trees that characterises agroforestry enables grazing at decreased livestock intensity throughout the life of the forest. Pervical and Hawke (1985) suggest that for 100 spha agroforestry blocks livestock carrying capacity does not drop below 30% of the lands open pasture carrying capacity. They state, "The combined effect of the trees on pasture growth and the reduced pasture available due to slash have nearly always resulted in less stock being carried than on open pasture ..... At the lower levels of stocking we found on many hill country pastures, the reduced stock carrying capacity may be compensated for by higher pasture utilization in an agroforestry system. This particularly applies at tree densities of around 100 spha where some farmers have commented that in the 10 year period after establishment there has been no reduction in livestock numbers." (P89 1985). The agro-forestry blocks in this scenario take up 10% of each farmer's grazed area so the maximum theoretical stock carrying capacity lost is 7% of the farms capacity. It is considered that this amount can be and would be absorbed within the remaining grazed area.

8.3 Woodlot and Agroforestry Cost and Management Practices

Unless otherwise stated, costs are from the joint MAF/NZFS study, with labour requirements being calculated from MAF and NZFS sources. As there was a significant variation in the labour requirement estimates, the figures here represent the author's judgement as to what were the most realistic labour requirement figures.

8.3.1 Woodlot Scenario Costs and Management

Roads:

It is assumed that roads are in a condition to allow establishment without additional expenditure.

Establishment:

Initial plantings are at 1000 spha which are thinned down to 200 spha in two steps, with the expenditure and labour requirements as laid out in Table 8.1

Table 8.1 Woodlot Establishment Costs

	$/ha	Labour hrs/ha
Landclearing (crush and burn)	350	8
Spot Spraying Grass	90	3
Trees	50	-
Planting -Spit Method	150	9
Hand Fertilising	130	5.5
Releasing	100	2.2
Totals	870	27.7

Note: Hand Fertilising = 170 gm/tree, 4c Fertiliser, 8c Labour
Releasing = Velpar $74.88/kg. 3.4c Chemicals, 6.6c Labour.

Note that these figures apply for the area treated, that is, they are not averages per hectare planted. For example, if 25 ha were planted on land that was 17 ha grass and 8 ha, then expenditure would equal $1,530 for spot spraying and $2,800 for land clearing.

Silviculture

Trees are tended to produce high quality clear wood, with three prunings and two thinnings over the total area planted.

Table 8.2 Woodlot Siliviculture

Activity	Year	$/ha	Labour hrs/ha
1. Pruning 1 0-2m (500spha)	3	200	18
2. Thin to Waste 1 (to 500spha)	3	130	9
3. Pruning 2 2-4m (300spha)	5	150	12
4. Pruning 3 4-6m (200spha)	7	170	11
5. Thin to Waste 2 (to 200spha)	7	130	9
6. Forest Health	8	30	-
		810	59.0

Note that aerial topdressing is carried out about year 13, but it is assumed the farmer would normally topdress, so this is not a cost to be assigned to the woodlot development.

Harvesting

Before harvesting can commence it is assumed that roads must be constructed. The length of roading that would need to be contructed would vary acording to the number of blocks planted and the distance between these blocks. As an overall average it is assumed that 3 km of road per farm at $15,000 a kilometre would be required. Volumes harvested are assumed to be 500 m3/ha at year 30. This is made up of:

1. Pruned logs 178 m3/ha.
2. Unpruned log 222 m3/ha.
3. Pulp logs 100 m3/ha.

In the MAF/NZFS study the woodlot trees are assumed to be harvested at year 36 and produce 548 m3 of recoverable timber per hectare. Earlier harvesting producing 500 m3 per hectare at year 30 is assumed here based on growing rates experienced to the north of the study area.

Prices are based on stumpages paid in the Auckland market. (Stumpage is the price paid to the owner of the trees, with the logger meeting harvesting and transportation costs. In the woodlot and agroforestry scenarios the income from the sale of the trees goes to the farmers.)

Stumages:

1. Pruned logs $83 m3.
2, Unpruned logs $50/m3.
3. Pulp $ 5/m3.

This would give a per hectare gross income of $26,128.

Harvesting costs are taken as $20 m3 on truck, however these costs are met by whoever buys the logs within the stumpage price and not by the farmers. The $20 m3 is 25% higher than the harvesting costs in the conventional forestry scenarios, due to the additional per unit cost of smaller scale harvesting and is an estimate based on data supplied by Spall (1986 pers comm). It is difficult to estimate where the logs would be transported to . With higher quality timber it is likely to go to a saw mill rather than a pulpmill, with the 45-50% "waste" (that is that part of the log left after the sawn timber has been cut from it) suitable for pulping. If the logs were transported 25 km at $0.25 per tonne kilometre, transportation costs would be as laid out in the scenario spreadsheet.

It is assumed that all the area harvested would be reafforested the year after logging. Restablishment costs are $470./ha plus $50 for trees. The labour requirement is 19.7/ha (rounded to 20 hours).

8.3.2 Agroforestry Scenario Costs and Management

Roads

Existing farm roads and tracks allow establishment of agroforestry blocks without futher expenditure.

Establishment

Initial plantings are at 300 spha of elite tree stock, with the trees planted in groups of three in rows 10

metres apart. This initial planting is thinned down to 100 spha in one step. Table 8.3 sets out establishment costs, with these figures applying per hectare treated. Note that agroforestry blocks would be established only on pasture that does not have a weed problem and if it is planned to plant where weeds are present they must be cleared before doing so to avoid problems as the trees grow.

Table 8.3 Agroforestry Establishment Costs

	$/ha	Labour hrs/ha
Spotspraying	33	1.5
Trees	90	
Planting - Split Method	50	4.0
Hand Fertiliser	43	2.0
Releasing	33	1.0
Totals	249	8.5

Note: Trees are elite stock at 30c each. Fertiliser (170gm/tree - 4c fertiliser, 9c labour). Releasing - Velpar $74.88/kg 3.4c/tree chemical, 6.4c/tree labour.

Silviculture

Trees are tended to produce high quality wood with four prunings and one thinning.

Table 8.4 Agroforestry Silviculture

Activity	Year	$/ha	Labour hrs/ha
1 Pruning (100spha)	2	35	3
2 Thinning (to 100spha)	2	65	4
3 Pruning 2 1.5-3m	4	55	3.5
4 Pruning 3 3-4.5m	6	70	4.5
5 Pruning 4	7	75	5
6 Forest Health	8	30	–
Totals		330	20

Harvesting

As with the woodlot scenario, roads are built/rebuild prior to harvesting at $15,000 a km for an average of 3 km per farm. The volume harvested is assumed to be 319 m3 per hectare at year 26. This volume is made up of:

1. Pruned logs 130 m3.
2. Unpruned logs 152 m3.
3. Pulp logs 37 m3.

The stumpages paid are assumed to be:

1. Pruned logs $83/m3 .
2. Unpruned logs $50 m3.
3. Pulp logs $5 m3.

This gives a per hectare income of $18,575.

The agroforestry harvesting and transportation costs and assumptions are the same as those in the woodlot scenario - $20 m3 and 25 km at $0.25 per tonne kilometre.

Reafforestation

Pasture is restored at an estimated cost of $900 a hectare and the agroforestry blocks are replanted the second year after harvesting at $160 per hectare, plus trees at $90, giving a total of $250.

8.4 Woodlot Scenario Results.

The expenditure incurred carrying out the woodlot and agroforestry development described here would be as in the two attached expenditure spreadsheets. Figures 8.1 and 8.2 graph the expenditure and labour requirements of the woodlot and agroforestry scenarios. In section 8.5 the agroforestry results are presented.

8.4.1 Woodlot Scenario Expenditure.

As with the conventional forestry scenario spreadsheets, woodlot forestry activities are across the top of the spreadsheets. The income from the woodlot roundwood sales is in column U and when the assumed loss of farm income is deducted net income to the farmers would be as laid out in column X. The spreadsheet shows that the expenditure necessary to develop the woodlot resource as detailed in this scenario would be $8,956,644 assuming the timber is transported 25 km. With the logs sold on a stumpage basis, $2,318,334 of this would be paid to contractors and others by the farmers. The cost of harvesting and transporting the logs ($6,903,750) would be borne by the logging contractors and largely paid out in the form of wages and other expenses .

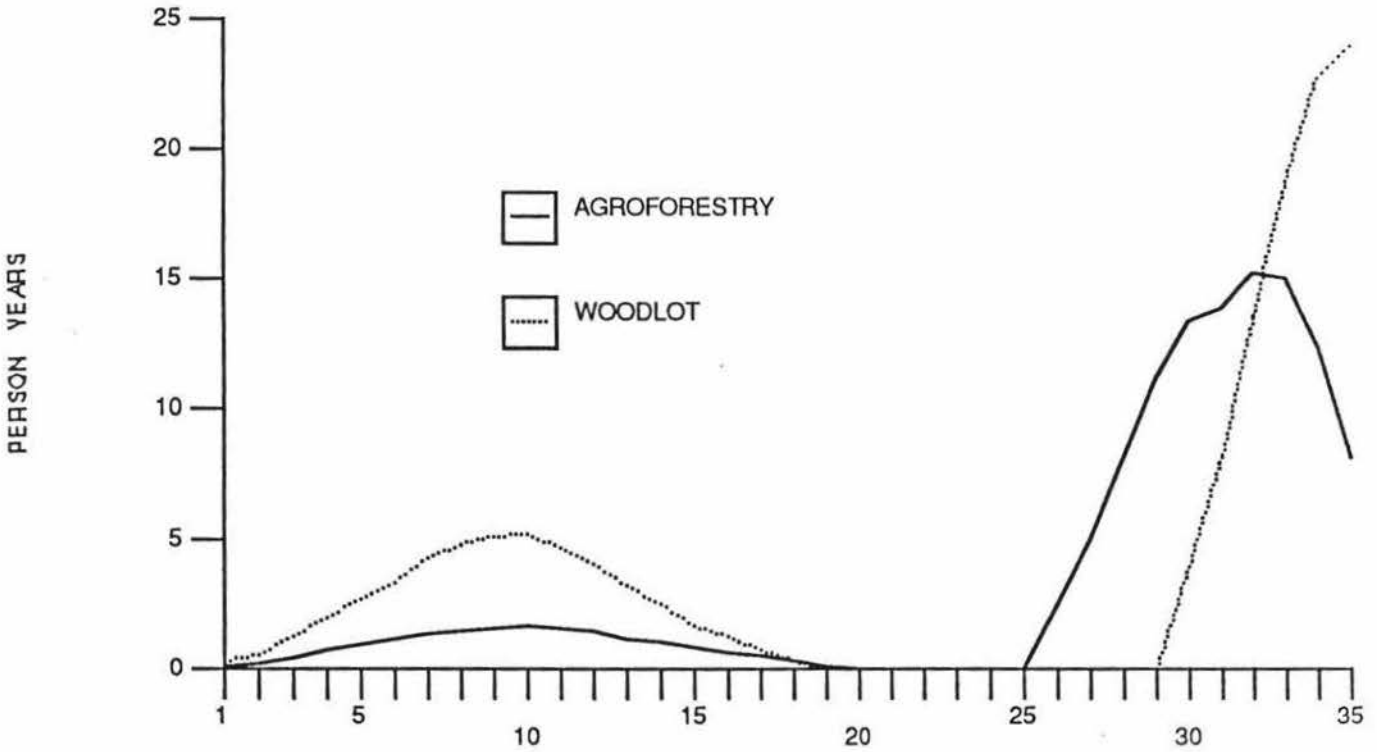
Table 8.5 provides a breakdown of woodlot scenario expenditure by category and shows that, as with the conventional forestry scenarios, harvesting is the largest item in the expenditure breakdown. But thinning and pruning make up a higher proportion of total expenditure than in the conventional forestry scenarios, because 100% of the area established is pruned. The 'Less Transport ' column is included because, while the other costs can be stated accurately, transport costs could vary widely according to where the logs are carried to.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1																								
2	YEARS	HECTARES	HECTARES	TOTAL ESTAB	TREES	PRUNING 1	NG 1	THINNING 1	PRUNING 2	FOREST	PRUNING 3	THINNING 2	AERIAL	KILOMETRES	ROADING	AMOUNT	HARVESTING	TRANSPORT	RESTABLISH	TOTAL	DEFLATED	FORESTRY	DFL FOREST	FARM INCOME	NET
3		PLANTED	CLEARED	COSTS						HEALTH			TOPDRESSING	OF ROAD	COST	HARVESTED	COST			OPERATIONAL	OPERATIONAL	INCOME	INC	LOST	INCOME
4					50	200																		
5							200	130	150	30	170	130	0		15000	500	20	6.25	470		0.8	26128	0.8	
6	1	25	8	13830	1250															15080	12064			2387	-2387
7	2	50	8	25580	2500															28080	22464			8284	-8284
8	3	80	7	39420	4000	5000	5000	3250												51670	41336			18535	-18535
9	4	110	7	53520	5500	10000	10000	6500												75520	60416			32997	-32997
10	5	129	10	63230	6450	16000	16000	10400	3750											99830	79864			32997	-32997
11	6	132	3	62820	6600	22000	22000	14300	7500											113220	90576			49707	-49707
12	7	143	25	73710	7150	25800	25800	16770	12000	750	4250	3250								143680	114944			67820	-67820
13	8	139	41	74044	6950	26400	26400	17160	16500	1500	8500	6500								157554	126043.2			84389	-84389
14	9	110	37	61320	5500	28600	28600	18590	19350	2400	13600	10400								159760	127808			98150	-98150
15	10	95	28	51930	4750	27800	27800	18070	19800	3300	18700	14300								158650	126920			108400	-108400
16	11	66	25	37520	3300	22000	22000	14300	21450	3870	21930	16770								141140	112912			117808	-117808
17	12	27	9	15030	1350	19000	19000	12350	20850	3960	22440	17160								112140	89712			123565	-123565
18	13				0	13200	13200	8580	16500	4290	24310	18590	0							85470	68376			126093	-126093
19	14					5400	5400	3510	14250	4170	23630	18070	0							69030	55224			126093	-126093
20	15						0	0	9900	3300	18700	14300	0							46200	36960			126093	-126093
21	16						0	0	4050	2850	16150	12350	0							35400	28320			126093	-126093
22	17						0	0	0	1980	11220	8580	0							21780	17424			126093	-126093
23	18						0	0	0	810	4590	3510	0							8910	7128			126093	-126093
24	19						0	0	0	0	0	0	0							0	0			126093	-126093
25	20						0	0	0	0	0	0	0							0	0			126093	-126093
26	21						0	0	0	0	0	0	0							0	0			126093	-126093
27	22						0	0	0	0	0	0	0							0	0			126093	-126093
28	23						0	0	0	0	0	0	0							0	0			126093	-126093
29	24						0	0	0	0	0	0	0							0	0			126093	-126093
30	25						0	0	0	0	0	0	0							0	0			126093	-126093
31	26	0					0	0	0	0	0	0	0							0	0			126093	-126093
32	27	0					0	0	0	0	0	0	0							0	0	0	0	126093	-126093
33	28	0					0	0	0	0	0	0	0							0	0	0	0	126093	-126093
34	29	0					0	0	0	0	0	0	0							0	0	0	0	126093	-126093
35	30	25					0	0	0	0	0	0	0							0	0	0	0	126093	-126093
36	31	50			1250		0	0	0	0	0	0	0	3	45000	12500	250000	78125		373125	298500	653200	522560	126093	527107
37	32	80			2500		0	0	0	0	0	0	0	3	45000	25000	500000	156250	11750	714250	571400	1306400	1045120	126093	1180307
38	33	110			4000	5000	0	0	0	0	0	0	0	3	45000	40000	800000	250000	23500	1121000	896800	2090240	1672192	126093	1964147
39	34	129			5500	10000	5000	3250	0	0	0	0	0	3	45000	55000	1100000	343750	37600	1538600	1230880	2874080	2299264	126093	2747987
40	35	132			6450	16000	10000	6500	0	0	0	0	0	3	45000	64500	1290000	403125	51700	1811825	1449460	3370512	2696409.6	126093	3244419
41							16000	10400	3750	0	0	0	0	3	45000	66000	1320000	412500	60630	1874730	1499784	3448896	2759116.8	126093	3322803
42		1632	208	571954	75000	252200	252200	163930	169650	33180	188020	143780	0	18	270000	263000	5260000	1643750	185180	8956644	7165315.2	13743328	10994662.4	3645178	10098150

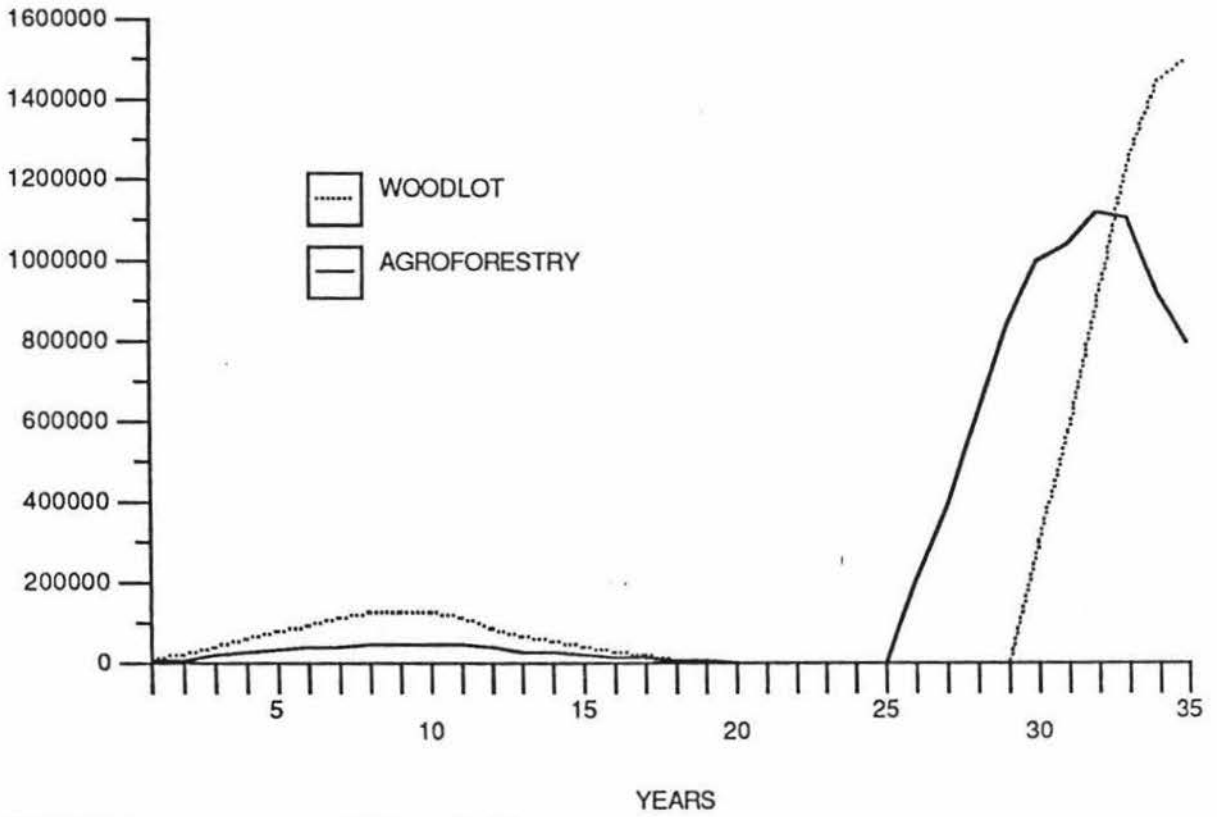
EXPENDITURE - WOODLOT SCENARIO

EXPENDITURE - WOODLOT SCENARIO

EXPENDITURE - WOODLOT SCENARIO



L.2
)LOT & AGROFORESTRY LABOUR



& AGROFORESTRY EXPENDITURE

Table 8.5 Woodlot Expenditure Breakdown

	Total ($)	%of Total	% of Total less Transport
Est + Rest incl trees	832,134	9.3	11.0
Pruning	609,870	4.1	5.0
Thinning	307,710	3.3	4.1
Forest Health	33,180	0.3	0.4
Harvesting	5,260,000	58.7	69.0
Transport	1,643,750	18.4	-
Roading	270,000	2.8	3.6
Total	$8,956,644		

The gross income to farmers would be $13,743,328, when their direct costs are subtracted, $11,424,994 remains. The farm income lost would total $3,645,178, subtracting this leaves a net income of $7,779,816 so it is clearly in the farmer's interest to absorb the displaced stock elsewhere on the farm. The drop in farm income and the decline in farm expenditure this is assumed to cause has important implications for the results of the scenario. (See below.)

8.4.2 The Direction of Woodlot Expenditure

The direction of expenditure is laid out in the two tables below. In both tables it is assumed that establishment (less tree stocks which are bought from the nursery near Kaitaia) and management expenditure is paid to contractors based in and about Dargaville. It is assumed that chemicals and fertiliser are bought from suppliers in Dargaville by the forestry contractors.

As stated previously, it is difficult to say where the logs would be transported to, so total expenditure for a longer haul distance was also worked out. In Table 8.6 it is assumed that those carrying out the harvesting and transportation of the wood do not come from the Dargaville area. This would be the case if the wood was bought by a sawmill outside the Dargaville area - say from Whangarei. If the logs are transported to Whangarei then total transportation costs would be higher, assuming a haul distance of 50 km and a per tonne kilometre cost of 20 cents, transport expenditure would be $2,630,000 - $657,500 higher than the Dargaville transport cost. In Table 8.7 it is assumed that the logs are transported 25 km at 25 cents a tonne kilometre.

Table 8.6 Woodlot Scenario Expenditure Direction - Non Dargaville Harvesting ($)

	Dargaville	Whangarei	Elsewhere
Total	1,977,894	6,903,750	75,000

The 'Elsewhere' expenditure is for trees bought from the Kaitaia nursery.

Study of the scenario spreadsheet and the graph shows that once harvesting commences reestablishment, silviculture and roading expenditure is a very small proportion of total expenditure. (About 7.5% for year 35) So, if harvesting and transport expenditure do not flow into the Dargaville economy, it would gain comparatively little directly from the woodlot development described in this scenario. However, the increase in farmer income would lead to an indeterminate rise in their expenditure.

Table 8.7 Woodlot Scenario Expenditure Direction - Dargaville Harvesting ($)

	Dargaville	Whangarei	Elsewhere
Total	8,881,644	0	75,000

The 'Elsewhere' expenditure is for trees.

Comparison of the tables illustrates how sensitive the expenditure direction results are to where harvesting expenditure goes to.

8.4.3 Woodlot Scenario Employment Generation

Table 8.8 indicates the labour hours generated by the woodlot scenario. These are a summary of the employment details on the employment spreadsheet, which breaks employment down by activity and year. Woodlot and agroforestry labour demand are graphed on Figure 8.2. As employment generated by the woodlot and agroforestry scenario would not be offset by any loss of on-farm employment, these figures represent the net increase in employment generated by the scenarios. As the labour hours generated per hectare are approximate, the figures provide a general, rather than exact indication of the labour hours that would be generated by the woodlot development.

The woodlot scenario employment spreadsheet calculates the employment hours generated by year and category, with the total person years of employment listed as well. Comparison with the employment generation of the conventional forestry scenarios shows that pruning takes a significantly higher proportion of total labour generation, because all the area is pruned and it is pruned four times instead of three. The impact of this is such that during the pruning phase, woodlot labour generation is about one half of that from the sub area conventional forestry scenario, even though about three times the area is planted with the sub area scenario.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1																							
2	YEARS	HECTARES	TOTAL ESTAB	TREES	PRUNING 1	THINNING 1	PRUNING 2	PRUNING 3	PRUNING 4	FOREST	KILOMETRES	ROADING	AMOUNT	HARVESTING	TRANSPORT	RESTABLISH	RESTABLISH	TOTAL	DEFLATED	FORESTRY	DFL. FOREST	NET	
3		PLANTED	COSTS							HEALTH	OF ROAD	COST	HARVESTED	COST		PASTURE	AGROFOR	OPERATIONAL	OPERATIONAL	INCOME	INC	INCOME	
4			160	90	35	65	55	70	75	30		15000	319	20	6.25	900	160		0.8	18395	0.8		
5																							
6	1	25	4000	2250														6250	5000			-6250	
7	2	50	8000	4500														12500	10000			-12500	
8	3	80	12800	7200	875	1625												22500	18000			-22500	
9	4	110	17600	9900	1750	3250												32500	26000			-32500	
10	5	129	20640	11610	2800	5200	1375											41625	33300			-41625	
11	6	132	21120	11880	3850	7150	2750											46750	37400			-46750	
12	7	143	22880	12870	4515	8385	4400	0	0	0								53050	42440			-53050	
13	8	139	22240	12510	4620	8580	6050	1750	1875	750								58375	46700			-58375	
14	9	110	17600	9900	5005	9295	7095	3500	3750	1500								57645	46116			-57645	
15	10	95	15200	8550	4865	9035	7260	5600	6000	2400								58910	47128			-58910	
16	11	66	10560	5940	3850	7150	7865	7700	8250	3300								54615	43692			-54615	
17	12	27	4320	2430	3325	6175	7645	9030	9675	3870								46470	37176			-46470	
18	13			0	2310	4290	6050	9240	9900	3960								35750	28600			-35750	
19	14			0	945	1755	5225	10010	10725	4290								32950	26360			-32950	
20	15			0	0	0	3630	9730	10425	4170								27955	22364			-27955	
21	16			0	0	0	1485	7700	8250	3300								20735	16588			-20735	
22	17			0	0	0	0	6650	7125	2850								16625	13300			-16625	
23	18			0	0	0	0	4620	4950	1980								11550	9240			-11550	
24	19			0	0	0	0	1890	2025	810								4725	3780			-4725	
25	20			0	0	0	0	0	0	0								0	0			0	
26	21			0	0	0	0	0	0	0								0	0			0	
27	22			0	0	0	0	0	0	0								0	0			0	
28	23			0	0	0	0	0	0	0								0	0			0	
29	24			0	0	0	0	0	0	0								0	0			0	
30	25			0	0	0	0	0	0	0								0	0			0	
31	26	25		0	0	0	0	0	0	0	3	45000	7975	159500	49843.75			254343.75	203475	459875	367900	205531.25	
32	27	50		0	0	0	0	0	0	0	3	45000	15950	319000	99687.5	22500		486187.5	388950	919750	735800	433562.5	
33	28	80		2250	0	0	0	0	0	0	3	45000	25520	510400	159500	45000	4000	766150	612920	1471600	1177280	705450	
34	29	110		4500	0	0	0	0	0	0	3	45000	35090	701800	219312.5	72000	8000	1050612.5	840490	2023450	1618760	972837.5	
35	30	129		7200	875	1625	0	0	0	0	3	45000	41151	823020	257193.75	99000	12800	1246713.75	997371	2372955	1898364	1126241.25	
36	31	132		9900	1750	3250	0	0	0	0	3	45000	42108	842160	263175	116100	17600	1298935	1039148	2428140	1942512	1129205	
37	32	143		11610	2800	5200	1375	0	0	0	3	45000	45617	912340	285106.25	118800	20640	1402871.25	1122297	2630485	2104388	1227613.75	
38	33	139		11880	3850	7150	2750	0	0	0	3	45000	44341	886820	277131.25	128700	21120	1384401.25	1107521	2556905	2045524	1172503.75	
39	34	110		12870	4515	8385	4400	1750	0	0	3	45000	35090	701800	219312.5	125100	22880	1146012.5	916810	2023450	1618760	877437.5	
40	35	95		12510	4620	8580	6050	3500	1875	750	3	45000	30305	606100	189406.25	99000	22240	999631.25	799705	1747525	1398020	747893.75	
41																							
42		2119	176960	172260	57120	106080	75405	82670	84825	33930	30	450000	323147	6462940	2019668.75	826200	129280	10677338.75	8541871	18634135	14907308	7956796.25	

EXPENDITURE - AGROFORESTRY SCENARIO

EXPENDITURE - AGROFORESTRY SCENARIO

EXPENDITURE - AGROFORESTRY SCENARIO

Table 8.8 Woodlot Scenario Employment Generation

Activity	Total Hours	% of Total
Landclearing	1,664	0.7
Establishment	21,788	9.3
Pruning	48,436	20.8
Thinning	21,219	9.1
Restablishment	8,784	3.8
Harvesting	131,500	56.3
Total	233,411	100.0

As expected the table shows that harvesting creates most of the total labour demand generated by this scenario. When compared with the expenditure percentage breakdown, pruning is seen to require a much higher proportion of the total labour needs than it does of total expenditure.

8.5 Agroforestry Scenario Results

8.5.1 Agroforestry Expenditure

The agroforestry scenario spreadsheet provides basically the same information as the woodlot one, with the differences in spreadsheet headings due to the different management assumptions. The spreadheet shows that it would cost $10,677,339 to carry out the agroforestry development detailed in this scenario, with harvesting commencing in year 26, which reflects the better growth experienced in agroforestry blocks. This better growth is partly the result of the wide tree spacing, the farmers normal fertiliser programme, which is assumed to continue, and the elite tree stocks. Table 8.9 provides a breakdown of agroforestry expenditure.

Table 8.9 Agroforestry Scenario Expenditure Breakdown

	Total ($)	% of Total	% of Total Less Transport
Establishment	176,960	1.6	2.0
Est + Rest incl trees	478,500	4.4	5.6
Pruning	355,554	2.6	3.4
Thinning	124,410	0.9	1.1
Forest Health	41,130	0.3	0.4
Harvesting	6,462,940	60.5	74.9
Transport	2,019,669	18.9	--
Roading	450,000	4.0	5.2
Restore pasture	826,200	7.4	9.0
Total	10,677,339		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2	YEARS	HECTARES	ESTABLISHMENT	PRUNING 1	THINNING 1	PRUNING 2	PRUNING 3	PRUNING 4	ROADING	HARVESTING	TRANSPORT	RESTORE	RESTABLISH.	TOTAL		PERSON	
3		PLANTED/	LABOUR							M3/HA		PASTURE		OPERATIONAL		YEARS	
4		HARVESTED	8.50	3.00	4.00	3.50	4.50	5.00	UNCLEAR	0.50	0.075	UNCLEAR	8.50				
5																	
6	1	25.00	212.50											212.50		0.12	
7	2	50.00	425.00											425.00		0.23	
8	3	80.00	680.00	75.00	100.00									855.00		0.46	
9	4	110.00	935.00	150.00	200.00									1285.00		0.70	
10	5	129.00	1096.50	240.00	320.00	87.50								1744.00		0.95	
11	6	132.00	1122.00	330.00	440.00	175.00								2067.00		1.12	
12	7	143.00	1215.50	387.00	516.00	280.00	0.00							2398.50		1.30	
13	8	139.00	1181.50	396.00	528.00	385.00	112.50	125.00						2728.00		1.48	
14	9	110.00	935.00	429.00	572.00	451.50	225.00	250.00						2862.50		1.56	
15	10	95.00	807.50	417.00	556.00	462.00	360.00	400.00						3002.50		1.63	
16	11	66.00	561.00	330.00	440.00	500.50	495.00	550.00						2876.50		1.56	
17	12	27.00	229.50	285.00	380.00	486.50	580.50	645.00						2606.50		1.42	
18	13	0.00		198.00	264.00	385.00	594.00	660.00						2101.00		1.14	
19	14	0.00		81.00	108.00	332.50	643.50	715.00						1880.00		1.02	
20	15	0.00		0.00	0.00	231.00	625.50	695.00						1551.50		0.84	
21	16	0.00		0.00	0.00	94.50	495.00	550.00						1139.50		0.62	
22	17	0.00		0.00	0.00	0.00	427.50	475.00						902.50		0.49	
23	18	0.00		0.00	0.00	0.00	297.00	330.00						627.00		0.34	
24	19	0.00		0.00	0.00	0.00	121.50	135.00						256.50		0.14	
25	20	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
26	21	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
27	22	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
28	23	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
29	24	0.00		0.00	0.00	0.00	0.00	0.00					0.00	0.00		0.00	
30	25	0.00		0.00	0.00	0.00	0.00	0.00					0.00	0.00		0.00	
31	26	25.00		0.00	0.00	0.00	0.00	0.00		3987.50	598.12		0.00	4585.62		2.49	
32	27	50.00		0.00	0.00	0.00	0.00	0.00		7975.00	1196.25		0.00	9171.25		4.98	
33	28	80.00		0.00	0.00	0.00	0.00	0.00		12760.00	1914.00		212.50	14886.50		8.09	
34	29	110.00		0.00	0.00	0.00	0.00	0.00		17545.00	2631.75		425.00	20601.75		11.20	
35	30	129.00		75.00	100.00	0.00	0.00	0.00		20575.50	3086.32		680.00	24516.82		13.32	
36	31	132.00		150.00	200.00	0.00	0.00	0.00		21054.00	3158.10		935.00	25497.10		13.86	
37	32	143.00		240.00	320.00	87.50	0.00	0.00		22808.50	3421.27		1096.50	27973.77		15.20	
38	33	139.00		330.00	440.00	175.00	0.00	0.00		22170.50	3325.57		1122.00	27563.07		14.98	
39	34	110.00		387.00	516.00	280.00	112.50	0.00		17545.00	2631.75		1215.50	22687.75		12.33	
40	35	66.00		396.00	528.00	385.00	225.00	125.00		10527.00	1579.05		1181.50	14946.55		8.12	
41																0.00	
42		2090.00	9401.00	4896.00	6528.00	4798.50	5314.50	5655.00	0.00	156948.00	23542.20		6868.00	223951.20	0.00	121.71	
43																	
44	PERSON																
45	YEARS		5.11	2.66	3.55	2.61	2.89			85.30	12.79		3.73	121.71			

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Compared with the woodlot scenario, a lower proportion of total expenditure is spent on establishment and management. This is because of the significantly lower per hectare costs of agroforestry establishment and management, which arises because of lower density planting and because agroforestry is established on pasture. Pruning and thinning are also a lower proportion of total expenditure due to the lower tree density.

Of the $10,677,339 total operational expenditure, $1,785,379 would be spent by the farmers to establish and manage the agroforestry blocks. Assuming restoration of pasture at $900 a hectare, another $826,200 would be spent by the farmers. The remaining $8,482,609 would be spent by whoever would harvest and transport the logs. The gross income to the farmers would be $18,816,475 at the stumpages quoted. With the purchaser of the wood, not the farmer, paying logging and transportation charges, the net agroforestry income would be $16,625,257 to farmers.

Agroforesty would inject less into the Dargaville economy per hectare and in total, during the establishment and management phase than the woodlot scenario. It would also inject less per hectare during the havesting phase. But because harvesting begins earlier with agroforestry, during this phase of the scenario, agroforestry would inject a significantly higher amount into the Dargaville economy than the woodlot scenario during its harvesting phase. If the scenario were extended long enough to allow harvesting of the original woodlot resource to be completed, then woodlot expenditure would be higher. The points to remember are that the characteristics of agroforestry are such that harvesting begins earlier and results are sensitive to the time span of the scenario.

8.5.2 The Direction of Expenditure.

In the first table establishment and management expenditure goes to contractors in and about Dargaville, while harvesting and transportation expenditure is assumed to be carried out by contractors based in Whangarei. Expenditure on pasture restoration is assumed to be split 70/30 between Dargaville and Whangarei, in both tables, as this is how farm expenditure is split. If logs were transported 50 km at 20 cents a tonne kilometre, transport expenditure would be $3,231,470. (It is $2,423,603 in the agroforestry scenario where it is assumed logs are carried 25 km at 25 cents a tonne kilometre.)

Table 8.10 Agroforestry Scenario Expenditure Direction - Non Dargaville Harvesting ($)

	Dargaville	Whangarei	Elsewhere
Total	1,368,531	8,730,468	172,260

The 'Elsewhere' expenditure is for trees.

Once harvesting commences a higher proportion of agroforestry expenditure would be from other than harvesting and transportation than would be the case with the woodlot scenario. Restoration of pasture, restablishment of the agroforesty blocks, silviculture etc comprises about 15% of total expenditure in year 31, for example. (Year 31 is the 6th year of harvesting in the agroforestry scenario, as year 35 is in the

woodlot scenario.) Therefore a higher amount of expenditure in the harvesting phase is available for expenditure in Dargaville than with the woodlot option. ($237,234 versus $142,878)

In Table 8.11 it is assumed that all harvesting and transportation expenditure goes to Dargaville.

Table 8.11 Agroforestry Scenario Expenditure Direction - Dargaville Harvesting ($)

	Dargaville	Whangarei	Elsewhere
Total	10,257,218	247,860	172,260

The 'Elsewhere' expenditure is for trees.

Comparing Tables 8.10 and 8.11 confirms the sensitivity of the expenditure direction results to the location of harvesting and transportation expenditure.

8.5.3 Agroforestry Scenario Employment Generation

Agroforestry employment generation is detailed in the attached spreadsheet and graphed on Figure 8.2 (See the comments under Woodlot Scenario Employment Generation.) As with the wooodlot case, the labour demands per hectare are approximate, so that the figures in the table below are a general, not exact, indication of the labour hours generated.

Table 8.12 Agroforestry Employment Generation

Activity	Total Hours	% of Total
Establishment	9,401	4.6
Pruning	20,104	9.8
Thinning	6,000	2.9
Harvesting	161,573	78.6
Restore Pasture	Unknown	
Restablishment	8,601	4.2
Totals	205,679	

Harvesting generates a high proportion of total labour demand compared with the woodlot scenario because harvesting has commenced earlier; on a per hectare basis woodlot forestry generates more employment.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2	YEARS	HECTARES	ESTABLISHMENT	PRUNING 1	THINNING 1	PRUNING 2	PRUNING 3	PRUNING 4	ROADING	HARVESTING	TRANSPORT	RESTORE	RESTABLISH.	TOTAL		PERSON	
3		PLANTED/	LABOUR							M3/HA		PASTURE		OPERATIONAL		YEARS	
4		HARVESTED	8.50	3.00	4.00	3.50	4.50	5.00	UNCLEAR	0.50	0.075	UNCLEAR	8.50				
5																	
6	1	25.00	212.50											212.50		0.12	
7	2	50.00	425.00											425.00		0.23	
8	3	80.00	680.00	75.00	100.00									855.00		0.46	
9	4	110.00	935.00	150.00	200.00									1285.00		0.70	
10	5	129.00	1096.50	240.00	320.00	87.50								1744.00		0.95	
11	6	132.00	1122.00	330.00	440.00	175.00								2067.00		1.12	
12	7	143.00	1215.50	387.00	516.00	280.00	0.00							2398.50		1.30	
13	8	139.00	1181.50	396.00	528.00	385.00	112.50	125.00						2728.00		1.48	
14	9	110.00	935.00	429.00	572.00	451.50	225.00	250.00						2862.50		1.56	
15	10	95.00	807.50	417.00	556.00	462.00	360.00	400.00						3002.50		1.63	
16	11	66.00	561.00	330.00	440.00	500.50	495.00	550.00						2876.50		1.56	
17	12	27.00	229.50	285.00	380.00	486.50	580.50	645.00						2606.50		1.42	
18	13	0.00		198.00	264.00	385.00	594.00	660.00						2101.00		1.14	
19	14	0.00		81.00	108.00	332.50	643.50	715.00						1880.00		1.02	
20	15	0.00		0.00	0.00	231.00	625.50	695.00						1551.50		0.84	
21	16	0.00		0.00	0.00	94.50	495.00	550.00						1139.50		0.62	
22	17	0.00		0.00	0.00	0.00	427.50	475.00						902.50		0.49	
23	18	0.00		0.00	0.00	0.00	297.00	330.00						627.00		0.34	
24	19	0.00		0.00	0.00	0.00	121.50	135.00						256.50		0.14	
25	20	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
26	21	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
27	22	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
28	23	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
29	24	0.00		0.00	0.00	0.00	0.00	0.00						0.00		0.00	
30	25	0.00		0.00	0.00	0.00	0.00	0.00					0.00	0.00		0.00	
31	26	25.00		0.00	0.00	0.00	0.00	0.00		3987.50	598.12		0.00	4585.62		2.49	
32	27	50.00		0.00	0.00	0.00	0.00	0.00		7975.00	1196.25		0.00	9171.25		4.98	
33	28	80.00		0.00	0.00	0.00	0.00	0.00		12760.00	1914.00		212.50	14886.50		8.09	
34	29	110.00		0.00	0.00	0.00	0.00	0.00		17545.00	2631.75		425.00	20601.75		11.20	
35	30	129.00		75.00	100.00	0.00	0.00	0.00		20575.50	3086.32		680.00	24516.82		13.32	
36	31	132.00		150.00	200.00	0.00	0.00	0.00		21054.00	3158.10		935.00	25497.10		13.86	
37	32	143.00		240.00	320.00	87.50	0.00	0.00		22808.50	3421.27		1096.50	27973.77		15.20	
38	33	139.00		330.00	440.00	175.00	0.00	0.00		22170.50	3325.57		1122.00	27563.07		14.98	
39	34	110.00		387.00	516.00	280.00	112.50	0.00		17545.00	2631.75		1215.50	22687.75		12.33	
40	35	66.00		396.00	528.00	385.00	225.00	125.00		10527.00	1579.05		1181.50	14946.55		8.12	
41																0.00	
42		2090.00	9401.00	4896.00	6528.00	4798.50	5314.50	5655.00	0.00	156948.00	23542.20		6868.00	223951.20	0.00	121.71	
43																	
44	PERSON																
45	YEARS		5.11	2.66	3.55	2.61	2.89			85.30	12.79		3.73	121.71			

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8.6 Transport

The transportation of the woodlot and agroforestry logs will significantly increase traffic over study area roads. The table below indicates the truck loads generated by the woodlot and agroforestry scenarios by year and assuming 20 m3 is carried per load. These truck journeys would be on top of the 2759 equivalent truck journeys generated by other farm activities (see Chapter 5).

Table 8.13 Truckloads Generated

Year	Woodlot	Agroforestry
26	-	399
27	-	798
28	-	1276
29	-	1755
30	625	2058
31	1250	2105
32	2000	2281
33	2750	2217
34	3225	1755
35	3300	1515

In Table 8.14 the level and direction of woodlot and agroforestry expenditure are compared. While agroforestry expenditure is higher, this is due to the time span of the scenarios, as woodlot expenditure per hectare is higher than agroforestry expenditure. Agroforestry expenditure is proportionately higher in Dargaville than that from the agroforestry scenario because of the restoration of pasture expenditure that would take place there. Table 8.14 does not include the impact of any loss of farm expenditure due to the drop in income assumed in the woodlot case, but Table 8.15 does. The 5% drop in farm income assumed with the woodlot scenario is assumed to cause a 4.25% drop in farm expenditure and this decline in farm expenditure is then split 70/30 between Dargaville and Whangarei.

Table 8.14 Woodlot - Agroforestry Scenario 35 Year Expenditure Direction Comparison (Dargaville Harvesting 1985/86 $)

	Dargaville	Whangarei	Elsewhere	Total
Woodlot	8,881,644	0	75,000	8,956,644
Agroforestry	10,257,218	247,860	172,260	10,677,339

Table 8.15 Adjusted Woodlot - Agroforestry Scenario 35 Year Expenditure Direction Comparison (Dargaville Harvesting 1985/86 $)

	Dargaville	Whangarei	Elsewhere	Total
Woodlot	6,712,763	- 929,520	75,000	5,858,243
Agroforestry	10,257,218	247,860	172,260	10,677,339

Table 8.15 shows that over the 35 year span of the scenario, a 4.25% drop in farm expenditure with the woodlot scenario implies a net decline in total expenditure to Whangarei from the study area farms. As column W on the woodlot scenario shows, the loss of income from the study area farms with woodlot blocks reaches a maximum of $126,093, which assuming a 70/30 Dargaville /Whangarei split is equal to yearly declines of $88,265 and $37,827 respectively. The $126,093 represents about 3.3% of total study area farm expenditure and is not considered a significant amount in the context of the Dargaville or Whangarei economies. In other words, the woodlot and agroforestry scenarios imply an increase in spending to some businesses without a significant decrease in spending to the agricultural orientated businesses. This type of forestry development therefore implies little or no distruption to existing farming expenditure patterns.

The lack of interest in woodlot and agroforestry has been discussed earlier, where it was noted that simply demonstrating the long term financial advantages of farm forestry would not be enough to ensure wide adoption of it. Farm forestry is seen as being different, and in conflict with pastoral farming. Interviews with the farmers suggested that the differences, such as the introduction of non-pastoral farming activities or people, are not seen in a positive light. Most farmers views are monoculture orientated, as exemplified by the farmers who said they were livestock farmers, not tree farmers and who did not see the two coexisting on their farm. Most farmers in the study area do not think of an integrated pastoral farming - tree farming approach. In addition many farmers would need to be convinced that the benefits of investing in on-farm forestry were greater than the results of the same level of investment in traditional farming activities (J. Currie pers comm.1985).

An integrated pastoral farming - tree farming approach does not necessarily have to involve woodlot and agroforestry as discussed above. It could involve the planting and management of shelter belts for high quality timber production as well as for beneficial climatic effects, or a more comprehensive planting of trees tailored to each farm's physical characteristics.

The Environmental Design Section (EDS) of the Ministry of Works and Development, Whangarei, carries out such comprehensive tree planning and planting on a farm by farm basis (D Scott Pers Comm 1986). Part of the philosophy behind the EDS approach is that a monoculture is not the best use of land in environmental or productive terms. This philosophy results in a variety of tree types, both native and exotic, being planted in varying densities over the farm. Trees are, for example, planted along stream banks to halt erosion, or erosion prone areas of hills and in shelter belts. Trees are also planted for aesthic

reasons, in addition existing areas of native bush may be fenced off and/or native bush restablished on areas of the farm. Woodlot and agroforestry blocks are planted as well, if they are deemed suitable for the farm concerned.

The EDS approach is much more than the erosion control approach of Catchment Commissions, it is an integrated tree and pasture approach to enhance pastoral farming and the environment. The EDS approach results in land use that combines a variety of tree types and planting patterns in a multi use concept that leads to environmental enhancement, increased livestock income and wood production. By adopting such an integrated total farm approach several benefits result.

1. Environment degradation is halted and often reversed.
   For example trees are planted to halt hill and stream bank erosion.

2. Farm production is increased.
   For example trees planted provide shelter and forage for stock. The Victorian Farmers and Graziers Association (1984) studied the results of with/without three row shelter belt productivity comparisons and reported higher lambing survival and faster weight gain. Also reported was better grass growth on the leeward side of the shelter belts, which resulted in a higher carrying capacity. Lands and Survey personnel running the experimental farm forestry blocks at Te Kuri also report improvements in productivity as a result off their shelterbelts and agroforestry blocks. Farm productivity is also increased with trees halting erosion which inhibits or prevents grass growth. Leaves from some trees, such as willows, provide forage for stock and this roughage is particularly suited to deer.

3. If trees are planted for timber production the farmers' income will be increased from wood sales, though many years later.

4. A more balanced ecosystem is established that is more adaptable to fluctuations in climate.

With traditional farming methods and approaches under severe trial, it can only be in farmers interests to investigate any approaches which will diversify income sources and increase farm productivity.

Summary.

Both scenarios imply a boost to the regional economy, with agroforestry contributing the most due to the time span of the scenario. Woodlot expenditure is higher on a per hectare basis over the life cycle of a forestry block. The expenditure and employment patterns follow those of the conventional forestry scenarios, but at lower absolute levels.

The expenditure totals of the woodlot forestry are offset by the assumed drop in farm incomes. If incomes

did not drop at all, then the contribution to the regional economy would be increased by about 32%. Once harvesting commences a significant injection into the regional economy above and beyond the forestry expenditure can be expected as farmers spend at least part of their tree income. But even though agroforestry expenditure and income would not be offset by any significant loss in non-tree farm expenditure, on a per hectare basis woodlot forestry would still provide a proportionately higher injection into the regional economy.

The locational impact is extremely sensitive to where the harvesting and transportation expenditure goes to, but in both scenarios the Dargaville economy would be boosted.

There would be a increase in employment without any offsetting loss in the non-farm sector.

There would be a minimal social impact resulting from either scenario, because the developments would not alter the existing social structure. It is the people on the farms who make the decision to plant and control the forestry blocks and there is no change in land ownership. While contractors would carry out the forestry work, they would travel there to do so and not live on the study area farms. The diversification of the study area income implied by these scenarios would strengthen it's economic base. As the existing social structure is largely the product of economic relationships, the strengthening of the economic base implies that the existing social structure and its relationships would also be strengthened.

NINE - MULTIPLIER ANALYSIS

9.0 Introduction

In this chapter, input-output multiplier analysis is used to show the total impact on the Northland economy of the changes in expenditure implied by the scenarios presented in earlier chapters.
First, there is a brief introduction to multipliers. (See Appendix 7 for some examples of multiplier impact calculations.)
Secondly, income and employment multipliers calculated for sectors in the Northland economy are used to estimate the impact of the agricultural and forestry expenditure contained in the scenarios.
Thirdly, the multipliers calculated for various forestry processing options are used to estimate and compare the total impact of these processing options, because the roundwood production from the scenarios is enough to have significant processing implications.

9.1 Multipliers

In the previous chapters direct expenditure, income and output flows from different land uses in the study area were calculated and traced. Comparing these direct flows does not measure the total impact of any particular land use or land use changes. This is because as this initial direct expenditure flows through the Northland economy it boosts turnover in other sectors (including households), which in turn increases their expenditure, with this process being repeated until the final impact of, say, a $1m increase in forestry expenditure is much more than this initial $1m. The total impact can be estimated by the use of input - output derived multipliers, for example, an output multiplier of 1.6 implies a total impact of $1.6 m for the above $1m of initial expenditure.

It is stressed that readers should be aware of the assumptions behind multiplier derivation in general and input-output multipliers in particular. The qualifications that must be made to the application of multipliers must always be borne in mind and, if not familiar with them the reader is referred to Butcher (1985).

All industries are linked to other industries because they must purchase inputs from these industries to produce their output. For example, farms buy fertiliser, fencing material and livestock to produce meat. These linkages are referred to as inter-industry linkages and because different industries have different linkages with other industries, they also have different multipliers. This means that the comparative total impact of expenditure changes in, for example, two industries may be different from their initial direct impact. Therefore using direct expenditure flows as a base for regional policy may lead to inappropriate policy formulation.

Regional input-output tables show the inter-industry linkages for a region. For example, how much Northland's farming sector must purchase from Northland's agricultural servicing sector to increase output by a stated amount. By showing the inter-industry linkages that exist between all industrial sectors, input-output tables can be used to show how an increase in economic activity in any sector of the economy will, given certain assumptions, affect all sectors of the economy. Work by Geoffrey Butcher (Butcher,

1985) and Christopher Moore (Moore, 1981) provides multipliers that allow the total impact of changes in Northland's economy to be measured. Moore's work was specifically concerned with the impact of changes in the forestry industry and was based on survey data on the inter-industry linkages in Northland's economy. Butcher's work presents non-survey based multipliers and it is stressed that wherever possible superior, that is survey data, should be used to enhance the accuracy of multipliers. While the detailed expenditure data collected in this research could be used to improve the accuracy of existing input-output multiplier estimates, there was not the time or budget to do so.

9.2 Income, Employment and Output Multiplier Derivation.

Income multipliers measure the change in personal incomes caused by a change in output. Personal incomes are made up of salaries, wages and proprietor incomes and are essentially a measure of people's spending power.

Output multipliers measure the increase in economic output, and regional output multipliers can be viewed as measuring the total change in regional turnover resulting from an initial change in sales.

Employment multipliers measure the total change in employment caused by an initial change in employment.

Regional planners are likely to be more interested in regional income and employment multipliers than output multipliers. That is, more interested in an increase in regional employment and household income than just an increase in regional output.

Income Multipliers

The Type 1 Income multiplier equals: $\frac{\text{Direct + Indirect Income Change}}{\text{Direct Income Change}}$

The Type 2 Income multiplier equals: $\frac{\text{Direct+ Indirect + Induced Income Change}}{\text{Direct Income Change}}$

'Direct' is the initial change. For example, a $1m increase in wages, salaries and proprietor income in the forestry sector. 'Indirect' is the impact of this $1m being spent and respent through the Northland economy - but not including the boost to incomes from the increased household spending resulting from the initial and subsequent rounds of expenditure triggered off by the $1m. Moore has calculated a Type 1 Income multiplier of 1.174 for the Northland forestry and logging sector, which results in a Type 1 multiplier impact of $1.174m from the initial $1m increase in spending.

'Induced' measures the impact resulting from the increase in household spending caused by the 'Direct' and 'Indirect' increase in incomes. The Type 2 Income multiplier for the Northland forestry and logging sector is 1.576, meaning that the direct, indirect and induced impact of the initial $1m increase in incomes

equals $1.576m. This shows that the majority of the multiplier impact comes from the increase in household spending.

Type 1 and 2 Employment multipliers correspond to the Income multipliers. That is,

Type 1 Employment Multipliers equal: $\frac{\text{Direct + Indirect Employment Change}}{\text{Direct Employment Change}}$

Type 2 Employment Multipliers equal: $\frac{\text{Direct + Indirect + Induced Employment Change}}{\text{Direct Employment Change}}$

The Type 1 and 2 Employment multipliers calculated by Moore for the forestry and logging sector are: 1.132 and 1.494. That is, for every job created in the forests an extra 0 .494 jobs are created after the increased expenditure has flowed though the economy.

Output multipliers measure the change in output through the economy caused by an increase in sales to final demand demand, such as an increase in the sale of cut timber.

Type 1 Output Multipliers equal: $\frac{\text{Direct + Indirect Output Change}}{\text{Direct Output Change}}$

Type 2 Output Multipliers equal: $\frac{\text{Direct + Indirect + Induced Output Change}}{\text{Direct Output Change}}$

Table 9.1 lists agriculture multipliers and Table 9.2 those applying to forestry.

Table 9.1 Multipliers for Northland Agriculture

Industry	Output		Income		Employment	
	Type I	Type II	Type I	Type II	Type I	Type II
Dairy Farming	1.49	2.89	1.37	1.84	1.39	1.93
Sheep Farming	1.74	3.25	1.51	2.03	1.72	2.74
Beef Farming	2.29	3.43	2.31	3.1	1.66	2.12
Meat Processing	2.18	3.42	2.7	3.6	2.62	3.54
Dairy Processing	2.27	3.58	10.74	14.43	3.54	11.81

Source: Moore P97

Forestry multipliers were calculated by Moore as part of his simulation of the impact of forestry expansion in Northland and these are used to measure the impact of the forestry development simulated in the forestry scenarios presented in this research. The forestry and logging multiplier quoted above refers to Northland's present forestry industry, not the different inter-industry linkages that will result from the expansion of the forests and the development of a forestry processing industry.

Table 9.2 Regional Forestry Multipliers

	Forest Establish.	Forest Siliviculture	Sawmill	Pulpmill	Integrated Pulpmill	Integrated Papermill
Output Type II	1.89	1.95	1.88	1.62	1.65	1.42
Income Type II	1.45	1.4	2.26	3.98	2.96	2.63
Employment Type II	1.40	1.39	2.96	5.87	4.09	3.39

In Appendix 7 the mulitipier implications of changes in agricultureal income are presented to illustrate the application of multipliers and the total impact of changes in agriculture income and output. These show, for example, that the initial impact of a decline in milkfat prices from $3.55 to $3.00 a kg is a $161,528 decline in the value of farm output. Thoughout the Northland economy that decline would lead to a total decline in output of $466,758.

9.3 Farming Multiplier Impacts.

If the whole study area was planted in forests then farm output worth $4,181,055 (in 1983/84) would be lost. The impact of this has the multiplier implications contained in Table 9.3. The income impact is the effect on personal income caused by a change in the economy, that is the impact on wages, salaries and proprietor income. Income multipliers impacts are worked out by taking the direct income per dollar of output for each industry and multiplying it by the output. For the Northland dairy, beef and sheep industries the income per dollar of output has been calculated as $0.43, $0.14 and $0.36 by Moore.

Table 9.3 - Study Area Output & Income Multiplier Impacts

Livestock Type	Output ($)	Type II Output Multiplier	Type II Output Impact $	Type II Income Multiplier	Type II Income Impact $
Dairy	1,212,256	2.9	3,515,542	1.8	938,286
Beef	1,507,622	3.4	5,125,915	3.1	654,308
Sheep	1,461,177	3.2	4,675,766	2.0	1,052,047
	4,181,055		13,317,223		2,644,641

These tables show that the cessation of farming over the entire study area implies a drop in total output throughout Northland of $13,317,223, once the effects of the loss of agricultural expenditure have flowed through the regional economy. Personal incomes would drop by $2,644,641.

Calculation of the employment impact is complicated by the difficulty in accurately estimating the number of full time equivalent (fte) paid positions on the farms. Over the 57 farms in the study area there were 103 people working 30 hours or more per week and 45 working less than 30 hours per week. This is assumed to be 125.5 fte's. As these 125.5 fte's are not all paid for their labour the consumption expenditure per head would be lower than that of the equivalent workforce in a wage earning situation. Subtracting unpaid family members who work on the farm gives a total of 103 fte's and to work out the employment generated by the different livestock types, each farms paid fte employment was divided up according to the percentage of total livestock income contributed by each livestock type. This calculated 39, 28 and 35 fte labour units as being generated by beef, dairy and sheep farming respectively. Applying the employment multipliers calculated by Chris Moore, this implies a total Type II employment multiplier impact of 233 jobs lost if all the study area farms stop farming.

Table 9.4 indicates the output impacts of the loss of farm production from the sub area. The loss of the SMP adjusted output of $853,154 from the sub area farms implies a total decline in regional output of over $2.7m .

Table 9.4 - Sub Area Output & Income Multiplier Impacts

Livestock Type	Output ($)	Type II Output Multiplier	Type II Output Impact $	Type II Income Multiplier	Type II Income Impact $
Dairy	111,063	2.9	322,083	1.8	85,963
beef	298,309	3.4	1,014,251	3.1	129,466
Sheep	443,782	3.2	1,420,102	2.0	319,523
Total	853,154		2,756,436		534,952

The table shows that regional incomes would drop by over $850,000. If the Sub-Area was planted in trees, the equivalent of 14 paid fte jobs would be lost on the farms. Allocated between income sources on a farm by farm basis these are divided up as 4.6 beef, 2.6 dairy and 6.8 sheep. Once the impact of this loss of farm income and employment has flowed through the regional economy, the multipliers imply that the total employment impact would be 33 jobs lost.

(These figures represent the impacts per year after the effects of the loss of farm output has spread through the Northland economy.)

9.4. Output, Income and Employment Impacts of the Study Area and Sub Area Forestry Development

An accurate measurement of the total multiplier impact of the forestry development is difficult because of the options available for harvesting (in terms of time and size) and processing. This also makes comparison of the agricultural and forestry multiplier impacts difficult.

Comparison is also made difficult by different processing thresholds of agriculture and forestry. That is, a smaller area of land planted in trees will support a wood processing plant (such as a pulp mill) than the amount of land needed to support a meat works or dairy factory. Planting the study area or sub-area in trees would, come harvesting, provide enough wood to support one or more processing options. But the loss of the study or sub area farms would not, in itself, be enough to cause a dairy factory or meat works to close down.

When potential processing impacts are excluded the total multiplier impacts are such that the pastoral farming scenario generally has a higher total output, income and employment impact than the forestry scenarios. The reverse is the case when processing implications are included, as will be demonstrated below. First the multiplier impacts of the forestry development contained in the scenarios are compared with the farming multiplier impacts, then the multiplier impacts of the processing options are presented. The annual farming multiplier impacts are summarised in Table 9.5, and it is with these that the forestry impacts will be compared.

Table 9.5 Farming Multiplier Impacts (SMP Adjusted $)

	Output:		Income:		Employment:	
	Direct	Type II	Direct	Type II	Direct	Type II
Study Area	4,181,055	13,317,223	1,258,361	2,644,641	103	233
Sub Area	853,154	2,756,436	249,282	534,592	14	33

Below the multiplier impacts of different phases of the forestry scenario are compared with those from farming.

Forestry Establishment

In the study area scenario 13,036 hectares are planted over 4 years and in the sub area 3,079 hectares are planted over 7 years. The expenditure and employment generated in establishing these forests resources would have the output, income and employment impacts listed in Table 9.6. The forestry figures are expressed in 1983/84 dollars. These figures confirm the direct forestry/farming comparison conclusion that farming impacts exceed those of forestry.

Table 9.6 Study and Sub Area Forest/Farming Establishment Multiplier Impacts
($ and Numbers Employed)

	Output:		Income:		Employment:	
	Direct	Type II	Direct	Type II	Direct	Type II
Study Area						
Farming	4,181,055	13,317,223	1,258,361	2,644,641	103	233
Forestry	2,525,073	4,772,388	1,732,200	2,511,690	53	74
Sub Area						
Farming	853,154	2,756,436	249,282	534,592	14	33
Forestry	340,801	664,114	233,790	338,995	72	10

Note: The 'Sub Area' figures are averages per year over the planting phase - different sized areas are planted each year.

Forestry establishment, output and employment multiplier impacts are proportionately lower than a comparison of direct farming and forestry establishment expenditure would suggest, because farming has much stronger regional inter-industry linkages. Forestry income multiplier impacts are closer to farm income multiplier impacts because of the high percentage of expenditure paid out as wages, which partially offsets the lower forestry income multipliers.

Silviculture

Pruning and thinning of the original planted area (as opposed to pruning and thinning of areas restablished after harvesting) occurs from years 5 to12, with 30% of the crop pruned. In the study area scenario a total of $5,874,020 is spent over these 8 years and in the sub area scenario, $1,387,397. (In 1985/86 $, 1983/84 $ are used in the table.) Taking average silviculture expenditure over the 8 years that silviculture occurs in the study and sub area conventional forestry scenarios the average annual multiplier impacts in Table 9.7 were calculated:

Table 9.7 Study and Sub Area Silviculture /Farming Multiplier Impacts
($ and Person Years)

	Output:		Income:		Employment:	
	Direct	Type II	Direct	Type II	Direct	Type II
Study Area						
Farming	4,181,055	13,317,223	1,258,361	2,644,641	103	233
Forestry	587,402	1,145,433	528,661	740,125	24	33
Sub Area						
Farming	853,154	2,756,436	249,282	534,592	14	33
Forestry	138,739	270,541	124,865	174,811	5.6	7.8

The scenario average silviculture yearly impacts would be significantly below the farm impacts on all counts. Should all trees be pruned the impacts in Table 9.8 are implied.

Table 9.8 Total Pruning and Thinning Impacts
($ and Person Years)

	Output:		Income:		Employment:	
	Direct	Type II	Direct	Type II	Direct	Type II
Study Area	1,273,310	2,482,953	1,145,979	1,604,370	53	74
Sub Area	300,818	586,596	270,737	379,031	12.5	17.4

This shows that although pruning all of the area initially planted more than doubles all of the forestry multiplier impacts, they would still be below those from farming. In other words the multiplier impact increases the magnitude of the direct expenditure and employment impact differences.

Harvesting

Neither Moore (1981) or Butcher (1985) present multipliers for harvesting. Based on data in Moore, Type II harvesting multipliers were estimated as: Output 1.8; income 1.4 ; employment 1.3. It is assumed that about 45% of harvesting expenditure would be income. (That is, wages salaries and proprietor income.)

Table 9.9 Harvesting /Farming Multiplier Impacts
($ and Person Years)

	Output:		Income:		Employment:	
	Direct	Type II	Direct	Type II	Direct	Type II
Study Area						
Farming	4,181,055	13,317,223	1,258,361	2,644,641	103	233
HV 29	4,322,035	7,779,663	1,901,695	2,662,374	92	119
HV 23	6,483,051	11,669,492	2,852,542	3,993,560	138	179
Sub Area						
Farming	853,154	2,756,436	249,282	534,592	14	33
HV29	980,890	1,765,601	431,591	604,227	21	27
HV23	1,471,334	2,648,402	647,387	906,342	31	41

The table shows that once harvesting begins, with the multipliers used above, forestry direct and multiplier income impacts would be significantly higher than the farming impacts. This is because the higher level of forestry expenditure is offset by the lower forestry multipliers. With output and employment the situation varies. For example, in the case of employment the HV23 option creates more direct employment than the farming scenario, but less total employment - because farming has higher employment multipliers than forest harvesting. Once the study area forest has moved into a harvesting/restablishment/silviculture cycle, direct expenditure increases by about another $500,000 and direct income by about another $350,000 - $400,000 a year; but the relative position would not change. Note that the HV 29 Study Area forestry and farming income multipliers are very close, too close to say more than that for practical

purposes.

Applying multipliers to the sustained annual yield of the study area and sub area forest resource shows that forestry has lower output, income and employment multiplier impacts when compared with farming. Sub area forestry income multiplier impacts are closer to the sub area farms than the study area income impacts due to the lower average income on the these farms. This suggests that if farms like those in the sub area are planted in conventional forestry, regional income would decline significantly less than if farms like the study area average were planted.

Table 9.10 Sustained Yield Harvesting/Farming Multiplier Impacts
($ and Person Years)

	Output:		Income:		Employment:	
	Direct	Type II	Direct	Type II	Direct	Type II
Study Area						
Farming	4,181,055	13,317,223	1,258,361	2,644,641	103	233
Forestry	3,025,600	5,446,080	1,331,264	1,863,770	66	85
Sub Area						
Farming	853,154	2,756,436	249,282	534,592	14	33
Forestry	742,400	1,336,320	326,656	457,318	16	20

The results of the total multiplier impact comparison show that, with the multipliers used, only in the case of harvesting income multiplier impacts does forestry, in some cases, come close to those from farming .

9.5 Processing Implications

The implications of the conventional forestry scenario roundwood production for downstream processing are worked through below, with backwards linkage multipliers being applied to processing options. In Section 9.6 forward linkage multipliers for agriculture and forestry are compared.

Whereas the loss of the farmland in either case would not be enough, by itself, to cause farm processing plants to close, the study area and sub area would produce enough roundwood to support new processing plants. Moore simulated the expansion of forestry in Northland and the processing implications of this expansion, estimating the impact of a number of forestry processing options. Applying the multipliers calculated for these processing options allows the processing implications of the study area and sub area roundwood production to be estimated. The processing backwards linkage multipliers applied in this section include harvesting and log transportation, but not forest establishment and siliviculture.

The sub area scenario HV 29 option would produce 76,632 m3 of roundwood per year and the HV 23 option 114,948 m3 per year, with the sustained yield of the sub area forest about 58,000 m3 per year.

This sustained yield is enough to support a sawmill the size of the Managh Herman mill in Whangarei which employs about 70 people. A mill this size could produce about 31,000 m3 of sawn timber per year. With fully treated timber at a wholesale price of $411 a m3, this means a total output of more than $12,800,000 per year in wholesale terms and an annual wage bill of about $1,400,000 (at $20,000 a year per person). Applying Moore's sawmill multipliers implies the following impacts:

Table 9.11 Sawmill Multiplier Impacts - Sub Area Sustained Yield Wood Input.
($ M and Person Years)

Output:		Income:		Employment:	
Direct	Type II	Direct	Type II	Direct	Type II
12.8	24.1	1.4	3.2	70	207

Table 9.11 shows that with a sawmill of the above size, the total output, employment and income multiplier impacts of forestry are much higher than the farming ones. Adding on the forest establishment and silviculture employment impacts would add on the equivalent of 3 person years employment.

The wood from farm forestry blocks would be high quality sawlogs and would therefore go to a sawmill. However, the multiplier impacts would vary with the timber produced from the woodlot and agroforestry scenarios varying from year to year. For example harvesting 25 hectares of the woodlot blocks at 500 m3 per year would produce 12,500 m3 of roundwood and about 6,750 m3 of sawn timber. With a wholesale value of $411m3, this implies a gross output of $2,774,250 and a Type II output multiplier impact of $5,215,590. In other words the multiplier impacts considerably increases the net contribution farm forestry makes to the regional economy. The wood production from either of the farm forestry scenarios would not be consistently high enough to cause a sawmill to be built in itself, but could provide a significant proportion of an existing sawmills input for a number of years.

In the two harvesting options used in the study area forestry scenario, 337,660 m3 and 506,488 m3 of wood would be cut per year. The 337,658 m3 would be enough to support an integrated TMP pulpmill producing 60,000 m3 of sawn timber and 100,000 air dried tonnes (adt) of pulp per year, which would require a roundwood input of about 300,000 m3 per year and employ about 206 people (Moore 1981). Assuming an average wage of $25,000 a year the multiplier impacts are presented below.

Table 9.12 Integrated Pulpmill Multiplier Impacts
($ m and Person Years)

Output		Income		Employment	
Direct	Type II	Direct	Type II	Direct	Type II
50	82	5.15	15.2	206	843

The sustained annual yield of the study area forest would be about 242,000 m3, which is enough to support a TMP mill producing 100,000 adt of pulp per year. Such a mill would require 240,000 m3 of roundwood per year, and employ about 93 people. (A TMP mill of this size would be similar to the Karioi mill which has recently been expanded from a production capacity of 80,000 adt per year to 120,000 adt of pulp per year and employs 112 people.) The multiplier impacts of a TMP mill of this size are presented in Table 9.13 Pulp output is valued at $250 a tonne and sawn timber at $411 a m3.

Table 9.13 TMP Mill Multiplier Impacts
($ m and Person Years)

Output		Income		Employment	
Direct	Type II	Direct	Type II	Direct	Type II
25	40.5	2.32	9.2	93	546

The sawmill example presented by Moore produces 60,000 m3 of sawn timber from a roundwood input of 110,000 m3 and employs 113 people to do so. The total employment multiplier impact would be 334, (2.96 times 113) and this employment multiplier impact shows that while a sawmill has the highest labour/wood input ratio and highest labour/capital ratio of the processing plants considered, it has the lowest Type II employment multiplier. This suggests support for sawmilling as the most labour intensive forestry processing activity does not take account of indirect employment impacts.

9.6 Forward Linkage Multipliers.

The multipliers used above are backward linkage multipliers. That is, they measure the impact of an industry's (e.g. forestry) purchases of inputs from other industries (e.g. chemicals). A number of industries, including farming and forestry, are driving industries, which means their output drives other industries, such as dairy factories and wood processing plants. Different driving industries have different forward linkage multipliers because the processing plants they drive have different output, input, income and employment characteristics. To measure the comparative total impacts, including the impact on downstream processing, multipliers that incorporate forward linkages can be used. These enable the downstream impacts of driving industries such as forestry and farming to be calculated without working through the implications of processing options as was carried out by Moore.

Forestry has stronger forward linkages because of the characteristics of the processing plants and because forestry has a lower processing threshold than farming. That is, a smaller area planted in trees is needed to support a forestry processing plant than is the case for farming. As forestry's forward linkages are stronger than farming's, when the processing implications of the study area and sub area are included, the forestry scenarios imply an increase in regional output, income and employment, when compared with farming. This assumes that the roundwood produced supports the construction of a processing plant inside the region. Whether or not Dargaville receives the processing plant output, income and

linkage multipliers are higher than those applying to farming, there would be many years between plantin and the realisation of the forestry multiplier impacts.

Summary

The direct expenditure comparison between farming and forestry indicates that until harvestin commences, conventional forestry development as contained in the two conventional forestry scenario: contributes relatively less to the regional economy. Once harvesting starts, direct expenditure, incom and employment would be higher under both harvesting options of each scenario.

When considering total multiplier impacts, farming's higher backwards linkage multiplier increases th pre-harvesting disparity between farming and forestry. Variable results are obtained with the multiplier used when harvesting multiplier impacts are compared with farming. In the case of harvesting multiplie output impacts, forestry's are lower for the HV 23, HV 29 and sustainable yield cuts. With income, tota multiplier impacts are higher with both harvesting options of the two conventional forestry scenarios. Wit the sustainable yield the forestry income multiplier impacts are lower for both the study and sub are forestry scenarios.

With employment, except in the harvesting phase of the sub area HV 23 option, forestry employmen multiplier impacts are lower than farming impacts.

When the processing implications of farming and forestry are calculated and multipliers incorporatinç forward linkages are used, then the forestry development contained in the conventional forestry scenario: means a increase in regional output, income and employment, when compared with the farming impacts This assumes processing occurs in Northland; whether or not Dargaville receives a proportion of these processing impacts depends on the location of the processing plant.

As there is no established large scale forest processing industry or infrastructure it is considered that the forward linkage multipliers are considered as realistic measures of the impact of any forestry processinç industry in Northland.

employment impacts depends on whether or not the processing plant locates in it's economic hinterla If a considerably larger area of farm land charged to forestry, agricultural processing plants would be like close down, but much more wood would be produced needing processing.

Butcher (1985) has calculated multipliers including forward linkages for farming and forestry, which national technical coefficents to calculate the average increase in processing unit production (e.g a saw or dairy factory) for a unit increase in the primary industry (forestry or dairy farming). These are containe Table 9.14.

Table 9.14 Type II Employment Multipliers Including Forward Linkages

	Multiplier	Forward Linkages Multipler
Dairy Farming -	3.0	
Into Dairy Factories		4.2
Sheep Farming -	3.2	
Into Meat Export		5.75
and Wool Scouring		5.75
and Greasy Wool		5.75
Beef Farming	3.0	
Into Meat Export		5.62
Forestry and Logging	3.2	
Into Pulp and Paper		22.1
Forestry and Logging	3.2	
Into Sawmilling and		
Pulp and Paper		21.8

These are national average figures and separate figures could not be calculated for Northland as North technical coefficents were not available. The figures in Table 9.14 show, for example, that on average extra production that leads to another person being employed in forestry and logging will lead to 20.8 e jobs outside the forest if the extra wood is processed in an integrated pulp and paper mill. It also shows on average, an extra 3.2 jobs are created for every extra dairy farm job, if the dairy farm sends milk or processing. These figures reinforce the point made above, that forestry has a lower processing thres than farming in terms of the area needed to support a wood processing plant.

Above it was stated that the loss of pastoral production from the study area farms would not be enou cause processing plants to close. If a larger group of farms were being considered it would be unreal not to consider the processing implications and forward linkage multipliers allow us to do that. For exan the national coefficents in Table 9.14 indicate that the loss of a beef farming job and the associ production going to meat export implies an additional 4.62 jobs being lost. So if a large area of beef farr changed to forestry, the forestry forward linkage multiplier implications would be offset by those applyin beef. However, the multipliers above take no account of the time frame involved. While forestry for

TEN - COMPARATIVE IMPACTS, SUMMARY, IMPLICATIONS AND CONCLUSIONS

10.0 Introduction

In chapters 4 to 8 the expenditure flows generated by the different scenarios were presented, with the forestry scenario expenditure impacts being compared, where appropriate, with the farming expenditure foregone. While the study area conventional forestry scenario resulted in the complete replacement of farming activity and expenditure, with all the other forestry scenarios the majority of farming activity and expenditure continued. This chapter compares the total expenditure flows that would come from the whole study area from each of the scenarios. That is, where part of the study area has trees planted on it, the expenditure on the forest is added to the remaining farm area's expenditure, and the totals compared. After the 35 year expenditure totals, expenditures by year are compared. The labour demands by year of the different scenarios are outlined next.

Following this, the findings of the research are summarised, implications are drawn and some conclusions presented.

10.1 Comparative Impacts

10.1.1 Expenditure

Table 10.1 lists the net total expenditure, that going to Dargaville and that spent within Northland over 35 years of all the scenarios, including the different harvesting options of the conventional forestry scenarios. After the table the assumptions behind each total are, where necessary, outlined. Figures 10.1 to 10.3 graph the expenditure totals listed in Table 10.1

Tabel 10.1 Comparative Total Area Expenditure (1983/84 $)

Scenario	Total	Dargaville	Northland
Study Area			
Study Area HV23 Option	161,803,403	152,252,425	157,795,754
Study Area HV29 Option	78,177,033	69,808,451	74,918,235
Sub Area			
Sub Area HV23 Option	143,114,763	90,720,068	131,030,528
Sub Area HV29 Option	124,029,761	71,920,261	112,126,150
Agroforestry	136,769,306	74,156,966	117,449,761
Woodlot	132,294,349	69,682,009	112,974,804
Pastoral Farming	128,227,435	65,615,095	108,907,890

The study area conventional forestry expenditure levels listed in Table 10.1 are close to the conventional forestry expenditures listed in Chapters 5 and 6. The difference is due to planting being spread over four years. It is assumed that farms are bought one year before planting and that farm production ceases in the

year the farms are bought. Therefore in the case of the study area scenario, farm expenditure drops to zero over four years, with expenditure assumed to decline an average of 25% per year. This shows that total expenditure in year one of the scenario is equal to forestry expenditure plus 75% of farm expenditure. With the sub area conventional forestry scenario, planting takes place over seven years on specific farms. Farm production and expenditure are assumed to cease one year before planting begins and the expenditure from the specific farms is deducted from total study area farm expenditure. This net study area farm expenditure is added to forestry expenditure to calculate the total expenditure coming from the study area. The impact on expenditure in Dargaville and within Northland is calculated in the same way, as forestry and farm expenditure direction has been previously calculated.

With the woodlot scenario, the 5% loss of non-tree farm income is assumed to lead to a 4.25% drop in farm expenditure, which is deducted from study area farm expenditure and then woodlot expenditure is added back on. Agroforestry is assumed to leave study area non-tree expenditure intact and is added onto farm expenditure.

Figure 10.1 graphs total expenditure, that is, the first column of figures in Table 10.1. The key refers to the total expenditure generated from the study area, so 'WOODLOT' refers to the expenditure incurred by the woodlot development and farm expenditure. The highest expenditure ($161.8 m) results from the heavy, early cut conventional forestry scenario, Study 23, and the lowest ($78.2 m) from the HV 29 option of the same scenario, Study 29. This is because the study area conventional forestry scenario displaces all farm expenditure and without this expenditure, harvesting commences too late with the HV 29 option for the higher harvesting expenditure to compensate for the farming expenditure forgone. This reinforces the point made throughout the research that expenditure levels are very sensitive to the year harvesting starts, the amount cut and the time span of the scenario. Expenditure from all the other scenarios ranges from $128.2 m to $143.1 m for the 35 years, and are therefore relatively close. The graph shows that in the case of the study area HV 29 option and the sub area HV 29 option, total expenditure is below farming expenditure, but only in the study area HV 29 option is it markedly below farming expenditure.

In Figure 10.2 cumulative expenditure within Northland is compared, and as a higher proportion of forestry expenditure takes place within Northland, the relative position of the conventional forestry scenarios are improved. Total expenditure from the sub area HV 29 option was less than that from the farming only scenario, however, the opposite applies when comparing expenditure within Northland. This graph shows that with all but the study area HV 29 option, Northland expenditure from the scenarios involving forestry is higher than the farming only scenario.

Figure 10.3 indicates that expenditure to Dargaville in the pastoral farming scenario is lower than that from any other scenario, though it is only markedly below the study and sub area HV 23 options. This reflects the level of farm expenditure paid outside the region and to Whangarei, plus the high proportion of forestry expenditure assumed to go to Dargaville. Obviously, the results are sensitive to the direction of expenditure assumptions.

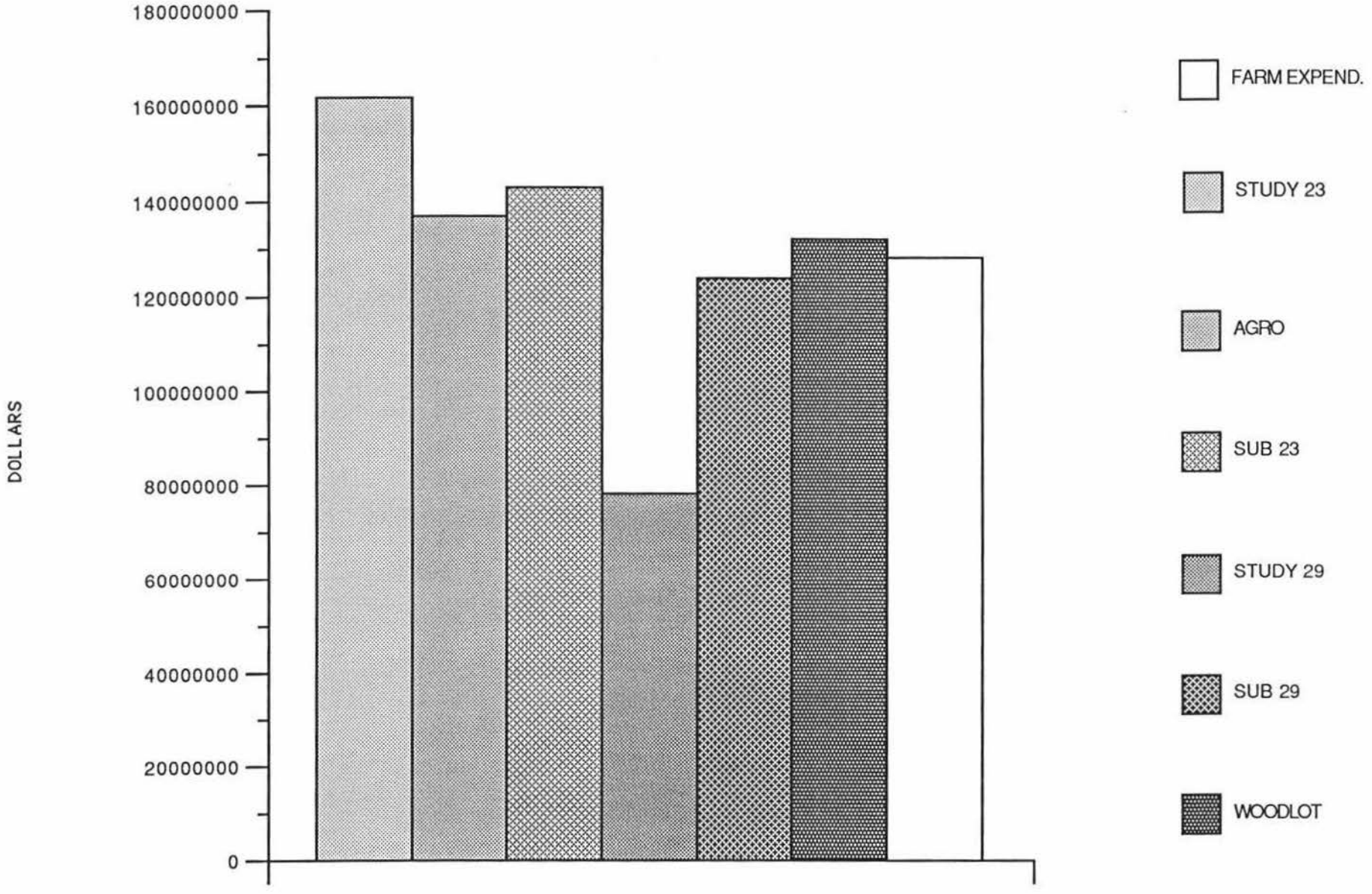

FIG 10.1 35 YEAR TOTAL EXPENDITURE

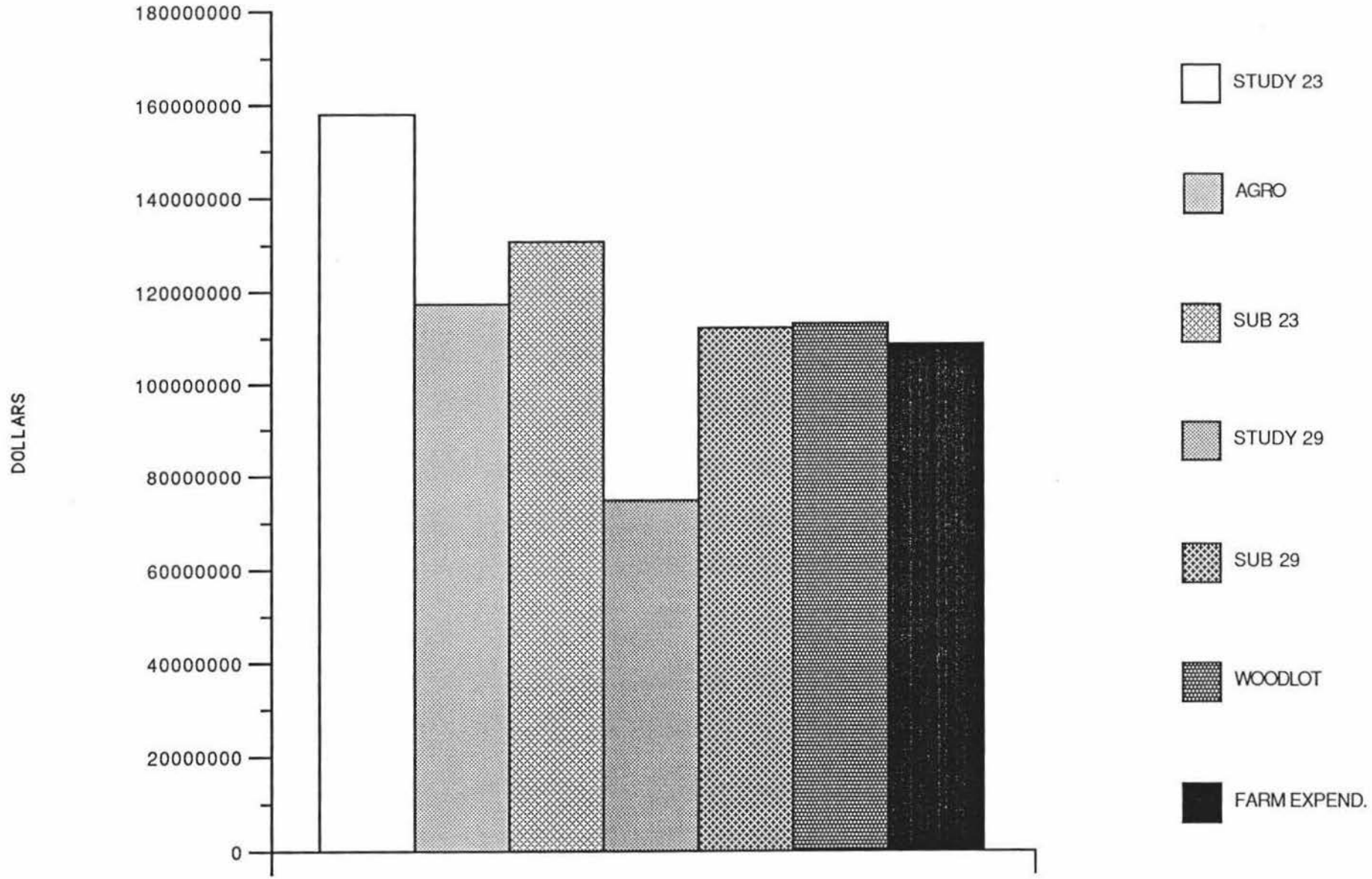

FIG 10.2 NORTHLAND TOTAL EXPENDITURE

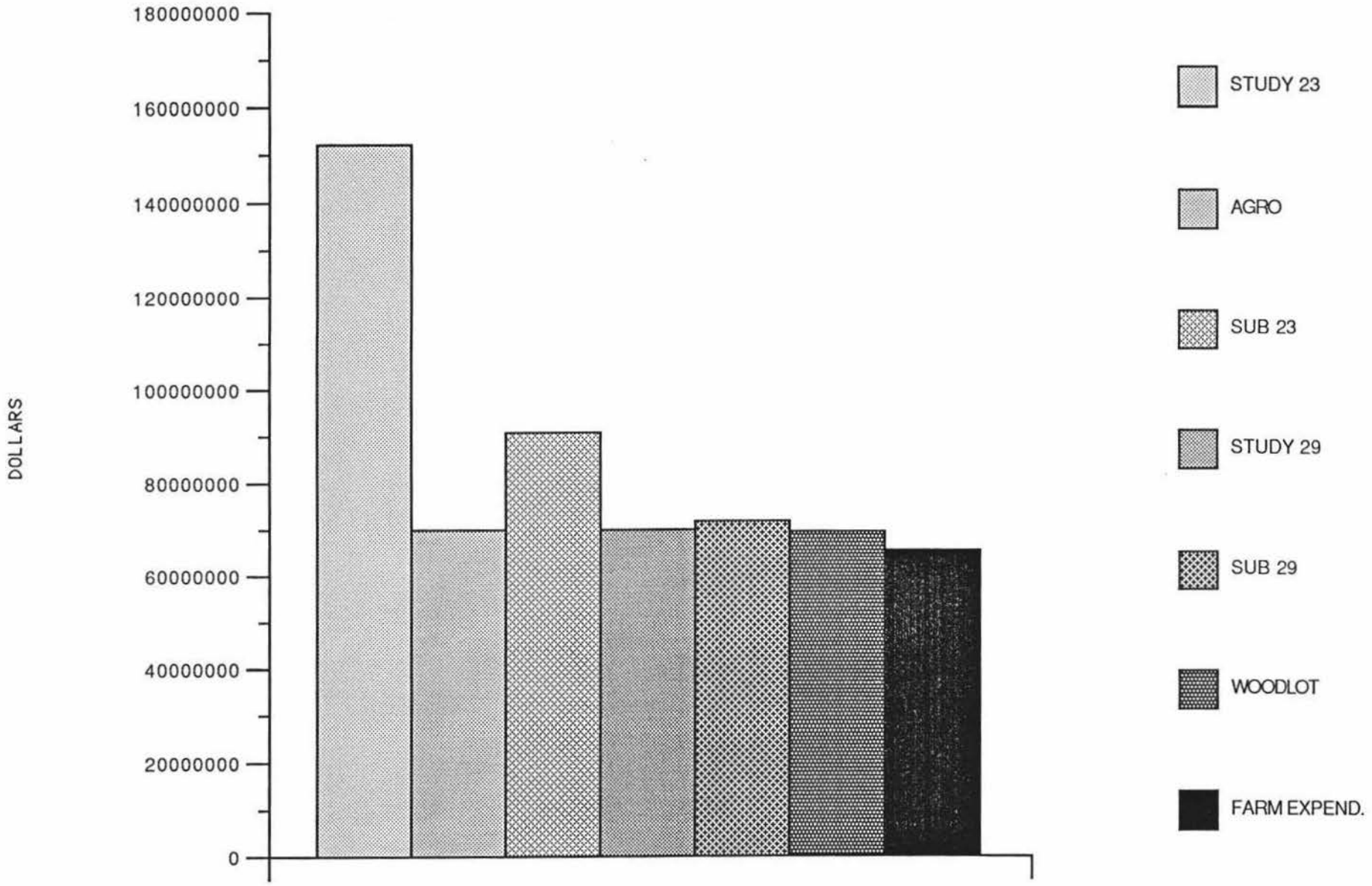

FIG 10.3 35 YEAR TOTAL DARGAVILLE EXPENDITURE

The timing of expenditure flows are considered to be more important than overall total spent and Figures 10.4 to 10.6 show these flows over the 35 years of the scenarios, graphing total, Northland and Dargaville expenditure flows. The key refers to total expenditure coming from the study area; for example, 'SUB 23' refers to the total expenditure generated from the sub area conventional forestry scenario and the study area farms not planted in forestry. Figure 10.4 graphs total expenditure flows, with the most obvious feature being the magnitude of the fluctuation in annual expenditure flows from the study area scenario and the comparatively similar flows from all other scenarios until harvesting starts. The increase in expenditure above farming expenditure at the beginning of the scenarios is due to progressive planting, which means farm expenditure falls gradually during the initial planting stage of the forestry development. While the study area conventional forestry scenario means a marked drop in total expenditure, with the sub area scenario total expenditure from the study area is at the most about $600,000 per year below base farm expenditure until harvesting starts. An interesting point brought out by the graph is that once harvesting starts, sub area HV 29 and farming expenditure is at times succeeded by the farm forestry and farming expenditure. This is because the farm forestry development would have little impact on non-forestry farm expenditure. However, while the farm forestry expenditure peak does not last long, the sub area HV 29 expenditure level would continue for about another 21 years.

In Figure 10.5 expenditure within Northland from the different scenarios is graphed. As with total expenditure comparisons, the higher proportion of forestry expenditure taking place within Northland means that the pre-harvesting differences between the conventional forestry scenarios and the farming only scenario are diminished, though the wide differences between the study area conventional forestry only scenario and the others remains for all phases of the scenarios. When expenditure to Dargaville is compared (see Figure 10.6) then the relative differences in pre-harvesting expenditure are further diminished, and the magnitude of the post harvesting differences increased.

These expenditure flows imply that where farming and forestry both take place within the study area as described in the sub area, woodlot and agroforestry scenarios constructed in this research, a relatively minor negative impact on expenditure within Northland and to Dargaville results. For example, with the sub area conventional forestry scenario, expenditure within Northland declines by less than $500,000 per year until harvesting starts. It then exceeds the farming only expenditure by more than $1,000,000 per year in the case of the HV 29 option. While these graphs give no indication of the sectoral shifts and consequent disruption implied by the forestry developments, (see Chapters 5, 6 and 7) they do suggest that the development of part of the study area for forestry would not have a serious impact on the Dargaville economy whilst the trees were maturing. As the discussion in Chapter 7 showed, the negative economic impact would be concentrated on some of those farm orientated businesses based in or close to the study area which depend on the farms for their turnover.

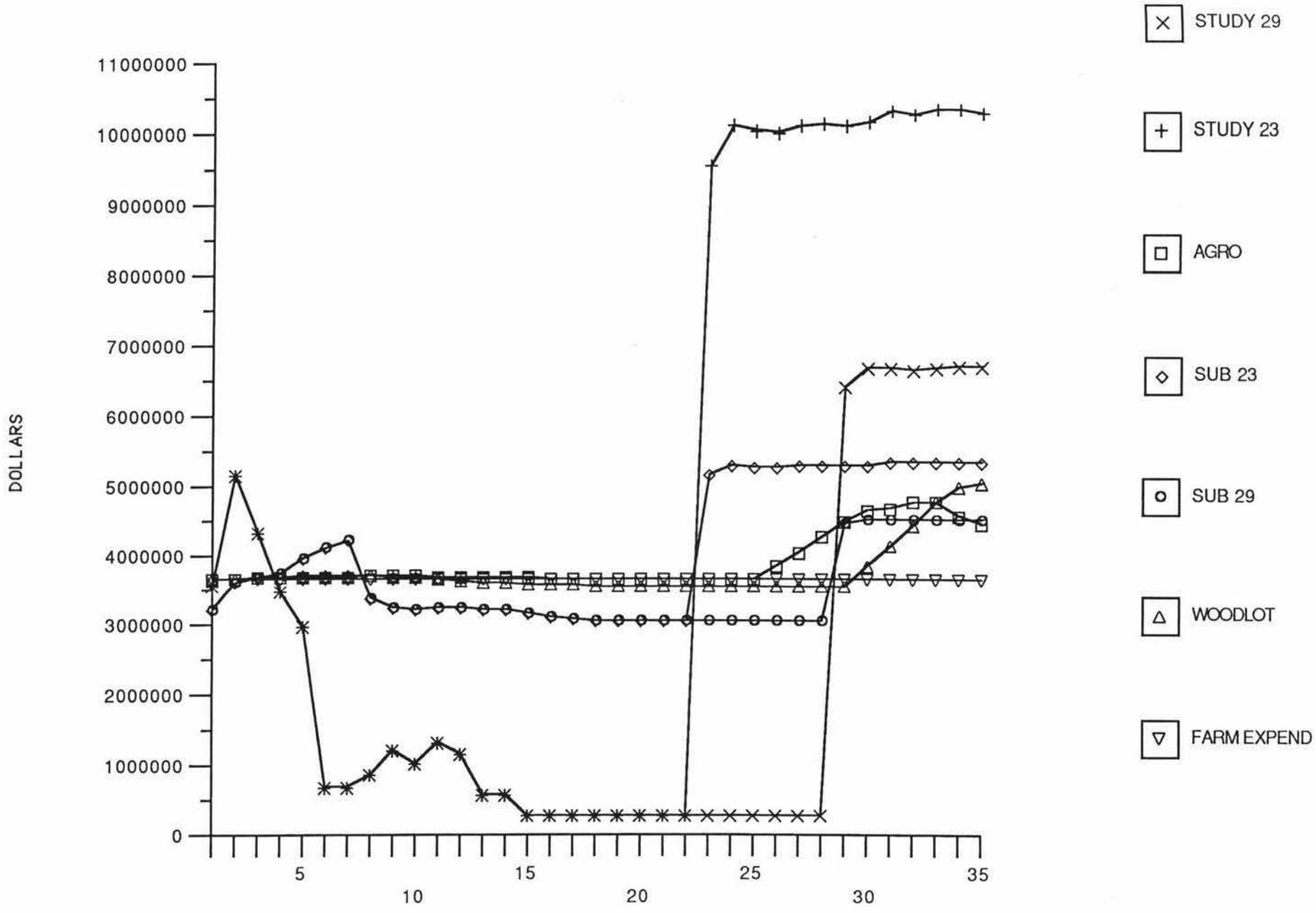

FIG 10.4 NET TOTAL EXPENDITURE

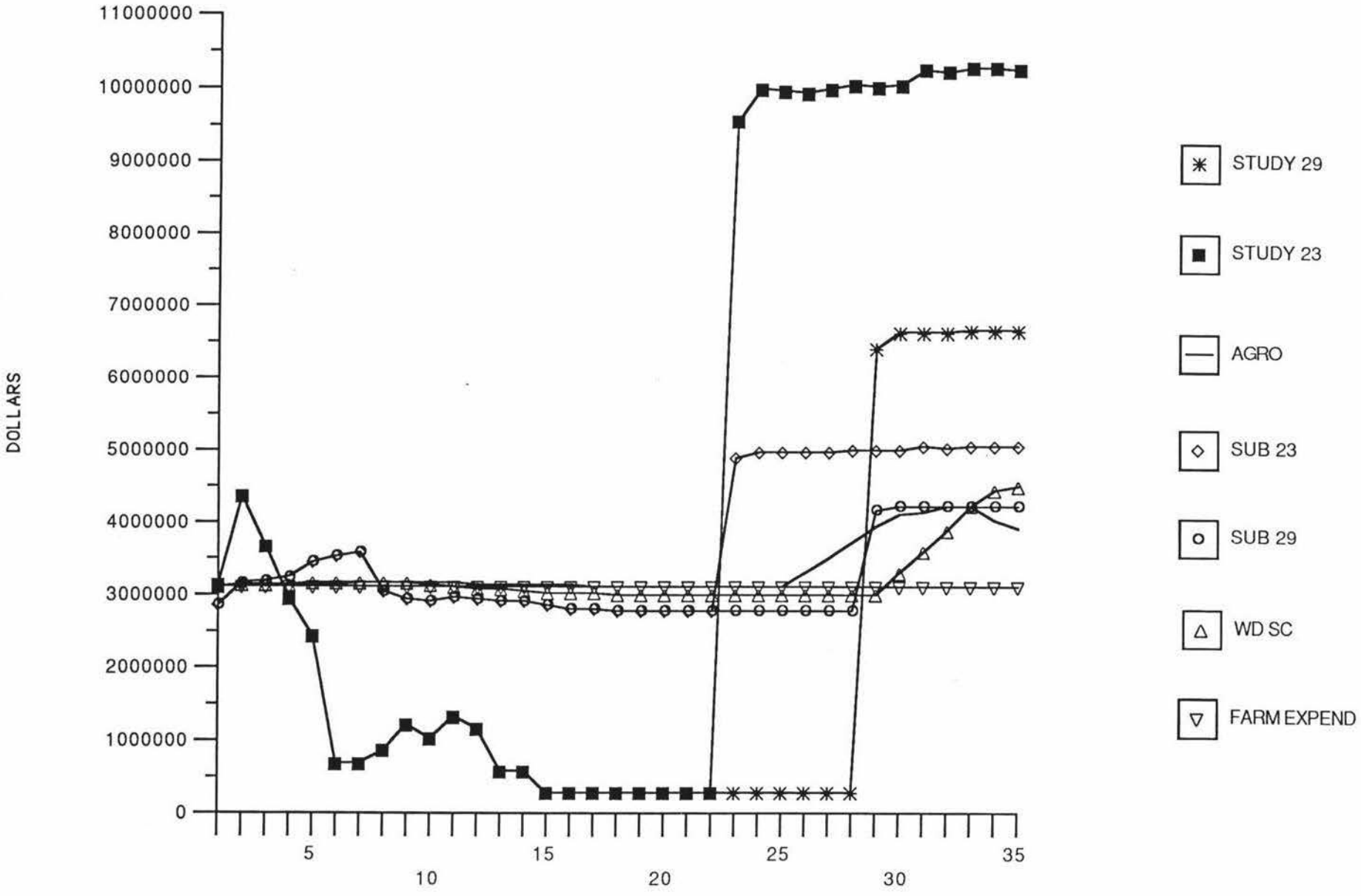

FIG 10.5 NET NORTHLAND EXPENDITURE.

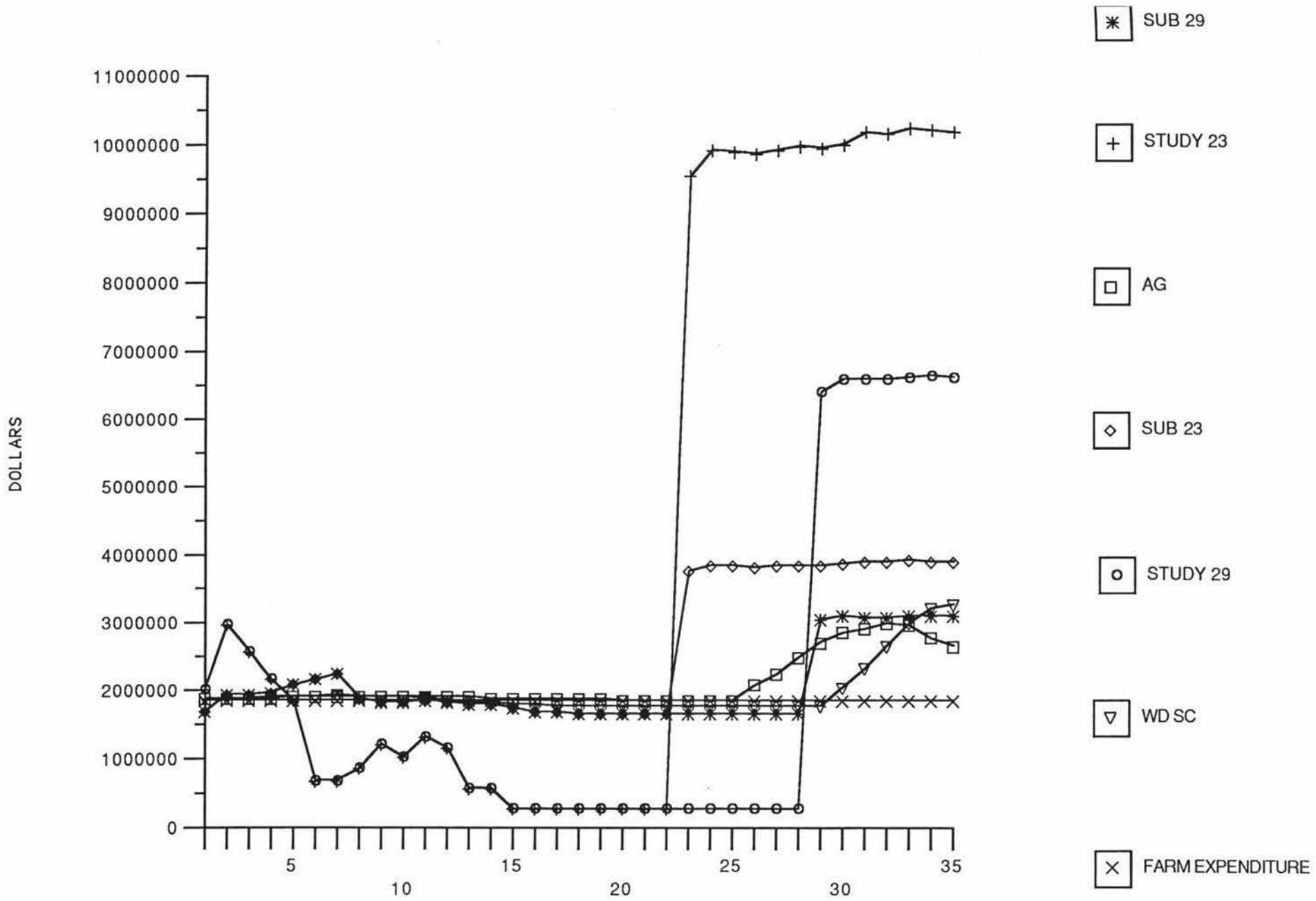

FIG 10.6 NET DARGAVILLE EXPENDITURE

10.1.2 Employment

Fig. 10.7 shows the net employment impacts of the scenarios in the same way as Figures 9.4 to 9.6 do for expenditure and many of the comments made about the expenditure comparison apply to the labour demand comparisons. For example, the woodlot and agroforestry development imply no decline in labour demand in the pre-harvesting phase, and a harvesting phase labour demand that at times exceeds that of the study area HV 29 option. Therefore this type of forestry development implies the least variation in labour demand generation. The graph shows that the study area conventional forestry scenario would lead to the most variable labour demand. Once harvesting commences the study area HV 29 post harvesting labour demand is about 10 person year equivalents above the farm only labour demand and is less than the net sub area forestry/farming employment. The graph suggests that the integration of farming and conventional forestry in the ratio of the sub area forestry scenario does not lead to a serious decline in employment.

10.2.3 Per hectare forestry expenditure and labour requirements.

Expressing forestry expenditure and labour requirements on a per hectare basis illustrates the comparative expenditure and employment implications of the different forestry types. It therefore illustrates the regional expenditure and employment implications of planting the same sized areas in different types of forestry. (Remember in the scenarios in this research different sized conventional and farm forestry areas were planted.)

Per hectare study area conventional forestry and woodlot expenditure are close but woodlot employment generation is higher because all forestry areas are pruned. Due to lower density planting, per hectare agroforestry expenditure and employment demands are the lowest. (See Tables 10.2 and 10.3)

Table 10.2 Per Hectare Expenditure Comparison (1985/86 $)

	Conventional	Woodlot	Agroforestry
Establishment	967	520	249
Silviculture	450	810	330
Harvesting	9,600	10,000	6,380
Total	11,017	11,330	6,959

The figures in Table 10.2 are those used in the scenarios constructed earlier. The conventional forestry expenditure is for land similar to that in the study area. If land with a higher proportion of bush and scrub was being used, expenditure would be higher, with scrub clearing costs of about $350 a hectare indicating the magnitude of the difference. (Land clearing costs are assumed to average $165 per hectare over the study area). Similarly, the woodlot establishment figure does not include land clearing, which would bring the woodlot establishment total up to $790 a hectare. (Spotspraying grass costs $90 a hectare and obviously would not be incurred with scrub clearing.)

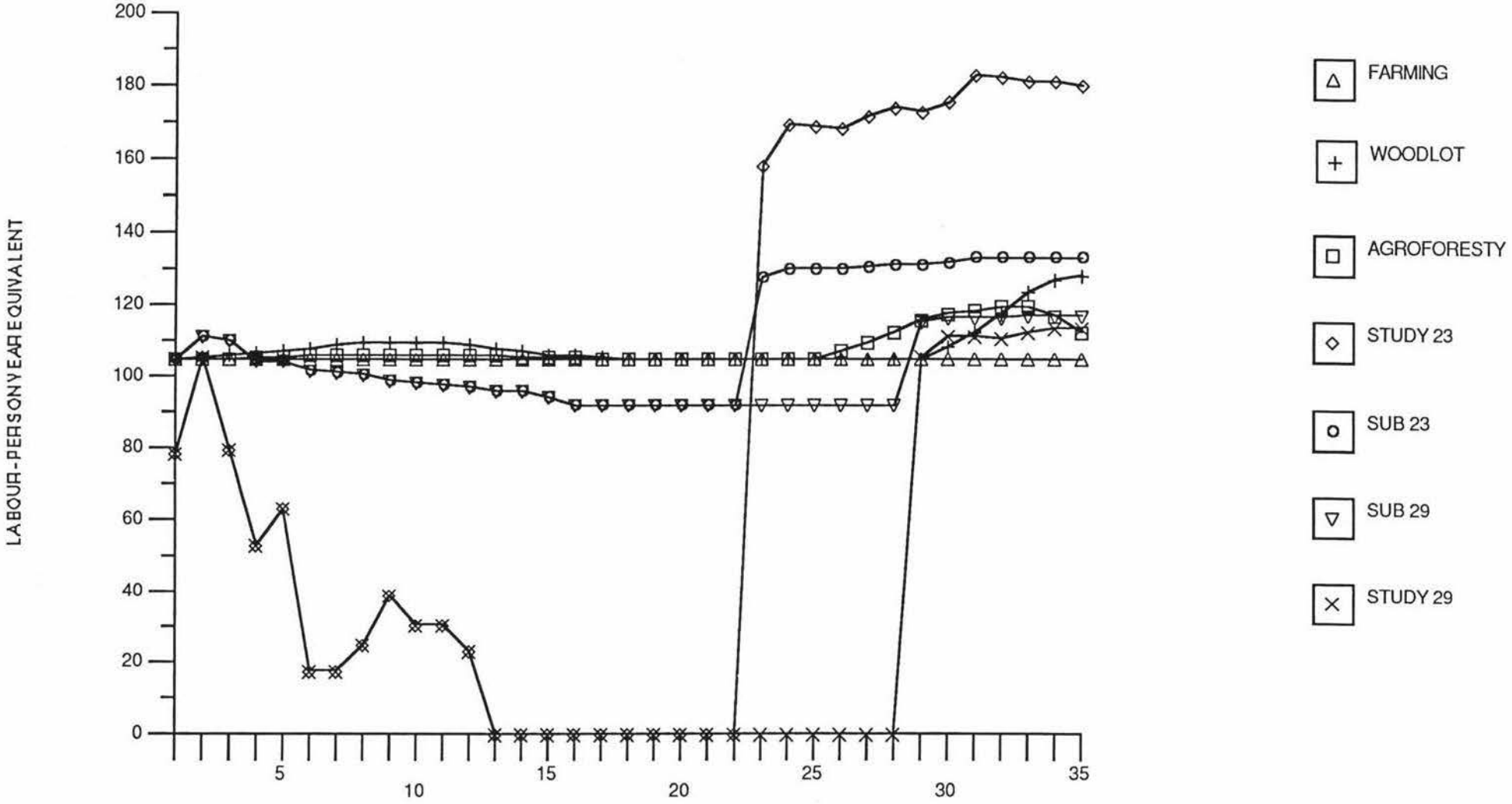

FIG. 10.7 LABOUR DEMAND COMPARISON

The most significant differences are seen when comparing relative siliviculture expenditure. Per hectare woodlot silviculture expenditure is markedly higher than for conventional forestry. This is because pruning and thinning over all areas planted in woodlots more than compensates for the lower density planting. With agroforestry, the 100 spha final stocking density means that silviculture expenditure is about 40% of woodlot and 75% of conventional forestry silviculture costs.

Conventional forestry harvesting expenditure is that for 600 m3 per hectare, woodlot for 500 m3 and agroforestry for 319 m3. Woodlot and agroforestry per hectare harvesting costs were calculated using $20 m3; if their harvesting costs were the same as conventional forestry's, then their harvesting costs would be $8,000 and $5,104 per hectare respectively.

Table 10.3 Per Hectare Employment Comparison

	Conventional	Woodlot	Agroforestry
Establishment	30	20	8.5
Silviculture	27	59	20
Harvesting	300	250	159
Total	357	337	187.5

In comparing employment demands, the statements made about the relative per hectare expenditure apply. For example, conventional forestry and woodlot labour demands are quite similar, with the higher woodlot pruning labour demand being offset by the higher conventional forestry labour needs.

10.2 Summary

With the conventional forestry scenarios direct expenditure and employment would drop significantly until harvesting commenced. While significant levels of direct expenditure and employment would be generated by planting, pruning and thinning, they would be lower than those generated by the farms. With both harvesting options, once harvesting and replanting commenced, direct forestry expenditure would be higher than the foregone farm expenditure. If harvesting levels were decreased to sustainable yield levels, direct forestry expenditure would still be higher than farming expenditure.

There would be changes in expenditure by location and sector. For example, compared with farm expenditure, forestry would lead to a dramatic increase in expenditure to Dargaville, once harvesting had commenced. Expenditure to Dargaville would also be higher during the establishment phase, but expenditure to Whangarei would drop once production on the farms started to decline. Similarly expenditure within the local area would drop as most of this goes to agricultural specific businesses such as shearing and livestock transport.

The sectoral shifts from the agricultural servicing sectors, such as fertiliser and transportation, to the generally more labour intensive forestry sector would cause varying degrees of disruption to businesses . Adjustment would be difficult and/or involve significant capital investment in some cases, either because the foregone farm business would not be replaced by forestry or other business without structural adjustments within the firms concerned or because of the time frame involved. For example, livestock transport firms would need to purchase logging trucks but the number of years between the loss of specific farm business and logging business from that farm means that work would have to be found elsewhere. As another example the Avoca Lime Co. has diversified into the horticultural industry, which lessens the impact of falling fertiliser and lime sales.

Some agricultural contractors are in a better position to adjust in the short run because forestry uses similar skills and machinery to agricultural contracting and/or because forestry specific tasks, such as planting and pruning, can be carried out with a minimum of training. Others, such as shearers, would have to change jobs unless there is an increase in demand for shearers elsewhere, which may require them to move.

The results of a comparison between direct forestry and farming paid employment generation are less clear cut. While forestry employment would be significantly higher under the harvesting levels adopted in both conventional forestry scenarios, this would not be the case if the sustained yield was cut. With the study area scenario, less paid employment would be generated by the sustained yield cut. The sub area sustained yield cut generates about the same level of employment as the farms.

Farming has higher backward linkage multipliers than forestry, so that if processing implications are not included, the total (backwards linkage) impacts of forestry are generally lower than for farming. But the higher forestry forward linkage multipliers mean the regional output, income and employment would grow as a result of the conventional forestry development on the study and sub area farms, provided processing plants where established in Northland.

The conventional forestry scenarios would change the present social organisation and power structure but it is more difficult to predict the impact on demographic characteristics and settlements. The work by Barry Smith and others summarises the likely impact of forestry development on pastoral farming based social structures. Smith found that the existing power structure tends to be diminished, with farming communities opinions reflecting the feared loss of power and change in the communities characteristics. The impact of the conventional forestry scenarios on demographic and settlement patterns will depend on whether or not the former farm houses are reoccupied. If they are, then the demographic and other community characteristics would change. For example, the community could become less cohesive, with a broader range of people being introduced. Should all or part of the study area be developed and the ex-farm houses reoccupied, the existing social structure would be replaced. If some of the area was developed then the existing social structure would be changed. In the opinion of the present residents those changes would be negative.

Woodlot and agroforestry development would lead to fewer impacts and conflicts than conventional forestry development. This type of development on study area farms would lead to a net increase in

expenditure and incomes within the existing land ownership structure. The income earned from the sale of the roundwood would lead to a further indeterminate increase in expenditure. While over a number of years, woodlot development would lead to a slight drop in farm income, it is considered this would have a minor impact on non-forestry farm expenditure. Therefore existing agricultural sector industries would not lose a significant amount of turnover. Woodlot and agroforestry development would not change the existing social structure and in the long term it would be strengthened because its economic base would be strengthened and diversified.

10.3 Implications.

The results of the research indicate some of the wider implications of forestry development on pastoral farmland. The results also have implications for the design and implementation of local and regional policies aimed at influencing the pattern of land use in Northland. While the study area is comprised of a certain mix of farms, run under traditional pakeha ownership patterns, the results have implications for land with different use and ownership characteristics, especially when considered in the light of other research, such as that by Marwick, and when allowance is made for differences between locations.

If conventional afforestation of pastoral farms like those in the study area occurs on a significant scale the most obvious economic implication is that there would be a relative decline in regional income, expenditure and employment until harvesting commenced, when compared with direct farm income expenditure and employment. (Other things being equal.) To qualify this statement, the net impact on the regional economy would depend on the scale and timing of afforestation, as well as the mix of non-productive and non -farm land being planted in trees.

The research shows harvesting at sustained yield levels is likely to generate as much expenditure as farming. However, it is more likely that harvesting cuts will be heavier for any one forest area and thus expenditure will be compressed. This means forestry expenditure flows would be highly variable and would lead to a cyclical impact on the areas economy if there is not a sufficently large forestry resource to ensure continuous forestry harvesting.

The expenditure and employment generated by forestry activity on former pastoral land may or may not replace farming expenditure foregone in specific rural servicing towns. Therefore widespread forestry development may lead to a permanent decline in economic activity and employment in some towns, while leading to an increase in others. For example, the forestry development in the conventional forestry scenarios would lead to a sustained increase in expenditure to Dargaville once harvesting commenced, while Whangarei and the local area would undergo a drop in expenditure when afforestation began.

When the total impact of forestry development on pastoral farmland on the regional economy is estimated by input-output derived multipliers, results imply that without processing plants being built in Northland, such development would lead to an overall relative decline in regional economic output and employment. Once harvesting starts, the multipliers used suggest the impact on regional incomes would vary according

to the farm income levels and the amount of roundwood cut. At sustained yield harvesting levels, the study farms generate a much higher income multiplier impact than forestry. However the sub area farms income impact is much more similar to forestry's.

Afforestation on large areas of former pastoral farmland in Northland, like that in the study area, generally imply that there would be a structural change in the economy with expenditure shifting to forestry sectors. Where afforestation leads to the establishment of processing plants, a diversification and expansion of the regional economy would occur.

The social implications of widespread afforestation on farms such as those in the study area, are a diminishing of the existing farmer based power structure in the areas, on county councils and other local and regional organisations. The population characteristics would be changed but it is not necessarily true to say that afforestation on pastoral farmland will lead to rural depopulation. (See Marwick (1981) and CNIPS (1983).

Woodlot and agroforestry is unlikely to occur on a similar scale as the areas planted in conventional forestry. When compared with conventional forestry woodlot and agroforestry would serve to diversify and increase local and regional economic activity while retaining the existing social structure. The implications of widespread woodlot and agroforestry development are therefore different and of a smaller magnitude than those for conventional forestry. Widespread woodlot and agroforestry would diversify and boost the local and regional economy without significantly diminishing other farm expenditure and would lead to increased employment.

The results of this research indicate the relative impacts of different land uses that can be used to guide regional land use policy. For example, if on a local and/or regional level it was decided to boost long term rural income within the context of the existing social and economic structure, then the establishment of woodlot and agroforestry on farms, rather than the conventional forestry establishment, is one way of doing this. However the research indicates that first, farmers attitudes towards farm forestry need to change. If local and regional planning policies were introduced that encouraged farm forestry but restrict conventional forest development, then certain statements can be made about such a policy. The attitudes of the farmers interviewed suggests that farm forestry development is unlikely to occur on a large scale and therefore such a policy is unlikely to lead to anywhere near the area planted or round wood produced by conventional forestry development. In addition, the research findings show the 'opportunity cost' of restricting conventional forestry development in terms of regional expenditure and employment foregone. The total impact, forward linkage multiplier inclusive, of forestry is higher than that of farming, therefore one of the effects of restricting conventional afforestation on pastoral farmland would be a lower overall level of regional economic activity.

But the higher total regional forestry impacts need to be considered in the light of the time frame involved. That is, while conventional forestry on pastoral farmland, if it leads to processing in the region, would result in a long term increase in regional incomes and employment, in the short to medium term it would lead to their decrease. There are therefore clear tradeoffs in the promotion of one land use instead of another.

The research indicates the processing implications of large scale conventional forestry development, whether forestry development takes place on pastoral farmland or not. The importance of the type and location of processing plants in determining regional impacts is highlighted by this research and implies that earlier identification of such factors is necessary to plan for forestry labour, transport and other infrastructural requirements and to measure the regional impact.

If regional and local policies were enacted that do stop afforestation on pastoral farmland, then a possible consequence is that other conventional forestry development could become less likely as contiguous forest establishment may no longer be possible in some areas.

The findings also indicate the likely magnitude of regional forestry labour demands resulting from forestry development and therefore their implications for regional employment patterns. Regional forestry development implies an increase in labour demand, once harvesting commences, such that for the regions workforce to gain the most benefit from it, specific skills training is required. Given current forestry work force characteristics, increased population in those towns close to processing plants and large forests is implied.

The results of the research also indicate the approximate impact of forestry development if it does not go ahead. As this research was nearing completion the impact of the primary sector taxation changes on forestry planting appeared, with planting rates and the size of planned forests reduced - in one case from 50,000 ha to 25,000 ha with all planting to finish by the end of 1987. Over the life of the forest and assuming harvesting at year 30 at 600 m3 per hectare, this represents a loss of the equivalent of about 4,800 person years of work over 30 years, and over $270,000,000 worth of expenditure. But the total effect may be much worse than that, with the number and viability of processing plants likely to be affected.

10.4 Conclusions.

10.4.1 Methodology

The methodology was successfully applied in this research and could be applied elsewhere. However, personal surveys of farms is a time consuming and expensive business. With the level of detail required in this research they were a prerequisite to success, but with different objectives surveys like those may not be necessary. For example, if the objective of the research was to identify the impacts of a change from pastoral farming to conventional forestry on businesses based in and about the study area only, then surveys of the businesses would be sufficient. (Provided one had an accurate list of the farmers living in the area under study.) When the impact of specific areas changing to forestry on rural towns and the region is to be measured, non-survey methods, such as MAF farm monitoring models, are likely to lead to misleading results. The level of farm indebtedness is an important determinant of farm expenditure within the region and to specific towns and accurate indications of the level of farm indebtedmess will only be obtained through individual farm surveys. It is considered that unless the farms are visited a low response rate to any survey would be achieved. Additionally, to gain accurate indications of the number of farms that would sell to forestry individual farm visits are necessary.

The success of research like this is very much dependent on people in the community and it is vital not to treat people so that they feel they are being used as guinea pigs in some academic exercise. Feedback on the findings and a willingness to listen as much as question encourage co-operation.

10.4.2 Research Findings

The interest and some of the concerns about the impact of forestry on pastoral farmland like that in the study area, voiced by the Northland United Council are justified. Such afforestation means a drop in employment and expenditure until harvesting starts and is likely to lead to a permanent decline in the turnover of agricultural based businesses, especially those located in the rural areas affected by afforestation. For some businesses, such as shearing and livestock transport, the nature of the change and the time frame involved will make adjustment difficult or expensive. Though harvesting will result in significantly increased expenditure overall, there will be expenditure sector shifts and there may be changes in the location of expenditure. The sectoral and possible locational expenditure shifts would cause disruption and may lead to a permanent decrease in expenditure and employment is some locations while increasing it in others. But there are major differences between the impact of the whole study area being planted in conventional forest and part of the study being planted. The mix of farm/forestry development is considered to be a very important variable when assessing the impact of forestry development in an area of pastoral farmland.

In addition, care must be taken to identify existing trends and to separate these from the impacts of changes in land use. For example, declines in rural population and economic activity have been occurring in some areas for many years. One of the reasons for the decline in rural businesses, such as shops and garages, has been the advent of widespread car ownership and the improvement of rural roads. These have made it easier for farmers and other rural dwellers to travel to towns like Dargaville for shopping, which leads to less use of rural businesses. (See Maunier et al 1985)

The comparative magnitude of the roading impacts suggests that concern over forestry roading impacts are quite justified.

Multiplier analysis also suggests that concerns about the impact of forestry development on pastoral farmland are justified, in that without processing plants being established, forestry results in lower regional output, incomes and employment. However the majority of land purchased by forestry companies is not farm land, and that which is, is not as productive as the study area farms. Therefore, a false impression could be gained if the loss of farm expenditure and employment is not balanced against the gain from non productive land being planted in trees. (See Marwick for a description of positve economic and social benefits of a shift from farming to forestry in a particular community).

It is more difficult to draw conclusions about the concerns relating to forestry impacts on rural population and services. This research and that by others (Marwick, CNIPS) suggests that forestry on pastoral farms does not necessarily lead to rural depopulation and it is felt that many of the concerns expressed are a reaction to the changes that forestry implies, with these changes threatening the status quo. That is not to

suggest that the concerns held by the existing farming community are not legitimate, but it does mean that care must be taken in finding the underlying reasons for the concerns. The most obvious reasons (e.g. forestry) may not be the cause of the publicly voiced fears such as rural depopulation. However, the more isolated a rural area the more likely it is that a change from pastoral farming to conventional foresty would lead to a permanent decline in forestry.

Conventional forestry as developed in NZ is accompanied by minimal on site worker residence, so servicing towns experience growth rather than rural areas. While overseas people farm trees and live in the forests, this pattern does not exist in New Zealand. (see Aitken 1985)

Continued exotic forestry development and processing plant establishment will have significant consequences for those towns or locations that serve to house employees and provide infrastructural support. It is considered most important that processing plant location be identified as soon as possible to assist in impact identification in time to allow preparation, including labour force training.

The evidence of this and other research suggest that variables such as distance from servicing towns, farm expenditure patterns, present farm productivity, ownership patterns, plus the ratio of farmland to non productive land, have considerable influence on the overall impact of forestry development on the local and regional economy and social structure. This influence is such that the characteristics of different locations need to be identified before drawing conclusions about many of the specific social and economic implications of land use changes.

While this research was designed to identify the implications of changes in land use from pastoral farmland to forestry, it also indicates the impact of the downturn in the agricultural sector and the future impact of any decrease in forestry activity, whether it results from tax changes or the corporatisation of the Forest Service. For example, a 10% decrease in expenditure from the 56 farms in the study area providing detailed data, means an annual $380,000 drop in expenditure. Any decision to cut planting equivalent to a forest the size of the study area farms (about 15,000 ha) could result in more than $162 million not being spent, and the equivalent of about 2,880 person years of work not being created.

While changes in land use from pastoral farming to conventional forestry do have important local and regional implications, it is considered they are not as important as the implications of the current rural depression, the corporatisation of the Forest Service, the new tax laws and the likely processing plant impacts. The impacts of the agricultural downturn are immediate, but those of the decline in forestry planting are more in the nature of an opportunity foregone - and the magnitude of this opportunity foregone is quite considerable.

Therefore, while the afforestation of pastoral farmland should be a matter of concern and interest for the Northland United Council, it is felt that a higher priority should be attached to the rural agricultural depression, the corporatistion of the NZ Forest Service and the change in forestry planting targets. The major impacts of forestry development will not occur until harvesting commences. When this occurs, the impacts of harvesting will be much greater than the present forestry development impacts. The economic,

social, infrastructural and environmental impacts of a wood processing industry would completely overshadow the present impact of forestry. It is emphasised that the impacts of forestry processing plants are of such a magnitude that their location and type should be identified as soon as possible and their infrastructure and labour requirements should also be identified and prepared for. Investigation into the feasibility of regional training programmes to prepare Northlanders for forestry and forestry processing jobs should take place.

Farm forestry should be encouraged throughout the region. Farm forestry diversifies the income base of the existing rural structure, strengthening it and improving it's ability to cope with product price declines. It is also likely to lead to a more appropriate land use, in that the less productive agricultural land on the farm could be planted in trees which may enhance overall farm productivity. Farm forestry should be interpreted in the wider sense to include woodlot, agroforestry, joint ventures, shelter belts and specialty trees.

Appendix 1

Terms of Reference

1. Title

The social and economic Impacts of alternative land uses involving pastoral farming and forestry.

2. Investigators

David Smith post graduate student in Natural Resource Economics (M.Phil.) under supervision of Dr Anton D. Meister, Reader in Natural ResourceEconomics.

3. Location

Department of Agricultural Economics and Farm Management, Massey University.

4. Background

It is likely and desirable that there will be further significant expansion of exotic afforestation in Northland over the next decade. There is some debate however, over which forms of forestry should be undertaken on certain types of land. In particular there is debate over what forms of forestry are most desirable from the regional point of view on land in existing pastoral use.

Many agencies within central and local government, have policies, or are considering introducing policies that influence land use decisions concerning forestry and pastoral farming. (government, though its policies on State purchase of land for development, on land aggregation, on land purchases by foreign companies, through its grants, subsidies, and taxation provisions relating to forestry and farming, through the Rural Banks lending policies relating to forestry and farming; County Councils through their District Planning Schemes; the United Council through the Regional Planning Scheme).

Because of the competition for land in formulating a regional strategy for the development of Northland's primary resources, consideration needs to be given to what regional policies, if any, there should be regarding land use in respect of forestry and pastoral farming.

An assessment of selected economic, social and physical impacts of alternative forestry and pastoral regimes on selected types of land is amongst the most important information needed by the United Council as a basis for such decisions.

In addition, such an assessment would assist the resolution of three of the United Councils current priorities for regional planning (see attatchment), and would be directly useful to Government and Counties when they review those of their policies that influence land use decisions with respect to forestry and pastoral farming.

5. Aim of the Study

The proposed study is a case study of a particular area in Northland. The results of the study will therefore

not be automatically applicable to the other areas of Northland. However the results will be indicative of the type of change that can be expected, given significant changes in land use patterns.

The study will further demonstrate an analytical approach which, if successful, can be applied to other areas of Northland.

The objectives of the study are:

(a) Analyse the social and economic impact of alternative land use scenarios (involving forestry) on a micro area in Northland;

(b) To extend the findings under (a) to a larger area of Northland to indicate the impact of changes in the micro area on the surrounding region (this being dependent on the results of (a) and on available time and money).

(c) To develop an analytical appoach which can be used elsewhere to study social and economical impacts of alternative land use scenarios.

6. Area of Study

The study area covers approximately 17,000 hectares and is situated 31 km from Whangarei along State Highway 14 towards Dargaville. The area consists of the Tangowahine and Kirikopuni Valleys seperated by the Maungaru Range, plus land along Sommerville Road.

The reason for choosing this area are:

(a) The study area is close to the area currently being developed for forestry. It would also be a logical area for future expansion of forestry;

(b) The size of the area is such that, within the time available, it would be possible to survey the farms, the rural community and the business community;

(c) Data is available from a previous survey of the area, to provide an historical picture.

As stated in the introduction, the study is a case study. The area is too small to be representative of anything. However, irrespective of the small size, the analysis should clearly demonstrate how different land use patterns will affect a typical rural area and how income and expenditure flows will be affected.

The wider area of interest is the area west of the study area up to and including Dargaville. We are particularly interested in the effects of changing expenditure patterns on Dargaville.

7. Land Use Options

For this study four major scenarios will be developed. To do this the area will be carefully studied using land use capability and current use information. From this information and from advice from Forestry and

MAF personnel the four scenarios will be drawn up. In each scenario one particular form of development will be emphasised.

However it is recognised that that particular development is not a realistic option for all land in the study area. Consequently, each scenario to be developed, while emphasising one particular form of development, will at the same time also include other form of development on land where they could realistically be carried out and where the emphasised form of development is not suitable or relevent.

The forms of development to be emphasised in the four scenarios are:

(i) Pastoral farming, I.e. a continuation of the present situation with further development;

(ii) Conventional large scale forestry, i.e. a situation where most land is covered with trees planted under a conventional density spaced regime;

(iii) Farm woodlots, I.e. a situation where forestry development is predominantly in the form of woodlots;

(iv) Two tier farming (agro-forestry), I.e. a situation where, whenever possible, forestry development will occur under a two-tier farming regime.

The four scenarios are to some extent extremes. The most likely scenario would be a mixture of all four. We have chosen these four scenarios to determine what the difference in social and economic effect will be. From a regional planning point of view this will answer the question of how different the impacts of the various proposed land use development patterns could be.

8. Research Questions

To achieve our objectives (5.a) and (5.b) we intend to analyse the four options in terms of relative impacts on:

(a) Expenditure patterns -
    by sector
    by location of purchase,
(b) Employment,
(c) Population and settlement patterns,
(d) Rural services.

9. Methodology

STAGE I

Using existing data a complete description will be made of the area, its population, income and expenditure flows in and out of the area, commercial activities in the area and rural services.

To this end, all farmers in the region will be surveyed (a mixture of postal questionnaires and personal interviews). The main purpose of this survey will be to establish expenditure patterns, (i.e where are inputs brought; goods sold; consumer items purchased etc.)

Further, all business enterprises within the area will be surveyed to find out the characteristics of the enterprise, labour force employed, and markets and clientele. Also , the relationship of the area with business enterprises in Dargaville will be looked at, but in less detail. The aim here is to find out how the business enterprises relate to the existing land uses and how their business may change with alternative land use patterns.

From background information and from the survey, an employment profile will be drawn up for the area together with a population profile. This information will be needed to study the effect of changing land use patterns on population and employment and this in turn on the rural community.

With regard to employment we will look at labour on site, on farms and in the servicing and processing sector. Using Moores work we could make some statements about indirect employment effects.

With regard to population we will be looking at age/sex distribution, number of households and their structure, children etc. We will also look at migration data and settlement patterns.

All the above will be the background data needed for the next stage of the analysis.

STAGE II

In this part of the analysis, assumptions are made about changing land use patterns. Hence four scenarios are drawn up as explained in section 7. For each scenario assumptions will be made about the amount of change taking place (i.e. hectares of forests and where); and what happens to farm ownership and migration. This information, combined with information on expenditure patterns, labour patterns and settlement patterns, will allow us to estimate the impacts of each scenario on the local area and on the wider region. This part of the analysis forms the heart of the study.

To be able to complete it, much consultation will be needed with forestry companies, MAF personnel and with people in the region. Further information from other related studies like CNIPS and the Waiapu studies may be helpful. Finally, throughout the study close liaison will be maintained with people like Mr Aldwell (Forest Research Institute) who also works in this area.

The time span for the study will cover four periods: .

0 -10 years (establishment and silviculture)
10 -20 years (maintenance period)
20 -30 years (gradual increase in harvesting)
30-35 years (harvesting and re-establishment).

Appendix 2

Land Use Capability

The extended legend refers to the Land Use Capability Map contained in Chapter Two. Land Capability zones are often used to assess the suitability of land for various uses and many of the arguments as to the suitability of land for farming or forestry are based on the attainable stock carrying potential of the different land classes. Wheeler and Moran state that the attainable potential "can be considered the agricultural production forgone when this land is planted in forest" (P38 1984). Others take this view - for example Federated Farmers - and argue that land with a productive potential above a certain stock carrying capacity should not be planted in exotic forests.

This approach rests on the implicit assumptions that stock carrying capacity is the main determinant of a farm's productive capacity and that this potential stock carrrying capacity is likely to be realised. To take this approach is to ignore the importance of farm management and farm economics to a farm's actual and potential stock carrying capacity.

An obvious question is: Why are farms carrying far below their technically attainable stock carrying capacity? That farms did not reach their attainable potential even when subsidies and incentives existed to financially assist and encourage farmers to do so, suggests that it is unrealistic to expect this potential to be realised. Therefore it its unrealistic to use this potential as an indication of the agricultural production forgone if this land changes to another use. While the attainable potential sets the upper limit on what the land can carry, it is farm management and economics that determine what the land can realistically carry - with farm economics being an exogenous variable while farm management is an endogenous variable.

The importance of farm management is demonstrated in the study area by farms that are on the same land class, with very similar terrain and wide variations in the stock carried per hectare, lambing precentages and income per hectare. The importance of farm economics is seen in farms with higher debt loadings forced to cut back on fertiliser (for example) as sheep meat income drops and interest rates rise. Therefore the author believes current performance in relation to farm management and farm economics is a more realistic assessment of suitable land use.

	1	2	3	4	5	6	7	8	9	10
1			LAND USE	LAND USE	SOILS	EROSION			SOIL CONSERVATION AND	ADDITIONAL
2	UNIT	UNIT DESCRIPTION	PRESENT	POTENTIAL		PRESENT	POTENTIAL	VEGETATION	WATER MANAGEMENT MEASURES	COMMENTS
3										
4	11W2	RIVER PLAINS AND	INTENSIVE GRAZING	MARKET GARDENING	RECENT SOILS FROM	NIL	NIL TO SLIGHT	HIGH PRODUCING		
5		TERRACES ON	AND CEREAL CROPPING	INTENSIVE CEREAL	ALLUVIUM - Kohumaru, Whareora,		STREAMBANK	PASTURE		
6		SEDIMENTARY	ROOT AND FODDER	CROPPING AND GRAZING	Kaipara and Waipu suites			ROOT AND FODDER		
7		ALLUVIUM	CROPPING					CROPS, HORTICULT.		
8										
9										
10	111W1	FLAT RIVER PLAINS	MARKET GARDENING	INTENSIVE GRAZING	RECENT TO SEMI-MATURE	NIL	SLIGHT STREAMBANK	HIGH PRODUCING	DRAINAGE	DEVELOPMENT OF LARGE DRAINAGE OR FLOOD
11		AND GENTLY	INTENSIVE CEREAL	CEREAL CROPPING	NORTHERN YELLOW BROWN		AND DEPOSITION	PASTURE		PROTECTION SCHEMES COULD UP GRADE THE
12		UNDULATING	CROPPING & GRAZING	ROOT AND FODDER	EARTHS -Whareora, Kohumaru,	NIL		SWAMP ASSNS		UNIT TO 11W2
13		TERRACES		CROPPING	Kaipara, Waipu, Maungaturoto and			RUSHES & SEDGES		
14					Waipapa suites.			MANUKA		
15										
16	IVE5	UNDULATING TO	INTENSIVE GRAZING	INTENSIVE GRAZING	WEAKLY TO MODERATELY	SLIGHT TO MODERATE	MODERATE EARTHFLOW	HIGH PRODUCING	CONTOUR CULTIVATION	
17		STRONGLY ROLLING		ROOT AND FODDER	LEACHED NORTHERN YELLOW	GULLY, TUNNEL GULLY	TUNNEL GULLY, EARTHSLIP	PASTURE	OPEN PLANT POPLARS ON MASS	
18		LAND ON		CROPPING	BROWN EARTHS - Omu, Omanaia,	EARTHFLOW, EARTHSLIP	SALSLIP	MANUKA	MOVEMENTS	
19		SEDIMENTARY			Waiotira, Purua, Marua, Omaiko,		SLIGHT SHEET	LOWLAND PODOCARP	PLANT POPLARS IN TUNNEL GULLIES	
20		LITHOLOGIES			Whareora, Whaka and Kaimaro	SLIGHT SHEET, SOIL	SEVERE SHEET WHEN	HARDWOOD FOREST	PAIR PLANT WILLOWS IN GULLIES	
21		EXCLUDING			suites.		CULTIVATED			
22		LIMESTONE								
23	IVE8	UNDULATING TO	SEMI-INTENSIVE TO	INTENSIVE GRAZING	STRONGLY LEACHED TO	NIL TO MODERATE	MODERATE GULLY, RILL	MANUKA	GRADED BANKS	SOILS HAVE POOR STRUCTURE AND ARE
24		ROLLING GUMLANDS	INTENSIVE GRAZING	ROOT AND FODDER	PODZOLISED NORTHERN YELLOW	GULLY	AND SHEET	HIGH AND LOW	CONTOUR CULTIVATION	VERY ACIDIC (PH 3.4-4.5)
25			MUCH UNDEVELOPED	CROPPING	BROWN EARTHS - Omu, Waiotira,	SLIGHT TUNNEL GULLY	SLIGHT TUNNEL GULLY	PRODUCING PASTURE	CORRECT SITING OF DRAINAGE	
26					Purua, Marua, Maungarei, Pinake	SHEET AND RILL	SEVERE GULLY, RILL	RUSHES AND SEDGES	CHANNELS TO PREVENT INITIATION	
27					and Kohumaru suites.		SHEET, AND SLIGHT	FERN	OF GULLIES	
28							TUNNEL GULLY WHEN	UNSPECIFICED SCRUB	PAIR PLANT WILLOWS IN GULLIES	
29							CULTIVATED	ASSNS	PLANT POPLARS IN TUNNEL GULLIES	
30										
31	IVE9	UNDULATING TO	SEMI-INTENSIVE TO	INTENSIVE GRAZING	STRONGLY TO VERY	NIL TO MODERATE	MOERATE SHEET, RILL	HIGH PRODUCING	CONTOUR CULTIVATION	HIGH CLAY CONTENT GIVES RISE TO POOR
32		ROLLING SLOPES ON	INTENSIVE GRAZING	ROOT AND FODDER	STRONGLY LEACHED BROWN	SHEET,GULLY AND	AND GULLY	PASTURE	GRADED BANKS	INTERNAL DRAINAGE AND ASSOCIATED
33		STRONGLY LEACHED		CROPPING	GRANULAR CLAYS AND LOAMS -	RIL	SEVERE SHEET, RILL AND	MANUKA	PAIR PLANTING OF WILLOWS IN	PUGGING
34		BROWN GRANULAR			Haunga, Te Kie, Huia, Katui,		GULLY WHEN CULTIVATED	GORSE	GULLIES	
35		CLAYS AND LOAMS			Kohumaru,Kaimaro, and Maungarei			FERN		
36					suites.					
37										
38	IVS4	FLAT TO ROLLING	SEMI-INTENSIVE	INTENSIVE GRAZING	STRONGLY TO VERY	NIL	NIL TO SLIGHT RILL AND	HIGH PRODUCING		OCCURS OFTEN AS TABLELANDS ON TANGIHUA
39		PLATEAUS ON	GRAZING	ROOT AND FODDER	STRONGLY LEACHED BROWN		SHEET WHEN	PASTURE		VOLCANICS, AND WAIPOUA BASALTIC FLOWS
40		STRONGLY LEACHED	UNDEVELOPED	CROPPING	GRANULAR CLAYS AND LOAMS -		CULTIVATED	MANUKA		THE HIGH CLAY CONTENT CONTRIBUTES
41		BROWN GRANULAR			Haunga, Huia, Te Kie, Katui,					MARKEDLY TO THE WINTER WETNESS AND
42		LOAMS AND CLAYS			Kohumaru and Maungarei suites					SUMMER DROUGHT
43										
44	IVW1	FLAT ALLUVIAL RIVER	INTENSIVE GRAZING	INTENSIVE GRAZING	RECENT SOILS FROM	NIL TO MODERATE	MODERATE STREAMBANK	HIGH PRODUCING	STOP BANKS	
45		PLAINS WITH A		ROOT AND FODDER	ALLUVIUM TO MODERATELY	STREAMBANK	SLIGHT DEPOSITION	PASTURE	DRAINAGE	
46		SEVERE WETNESS		CROPPING	LEACHED NORTHERN YELLOW	SLIGHT DEPOSITION		SWAMP		
47		LIMITATION			BROWN EARTHS - Kohumaru,			RUSHES AND SEDGES		
48					Whareora, Kaipara and Waipu suites					
49										
50	VIE1	STRONGLY ROLLING TO	SEMI-INTENSIVE TO	INTENSIVE GRAZING	WEAKLY TO STRONGLY LEACHED	NIL TO MODERATE	MODERATE TUNNEL	HIGH PRODUCING	OPEN PLANT POPLARS ON MASS	TUNNEL GULLY IS THE MOST SEVERE EROSION
51		MODERATELY STEEP	INTENSIVE GRAZING		NORTHERN YELLOW BROWN EARTHS	TUNNEL GULLY,GULLY	GULLY, GULLY	PASTURE	MOVEMENTS	FORM ESPECIALLY ON WAIOTIRA SOILS
52		SLOPES ON			Whaka, Omu, Ornanaia, Puhoi,	AND EARTHFLOW	AND EARTHFLOW EARTHSLI	MANUKA	PAIR PLANT WILLOWS IN GULLIES	THIS UNIT ALSO INCLUDES LOW ANGLE,
53		SEDIMENTARY HILL			Waiotira, Kaimaro, Maungarei,	EARTHSLIP	SLIGHT SHEET,	LOWLAND PODOCARP	PLANT POPLARS IN TUNNEL GULLIES	STABLE GREYWACKES, AND DACITES
54		COUNTRY			Purua, Marua and Omako suites.	NIL TO SLIGHT SOIL	AND SLUMP, SOILSLIP	HARDWOOD FOREST		
55						SLIP, SHEET, AND		FERN		
56						SLUMP		KAURI FOREST		
57										
58	VIE2	STRONGLY ROLLING TO	SEMI-INTENSIVE TO	INTENSIVE GRAZING	WEAKLY TO MODERATELY	NIL TO MODERATE	MODERATE SOIL SLIP,	HIGH AND LOW	OPEN PLANT POPLARS ON MASS	SOILS ARE OF MEDIUM TO HIGH FERTILITY
59		STEEP SLOPES ON	INTENSIVE GRAZING		LEACHED BROWN GRANULAR	SOIL SLIP, SHEET, AND	SHEET, AND GULLY	PRODUCING PASTURE	MOVEMENTS	DEEP COLLUVIUM AT BASE OF SLOPES
60		MODERATELY LEACHED			LOAMS AND CLAYS - Huia, Te Kie,	GULLY, EARTHSLIP	EARTHSLIP	LOWLAND PODOCARP	PAIR PLANT WILLOWS IN GULLIES	PRONE TO GULLY AND EARTHSLIP EROSION
61		BROWN GRANULAR			Katui, Kaimaro, Haunga, Tokawhero			HARDWOOD FOREST		
62		CLAYS AND LOAMS			Maungarei and Parau suites.			MANUKA		
63								FERN		
64										
65	VIE10	STRONGLY ROLLING TO	SEMI-INTENSIVE GRAZING	SEMI-INTENSIVE TO	STRONGLY LEACHED TO PODZOLISED	NIL TO MODERATE	MODERATE SHEET	MANUKA	PAIR PLANT WILLOWS IN GULLIES	SOILS VERY ACIDIC (PH 3.4-4.8)
66		MODERATELY STEEP	LARGE AREAS UNDEVELOPED	INTENSIVE GRAZING	NORTHERN YELLOW BROWN EARTHS	SHEET, GULLY	GULLY, EARTHSLIP	HIGH AND LOW	DIVERSION BANKS	
67		GUMLAND SLOPES		PRODUCTION FORESTRY	- Omu, Waiotira, Marua, Purua, Te	EARTHSLIP AND	AND SOILSLIP	PRODUCING PASTURE		
68					Kie, Maungarei, Pinaki, and Omaiko	SOILSLILP		FERN		
69					suites.			RUSHES AND SEDGES		
70										
71	VIIE1	STEEP TO VERY	SEMI-INTENSIVE TO	SEMI-INTENSIVE GRAZING	NORTHERN STEEPLAND BROWN	SLIGHT TO MODERATE	MODERATE SOILSLIP	LOWLAND PODOCARP	OPEN PLANT POPLARS ON MASS	SOILS OF MEDIUM TO HIGH FERTILITY, PRONE
72		STEEP SLOPES ON	EXTENSIVE GRAZING	EROSION CONTROL	GRANULAR LOAMS AND CLAYS -	SOILSLIP, EARTHSLIP	EARTHSLIP, SHEET AND	HARDWOOD FOREST	MOVEMENTS	TO SUMMER DROUGHT, COLLUVIAL SOILS
73		BROWN GRANULAR		FORESTRY	Huia, Te Kie and Maungarei suites.	GULLY AND SHEET	GULLY	HARDWOOD FOREST	PAIR PLANT WILLOWS IN GULLIES	SUBJECT TO GULLY AND FLOW EROSION. DUE TO
74		LOAMS AND CLAYS						HIGH AND LOW		DEEPER WEATHERING. F SLOPES ON MANUKAU
75								PRODUCING PASTURE		BRECCIA HAVE SIMILAR CHARSACTERISTICS TO
76								MIXED NATIVE SCRUB		G SLOPES ON TANGIHUA VOLCANICS
77								ASSNS		
78										
79										
80										

LAND CAPABILITY EXTENDED LEGEND

Appendix 3
Pastoral Farming Scenario Details.

There are four parts to this appendix. The first part contains a copy of the farm questionnaire, the second the questionnaire results and the third details on the direction and categories of farm expenditure. The fourth part compares the farm questionnaire results with the farm data that would have been collected if MAF representative farm models had been used.

Part A The Farm Questionnaire.

This questionnaire does not contain all the questions asked of farmers. They were, for example, also asked about shearing expenses, sheep income details and were appropriate more details on the direction of expenditure.

DEPARTMENT OF AGRICULTURAL ECONOMICS AND FARM MANAGEMENT

MASSEY UNIVERSITY

FARM QUESTIONNAIRE

Instructions/Introduction

1 Please answer questions for the total area you farm.

2 Please attempt all questions, even if you are unable to complete them fully.

3 Personal Interviews and Collection of the Questionnaire

I would like to interview all of the 70-odd farmers in the study area - to discuss the questionnaire, the forestry/farming issue and government agricultural policy. I'll telephone to ask for an interview and to arrange a time suitable to you. The interviews should not take any longer than 1.5 hours. It would be very much appreciated if you could complete the questionnaire before the interview takes place, so that I can take it with me when the interview is finished.

I will begin telephoning shortly and wish to have the interviews completed by the end of July. If you have not been contacted by me by August 1 could you please return the questionnaire to me in the envelope provided.

4 Confidentiality of Information Supplied

No information in this questionnaire will be used in any way that could lead to that information being linked to you.

No information in this questionnaire will be seen or used by anyone except the researchers - Dr Anton Meister and myself - and we will not reveal anything to anyone else.

5 Accuracy of Information Supplied by You

It isn't necessary to provide information on income and expenditure accurate to the last dollar. An accuracy of plus or minus 10% is good enough.

6 If you cannot complete the survey because you do not live or work on the farm the Valuation Department has in your name, please return the questionnaire to me, with the name and address of the person best able to answer the questions. (The study area was mapped on Valuation Dept. maps and your name and address gained from their records and the telephone book.)

7 The success of the research depends on your participation - please complete the questionnaire. Having grown up and worked in Northland I am very much aware of the concern expressed over forestry operations in some areas. This research provides you with an opportunity to have your views on the issue included in the research report. The greater the participation of the farmers

the more accurately this research will indicate the impact of forestry operations on the economic and social fabric of pastoral farming areas.

If you have any queries please feel free to contact me at :

70A Marsden Point Rd
Ruakaka
Phone 27586 (Evenings)

David H. Smith.

Accounting Period Used In This Questionnaire

Many of the questions concerning income and expenditure in this questionnaire seek answers based on the 1July 1983 to 30 June 1984 accounting year . This is called the 1983-84 accounting year throughout the questionnaire. If you use a different accounting year could you please write it down here _____ and answer the questions according to whatever accounting year you do use.

A BASIC FARM STATISTICS

1 Farm Area

Total surveyed hectares owned and occupied (1ha = 2.5ac) _____

Additional leased hectares farmed in association with the above total hectares _____

Total of all land regularly grazed _____

2 Exotic Forests

Are you considering planting trees for timber production at some future date? Yes No Not Sure (Circle one)

Please give your reasons for answering the way you did _ _ _ _ _ _ _ _ _

_ _

_ _

_ _

If you are considering planting exotic trees for timber production, would you have woodlot forestry or agroforestry on your farm? _ _ _ _ _ _

_ _

_ _

3 Livestock Numbers

Please state the number of animals as of:

30 June 1980, 30 June 1984 and the Present. Could you please put down your latest lambing and calving percentages.

	30 June 1980	30 June 1984	Present	Lamb/Calving % 1984
Total Sheep				
Total Ewes				
Total Dairy Cattle				
Total Beef Cattle				
Total Breeding Cows				
Total Deer				
Total Horses				
Total Goats				

6 If you have children not yet old enough for school, please indicate the primary school each is most likely to attend _ _ _ _ _ _ _ _ _ _ _ _ _ _

_ _

7 If you have children not yet old enough for high school, where are they likely to go for their high school education if you are still on the farm?

_ _

8 How long have you owned/operated/managed this farm? _ _ _ _ _ _ _ _ _ _

FARM EMPLOYMENT INFORMATION

1 Numbers Employed

Could you please fill in the 2 tables below. The first table seeks information on the number of people working on the farm as of 30 June 1984, the second on numbers presently working on the farm.

Farm employment is split into three catagories:

i) The first includes working owners, leaseholders, sharemilkers and managers who have a financial or managing interest in the farm.

ii) The second catagory concerns unpaid work by members of the family.

iii) The third catagory concerns permanent paid farm employees, but casual employees and contractors are not included.

AS OF 30 JUNE 1984

Number Of:	Number of Persons Working on Farm 30 hours or more per week		Less than 30 hours per week	
	Male	Female	Male	Female
Working owners, managers, leaseholders, shareholders				
Unpaid family members assisting with farm work				
Permanent farm employees				

AS OF THE PRESENT TIME

Number Of:	Number of Persons Working on Farm 30 hours or more per week		Less than 30 hours per week	
	Male	Female	Male	Female
Working owners, managers, leaseholders, shareholders				
Unpaid family members assisting with farm work				
Permanent farm employees				

2 Salaries & Wages Paid

Please write down how much was paid to working owners , managers, sharemilkers, leasesholders and permanent farm employees as marked in the tables above. Please don't include any money paid to contractors.

Please include all salaries paid before tax and any bonuses paid.

Salaries and Wages Paid 1 July 1983-30 June 1984 _____

Salaries and Wages Paid 1 July 1984-30 June 1985 (Please estimate)

_____

B FARM POPULATION AND RESIDENCY INFORMATION

1 How many people are currently living in the main or only house on this farm? _____

2 Please indicate who lives in the main or only house on this farm by filling in the table below.

i) If the person listed presently lives in the house, please put a tick in the 'Yes' column.

ii) Write their age in the 'Age' column and

iii) Write 'M' or 'F' for male or female in the 'Sex' column.

	YES	AGE	SEX		YES	AGE	SEX
Yourself				Other 1			
Spouse				Relatives 2			
Defacto				3			
Child 1				Boarders/ 1			
Child 2				Flatmates/ 2			
Child 3				Others 3			
Child 4				4			
Child 5							
Child 6							

3 How many permanently occupied houses are there on this farm? _____

(If your answer was '1', please go to ques. 5.

4 For each house beside the one you live in, could you please provide the following information:

a) Are the people in the additional house(s) there because at least one of them works on the farm?

House 1 House 2 House 3 (Circle one for each house.)

Yes No Yes No Yes No

b) Could you please note down a contact name and phone number for each household _____

_____

5 If there are children of school age in your home, please name the school that each attends _____

_____

D FARM INCOME FOR THE 1983-84 ACCOUNTING YEAR

To successfully complete the research we need to know what you sold from your farm and how much you earned. With this information from all the farms we can say how much production and income will drop if the study area goes into forestry.

Accuracy of figures given by you: Figures given by you do not have to be accurate to the last $, as a guide give figures accurate to plus or minus 10%.

1 Gross Income Over Accounting Year

1.1 Beef Cattle Gross Income

Total earned from sale of beef cattle _____

Total number of stock sold _____

Number of store store stock sold _____

Number of fat stock sold _____

What percentage of total store stock sold were sold at:

Dargaville stock yards ____% Whangarei stock yards ____%

1.2 Milk Gross Income

Kilograms of butterfat sold during the 1983-84 season _____

Dairy company milk sold to _____

1.3 Dairy Stock Gross Income (Boner cows, bobby calves, dairy beef.)

Total gross income from dairy stock _____

Total numbers of dairy stock sold _____

1.4 Wool Gross Income

Total gross income from wool _____

Total kilograms sold _____

How often do you shear? _____

How many times did you shear in the 1983-84 year? _____

1.5 Other Income

This includes income from other livestock sales, casual or contract work off farm and employment elsewhere.

Total gross 'Other Income' _____

Income from other livestock _____

E FARM EXPENDITURE OVER THE 1983-84 ACCOUNTING YEAR

By finding out how much you spent on goods and services used on your farm and where you spent this money we can see how much all the farms in the study area contributed to businesses in Dargaville and Whangarei.

Accuracy of figure provided by you: As a guide, round figures to plus or minus 10%.

1. Location of Expenditure

1.1 Do you or your farm have accounts with shops and businesses in:

Whangarei	Yes	No	(Circle as appropriate.)
Dargaville	Yes	No	
Parakao	Yes	No	
Tangiteroria	Yes	No	

1.2 If you circled both Whangarei and Dargaville could you please indicate what percentage of total farm expenditure took place in each.

Dargaville _____% Whangarei _____%

2. Fertiliser Use

2.1 Total amount spent on fertiliser (including spreading costs) over the 1983-84 accounting year _____

2.2 Amount of fertiliser spread in tonnes _____

Fertiliser Type	Tonnes Spread	Who did you buy it from?	Spread by? (Please name companies)
Phosphatic types, Total			
Total Lime			
Others e.g. Nitrogen			
Commercial Mixtures (Specify)			

Was this a typical year for fertiliser application? _____

_____

3. Development Projects

3.2 If you have commenced any development projects since July 1 1983, please list them below, along with their estimated completed cost

_____

_____

_____

3.2 Could you please indicate total expenditure on development projects for the 1983-84 accounting year. _____

4 Animal Health Expenditure

Total paid for animal health - including LIA fees _____

Where is your vet based? _____

5. Chemical Weed and Pasture Control

Please put down the total paid for sprays to control weeds, crickets gorse etc _____

6 Farm Repairs and Maintenance

Total spent in farm repairs and maintenance (excluding vehicles) _____

Could you please indicate the amount of the total given above spent on:

Fencing _____

Water Supply and Drainage (exclude electricity costs) _____

7 Vehicle Expenses

Total paid for fuel,oil and grease _____

Total paid for vehicle repairs and maintenance _____

Do you use garages for repairs and maintenance in:

Dargaville Whangarei Tangiteroria Parakao Elsewhere

(Circle as appropriate)

Please list vehicles owned by you and the year they were manufactured.

For example:

Falcon Car	1979	_____
Datsun Ute	1978	_____
John Deere 250hp	1980	_____
Isuzu Truck	1984	_____
Yamaha 175	1983	_____

If you bought any vehicles during the 1983-84 accounting year, could you please list them, their approximate cost and what town or city you paid for them in:

Vehicle	Approx. Cost	Where Paid For

8 Administrative Expenses

Accountancy Fees

Total Spent _____

Where is your accountant based? _____

Whangarei Dargaville Elsewhere (Circle One)

Where was your accountant based on 1 July 1980? _____

Legal Costs

Total Spent _____

Was this a typical year for legal expenses? Yes No (Circle One)

Where is lawyer based?

Whangarei Dargaville Elsewhere (Circle One)

Where was your lawyer based on 1 July 1980? _____

9 Insurance

Premiums paid as on farm accounts _____

10 Loans and Mortgages

Total annual interest and principal paid on fixed mortgage 1983-84

_____

Could you please indicate your overdraft limit _____

Please indicate sources of funds borrowed for financing your farm business. (Tick those sources used)

	Location/Branch
1. Rural Bank	- - - - - - - -
2. Bank	- - - - - - - -
3. Insurance	- - - - - - - -
4. Solicitors	- - - - - - - -
5. Others (E.g. Family, Stock Firm etc)	- - - - - - - -

F PERSONAL DRAWINGS 1983-84 ACCOUNTING YEAR

1 Personal Drawings 1983-84 _____

2 Current average monthly housekeeping budget.
Could you please estimate your monthly housekeeping budget, excluding power, hire purchase payments and telephones charges. _____

3 What did you buy in the way of:
Furniture & fittings, stereos, T.V.'s, freezers and refrigerators (etc) over the last 12 months?

i) Please list any items worth over $100 purchased in the last 12 months in the table below.

ii) Could you please indicate their approximate retail cost and what town or city you bought them from.

iii) If they where bought on hire purchase, please tick the last column of the table.

iv) Please indicate your total monthly hire purchase payments under the table.

Item Bought	Approx Retail Cost	Where Bought	H.P.?

Present total monthly H.P. payments on household items (not including vehicles.) _____

THANK YOU VERY MUCH FOR YOUR ASSISTANCE

Part B

Questionnaire Results and other data relevant to the study area farms.

A. BASIC FARM STATISTICS

NUMBER OF FARMS APPROACHED	59
REFUSALS	2
PARTIAL INFORMATION - FARM OCCUPIED LESS THAN 1 YEAR	1
FARMS INFORMATION ANALYSED FROM	57

1. FARM AREA _____

SIZE OF SURVEY AREA -	59 Farms	16,168. ha
REFUSALS -	2 Farms	831. ha
ON FARM LESS THAN 1 YEAR -	1 Farm	220. ha
TOTAL AREA SURVEYED		15,117.ha
TOTAL REGULARLY GRAZED		About 14,550.ha
		Or About 95%

3 LIVESTOCK NUMBERS

SHEEP NUMBERS 1980	
Farms with sheep	38
No data	6
(4 no reason, 2 not on farm in 1980)	
Farms supplying data	32
Total ewes	38,466
TOTAL SHEEP	58,043
SHEEP NUMBERS 1984	
Farms with sheep	39
No data	1
(No reason)	
Farms supplying data	38
(4 of these had smali numbers of sheep mainly for on farm use.)	
Total ewes	54,423
TOTAL SHEEP	70,114

SHEEP NUMBERS 1985	
Farms with sheep	39
No data	1
(No reason)	
Farms supplying data	38
(4 of these had small numbers mainly for on farm use.)	
Total ewes	52,930
TOTAL SHEEP	78,916

Sheep numbers could be compared between 1980 and 1985 on 32 farms:
1980 58,043
1985 64,089 - an increase of 10.4%

Farms increasing sheep numbers	25
Farms decreasing sheep numbers	6
Stationary	1

DAIRY CATTLE NUMBERS 1980	
Farms with dairy stock	23
Farms milking	22
Refusals (No reason)	1
Farms supplying data (1 non milking)	21
TOTAL NUMBERS OF DAIRY STOCK	3,048

DAIRY CATTLE NUMBERS 1984	
Farms with dairy stock	24
Farms milking	22
Refusals (No reason)	1
Farms supplying data (2 non milking)	23
TOTAL NUMBER OF DAIRY STOCK	3,701

DAIRY CATTLE NUMBERS 1985	
Farms with dairy stock	24
Farms milking	21
Farms supplying data (3 non milking)	24
TOTAL NUMBER OF DAIRY STOCK	3,841

BEEF CATTLE NUMBERS 1980	
Farms with beef cattle	44
Refusals/No data (3 No reasons, 1 farm boundary changed)	4
Farms supplying data	40
TOTAL NUMBER OF BEEF CATTLE 1980	9,824

BEEF CATTLE NUMBERS 1984	
Farms with beef cattle	46
Refusals (No reason)	1
Farms supplying data	45
TOTAL NUMBER OF BEEF CATTLE 1984	11,525

BEEF CATTLE NUMBERS 1985	
Farms with beef cattle	46
Refusals (No reason)	1
Number of farms moving into beef	2
Number of farms moving out of beef	2
Farms supplying data	45
TOTAL NUMBER OF BEEF CATTLE 1985	12,388

On the 37 farms that allow comparison between 1980 and 1985, beef cattle numbers changed from 9,754 to 9,672.

BREEDING COW NUMBERS 1980	
Farms with breeding cows	36
Refusals (No reason)	5
Number supplying data	31
TOTAL NUMBER OF BREEDING COWS	3,746

BREEDING COW NUMBERS 1984	
Farms with breeding cows	34
Refusals (No reason)	1
Number supplying data	33
TOTAL NUMBER OF BREEDING COWS	3,900

BREEDING COW NUMBERS 1985	
Farms with breeding cows	35
Refusals (No reason)	1
Number supplying data	34
TOTAL NUMBER OF BREEDING COWS	3,676

FARM CARRYING CAPACITY SU PER HA

Two sets of figures are presented: one for stock units per total farm area; the other for stock units per grazed farm area. Although figures are presented to one tenth of a su, it is stressed this is only to indicate the differences between total farm and effective farm carrying capacity. The figures should be rounded up or down to the nearest stock unit when used generally.

Basis on which stock units figures were calculated:
Sheep - ewes = 1, other sheep = 0.7.
Dairy Stock = 6. (This worked out as an average figure to take account of milking cows of different breeds and of other dairy stock.)
Beef Cattle = 4.5 (Again an average to take account of different age groups.)
Breeding Cows=6.
Goats=0.4.

The third column lists the main income source of each farm.
Key: S+W = Sheep and Wool, D = Dairy, B = Beef.

Table 1 Stock Units Carried & Farm Income Source.

Farm	Total Farm	Effective Farm	Main Income Source
1	11.7	12.9	S+W
2	12.2	12.2	D
3	10.2	18.6	D
4	12.6	13.5	S+W
5	8.4	8.4	S+W
6	11	9.5	S+W
7	9.7	9.7	S+W
8	14.5	14.5	W
9	12.3	13.3	S+W
10	10	10.1	B
11	12.3	13.4	S+W
12	INSUFFICENT DATA		
13	9.6	9.6	D
14	12.1	12.8	D
15	12.9	12.8	B
16	11.9	12.6	D
17	9.3	13.4	D
18	12.7	12.9	S+W
19	10.2	10.4	S+W
20	13.4	13.4	S+W
21	.7	10.9	S+W
22	11.5	12	S+W
23	13.5	13.5	D
24	9.5	9.5	S+W/D
25	16.5	16.8	B
26	13.1	13.1	B
27	11.2	16.5	B
28	12.7	12.7	
29	10.8	10.8	S+W
30	8.8	8.8	B
31	12.8	12.8	D
32	9.4	10	B
33	12.3	12.3	B
34	11.1	11.1	S+W
35	12.8	14.4	S+W
36	12.1	12.9	B
37	2.1	2.7	B
38	15.1	15.4	D
39	9.6	9.7	B
40	11.6	11.6	S+W
41	10.3	11	B
42	8.7	10.5	S+W
43	12.9	14.3	D
44	3.5	3.5	D
45	8.1	8.1	B
46	10.3	10.3	D
47	14.8	14.8	D
48	10.4	13.1	D
49	11.2	11.2	D
50	21.5	21.5	B
51	8.1	9.7	D
52	13.9	14.1	B
53	10	13.1	D
54	11.6	16.2	D
55	12.4	12.5	S+W
56	12.2	12.2	S+W
57	11.8	11.8	N/A

B FARM POPULATION AND RESIDENCY INFORMATION

Farms supplying data	57
Number with occupied houses on the farm property	53
(The 4 without are part-timber farms (3) and part of a farm with the house and the rest of the farm elsewhere)	
Total number of occupied houses on the 57 farms	78
Total number living in these houses	300
Total number of houses where the household is not dependent on farm as main source of income.	14
Total number living in these houses	33
Total living in houses where the farm is the main or only source of household income	267

CHILDREN - School Breakdown

Pre-school children	Main farm houses	14
	Other farm houses	3
	Non farm houses	
Primary school children	Main farm houses	43
	Other farm houses	9
	Non farm houses	6
High school children	Main farm houses	27
	Other farm houses	2
	Non farm houses	0

'Main farm houses' are those lived in by the farm owner, manager or leaseholder.

'Other farm houses' are those lived in by sharemilkers farm workers or any other person such that that household receives its main source of income from the farm.

'Non farm houses' are those on the farm and where the household is not dependent on the farm for its source of income.

School Attendance/Intended Attendance

Key: P= Parakao TGT= Tangiteroria T= Tangowahine M= Mangakahia Area School D= Dargaville High School W= Any Whangarei School E= Any school elsewhere.

Table 2 School Attendance

	P	TGT	T	M	D	W	E	Total
Primary School (Intended)	1	6	6	2				14
Main farm houses			3					3
Other farm houses			1					1
Primary School (Actual)								
Main farm houses	6	20	13	2		1	1	43
Other farm		1	6				2	9
Non farm		3	3					6
Secondary School (Intended)								
Main farm houses				6	38	7	2	53
Other farm				2	10			12
Non farm						1		1
(Unsure: 4 Main farm and 2 Other Farm between W and D Unknown: 4 Non farm)								
Secondary School (Actual)								
Main farm				2	24	1		27
Other farm					2			2
Non farm								0

C FARM EMPLOYMENT INFORMATION

The many hours work per week contributed to farm households by wives/partners is recognized as an integral part of the farm. These employment questions are designed find out the employment generated by the farm not the farm household - household work would continue if the household was located in a non-farm environment.

FARM EMPLOYMENT

Key: W= Working owners, managers, leaseholders and shareholders

U= Unpaid family members assisting with farm work

P= Permanent farm employees

DATA FROM 56 FARMS
FOR 30 JUNE 1984

Table 3 Farm Employment June 1984

	Number of people working on farms: 30 hours or more per week.		Less than 30 hours per week	
	Male	Female	Male	Female
W	59	19	2	6
0	7	19	19	17
P	17	1	1	0
Totals	76	27	22	23

DATA FROM 57 FARMS
FOR 30 JUNE 1985

Table 4 Farm Employment June 1985

	Number of people working on farms: 30 hours or more per week.		Less than 30 hours hours per week	
W	58	23	5	7
U	0	6	16	10
P	14	2	2	0
Totals	72	31	23	23

WAGES & SALARIES PAID

Only wages and salaries going to farm employees (including manager and family members paid for farm work) was counted. Wages and salaries taken out of the farm by owners were counted under personal drawings.

Wages and salaries paid 1983-84 Financial Year: $167,503

This was paid to 16 30+ hours per week employees

Wages and salaries information was not supplied for one other 30+ and two 30- hours per week.

Distribution of Wages and Salaries

5 people received $12,000 or more

0 " " $10,000-$12,000

5 " " $8,000-$10,000

4 " " $6,000-$8,000

3 " " Less than $6,000

WAGES AND SALARIES PAID 1984-85 FINANCIAL YEAR: $168,494

This was paid to 17 people - two were employed for only part of the year

There were 15 30+ hours per week employees

Wages and Salaries paid were not stated for one other employee.

Distribution of Wages and Salaries:

4 people received $12,000 or more

2 " " $10,000-$12,000

8 " " $8,000-$10,000

2 " " $6,000-$8,000

1 person received Less than $6,000

D FARM INCOME FOR THE ACCOUNTING YEAR

BEEF CATTLE SALES AND INCOME FOR THE 1983-84 YEAR	
Number of farms with beef cattle income	45
Number supplying data	44
TOTAL INCOME FROM BEEF CATTLE	$1,507,622
Number sold	4,752
Store Stock sold	2,042
Fat Stock sold	2,550
Not stated	160

Store Stock Sales	
Sales through Dargaville	1,284
Sales through Whangarei	607
Place of sale not stated	151
Total	2,042
Sales to private buyers	161

BUTTERFAT PRODUCTION 1983-84 YEAR	
Number of farms selling butter fat	21
Farms supplying data	21
TOTAL KILOGRAMS OF BUTTERFAT PRODUCED	295,460
TOTAL INCOME FROM BUTTERFAT	$1,047,868
DAIRY STOCK INCOME	
Number of farms selling dairy stock	20
Number supplying data	19
Total Income from Dairy Stock	$164,388
Total Number of Dairy Stock Sold	972
SHEEP & WOOL SALES AND INCOME 1983-84	
Number of farms selling wool	38
Number of farms supplying data	38
(Approximate data-to within 10% accuracy-came from of these farms)	5
TOTAL WOOL SOLD (Kgs)	334,155
TOTAL WOOL INCOME	$895,441
Number of farms selling sheep	33
Number of farms supplying data	33
(Approx data-to within 10% accuracy-came from 4 of these farms)	
TOTAL SHEEP and LAMBS SOLD	42,666
TOTAL SHEEP and LAMB INCOME	$808,194

OTHER INCOME	
Income from other livestock	$16,351
Other farm related income (E.G work on other farms, grazing, and horticulture.)	$41,188
Wages Non farm jobs	$37,040
(4 People had non farm jobs)	
Interest	$5,000
Total Livestock Income	$4,439,864
Total Non-Livestock Income	$83,228
TOTAL INCOME	$4,523,092

Table 5 Farm Income Breakdown

	% Of Income From: Beef	Milkfat	Dairy	Wool	Sheep	Other Livestock	Other
1	5.9			51.9	37.3	4.9	4.5
2		100					
3		75.5	17.7				
4	15.4			49.9	33.1		1.5
5	41.2			38.1	20.7		
6	32.8			31.4	35.7		
7	37.3			30.2	32.6		
8	40.0			46.9			13.1
9	35.5			39	25.6		
10	71.2			16.2	12.6		
11	28.1		15.2	24.5	23.7		
12	INSUFFICIENT DATA SUPPLIED						
13		73.7	22.4	2.2	1.6		
14	46.0	37.2	13.3	3.5			
15	95.9			2.4	1.8		
16	23.1	52.6	1.4	7.3	15.6		
17		71.5	18.3	4.4	5.8		
18	42.9			40.6	16.4		

Table 5 (Con't)

19	28.6			46.1	25.3	
20	31.8			40.9	27.3	
21	40.4			32.2	27.4	
22	50.0			33.3	16.7	
23	33	67				
24	27.5	33.4	4.1	19.6	15.4	
25	98.8			1.2		
26	100					
27	100					
28	41.4			27.4	31.3	
29	35.9		12.0	29.5	22.6	
30	71.3			8.8	20	
31	16.6	79.6		2.3	1.5	
32	65.3	7.9				26.8
33	57.7			22.0	20.4	
34	27.0			40.0	33.0	
35	46.7			25.9	27.4	
36	66.0			21.0	13.1	
37	100					
38	17.6	69.8	7.5	5.0		
39	100					
40	4.3			44.9	50.9	
41	100					
42	44.2			31.4	28.6	
43	39	52.3	8.7			
44	76.8	23.2				
45	100					
46		85.4	14.6			
47		91.6	8.4			
48		79.1	20.9			
49	14.3	78.1	7.6			

Table 5 (Con't)

50	56.0		11.8				32.2
51	17.2	59.3	4.8	6.8	11.9		
52	37.3			20.1	13.8	7.5	22.1
53	38.5	61.8					
54		73.9	16.4	.8		8.9	
55	22.1			49.8	28.1		
56	26.2			31.8	42.1		
57	N/A						

The detailed data in Table 5 gives a farm by farm income source breakdown. This information indicates the relative dependence of farms on different income sources. For example, seven of the farms that gained income from dairying received 91 - 100% of their total income from dairying, which shows that are few exclusively dairy farms in the study area. The table also shows that seven farmers are almost exclusively dependent on beef for their income, while no farmer is similarly dependent on sheep. The current trend is for increasing beef numbers on Northland farms, so one can expect that farmers income dependency on beef will increase.

E FARM EXPENSES

1 LOCATION OF EXPENDITURE

Location of Farm Accounts

Shop and Business Accounts in Dargaville only	24
Shop and Business Accounts in Whangarei only	3
Shop and Business Accounts in Whangarei & Dargaville	30
Shop and Business Accounts in Parakao	6
Shop and Business Accounts in Tangiteroria	7

These figures suggest that more study area farm expenditure will go to Dargaville than Whangarei, as will be shown to be the case.

Table 6 shows the direction of expenditure from the study area farms by percentage category. It shows, for example, that eight farms spend 90% or more of their farm expenditure in Dargaville, with 3 other farms spending 90% or more in Whangarei.

Table 6 Farm Expenditure Direction by Percentage Category.

Percentage Category	Number Of Farms In Category & Spending In: Whangarei	Dargaville
5	2	1
10	7	3
15	0	0
20	3	0
25	1	2
30	1	2
35	3	1
40	0	1
45	0	1
50	1	0
55	5	5
60	0	1
70	1	3
75	0	1
80	2	3
85	0	1
90+	3	8

2 FERTILISER USE

Total Spent on Fertiliser and Lime (Including Spreading)	$647,992
Farms spreading fertiliser	50
Accurate data on the amount spent	44
Approx data (accurate to + or - 10%	6
Total Amount of Fertiliser Sold (Data from 49 out of 50 farms)	7,495. Tonnes

Table 7 Fertiliser and Lime Use

Fertiliser Type	Ground Spread	Air Spread
Phosphatic	1785	1761
Lime	366	3555
Others		13. (About)
Unclear		15
	2151	5344

Fertiliser Air Spreading Split	
Fixed Wing	1861 tonnes
Helo	290 tonnes

3 DEVELOPMENT EXPENDITURE

Farms with development projects	15
Farms supplying expenditure data	14

The 15th farm had a continuing development programme and the figure of $126,712 understates the total spent. By how much is difficult to estimate, but is by at least 10%.

Most development projects consisted of bringing in or improving pasture. For 2 farmers, development was on land next door bought and being incorporated into the existing farm.

Total Spent	$125,712

4 ANIMAL HEALTH EXPENDITURE

(Note this includes stock food)

Data from :	55
Approximate data :	2

The Northern Wairoa Dairy Company has a vet club which is used by most farmers with the 2 Maungatapere dairy factory suppliers using the vet there.

Total Spent	$141,835

Location of Vet Used	Dargaville	52
	Whangarei	3
	Maungatapere	2

5 CHEMICAL WEED AND PASTURE CONTROL

Number of farms supplying information	56
On farm less than one year	1
Number of farms with no expenditure in this category	7
Total Spent	$111,392

6 FARM REPAIRS AND MAINTENANCE

Number of farms supplying complete data	51
Partial data	5
No data - on farm less than one year	1
Total from 50 farms (Complete Data)	$339,437
+ Partial Data	$22,156

The partial data consisted of 5 farm's spending on fencing, water supply and drainage. Fencing spending = $108,242, Water supply and drainage = $58,478.
Therefore, spending on farm repairs and maintenance is understated. Taking average farm expenditure on this catagory suggests it is understated by about $10,000 - less than 3%.

7 VEHICLE EXPENSES

Farms Supplying Data	55

Farmers were asked to split vehicle running expenses between fuel and repairs, but farm accounts did not always provide such an information breakdown. The average percentage split between fuel and repairs over the 28 farms that gave accurate figures for the two were applied over all the farms.

Fuel and oil expenditure	$159,886
Repairs	$130,816
Total Spent	$290,702

Location of garages used

Whangarei	Number using garages there	18
Dargaville		41
Tangiteroria		12
Parakao		1
Elsewhere		2

Table 8 Vehicles Bought

Vehicle Type	Where Bought	Amount Spent	Number Bought
Bike/Trike	Dargaville	$16,050	6
	Wellsford	$2,700	1
Cars	Whangarei	$17,300	1
	Dargaville	$153,657	11
	Kaikohe	$19,300	1
	Auckland	$18,000	2
Utes	Whangarei	$20,000	2
	Dargaville	$31,000	2
Tractors	Whangarei	$82,500	3
	Dargaville	$68,700	5
Trucks	Whangarei	Not Known	1
	Dargaville	$13,000	1
	Elsewhere	$3,550	1
Totals		$445,757	

Total Vehicle Purchase Expenditure in:	Dargaville	$282,407
	Whangarei	$119,800
	Elsewhere	$43,550

Shearing Expenses $141,200

This was calculated by taking actual shearing costs supplied by 25 farmers, finding the per sheep stock unit cost and applying this to all farms with sheep, (except those that did their own shearing).

Freight $165,000

The freight operators who gained a significant part of their business from the study area where asked to estimate how much business they got from the study area, then about 15% was added on to allow for freight going to other transport firms. This 15% is an estimate only based on farmer statements. $145,000 of the $165,000 went to local transport firms.

Electricity $65,023

This was calculated from MAF estimates of per stock unit expenditure on electricity

B ADMINISTRATIVE EXPENSES

Accounting Fees
Data from 55 farms

Total Spent		$43,014
Amount of this spent in:	Whangarei	$16,319
	Dargaville	$14,227
	Elsewhere	$12,468
Location of Accountants Used	Whangarei	23
	Dargaville	26
	Elsewhere	7

Legal Costs
Data from 56 farms

Number of farms with legal expenses		24
Total Spent		$13,877
Locaton of Lawyers	Whangarei	19
	Dargaville	30
	Elsewhere	7

9 INSURANCE (FARM INSURANCE)

Data from 56 farms

This is farm insurance only, which does not include personal insurance and it understates expenditure on farm insurance as a number of farmers could not reconcile insurance premiums paid for farm insurance with the amount in the farms accounts.

Total Spent $55,539

10 LOANS AND MORTGAGES

Number of farms without mortgage	7
Number of farms not supplying data	3
Farms paying mortgage and supplying data	47
Total Annual Interest and Principal Paid on Fixed Mortgage	$563,730

Sources of funds: (Mortgage and other farm finance.)

Rural Bank	42
Bank	36
Insurance	2
Solicitors	6
Others	20

Of the 36 farms using their trading bank as a source of farm finance, 23 used Dargaville banks and 13 used Whangarei banks.

F PERSONAL DRAWINGS AND EXPENDITURE

Personal Drawings	
Farms supplying data	45
Refusals	8
Non resident owners/operators	3
On farm less than one year	1
Personal Drawings Total	$510,660

The partial data is where farmers did not give a total for personal drawings, but did give figures for monthly housekeeping and/or major items of household expenditure. Included in 'Personal Drawings' figure are any wages and salaries paid to owners and partners by the farm, with wages paid to non-owner managers are counted under the wages section.

Farmers were asked what their monthly housekeeping budget was and what their expenditure on major household appliances, furniture and fittings had been in the previous 12 months . (The amount spent on household appliances and fittings was $55,204.) For many farmers the monthly housekeeping budget given was an estimate only, as there was an extraordinary range in the figures supplied for the monthly housekeeping budget question, these figures should be taken as an indication only

Main Farm House data	
Farms supplying data	50
Not sure, refusals	4
Non resident farm owner/operator	3

Total Spent per Month on Food and Clothing	$21,497
Total per Year	$257,964

Expenditure on Household Appliances, Furniture and Fittings	
Number of farms supplying data	54

Non residents	3
Total Spent	$55,204
Amount spent in:	
Dargaville	$38,185
Whangarei	$13,919
Auckland	$3,100

FARMER ATTITUDES TOWARDS FORESTRY AND GOVERNMENT AGRICULTURAL POLICY

EXOTIC FORESTS _____

Are you considering planting trees for timber production at some future date? Yes No Not Sure

Please give your reasons for answering the way you did.

Number of respondents

Yes 14

No 37

Not Sure 5

Reasons given by those 14 who answered "Yes" were:

1. For possible/intended future farm use - posts, shelter and other farm use 4
2. Areas of farm are suitable only for trees or trees are the best use of some land 3
3. Erosion Control 3
4. Have an interest in trees 3
5. Trees will and are being planted in rough corners of paddocks and untidy areas 2
6. Poor soil 1
7. Trees will help spread income source 1

Timber production was the prime reason for considering planting in 2 cases.

Reasons given by those 37 who answered "No" were:

1. The returns are too slow 6
2. Not interested,the idea doesn't appeal 4
3. No particular reason 4
4. Have already planted trees and do not want anymore 3

5. Doubts about the financial return	3
6. Already enough timber on the farm (IE Natives)	3
7. The farm size is such that all of the farm is needed for stock, and doesn't want to lose land to trees	2
8. Doesn't want or need timber	2
9. Too much work involved	2
10. The farm is already in pasture and is more suited to pasture than trees	2
11. Development costs are too high	1
12. Have never thought about it and there is no incentive to	1
13. Trees planted for stabilisation purposes only	1
14. Prefers grass, with native trees for shade and shelter	1
15. It's cheaper to buy timber and posts	1
16. Not a timber farmer	1
17. The majority of the farm has already been sold to forestry interests	1

Reasons given by those 5 who answered "Not Sure" were:

1. The County restricts area that can be planted in trees, would be interested in planting all of hill country (160ha) it it was more profitable than sheep.	1
2. Lack of taxation or investment incentives	1
3. Forestry is a waste of pastoral farmland but would consider woodlot or agroforestry on the rougher country	1
4. Have 25ha in scrub/manuka and forestry is one option for using it	1
5. Have thought about it but probably would not get around to it	1

If you are considering planting exotic trees for timber production would you have woodlot forestry or agroforestry on your farm?

Of the 14 who are considering exotic forestry:

Woodlot	8
Agroforestry	1
No answer/Not sure	5

Of the 5 who said Not Sure:

Woodlot	4
Agroforestry	1

There is a general lack of enthusiasm for planting trees for timber production. In only two cases was timber production the the prime reason and those two farmers are the only ones I would describe as being very interested and enthusiastic about forestry. Speeding up the financial returns (through a joint venture with a forestry company, for example) and demonstrating an adequate return would still leave the majority of farmers unenthusiastic about farm forestry because most reasons for not planting exotics for timber production were non financial. What was clear in the discussion I had with farmers is that the majority see a conflict of interest between growing trees for timber production and pastoral farming.

Woodlots were favoured over agroforestry for a number of reasons: Doubts were expressed over pasture loss with agroforestry, over stock management amongst the trees and the amount of work involved. Additionally, agroforestry is more of an unknown for those thinking about planting exotics. Farmers had not heard of the new tree stocks which significantly reduce pasture loss and tree management effort and the majority showed interest in this development.

Part C.

Farm Expenditure by Category and Direction

Table 9 and 10 are the detailed versions of Tables 4.19 and 4.20 in Chapter 3. These tables are commented on in some detail below - usually by category heading.

Table 9 Farm Expenditure by Direction

Expenditure Catagory	Expenditure Direction Dargarville	Whangarei	Local	Elsewhere	Unclear	Total Expend
Farm Working	1,075,543	542,915	63,250	2,586	0	1,684,294
Shearing	121,100	0	13,500	6,600	0	141,200
Freight	0	0	145,000	0	20,000	165,000
Veh. Purch.	282,407	119,800	0	43,550	0	445,757
Mortgage	51,200	0	0	512,530	0	563,730
Accounting	14,227	16,319	0	12,468	0	43,014
Legal	5,918	5,220	0	2,739	0	13,877
Insurance	0	0	0	0	55,539	55,539
Electricity	65,023	0	0	0	0	65,023
TOTALS	1,615,418	684,254	221,750	580,473	75,539	3,177,434
% (Rounded)	51	22	7	18	2.4	

Table 10 Farm Expenditure by Direction - Including Wages and Personal Drawings

	Dargaville	Whangarei	Local	Elsewhere	Not Clear	Total
Totals	1,615,418	684,254	221,750	580,473	75,539	3,177,434
Wages	115,951	51,552	0	0	0	167,503
Pers. Draw.	338,790	168,776	0	3,100	0	510,666
Totals	2,070,159	969,605	221,750	583,573	75,539	3,855,603
% (Rounded)	54	23	6	15	2	

Farm Working Account

This consisted of expenditure on:

- Fertiliser
- Development
- Animal Health
- Chemical Weed and Pest Control
- Repairs and Maintenance
- Vehicle Fuel and Repairs

All fuel expenditure is assumed to go to Whangarei - there are no oil company offices or storage depots in Dargaville and all fuel is delivered by tanker from Whangarei. It is assumed that farms have fuel delivered, and any purchases from garages in Dargaville or the local area comprise an insignificant proportion of total fuel expenditure.

Shearing and Freight

Shearing and freight expenditure was not included under Farm Working Account because this information was collected separately from the main farmer survey. (See Section 2.3) In the case of shearing there is one shearing gang living inside the study area that has significantly increased its business from the 1983-84 year. The figure down for the 1983-1984 year is an estimate for that year, not for current expenditure on shearing going to the local area.

Freight expenditure from the study area goes mainly to freight operators based in Tangowahine and Tangiteroria, with freight expenditure going to other transport operators difficult to isolate. The MAF representative farm model figures would suggest that overall freight expenditure would be $185,000 - that is $40,000 above the $145,000 going to local freight operators, however study of the amount of stock moved and fertiliser applied would suggest $165,000 is a more realistic figure for total freight expenditure. As it is not possible to say where this estimated $20,000 freight expenditure went, it is listed under the "not clear" column.

Vehicle Purchases

Of the $445,757 spent on vehicles $237,500 was spent on farm vehicles - that is, bikes, utes, trucks and tractors.

Mortgage Payments

The vast majority of farm mortgage finance has been provided by the Rural Bank. It is assumed that all mortgage payments not going to lawyers and trading banks in Dargaville or Whangarei goes outside the region and for all intents and purposes is not available to be spent in the local, Dargaville or Whangarei economies.

Insurance

The direction of insurance expenditure is not clear. Insurance offices are based in Whangarei with only agencies in Dargaville. A number of insurance agents live in Dargaville so some insurance expenditure will go to them and they will in turn spend at least part of their income in Dargaville. However there was not

enough information on where insurance expenditure went to so it was listed under 'Not Clear.'

Electricity

Electricity is supplied by the North Auckland Electric Power Board, which has its head office in Whangarei with a branch office and maintenance depot in Dargaville. Electricity expenditure, which has been estimated from MAF farm model calculations, is assumed to be through the Dargaville office of the NAEPB.

Wages

Most of the farm employees lived on the farms they worked on. All bar one of the farm employees households were asked what their housekeeping budget was and where they carried out their household shopping. This indicated that allocating wage expenditure between Dargaville and Whangarei on the same basis of 30% Whangarei 70% Dargaville was a reasonable estimate.

Personal Drawings

The direction of personal drawings expenditure is an estimate based on the direction of basic farm expenditure. The figure for personal drawings significantly understates actual personal drawing expenditure, because not all farms provided this information. (Though all major appliance, household fittings and furniture items were identified by the place purchased and the amount spent.)

Disaggregating farm and farm household expenditure cannot be done in a completely accurate manner. However the split presented in Tables 9 and 10 provides an accurate picture of the direction of expenditure. All major items of expenditure have been separately identified by the amount and direction of expenditure flow and this allowed checking of farmer estimates of overall percentage expenditure split between Whangarei Dargaville and the local area.

Applicability of the Expenditure Level and Directions Results to other Northland Locations.

This research is a case study based on a specific area and the results cannot automatically be applied elsewhere in Northland. While income and expenditure levels from 56 farms located elsewhere could be close to the income and expenditure levels here, the source of the income and location of expenditure flows are unlikely to be the same. For example, the group of farms being considered may not include any dairy farms and could be located closer to Kaikohe. The impact of a similar mix of sheep/beef and dairy farms is likely to have a similar overall regional impact - but the impact on specific towns and localities will depend on the size and direction of the income and expenditure flows coming from these farms.

This means that before making statements about the impact of changes in land use involving any group of farms, information should be collected off these farms to find out:

1. What the farms produce.
2. Where and what their farm expenditure is spent on.

In some areas there will only be one farm servicing centre which is realistically close, such that farm purchases outside of this centre are unlikely to be significant. For example, in the Far North, once over the Mangamuka Ranges, Kaitaia is the only rural servicing town within reasonable travelling time.

Part D

MAF Representative Farm Income and Expenditure/Questionnaire Comparison

An alternative to the survey method used in this research would be to use MAF representative farm models to calculate the production, income and expenditure arising from a group of farms. Below is presented a comparison between the MAF representative farms predictions of production, income and expenditure and the actual levels produced and spent from the study area farms. (This comparison is not meant to suggest that this is what MAF representative farm models are designed for.) The comparsion shows that a different picture would have been gained by using the MAF Representative Farm figures to predict detailed study area farm production, income and expenditure. The table shows that while in some categories the representative farm and study area figures are close, in most categories there is significant variation between the two.

Study of Table D1 shows that summing categories 1 to 8 inclusive gives a significantly different total for the MAF and study area farms - $2,185,044 and $1,889,190 respectively. The study area figure is 86% of the MAF figure.

Table D.1 MAF/Study Area Comparison

Production/ Expenditure Catagory	Representative Farms	Study Area Farms	Study Area % of MAF Figures
Wool Produced (kg)	308,697	334,155	119
Sheep Sold (nos)	47,832	43,747	91
Beef Cattle Sold	4,993	4,752	95
Milk fat Produced (kg)	362,345	295,460	82
1. Wages Paid	$87,576	$67,043	77
2. Animal Health, Breeding and Feed	$317,738	$141,835	45
3. Fertiliser	$771,175	$647,992	84
4. Shearing	$205,228	$141,200	69
5. Weed & Pest Control	$71,764	$111,392	155
6. Repairs & Maintance	$281,952	$362,314	128
7. Vehicle Expense	$306,601	$270,702	88
8. Development	$143,010	$126,712	89
9. Administration	$279,139	$113,029	45
10. Loans & Mortgages	$1,115,090	$563,730	46
11. Personal Drawings	$561,044	$510,666	91

The addition of administration, loans and mortgages plus personal drawings widens the difference between the two as Table D.2 shows.

Table D.2 MAF/Study Area Comparsion - Sub Totals

Catagories Added	MAF($)	Study Area ($)	Study Area %
1-8	2,185,044	1,889,190	86
1-9	2,464,183	2,002,219	81
1-10	3,579,273	2,565,949	72
1-11	4,140,317	3,076,615	74

Using MAF calculated figures for categories 1-8 would overstate overall expenditure by about 15%, with there being a much wider variation for some categories. For example, study area expenditure on weed and pest control is 155% of the MAF figure. So using the MAF figures would have significantly overstated expenditure and would have led to very inaccurate predictions as to expenditure from different categories. This means changes in expenditure by sector cannot be estimated for the study area farms from MAF figures, which may apply more accurately on a category basis with other farms, but the point is, one cannot assume that this will be the case. Additionally, the MAF figures, even if they were an accurate indication of farm expenditure by category, cannot give any information on the direction of expenditure, so they are of limited use in a study such as this.

In terms of total livestock income the study area income is 87% of the MAF estimate, and there exists significant variation within categories.

Table D.3 MAF/Study Area Income Comparison ($)

Income Source	MAF	Study Area	Study Area as % of MAF Figures
Sheep	2,027,451	1,703,635	84
Beef	1,492,877	1,507,622	101
Dairy	1,585,720	1,212,256	76
Total	5,106,048	4,423,513	87

This income comparison suggests that:

1. The MAF representative farm models could apply to above average farms and/or
2. The study area farms are below average producers.

Study of Northland farm income statistics suggests that the MAF representative farm models relate to above average farms. The study area dairy farms are below average producers, but the sheep and beef income appears to be at least equal to the Northland average - therefore the MAF/Study Area sheep and beef income differences are explained by the representative farm models being "above average."

Conclusion

To accurately measure the size, direction and detail of farm expenditure flows for a study such as this, data needs to be collected from the farms concerned.

Appendix 4

Study Area Conventional Forestry Scenario Details

Tables 1 and 2 give a detailed breakdown of the information provided in Tables 5.15 and 5.16 of Chapter 5 on the direction of forestry expenditure. They show how most forestry expenditure takes place within Northland, and more specifically, in and about Dargaville. The figures in brackets are the expenditure levels above the bracketed figures expressed in 1983/84 $.

Table 1 HV 23 Option - Expenditure Direction

	Total Northland	Dargaville	Outside Northland
Roads	3,910,800 (3,128,640)	3,011,316 (2,409,053)	
Establishment - Incl trees.	9,966,022 (7,972,818)	7,011,347 (5,609,078)	2,646,308 (2,117,046)
Silviculture	5,874,020 (4,699,216)	4,699,217 (3,759,373)	
Aerial Topdressing	1,512,176 (1,209,741)	1,512,176 (1,209,741)	
Operational Overheads	11,020,618 (8,816,494)	11,020,618 (8,816,494)	
Sub Total	32,283,636 (25,826,909)	27,254,674 (21,803,739)	2,646,308 (2,117,046)
Harvesting Roads	3,763,818 (2,939,054)	3,673,818 (92,939,054)	
Harvesting	105,349,504 (84,279,603)	105,349,504 (105,349,504)	
Transport	41,152,150 (32,921,720)	41,152,150 (32,921,720)	
Restablish - Incl Trees	5,616,568 (4,493,254)	4,860,822 (3,888,657)	1,305,380 (1,044,304)
Siliviculture	2,957,091 (2,365,673)	2,957,091 (2,365,673)	
Aerial Topdressing	377,573 (302,058)	377,573 (302,058)	
Total	191,410,342 (153,128,273)	185,625,632 (148,500,506)	3,951,688 (3,161,688)

Table 2 HV29 Option - Expenditure Direction

	Total Northland	Dargaville	Outside Northland
Sub Total	32,283,636 (25,826,909)	27,254,674 (21,803,739)	2,646,308 (2,117,046)
Harvesting Roads	1,122,111 (897,689)	1,122,111 (897,689)	
Harvesting	37,817,920 (30,254,336)	37,817,920 (30,254,336)	
Transport	14,772,625 (11,818,100)	14,772,625 (11,818,100)	
Restablish - Incl Trees	1,589,033 (1,271,226)	1,375,219 (1,100175)	369,317 (295,454)
Siliviculture	228,115 (182,492)	228,115 (182,492)	
Aerial Topdressing	0	0	
Total	87,813,442 (70,250,754)	82,570,664 (66,056,531)	3,015,625 (2,412,500)

Appendix 5

Sub Area Conventional Forestry Scenario - Detailed Statistics.

The tables below expand information contained in Chapter 7 .

Table 1 Sub Area: Size and Stock Carried 1984

Total Area (Ha)	3,622
Area Regularly Grazed (Ha)	2,919
Sheep	19,608
Beef Cattle	10,239
Breeding Cows	1,775
Dairy Stock	2,502
Total Stock Units Carried	34,124

Table 2 shows that if the sub area was sold to forestry and the farm dependent houses became empty the study area population would drop by 22 and 5 of those would be preschool or school aged children.
The table also shows that 13 full time paid jobs would be lost if the sub area was planted in trees. In addition, 2 paid part time positions and 2 full time unpaid positions would be lost.

Table 2 Sub Area Farm Population and Employment

Total Resident Population Decline	22
School and Preschool Age Children Decline	5

Farm Employment	Male		Female	
	Partime	Fulltime	Partime	Fulltime
Fulltime working owners, managers and leaseholders	1	8	1	2
Unpaid Family Members	0	3	0	0
Permanent Employees	0	0	0	0
Total	1	11	1	2

Table 3 Sub Area Farm Production and Income

		Income ($)
Total Beef Cattle Sold (hd)	1,042	298,309
Store	615	
Fat	309	
Not Stated	118	
Total Milkfat (kg)	31,695	91,223
Total Dairy Stock Sold (hd)	118	19,840
Total Sheep Sold (hd)	12,988	190,185
Store	2,029	
Fat	9,922	
Not Stated	1,037	
Wool (kg)	88,617	253,597
Total Income		853,154

Income from the sub area averaged $25.23 per stock unit and $251 per hectare.

Table 4 Sub Area Farm Expenditure By Catagory

Category	Amount	How Calculated
Fertiliser	106,144	Survey
Development	7,100	"
Animal Health	42,527	"
Chemical Weed & Pasture Control	16,244	"
Farm Repairs & Maintenance	39,945	"
Vehicle Running Expenses	48,528	"
Vehicle Purchases	41,700	"
Freight	42,507	Freight Op/MAF
Shearing	34,245	Survey
Wages	21,947	"
Accounting	5,826	"
Legal	955	"
Insurance	14,109	"
Electricity	11,395	MAF
Loans & Mortgages	256,792	Survey
Sub-Total	674,708	
Personal Drawings	76,729	Survey
Total	751,437	

Note: Of the total spent on R & M, $13,387 was spent on fencing and $4,904 on Water Supply and Drainage.

Table 5 Sub Area Fertiliser Use (Tonnes)

Fertiliser Type	Air Spread	Ground Spread	Total
Phosphatic	243	314	557
Lime	0	772	772
	243	1086	1329

Table 6 CompariSon of the Study Area and Sub Area Expenditure

Expenditure Catagory	% of Total Expenditure (excl Personal Drawings)	
	Study Area	Sub Area
Loans and Mortgage	17	37
Fertiliser	19	15
Vehicle Purchase	13	6
Development	4	1

In paying over one third of farm expenditure to loans and mortgage repayments, the sub area has much less flexibility to adapt to changes in income, besides having less to spend to increase production. While study area debt servicing averaged $3.49 per stock unit, in the sub area it averaged $5.97. As interest rates have increased significantly since 1984 debt servicing will be a higher proportion of total farm expenditure.

The sub area spends a significantly lower proportion of farm expenditure on fertiliser, vehicle purchases and development. While the study are spread 0.51 tonne of fertiliser and lime per grazed hectare, the sub area spread 0.42 tonne.

Table 8 indicates that the sub area is less productive than the study area.

Table 8 Sub Area & Study Area Income Comparision

	Sub Area		Study Area	
	Total	Effective	Total	Effective
Average Income per ha ($)	251	281	289	305
Average Income per su ($)	25.23		27.49	

The statistics show that those farms seen as likely to change to forestry tend to be less productive and faced with a high and increasing debt servicing burden. The stock carrying statistics show that this

farmland - on an effective hectare basis - has the potential to produce as least as much as the study area average. That the sub area is not doing so is a reflection of a heavy debt burden and farm management practices, not land capability. It is impossible to calculate the relative importance of the two.

The Sub Area Farming Expenditure Direction

Table 9 below indicates where sub area farm expenditure was spent.

Table 9 Sub Area Farm Expenditure Location

Expenditure Catagory	Expenditure Direction Dargaville	Whangarei	Local	Elsewhere	Unclear	Total Expenditure
Farm Working	173,263	76,661	5,922	0	0	255,846
Shearing	29,007	0	5,238	0	0	34,245
Freight	0	0	33,155	0	0	33,155
Veh Purchase	41,700	0	0	0	0	41,700
Mortgage	17,000	0	0	239,792	0	256,792
Accounting	2,608	0	0	2,216	0	4,824
Legal	955	0	0	0	0	955
Insurance	0	0	0	0	14,109	14,109
Electricity	11,395	0	0	0	0	11,395
Totals	275,928	76,661	44,315	242,008	14,109	653,021
% (Rounded)	42	12	7	37	2	100

Table 10 Sub Area Farm Expenditure Location - Including Wages and Personal Drawings

	Dargaville	Whangarei	Local	Elsewhere	Not Clear	Total
Totals	275,928	76,661	44,315	242,010	14,109	653,021
Wages	16,094	5,852	0	0	0	21,946
Personal Drawings	56,265	20,461	0	0	0	76,726
Totals	348,287	102,974	44,315	242,010	14,109	751,695
% (Rounded)	44	14	6	32	2	

Tables 11 and 12 indicate the direction of forestry expenditure by category.

Table 11 HV29 Expenditure By Location ($)

	Total Northland	Dargaville	Outside Northland
Roading	923,700 (73,896)	618,879 (495,103)	
Establishment (incl trees)	2,353,895 (1,883,116)	1,657,142 (1,325,714)	625,037 (500,030)
Silviculture	1,387,397 (1,109,918)	1,109,918 (887,934)	
Aerial Topdressing	357,164 (300,131)	357,164 (300,131)	
Operational Overheads	2,505,539 (2,004,431	2,505,539 (2,004,931)	
Sub Total	7,527,695 (6,022,156)	6,341,021 (5,072,817)	625,037 (500,030)
Harvesting Roads	256,830 (205,464)	256,830 (205,464)	
Harvesting	8,582,784 (6,866,227)	8,582,784 (6,866,227)	
Transport	3,352,650 (2,682,120)	3,352,650 (2,682,120)	
Restablish (Incl Trees)	364,117 (291,294)	315,124 (252,099)	84,627 (67,701)
Silviculture	51,772 (91,418)	51,772 (91,418)	
Aerial	0	0	
Total	20,135,848 (16,108,678)	18,900,181 (15,120,145)	709,664 (567,731)

Table 12 HV23 Expenditure by Location ($)

	Total Northland	Dargaville	Outside Northland
Sub Total	7,527,695 (6,022,156)	6,341,021 (5,072,817)	625,037 (500,030)
Harvesting Roads	876,249 (700,999)	876,249 (700,999)	
Harvesting	23,909,184 (19,127,347)	23,909,184 (19,127,347)	
Transport	9,339,525 (7,471,620)	9,339,525 (7,471,620)	
Restablish (Incl Trees)	1,335,663 (1,068,530)	1,155,958 (924,766)	310,399 (248,319)
Aerial Topdress	87,157 (69,726)	87,157 (69,726)	
Total	43,766,422 (35,013,138)	42,400,043 (33,920,034)	935,436 (748,349)

Appendix 6

Part A Farm-Forestry Economics.

NEW ZEALAND GRASSLAND ASSOCIATION - 47TH ANNUAL CONFERENCE 1985

THEME : CHANGING LAND USE PATTERNS

TITLE : ON-FARM FORESTRY DEVELOPMENT OPTIONS FOR NORTHLAND

AUTHOR : JOHN S. CLARK, ADVISORY SERVICES DIVISION, M.A.F. AUCKLAND

Mr Chairman, Ladies and Gentlemen.

Prompted in part by the economic downturn in traditional pastoral farming, more Northland hill country farmers are showing interest in establishing some form of forestry on their properties.

Intergrated on-farm forestry development offers them opportunities to improve long-term profitability, diversify their future income source and enhance the flexibility of their land resource.

Over recent months, Farm Advisors from the Ministry of Agriculture and Fisheries and Forest Extension Officers from the New Zealand Foreset Service in a joint study have been examining some of the on-farm forestry options open to Northland hill country farmers.

Agroforests and woodlots were considered, the first as an 'added value' investment, the second as a form of diversification.

It is important to note that the study was not designed to compare the economics of forestry versus farming, but to incorporate forestry development options into the farm's existing financial and management structure.

Some of you may be aware of the Farm Monitoring Scheme operated by M.A.F.'s Advisory Service Division. Farm Advisors regularly evaluate the physical and financial performance of farms throughout the country. Hypothetical, but representative, farms in a number of farm classes are used to reflect trends occuring in the farming community.

The Farm Monitoring Scheme's "Northland Hill Counrty Sheep and Beef Farm" was used as a base for this study. This first slide shows some of its "vital statistics". The land not used for farming comprises 20 hectares of remnant native bush and 30 hectares of regrowth scrub. The sheep to cattle ratio is 63 to 37 per cent.

The three main soil types present on the farms each have differing fertility and pastoral productivity levels. The low fertility Waiotira clay soils comprise 10 per cent (30 hectares) of the effective area, 60% (180 hectares) is medium fertility Hukerenui clay soils, and high fertility Managakahia silt loams make up the remaining thirty per cent (90 hectares).

The forestry development options considered in this study were a woodlot on existing low fertility scrubland, and areas of agroforestry on the low, medium and high fertility soils. In each case, the 30 hectares planted were assumed to be in three blocks of 10 hectares.

Using elite, genetically improved radiata pine cuttings the woodlot was planted at 1,000 stems per hectare, pruned three times and thinned to waste twice to a final stocking of 200 stems per hectare by year eight. Agroforestry blocks were planted at 300 stems per hectare, pruned four times and thinned to waste once to a final stocking of 100 s.p.h. by year five.

Making use of known tree growth data for Northland, SILMOD (the Forest Service Silvicultural Stand Computer Model) simulated tree growth to determine the dates of clear-fell, and types and volumes of timber available.

Using Auckland Conservancy stumpage prices and contrast costs of forest establishment, tending, roading, etc. Internal Rates of Return, or I.R.R.'s, were calculated for the four forestry options.

By way of explaining, an I.R.R. value (expressed as a percentage figure) indicates the rate of return which a future project is likely to show on the capital invested. If this is a positive figure and greater than the market rate of interest, then the project would provide an acceptable return. Despite some limitations, this method gives reasonable indication of a project's likely economic worth.

This next slide summarizes the results of the various forestry options.

The stumpage prices used were - $83 per cubic metre for pruned logs
- $50 per cubic metre for unpruned logs
- $ 5 per cubic metre for pulp

Forestry type		Woodlot	Agroforestry		
Soil fertility level		low	low	medium	high
Age at clearfell (years)		36	26	24	22
Volumes (m3)	: Pruned logs	195	130	126	121
	: Unpruned logs	243	152	151	147
	: Pulp	110	37	45	48
Stumpage/ha ($)		28,705	8,395	18,043	17,453
I.R.R.. (%)	: status quo	8	14	17	18
	: 30% increased costs	7	12	16	16
	:15% drop in volume	n.c.	13	16	17
	:25% drop in revenue	7	12	15	16
Breakdown stumpage ($/m3) at 10% I.R.R.		91	30	19	18

n.c. = not calculated : volumes are more predictable in woodlots than in agroforests in Northland - this will be mentioned in more detail later.

PROGRESSIVE PLANTING

I would like to mention the progressive, or gradual, nature of the planting system adopted. Agroforestry and woodlot establishment are considerable modifications of present land use on hill country farms. In order to reflect the approach taken by a "typical" farmer when thinking of "going into trees", a gradual rate of tree planting was decided upon, i.e. five hectares per year for six years.

A progressive planting approach ensures that any stock displaced are more easily absorbed by the remainder of the effective farm area. In contrast, mass initial plantings immediately make some form of de-stocking necessary. In previous studies looking at on-farm forestry development, a mass planting approach has disadvantaged agroforestry as an investment option.

FINANCIAL ASPECTS :

You can see from this data summary slide that the greater volumes of wood harvested from woodlots

compared with agroforests lead to higher stumpage values per hectare.

However, woodlots have much lower returns on the capital invested. There are two main reasons for this. The first is that woodlot establishment and tending costs are a lot higher than for agroforests, especially if existing scrub areas are crushed. The difference in per hectare costs are shown on this next slide. On low fertility land, the cumulative costs per hectare to year 15 (in todays values) are $2,277 for a woodlot (including scrub crushing) compared with $1,300 for agroforestry.

The second reason for the woodlot's relatively poor economic performance is the much longer period to clearfell - 10 to 14 years in ths study, but it could be longer depending on the site.

The difference between the profitability and the feasibility of a project must be emphasized. Even though the profitability may look good, as evidence by the Internal Rate of Return values here, whether or not the project goes ahead should depend on the feasibility in a "whole-farm" context. The crux of the matter is whether the farm can adequately meet the demands for development funds during the time the trees are growing.

An advantage of progressive planting is that the necessary annual tending costs are not too great. A mass initial planting would mean that much greater sums of money would have to be spent, whereas a progressive approach allows a farmer to hold back on planting for one or two years if finances are limiting.

This next slide shows the total annual costs of the two forestry regimes on low fertility soils established at five hectares per year for six years.
You can see that for agroforests, the highest annual cost is about $3,200, whereas for the woodlot it is about $6,100.

At a gross margin per stock unit figure of $13.70 for the 1985/86 season, an increase of 234 stock units (or 6% of the current number) would fund the highest annual agroforestry cost, whereas 445 stock units (or 12%) would be required for the woodlot.

Northland hill country farmers should give priority to establishing agroforestry blocks in preference to woodlots, especially if the project can be funded out of farm income. At current high interest rates of 26% and climbing further borrowing to finance forestry development would be unwise.

Although considerable information is available on woodlots in Northland, little research work has been done on agroforests in the North. Therefore, it must be recognised that some assumptions made by SILMOD, environmental factors and departures from the prescribed tending regimes are all potential sources of risk.

To take some account of this risk, sensitivity analyses were carried out on the data. As you can see from this slide, the I.R.R. values were relatively unaffected by significant reductions in volumes or prices of wood or by increases of costs.

Of particular significance is the breakdown stumpage price required to give a ten per cent return on capital. The woodlot has to achieve an unrealistically high sawlog stumpage value to breakeven, whereas all agroforestry options have great flexibility over even unprecedented declines in stumpage expectations.

GRAZING UNDER TREES:

Now a few comments about grazing under trees. There is a total loss of grazing on any area planted in trees for the 12 months or so after planting unless trees are protected from livestock in some way, or a farmer is in a mood for taking risks.

Research work at Tikitere Forest Farming Research Area near Rotorua, has shown that at tree densities similar to those used in this study, grazing availability is about 40% by the second year after planting, and 90% by the third year. This gradually declines to 40% by year 15, then to 20% or so over the next 10-15 years.

Even when agroforestry was established on the high fertility areas, the maximum annual stock displacement effecting the representative Northland sheep and beef farm was equivalent to 340 stock units, about 9% of the total stock units currently carried on the property. With a reduced effective area, the overall stocking rate rose from 12.3 stock units per effective hectare to 13.2.

In the normal course of events, stocking rates may change to a similar extent between seasons. Over the period to clear fell, stocking rates are likely to lift by at least this degree due to improved pastoral husbandry.

Therefore, the theoretical "opportunity cost" of any "lost" grazing and the value of any remaining grazing to the agroforestry options over time were not taken into account. It was felt that there was no significant effect on the whole farm situation in practical terms. However, if larger proportions of the farm's total effective area were to be planted, both of these points would assume greater importance.

The woodlot option used in this study could support grazing for a number of years on a less intensive basis than agroforests, and the introduction of Maku lotus would further improve grazing value. The non-grazing period after planting would assist clover seeding and establishment, but a black field cricket problem could become worse.

To minimize detrimental effects of shading on pastoral production capabilities, group or "shelter belt" (that is double or triple row) plantings may be more appropriate than convential "grid" arrangements on better quality land. Observations of Tikitere agroforestry blocks suggest that final stocking densities of between 50 and 100 stems per hectare would significantly slow the decline in grazing availability as the trees develop.

Agroforestry blocks should be greater than 3 hectares, as sheep management amongst the trees in a paddock any smaller than this becomes rather awkward. It's probably fair to say that most farmers would be reluctant to plant trees on higher fertility land from which silage or hay is usually taken. However, this is not always the case, as shown here.

WEED PROBLEMS :

In Northland, on low fertility farmland with a stock carrying capacity of six stock units per effective hectare or less, woodlots may be more appropriate than agroforests. In some areas, re-infestation with gorse, blackberry and Australian sedge would become a major problem during the non-grazing period following planting.

The greater planting density in woodlots significantly reduces weed populations. Farmers would be able to save considerable sums of money if repetitive weed control measures could be avoided. However, even in woodlots grazed intermittently with cattle, satisfactory control of pampas can be hard to achieve, and it is often necessary to use weedicides.

ROADING COSTS :

The cost of on-farm roading at the clear-felling stage has been identified in the other studies as one of the key parameters reducing the profitability of forestry development. In this study, even when roading costs were significantly increased (i.e. to the order of 2.5-4 times), the I.R.R. values dropped by less than one percentage point. This was equivalent to about a 6% reduction in sawlog stumpage value. Accessibility to good off-farm roading (that is, state highways or county roads) is critical to the viability of forestry operations.

PASTURE RENOVATION :

After clearfelling of agroforests, there is obviously a need for some kind of pasture renovation, regardless of whether the forestry cycle is to continue or not. However, incorporation of regrassing costs had a minimal effect on the overall financial performance of the agroforestry options considered in this study.

FERTILIZER APPLICATIONS :

In this study, annual fertilizer dressings were continued annually on all agroforestry blocks until the ninth year after planting, and then in years 11, 13 and 15, largely for the pastures benefit. According to soil fertility levels and financial constraints, a farmer may wish to vary the agroforestry fertilizer regimes in this latter part of the production cycle.

Soil fertility levels on the representative farm were assumed to justify supplementary fertilizer dressings only on woodlots and agroforestry on low fertility soils These were made by hand prior to planting and by air seven and 14 years later.

JOINT VENTURES :

An alternative to additional borrowing to finance on-farm forestry establishment is a joint venture agreement. Northland farmers within a prescribed boundary now have the opportunity to become involved in joint venture woodlots with a major forestry company.

The farmer can establish a share in the joint venture by re-investing rent payments in the project, paying all rates, levies and land taxes on the planted area, undertaking forestry work on the blocks or by investing cash from time to time within the limits of each year's scheduled expenditure.

Sharing of the proceeds of the venture is in direct proportion to the costs paid by each party, adjusted for inflation and timing differences. Even if a farmer contributes nothing more than the minimum 20 hectares in a fenced block, the annual rent from the joint venture (about 6% of the assessed land value) for any idle land planted in this way will provide additional farm income.

SUMMARY

Agroforests and woodlots offer Northland hill country farmers investment and diversification opportunities. Agroforests have less effect on the "whole farm" financial position than woodlots, especially where a progressive planting regime is adopted and where no further borrowing is required. Establishment and tending costs for agroforests are lower, and returns come much sooner.

The proven opportunity for continued grazing under trees established in this manner, apart from a short post-planting period, further enhances the agroforestry option.

Even where there is reluctance on a farmer's part to plant trees on high fertility land, the expected financial returns from agroforests on low and medium fertility land will increase the overall long-term profitability and flexibility of the whole farming operation. Woodlots may be more appropriate on low fertility areas where weed reversion is likely.

Part B M.A.F. Agroforestry Handout

M.A.F. Whangarei June 1985

AGROFORESTRY AND NORTHLAND

SUMMARY :

1. Three demonstration farming and forestry blocks of approx. 4 ha each have been set up at Waioitira, Titoki and Kaikohe.

2. The aim is to ensure the public at large know and can see what's involved with Agroforestry.

3. Regular "open days" will be held on co-operating properties to discuss the concept, show what's been done so far and what needs to be done over the next few years.

4. A booklet is being proposed which will detail the present plantings and programme.

5. Further plantings particularly on the drier coastal country are also planned over the next 2-3 years.

BACKGROUND:

1. There has often been a certain amount of "Agro" between farming and forestry interests in Northland.

2. However a number of projects are underway to clarify the potential for agroforestry as a possible means of diversification for pastoral farmers.

3. A Northland Agroforestry Demonstration Co-ordinating group has been set up to oversee the establishment of Agroforest blocks in Northland.

4. This group consists of four members, Jim Currie Senior Advisor MAF (Chairman), Gordon Gillespie NZFS, Richard Alspach Federated Farmers and Richard Davies-Colley Farm Forestry Assn.

5. On a local level the resident MAF farm advisor for the district is the initial contact for information or advice on the project, Tony Langton for Waiotira, Colin Page for Titoki and John Bryant at Kaikohe.

6. These first three demonstration blocks were planted in June with a further three co-operative plantings planned for 1986. The co-ordinating group will be inviting applications for the next plantings.

WHAT IS AGROFORESTRY :

1. Simply trees grown at low stocking rates on pasture in such a way that stock can still graze amoung the trees most of the time.

2. Specifically "elite" (grafted) trees are planted 3 metres apart in 10 metre rows, or in triangles 10 metres apart in 10 metre rows.

3. This initial "stocking" of 330 stems/ha is thinned down to 100 stems/ha in the second or third year. Final crop trees regularly pruned.

4. No stocking at all in the first year.

5. Limited stocking the second year.

6. General grazing between years 3-15 until canopy is complete.

7. High quality logs milled years 25-30

HOW PROFITABLE?

1. Lots of room for argument and discussion here which is one reason why the demonstration areas have been set up.

2. However studies at Whatawhata, Tikitere, Invermay and Akatore have shown from a national viewpoint agroforestry is more profitable than current farming at up to 11 stock units per ha. The break even point appears to be between 12-13 su/ha.

3. The big problem for individual farmers is the long period to when the trees are first harvested.

4. Present returns suggest around $20,000 per ha at harvest from the timber which is taxable.

THE MEINS - DAVE, JAN & PETER:

1. Approx. 4 ha were planted on 18.6.85, 2 ha totalling 660 "elite" trees on a 3m x 10m spacing and 2 ha on the triangular system.

2. The trees were supplied and planted by Forest Service with subsequent prunings the Meins responsiblity. The ultimate crop belongs to the Mein's.

3. However "open days" will encourage active participation by visitors in the tree tending operations.

CALENDAR:

First year	May	fence, heavy graze, spot spray (Roundup/Simazine) (exc fencing)	$200/ha
	June	plant	
	Aug	perhaps fertilize	
	Sept	release spray	
2nd -3yr	June	thin to waste (330-100/ha)	$100/ha
	June	prune 0-2m 45c/tree	$ 45
4-5	June	prune 2-3m 55c/tree	$ 55
6-7	June	prune 3-4.5m 70c/tree	$ 70
7-8	June	prune 4.5-6m 75c/tree	$ 75
7-8	November	forest health (Dothistroma)	$ 30
		fertilizers (grass)	?
27-28		roads	?
30		clearfell	?

TO AVOID DISASTERS:

1. Fence the selected site before planting.
2. Order your tree stocks well in advance (12 months from nursery)
3. Ensure that rabbit, hare and opposum populations are eradicated before planting.
4. Pre spray spots 3-4 weeks prior to planting. Check weather/application rates.
5. Neighbouring 24D spray proggrames of thistles can ruin trees if "drift" occurs.
6. There is no remedy for trees mutilated by livestock, other than starting again.
7. When grazing with sheep (after yr 1) be cautious. Check planted area at least daily.
8. Never use goats (back stripping).
9. Cattle grazing, usally form year 4. Monitor carefully (pugging etc).
10. If there is a problem contact the local advisory officer.

Appendix 7
Multipliers

In this appendix the multiplier impacts of changes in agricultural prices are presented as an indication of the magnitude of such impacts and examples of the application of multiplier analysis. Multipliers should be applied with a degree of caution, because of the theoretical assumptions underlying their derivation, because they are usually contructed from data on inter-industry linkages that are at least 5 years old. and because of the circumstances applying to the case being studied. Readers are referred to Butcher (1985) if they are not aware of the pitfalls and qualifications that should be borne in mind when calculating and applying multipliers.

Table 1 Multipliers for Northland Agriculture

Industry	Output		Income		Employment	
	Type I	Type II	Type I	Type II	Type I	Type II
Dairy Farming	1.49	2.89	1.37	1.84	1.39	1.93
Sheep Farming	1.74	3.25	1.51	2.03	1.72	2.74
Beef Farming	2.29	3.43	2.31	3.1	1.66	2.12
Meat Processing	2.18	3.42	2.7	3.6	2.62	3.54
Dairy Processing	2.27	3.58	10.74	14.43	3.54	11.81

Source: Moore P97

Table 2 summarises the pastoral farming income and expenditure levels the multipliers were applied to.

Table 2 Study Area and Sub Area Income and Expenditure Summary

Income Source	Income ($) From: Total Study Area	Sub Area
Dairy	1,212,256	111,063
Beef	1,507,622	298,309
Sheep	1,703,635	500,838
Total Income	4,423,513	910,210
Total Expenditure Traced & Estimated	3,851,535	751,437

Dairy incomes will decline drastically with the drop in milkfat payout and multipliers can be used to estimate the impact of this on the Northland economy. The average payout in the 1983-84 season was $3.55, if that dropped to $3.00, the 1983-84 milkfat income for the total study area would decline to $886,360 and total dairy income to $1,050,748. This is a decline of $161,508.

Output Impact.

The Type I and Type II dairy farming output multipliers are calculated as 1.49 and 2.89 by Moore, applying these implies a total output decline to the value of $240,647 (Type I) and $466,758 (Type II) throughout Northland's economy. That the magnitude of the total output decline is markedly above the direct impact indicates that there are very strong intra-regional linkages for the dairy industry.

Income Impact

The income impact is the effect on personal income caused by a change in the economy, with the income change per dollar of output delivered to final demand representing that part of total inputs paid out as salaries, wages and proprietor income. For example, in the case of Northland dairy farming personal income represents 43% of input costs. This means that for every $1 change in sales to final demand personal incomes will change by 43 cents. Once the impact of the changes in dairy farming purchase of inputs has flowed through the economy, the impact on incomes will be 1.37 (Type I) and 1.84 (Type II) times the direct impact on dairy farmers incomes. That is, for every dollar of income lost directly, another 84 cents will be lost throughout the Northland economy. If dairy farmers incomes drop by $161,508, the direct income drop would be about $69,448. Applying the Type II income multiplier, total incomes throughout Northland would drop up $127,784.

A change in beef income would have a higher income impact per dollar than a change in dairy or sheep income, because a higher proportion of the beef industry's inputs come from within Northland. For example, a 10% drop in beef output in the total study area would, other things being equal, cause on initial drop of $150,762 in output. When the effect of this has flowed through the Northland economy and the change in household spending is included the total decline in output would equal $517,124. The income impact of a decline in beef sales to final demand would have a lower direct effect per $ compared with dairy farming - for every $1 change in sales to final demand, income drops by about 14 cents. But the indirect and induced income impacts are very large so that the Type I and Type II income effects are 2.3 and 3.1 times the initial impact. The decline in incomes arising from a 10% drop in beef farming sales to final demand would be: ($150,7652 x .14) times 2.3 (Type I) and 3.1 (Type II). The resulting impacts would be: $48,545 and $65,431.

The decline in sheep incomes caused by the end of SMP payments was estimated to cut 1983-84 non-wool sheep incomes by $242,458 to $565,736 (This is on the assumption that the removal of SMP leads to a 30% drop in non-wool sheep income.) With Type I and Type II output multipliers of 1.7 and 3.2 this implies a total decline in output of $412,877 and $787,988. Each dollar change in sheep sales to final demand results in a 36 cent change in personal incomes. The Type I and Type II income multipliers are 1.8 and 2.5 so taking the $242,458 change above and multiplying it by .36 the direct income change is $87,285. Multiplying this by 1.8 and 2.5, the Type I and Type II income multiplier impacts of $157,113 and $218,212 are calculated.

These examples demonstrate how changes in output and production have an impact considerably larger than the initial change and how the use of initial impact figures to construct regional policy may lead to inappropriate policy formulation.

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