Studies in Land Use Change and Socio-economic Consequences

Forestry and Agriculture on the New Zealand East Coast: Socio-economic Characteristics Associated with Land Use Change

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Preface

The topics of land use, and issues associated with land use change, have been a major theme of research in the AERU since its inception in 1962. In earlier years the research focused on pastoral land uses, reflecting the dominance that pastoralism had in New Zealand's primary production history. In recent decades, forestry has become more important both in terms of land use and contribution to the economy. However, the ascendancy of forestry has not been without contention. In the recent past there has been vigorous debate about planning regulations as they relate to forest development. Now, much debate is heard about the effect of forest sector development on the rural community.

This research report is one of two related reports that address the second of the issues above. One report focuses on national and regional data on employment generated by farming and forestry and the other focuses on the North Island East Coast and focuses on employment and other socio–economic variables. This report has the East Coast perspective. Both reports are intended to contribute to policy debates about forestry and its role in regional development. Rural people, planners, councillors and sector representatives will find this report provides a basis for an improved understanding of the consequences of land use change from farming to forestry.

Ross Cullen
Director

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Barbara Hock, Forest Research Ltd. Rotorua, provided GIS expertise to enable land cover changes to be documented and mapped. Steve Thompson, MAF Christchurch, provided the map showing forest cover on the East Coast. Helpful comments on earlier drafts were received from a number of people, including: Dr. Parnell Trost (Ministry of Agriculture and Forestry, Dunedin), Dr. Mike Roche (Geography, Massey University), Dr. Patrick Aldwell (Commerce Division, Lincoln University) and Barbara Hock (Forest Research Ltd. Rotorua).

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Summary

Forestry and Agriculture on the New Zealand East Coast: Socio-economic Characteristics Associated with Land Use Change

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Conclusions

- Comparison of land use change and census data effectively showed spatial differentiation for a range of socio-economic indicators.
- Locations with gains in either farming or forestry as a land use have experienced decline in a variety of indicators but these have been less severe in the farming locations.
- Established farming areas close to Gisborne have experienced increases in a variety of indicators often in contrast to the entire East Coast region.

Background and Rationale:

- Work on forest sector development in the Gisborne/East Coast region requires background information on changes in land use and associated changes in rural community structures.
- A popular rural opinion is that forestry has a negative effect on rural communities and there is a need to assess the veracity of this view.

Research Objectives:

- Describe relationships between recent trends in land use change and associated change in rural community characteristics.
- Analyse land use change in different locations, especially for those with increases in farming or forestry.

Method:

- Compare East Coast land cover in the 1970s to 1991 (the only times for which data were available) to identify census mesh blocks with increases in forestry, increases in farming and with no change.
- Describe the mesh block with these types of changes, and other locations, in terms of a number of basic social and economic variables, using census data for 1986 and 1996 (allowing for a small lag in time between land use change and community restructuring).

Results:

- Overall East Coast employment has decreased with fewer full-time jobs and more part-time jobs.
- There are now fewer young people and more older people on the East Coast, and this is even more so for rural areas.
- There has been an increase in levels of educational qualification generally and this is more pronounced in the rural areas.
- The data on rural mesh blocks show a consistent pattern of gradation from the forestry to the no change mesh blocks. The forestry mesh blocks, which have only a low population, show relative decline in a range of indicators of community well being, over the period of analysis. The farming mesh blocks also show decline, but not to the same degree. In contrast, the no change mesh blocks have increasing population and many positive features, often in contrast to the entire East Coast area.

Chapter 1
Introduction: Background and Research Objectives

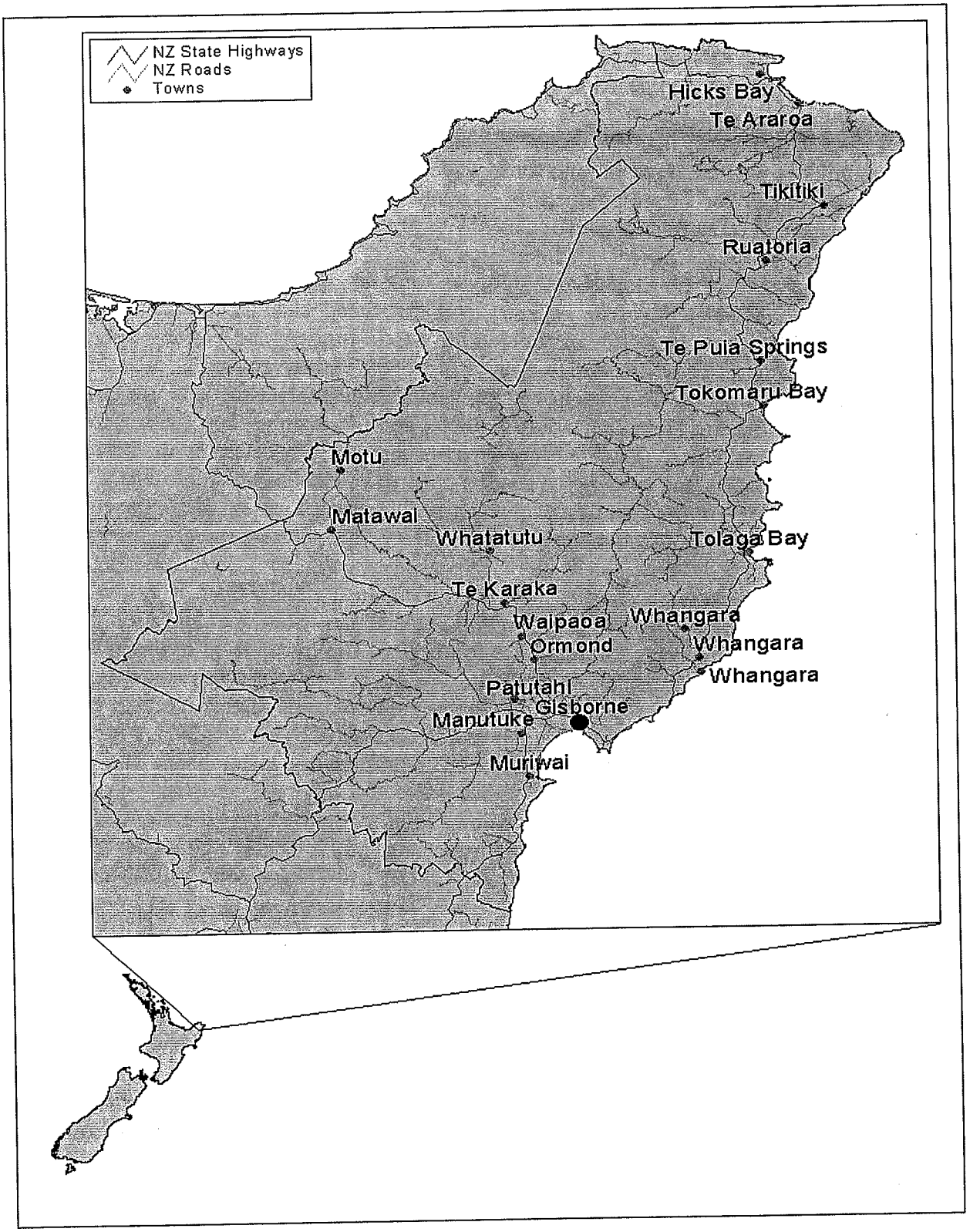
The research presented in this report is part of a broader programme of research aimed at facilitating economic development in the East Coast region of New Zealand. The overall Lincoln University/Forest Research Ltd. programme seeks to examine the interrelationship between market dynamics, investor motivation and constraints, and community well-being and adaptability to change in response to forest sector growth. It aims to promote adaptation to emerging markets for forest products by providing timely and useful research results relating to social and economic issues associated with forest sector development.

The primary objective of the Lincoln research was to describe relationships between recent trends in land use change involving forestry and associated change in rural community characteristics. The main land uses considered are exotic forestry and pastoral agriculture. Rural community structures are defined in terms of a variety of social, economic or demographic characteristics. This main objective included an analysis of land use change in forestry and agriculture in New Zealand as a whole, and the main regions, with a focus on employment. The results are presented in a separate report (Fairweather et al., 2000). That report provides an understanding of some general patterns of change which provide a context to the case study region of the East Coast upon which this report focuses. Here, the emphasis is upon a broad range of socio-economic data associated with land use change.

The East Coast region was chosen for study for two main reasons. First, it is a relatively isolated and economically disadvantaged region, which has been the focus of regional development schemes involving forestry since the 1970s. The most recent of these, the East Coast Forestry Scheme, although directed at erosion control, includes socio-economic objectives and clearly has socio-economic as well as environmental effects. Second, partly in response to this scheme, forestry land use has increased markedly in recent years in the East Coast region, and replaced a significant proportion of hill country pastoralism. The increase in forest area has generated a number of social issues, for example, resistance from some people who prefer pastoral land uses. It has long been recognised that there are important social factors involved in the response to land use change and in achieving maximum benefit from forest sector development (Robb et al., 1966). This report builds upon and complements earlier studies in the East Coast, and elsewhere, into socio-economic dimensions of land use change involving forestry, and like the companion report (Fairweather et al., 2000a) adopts a comparative approach based upon successive census periods analysing the relationship between land use change and socio-economic profile. Figure 1 shows the location of the East Coast region in New Zealand.

This report is organised as follows. Chapter 2 describes the methods of research used to identify the different types of mesh blocks used as a basis to examine census data. Chapter 3 presents the results and Chapter 4 provides a discussion and conclusion. A review of relevant literature and the findings of previous studies was included in the companion report (Fairweather et al., 2000) and is therefore not repeated here.

Figure 1: Map Showing Study Area and Location Within New Zealand



Chapter 2
Method

2.1 Introduction

The method of analysis had three main components: GIS classification of land use change, by area; derivation of key socio-economic indicators from census data, by area; and spreadsheet calculation and analysis of the two data sets.

The areal unit of comparative analysis is the census 'mesh block'. Mesh blocks are the smallest geographical units by which the five-yearly census data are collected by Statistics NZ. The analysis of land cover (see following section) included reclassification of two different sets of data onto the standard mesh blocks. This process involved a series of translations and assumptions, which are described below. The sequence of the process was determined by the overall focus of the study. Hence, rather than attempting a comprehensive description of all facets of change, the analysis focused upon the dimensions of land use change of particular relevance. By the end of the spatial analysis phase, all rural mesh blocks in the region had been categorised into one of three conditions: forestry positive change, indicating an increase in forestry land cover between the 1970s and 1991, farming positive change, and no change.

The approach to the analysis of the socio-economic changes involved basic tabulation of census data by geographical mesh block. A regional description of forestry characteristics for the East Coast region was also undertaken, based upon Ministry of Forestry Wood Supply Region data.

One of the main assumptions in the overall analysis is the dating of land use change data, compared with census data. While census data are precisely dated, land cover data must be interpreted to some degree (as discussed below), as there is no comparable land use survey in the census years. For the 'baseline' figures a vegetation cover map published in 1987 was used (Newsome, 1987), and as noted below, the data for this were from a number of years from the preceding decade, referred to here as the 1970s. We have taken this source as the best available indicator of base line land use. The best corresponding census data are those for 1981. Using 1976 census data would have meant that some of the land use data would have occurred after the census. For the comparative data set, the census year 1991 was selected. The rationale for this is that although the satellite images upon which the land cover data are based, is dated 1996/97, for technical reasons the imagery does not show trees less than approximately five years old. Hence the effective date of the data on forest cover is closer to the 1991 census than the 1996 census.

The time period of this regional study overlaps with the first period only of the national study reported in Fairweather et al. (2000a) (i.e., 1986-1991). The national study also presents data for 1991-1996.

The derivation of the overall classification of land use change is described below in two steps. First, the data sources are characterised and compared, and some limitations inherent in utilising historical data are noted. Second, the process of classification of mesh blocks is described. This involved establishing a sequence of allocation rules, so that the complex data

on change in a large number of land use categories could be distilled down to identify key change indicators of direct relevance to the study. The classification results are shown with maps of the aggregate patterns of change involving forestry and agriculture. The chapter concludes with an account of the important issues associated with our approach to the analysis of associations between land cover change and census data

2.2 Derivations of Change in Land Cover on the East Coast

The two geographical data sets used in the analysis were combined using the Arc-Info™ geographic information system. The land uses considered, exotic forestry and pastoral agriculture, can be distinguished on remotely-sensed data by their different land covers and hence the terms land cover change and land use change are used interchangeably in this report.

Data Sources. The data used for analysis of land use change were taken from two different sources. The source of the 'base line' data was the Vegetative Cover Map (VCM). (Newsome, 1987). This composite manual classification of vegetation cover drew upon a range of sources (Newsome, 1987), including indigenous forest maps from the 1970s only. The source for the 1991 situation was the latest Land Cover Database (LCDB), which was based on 1996/7 satellite images.

An important point with these data is that while they are indicative of what is and what used to be the land cover (and hence indicative of the land use), the two data sets were created very differently. The most important differences are:

VCM:
1. Manual photo-interpretation, i.e., the photo-interpreter delineates boundaries subjectively on aerial photos, with field checks.
2. Minimum polygon size (i.e. smallest unit of analysis) of ten hectares.
3. Many classes of vegetation cover, including composite classes.

LCDB:
1. Supervised classification of satellite images.
2. Minimum polygon size of one hectare.
3. Few classes (no composite classes).

In order to compare land cover in the VCM and LCDB data sets, a standardised code system was devised. The following four LCDB classes were used: indigenous forest (I), plantation forest (P), shrub or scrub (S) and other – urban, wetland, horticulture, and pastoral – (O). The 11 VCM codes were linked to the four LCDB codes as follows:

Table 1: Matching the Vegetation Cover Map with the Land Cover Database

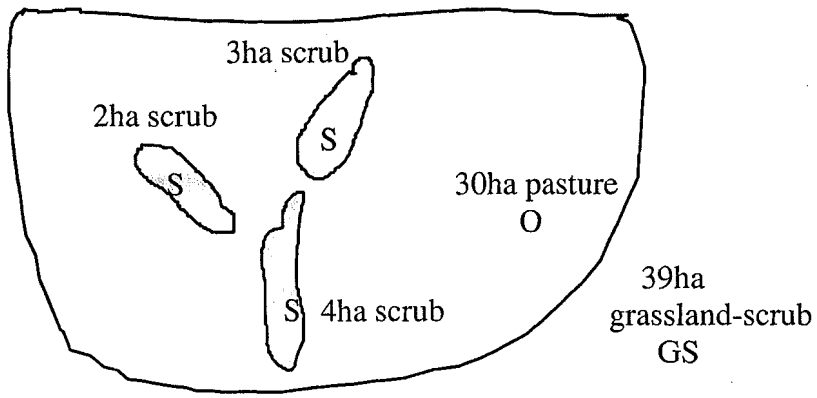
VCM Codes	LCDB Codes Assigned
C1-2 cropland	O
G1-6 grassland	O
GS1-GS8 grassland-scrub	O
S1-S4 scrub	S
GF1-3 & 5-6 grassland-forest	I
GF4 pasture and exotic forest	P
FS1-78 forest-scrub	I
FS8 exotic forest and scrub	P
F1-8 forest	I
F9 exotic forest	P
M1-4 miscellaneous, e.g., wetland	O

Assigning an LCDB code to the composite VCM classes was particularly difficult. As their name implies, these composite classes contained a dominant vegetation type as well as smaller areas of other vegetation types. The assignments for the composite classes were to the closest LCDB code based on local knowledge of Gisborne/East Coast. For example, the mixed grass and scrub classes are more indicative of pastoral land use than any other land use[1]. Thus from the point of view of land use, it was decided to classify these mixed classes into the category 'O' which incorporates pastoralism.

There is a technical difficulty with this approach, which is that part of a reclassified VCM area will be incorrectly classified. In the Gisborne/East Coast region this can lead to the erroneous conclusion that many scrub areas are now pasture. As the main purpose of the data is to analyse land use change to plantation forestry, a land use that does not appear in any of the mixed classes, the net effect of this difficulty on the overall results is insignificant. Figure 2 shows an example where a change of nine hectares from pasture to scrub is indicated when the two data sets are overlayed. This change may in fact not have occurred; it could be based solely on the differences of the mapping resolutions and classifications used.

[1] About a quarter of the GS classes are class GS1 Grassland and Mixed Indigenous Scrub, and the remainder is GS2 Grassland and Leptospernum Scrub or Fern. The descriptions include:
GS1 - low producing pastureland, often present as wooded gullies and scrub patches on steep, less productive hill slopes.
GS2 - low-producing or recently 'broken-in' pastureland.

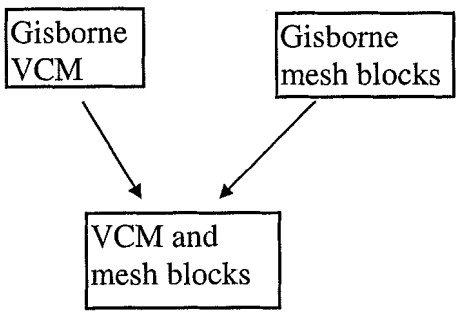
Figure 2: Example of the Different Approaches to Classifying Scrub and Pasture



Notes: 1. The LCDB-based classification approach (S=scrub, O=class containing pasture) is shown within the outermost boundary.
2. The VCM-based classification approach (GS=grassland-scrub) is shown to the right of the outermost boundary.
3. The scrub areas are larger than the minimum mapping unit for LCDB, but less than the minimum mapping unit for VCM.

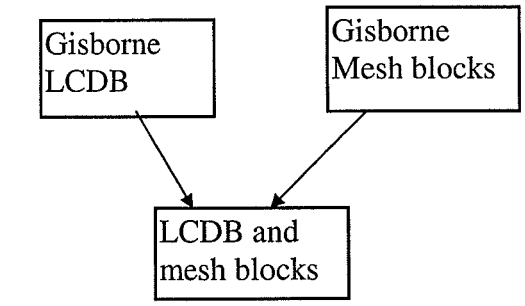
Determining land use change. The focus of the study is upon change. The census mesh blocks were therefore categorised into their earlier and later land cover by overlaying with the VCM and LCDB data respectively (Figures 3 and 4).

Figure 3. Mesh Blocks Categorised by Earlier Land Cover



output areas for each combination of
mesh block and VCM standardised code

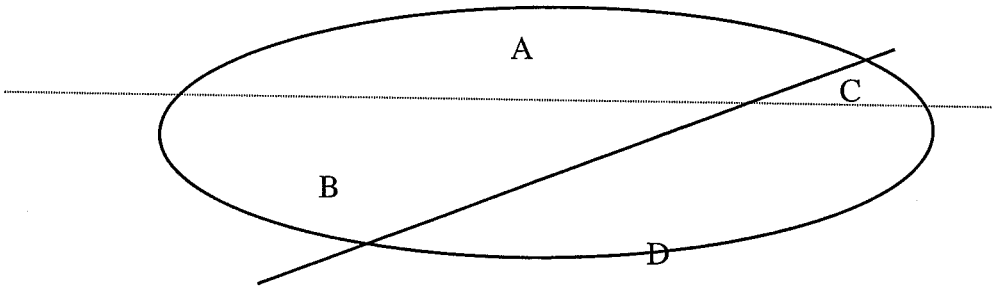
Figure 4. Mesh Blocks Categorised by Later Land Cover



output areas for each combination of mesh block and LCDB code

Note that combining two data sets can result in areas smaller than the mapping accuracy of one or both of the original data sets (Figure 5). In order to ensure that all component areas always balance, no matter which way they are summed, it was decided to not modify these small areas in any way. Instead, no significance was placed on values smaller than at least ten hectares (the minimum mapping unit of the VCM data).

Figure 5. Example of Data Inaccuracies



——Land cover boundary (VCM or LCDB)
·····Mesh block boundary

For A, B and D in Figure 5 it is reasonable to say that they represent different land uses, while for C this may be less than the accuracy of the respective land cover data. A further caution is that totals of land use change in excess of the accuracy levels may be composed of many small components of very low accuracy. Notwithstanding these cautions, large areas of change do indicate clearly that significant changes have occurred in the land cover.

2.3 Classification of Mesh Blocks

Initially, the base GIS data, including mesh block number, land use category and area were amalgamated into two spreadsheets, one for the 1970s and one for 1991. The second step was to categorise the area values for different land use types to produce a spreadsheet with total

land, land with indigenous forest cover (indigenous land), land available for productive use (available land), scrub, forestry, and farming[2] showing proportions and percentage change between 1970s and 1991. Total land comprises the sum of indigenous land, scrub land, forestry land and farming land. The land available for primary production (referred to here as available area) is the total land minus the indigenous land. It is land that is potentially available but may include small amounts of land such as lakes and swamps. From the main spreadsheet, a summary table of area unit and East Coast totals was formulated to facilitate a regional analysis of the total rural area.

The third step was to develop a method to identify the dominant character of change in land use for each mesh block. Initially, ten categories of land use change were formulated and then assigned to each mesh block on the basis of proportion of available land in scrub, forestry, and farming for 1970s and 1991 land use data. The ten categories included three relating to size of each land use type (i.e., three each for scrub, forestry, and farming) and one for unidentified land (1970s only). Three thresholds were used to determine the categories for each land–use type: 75.0 per cent or more, 50.0 – 74.9 per cent, and 33.4 – 49.9 per cent. The category assigned to each mesh block was selected on the size of largest land use type. The results from this categorisation were, *prima facie*, less than promising because there were so few mesh blocks in the forestry category.

The fourth step involved a more detailed analysis in which each mesh block was assigned a category according to its percentage change in both absolute area and for proportion of available area for each land use (i.e., scrub, forestry, and farming). The eight categories used were:

0 = No change
1 = 0–5 per cent change
2 = 6 – 10 per cent change
3 = 11 – 15 per cent change
4 = 16 – 20 per cent change
5 = 21-25 per cent change
6 = 25+ per cent change
7 = Negative change
8 = Infinite change

Each mesh block was assigned a category according to its percentage change for each land use. This classification was simplified to three categories: no change (0), positive change (1+2+3+4+5+6+8), and negative change (7).

The results from the first method, namely using percentage change in absolute area, were then 'cleaned' by the omission of mesh blocks where the value for the second method, namely the percentage change in available area, was less than +5 per cent (or –5 per cent). This resulted in the elimination of mesh blocks where the increase or decrease in each land use's proportion of available land was marginal, therefore essentially irrelevant to the study of land use **change**.

The above approach resulted in a categorisation of each mesh block according to **all three** land uses, whereas the task was to simplify the analysis and assign **one** type of land use change to individual mesh blocks. The fifth step, therefore, was to eliminate scrub from further analysis, because as a land use **change** it was essentially all decreasing, and was therefore the inverse of forestry and farming increases. Next, the forestry and farming land

[2] The land referred to as farming land refers to the category of 'other' in section 2.2. While this land included such areas a wetlands, these were very much in the minority in the study area.

use data for each mesh block was again analysed, and a series of rules leading to the assigning of ONE land use change category were developed.

The seven possible categories determined by this initial analysis were:

(i) **forestry** (positive change)
(ii) **farming** (positive change)
(iii) **both** (forestry and farming positive change)
(iv) **neither** (forestry nor farming positive change)
(v) **forestry** (negative change)
(vi) **farming** (negative change), and
(vii) **Alternate** (forestry positive change and farming negative change, or vice versa).

In order to ensure that a change was of a sufficient order of magnitude that it exceeded any potential source data inaccuracies, a number of categorisation rules were needed. The first rule of categorisation was:

(i) Mesh block is **forestry** if:
Forestry = positive change >5 per cent (absolute area) **and**
Farming = No change or positive change <5 per cent or negative change <5 per cent .
(ii) Mesh block is **farming** if :
Farming = positive change >5 per cent (absolute area) **and**
Forestry = no change or positive change <5 per cent or negative change <5 per cent.

The second rule of categorisation was:

(i) Mesh block is **forestry** (negative change) if:
Forestry = negative change >5 per cent (absolute area) **and**
Farming = No change or positive change <5 per cent or negative change <5 per cent
(ii) Mesh block is **farming** (negative change) if:
Farming = negative change >5 per cent (absolute area) **and**
Forestry = No change or positive change <5 per cent or negative change <5 per cent

The third rule of categorisation was:

(i) Mesh block is **Both** if:
forestry = positive change >5 per cent **and**
Farming = positive change >5 per cent

The fourth rule of categorisation was:

(i) Mesh block is **Neither** if:
Forestry = No change or positive change <5 per cent or negative change <5 per cent **and**
Farming = No change or positive change <5 per cent or negative change <5 per cent

The fifth rule of categorisation was:

(i) Mesh block is **Alternate** if:
Forestry = positive change >5 per cent **and** Farming = negative change >5 per cent **or**
Forestry = negative change >5 per cent **and** Farming = positive change >5 per cent

The results of this analysis and assigning of categories resulted in the following numbers of mesh blocks:

Forestry (positive change) = 6;
Farming (positive change) = 114;
Both (forestry and farming positive change) = 30;
No Change (neither forestry nor farming positive change) = 53;
Forestry (negative change) = 0;
Farming (negative change) = 7;
Alternate (forestry positive change and farming negative change, or vice versa) = 15.
Total = 225.

These results suggested that further refinement was possible, and this was carried out in a final sixth step which involved a number of refinements. First, the forestry (negative change) and farming (negative change) categories were considered so small, both individually and collectively, as to be unworthy of further investigation, and were thereby eliminated. Second, it was noted that one of the Neither (forestry nor farming positive change) mesh blocks had no forestry and no farming land whatsoever, in either the 1970s or 1991, and was therefore also eliminated from further analysis and reduced this category to 52. Third, the 30 mesh blocks in the both category (forestry and farming positive change) were redistributed, in accordance to the largest percentage increase (proportion of available area) between the two, into either the forestry (positive change) or farming (positive change). This redistribution added seven mesh blocks to the forestry (positive change) category, bringing its total to 13, and the remaining 23 to the farming (positive change) category, bringing its total to 137. Fourth, the 15 mesh blocks in the Alternate (forestry positive change and farming negative change, or vice versa) category were also redistributed according to the **positive** land use change, given that negative land use change has already been eliminated as a viable path of investigation. Of these 15 mesh blocks seven were added to forestry (positive change), bringing this category's final total to 20, while the remaining eight mesh blocks were added to farming (positive change), bringing its final total to 145. Table 1 shows the results of this categorisation and adjustment process.

Table 2: Numbers of Mesh Blocks by Category of Land Use Change, 1970s-1991

Mesh Block Categorisation	Initial	Final
Forestry Positive	6	20
Farming Positive	114	145
No Change	53	52
Forestry Negative	0	-
Farming Negative	7	-
Forestry and Farming Positive Change	30	-
Alternate	15	-
Eliminated	-	8
Total	225	225

The results show a modest number of mesh blocks that have had an increase in forestry land cover between the 1970s and 1991. These mesh blocks are located throughout the East Coast but with aggregations in the south, the mid region and the north (see Figure 6). These locations correspond well with the planted forest cover map for the East Coast (see Figure 7).

There are a large number of mesh blocks with an apparent increase in farming land use. However, this is in part a product of our classification, in which scrub land appeared to decrease by 1991. In reality there may not have been a significant expansion in farming and it is perhaps more accurate to consider this category as continued, and possibly, expanded farming. These farming mesh blocks are located throughout the East Coast. The No Change category (neither forestry nor farming positive change) comprises 52 mesh blocks of which 51 have more than 90 per cent farming, and in most cases actually 100 per cent, in both 1970s and 1991, while the remaining one was 56 per cent farming. Most are near Gisborne and are on the Poverty Bay flats. In effect, the three-way classification (no change, farming and forestry) shows an ordering of land use change from more intensive uses (horticulture, arable) through pastoral agriculture to forestry.

When presenting the mesh blocks results in the next chapter, the individual mesh blocks are combined into 22 Statistics New Zealand 'area units', in order to reduce the 225 mesh blocks to a more manageable data set.

Figure 6: Map Showing East Coast Mesh Blocks with Land Cover Change Classification

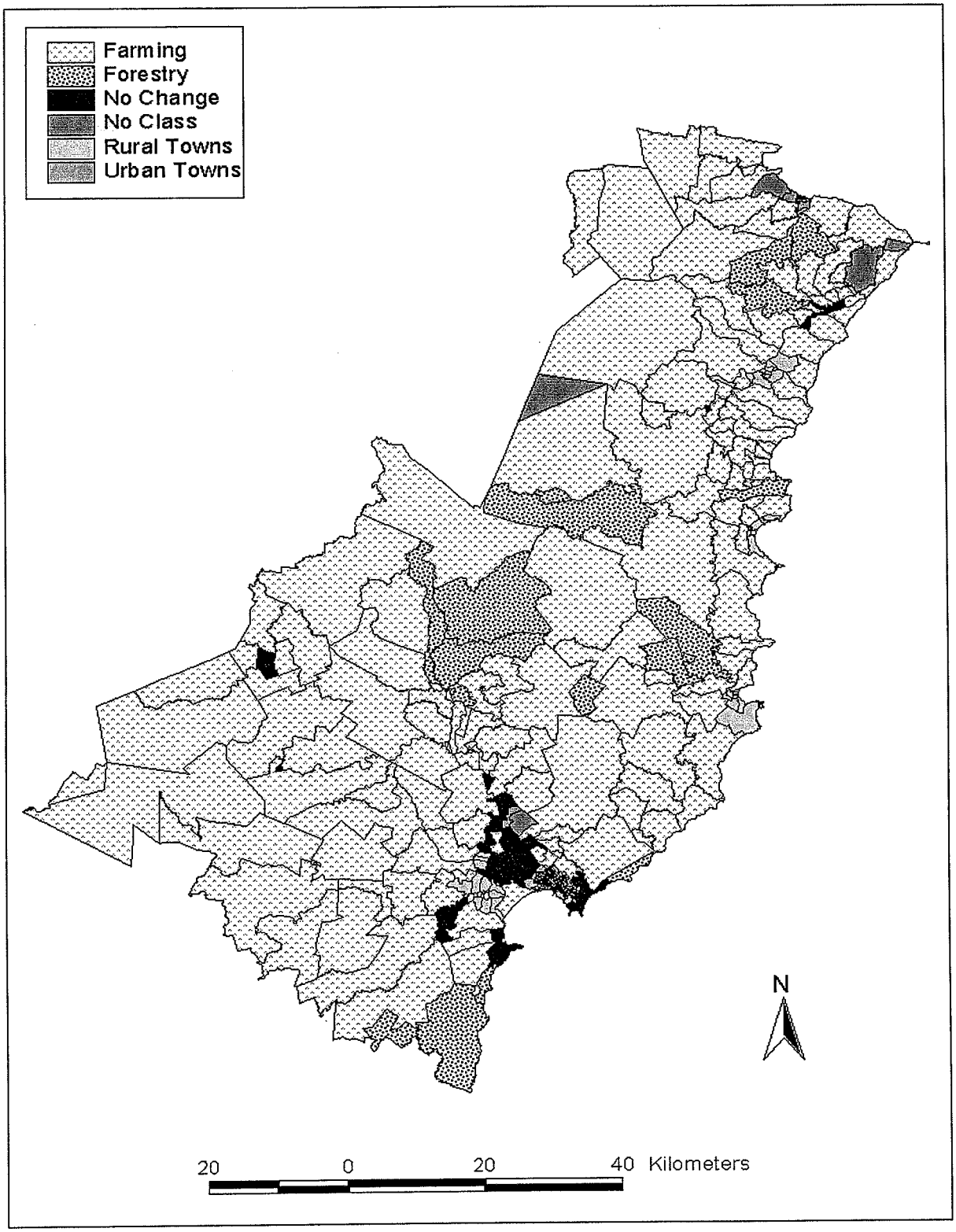
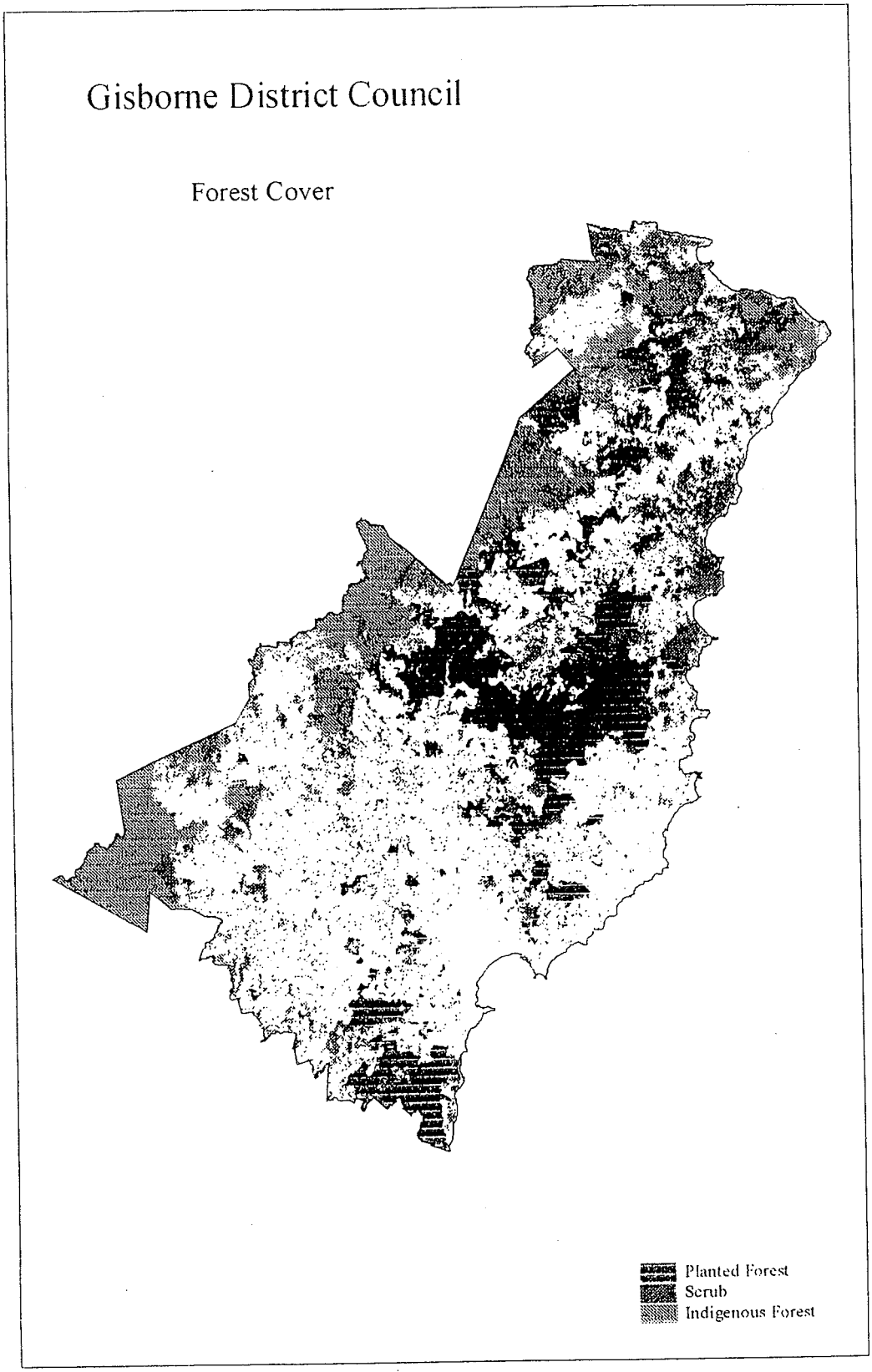


Figure 7: Map Showing Forest Cover on the East Coast



2.4 Linking Land Cover Change With Census Data

Matching the two land cover data sets to census information is somewhat problematic because of the different approaches to the dating of the land use data. Whereas census data are precisely located in time, available historical land use data represent the compilation of information over a period of time, and do not correspond precisely to the date of publication. The more recent data base, derived from satellite images, can be dated precisely in terms of its capture, but the resolution of images means that this precision does not translate directly into the complete data set because very young trees do not register in the satellite imagery at the scale it is captured. Hence the date of the tree cover shown must also be interpreted to some degree.

Note also that the census data are for 1986 and 1996. This was done because these census years offer the best correspondence to the data on land cover change, as described in Section 2.1. A key issue in the following analysis is the nature of any link between land use change and social or economic consequences. In an ideal analysis, several successive census returns would be compared with land use changes derived from the same survey dates. Furthermore, direct relationships would be analysed as well as trends over time. Hence, the nature and extent of any lag in effect of land use change upon socio-economic characteristics would become apparent. For the reasons noted earlier, it is not possible with available data to achieve such a tightly structured analysis. What we have to work with is an aggregated baseline of land cover from the 1970s, dated 1987, and a second data set dated 1996/7, but recording new forest planting only up to 1991 or so.

The census period selected for analysis, 1986-96, represents a similar time span to the period between land cover baselines (a decade), and lags approximately five years behind the land cover data. The key factor behind the overall design is to achieve a similar period of analysis. Our assumption is that at the level of analysis being undertaken, essential relationships between land use and socio-economic profile will become apparent. Intuitively, one might also anticipate a five year or so lag for effects of land use change to express themselves in socio-economic indicators. Nonetheless, the assumption does reinforce the 'broad bush' nature of the analysis of interrelationships.

A final factor to consider in the approach we have taken is the fact that any characterisation of a mesh block for a given time period may be a reasonable indicator for other years near to the selected time period. This is because the land use on any mesh block is not completely open in the sense that forestry or farming or other uses are equally likely to occur. That is, mesh blocks suited to forestry in one year are likely to be suited in another year because of the character of the land and its inherent suitability to forestry.

Chapter 3
Results

3.1 Land Use Change and Socio-economic Associations

Within the overall objective of describing recent trends in land use change involving forestry, and associated change in rural community characteristics, there are a number of detailed research objectives that guide the analysis of forestry and agricultural data in this report. The first was to give a general account of forestry in the East Coast in terms of forest type, plantation area and volume. This elaborates upon the summary profile in the companion report (Fairweather et al., 2000), which showed the East Coast to be quite unlike other regions. The second was to examine changes in land use between the decade up to 1986, and 1991, by focusing on the relative size of indigenous forest land, and available land, and, within the latter, the areas in scrub, forestry, and farming. The third objective was to examine land use change in each of the seven rural area units using the main categories introduced above. The fourth objective was to examine land use change in relation to socio-economic indicators for all parts of the East Coast (Gisborne, rural towns and rural areas) and for all three categories of forestry, farming and no change mesh blocks. Here the different locations are analysed in terms of population, gender, ethnicity, age group, education, income support, superannuation and employment.

3.2 General Description of East Coast Forestry

The East Coast Wood Supply Region is a relatively minor contributor to the New Zealand forestry industry: the East Coast is in the fifth largest group of Wood Supply Regions in terms of area (Fairweather et al., 2000). Table 2 presents some basic forestry statistics to illustrate the small role of the East Coast WSR in the national picture. The East Coast WSR contains just 8.3 per cent of New Zealand's total exotic forest area and just 5.8 per cent of New Zealand's total exotic forest volume.

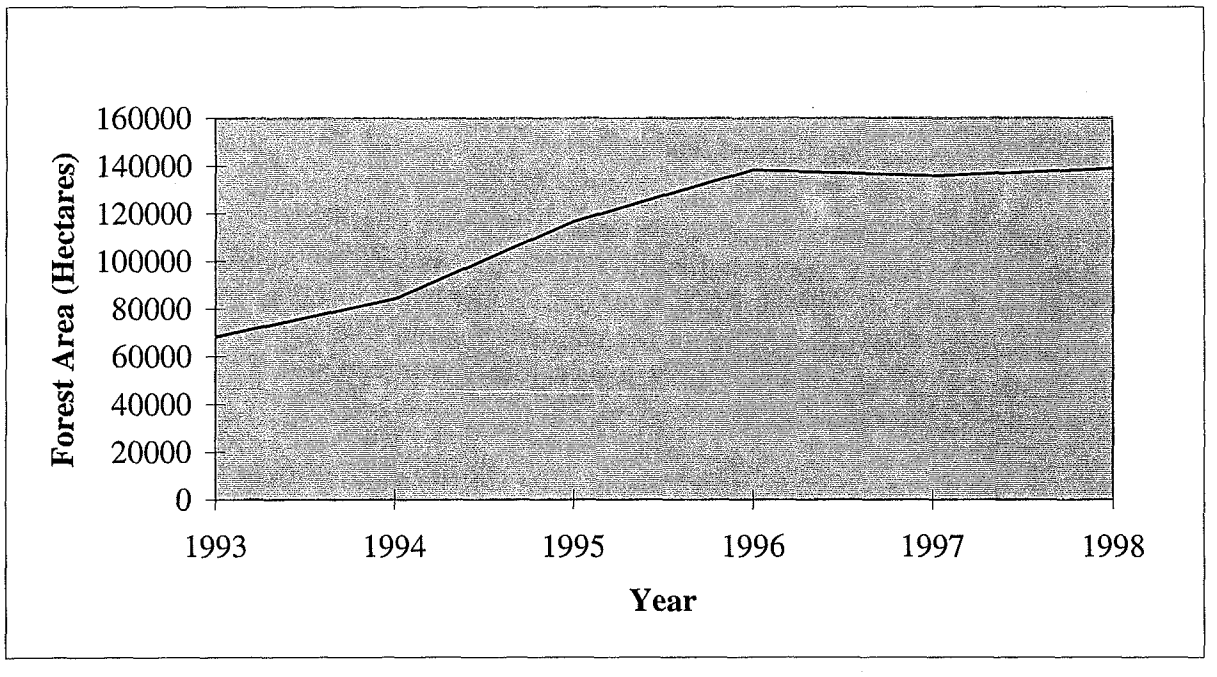
Table 2: Forest Characteristics of East Coast Wood Supply Region

Forest Characteristic	East Coast WSR	Percentage EC WSR Total	New Zealand Total	Percentage NZ Total
Forest Area				
Radiata Pine	134,162	96.6	1,520,152	8.8
Douglas Fir	2,390	1.7	80,730	3.0
Other Softwoods	1,547	1.1	31,644	4.9
Hardwoods	730	0.6	46,417	1.6
Total (Ha)	138,829	100	1,678,943	8.3
Standing Volume (m3)	19,478,000	100	337,619,000	5.8
Forest Area by Age				
1 - 10 yrs	87,160	62.8	754,878	11.5
11 - 20 yrs	37,055	26.7	550,828	6.7
21 - 30 yrs	12,597	9.1	333,041	3.8
31 - 40 yrs	1,886	1.3	26,512	7.1
41 - 50 yrs	68	0.05	5,473	1.2
51+ yrs	63	0.05	8,211	0.8

Source: MAF 1999, figures as at 1 April 1998.

Figure 8 shows the rise in forest plantation area in the East Coast Wood Supply Region over the past five years. The growth in East Coast forestry area during the 1990s coincides with the third phase of forestry development in New Zealand which was supported by taxation changes and increases in international timber prices. In addition, the East Coast Forestry Project, which used government funds to support planting on eroding land, also contributed to growth in the East Coast forest area. Prior to that the East Coast and Hawke's Bay WSRs also experienced substantial forest expansion during the "Second Planting" from the early 1960s until the mid 1980s. As Figure 9 illustrates, these earlier plantings are about to mature and substantial areas of forest will become ready for harvest. Data for Hawkes Bay are included for comparison and show a broadly similar pattern of planting. However, since 1993, the East Coast has outpaced Hawkes Bay in new forest plantings. A possible explanation of this is the higher level of agricultural activity and population in the Hawke's Bay, meaning less land is available for forest development compared to the East Coast. The latest figures have the East Coast forest estate at nearly 139,000 hectares and the Hawkes Bay forest estate at just over 119,000 hectares.

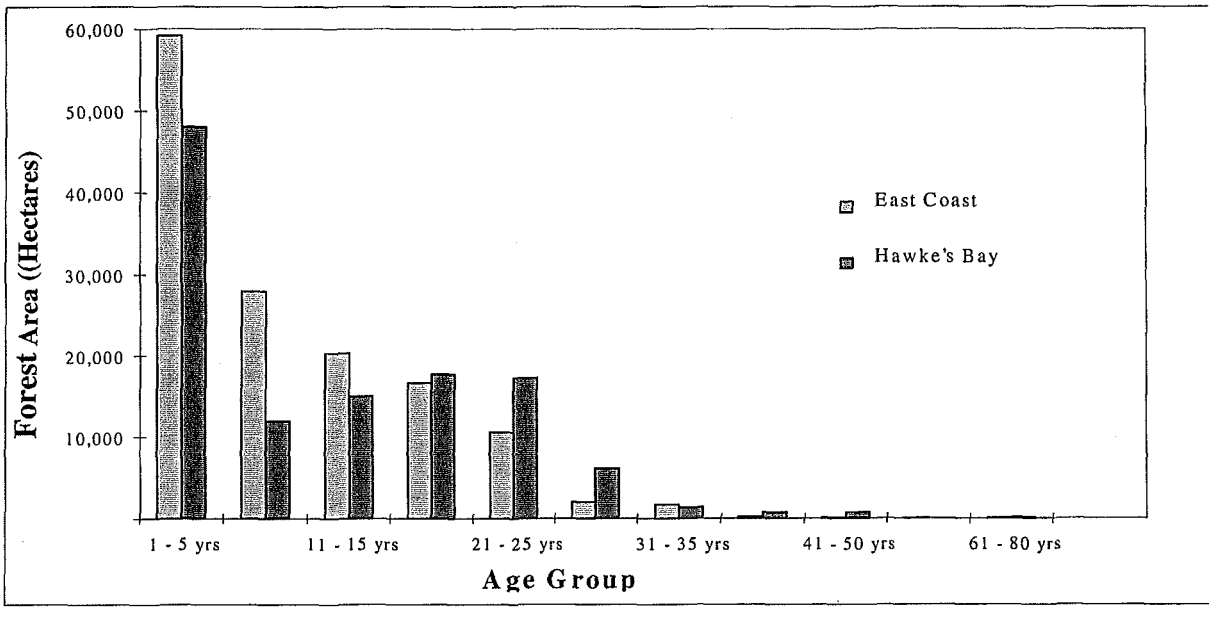
Figure 8: Exotic Forest Plantation Area in the East Coast Wood Supply Region, 1993-1998



Source: MAF 1994, 1995, 1996, 1997, 1998, and 1999.

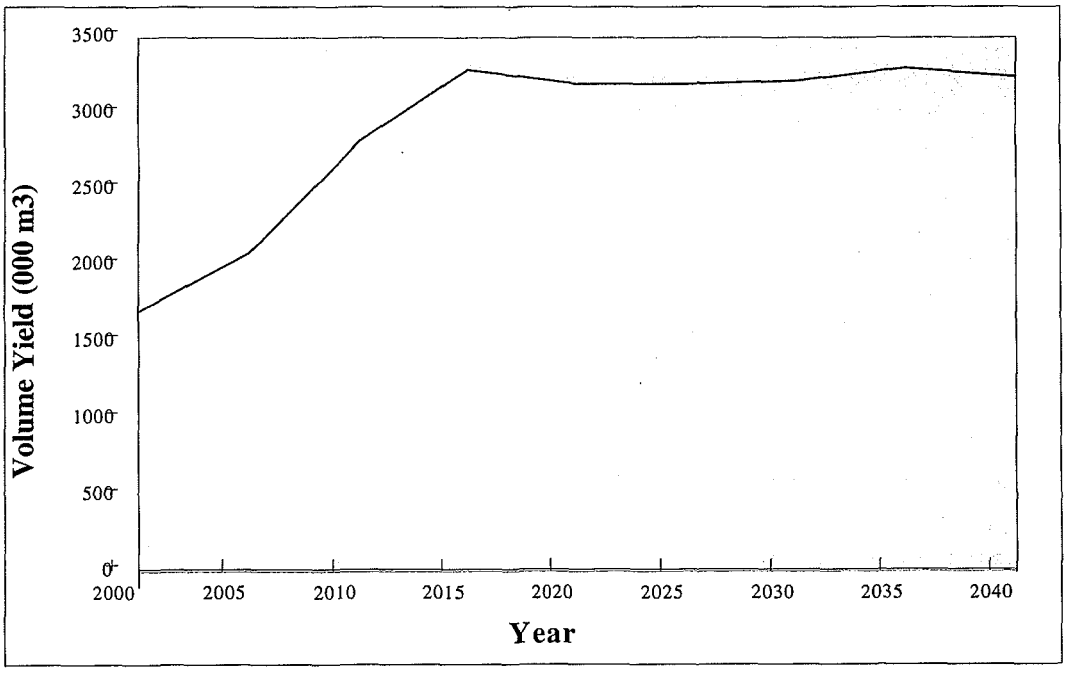
The progressive plantings on the East Coast throughout the 1960-1986 period will provide a constant supply of mature timber for harvest over the next three decades, by which time the recent 1990s plantings will have matured. This prospect of a considerable and sustained forestry industry in the East Coast is confirmed by the projected volume yields and clearfelled area presented in Figures 10 and 11.

Figure 9: Forest Area by Age Group for East Coast and Hawke's Bay Wood Supply Regions



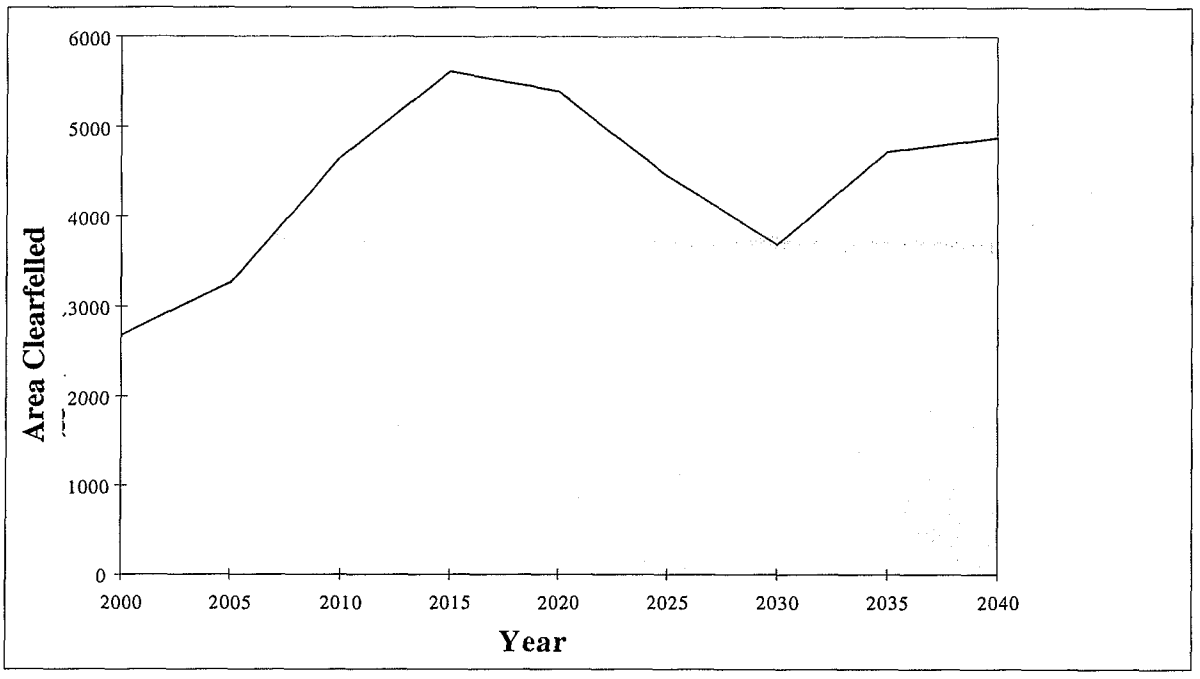
Source: MAF 1999:34-35.

Figure 10: Projected Volume Yield, East Coast, 2000-2040



Source: MoF 1996.

Figure 11: Projected Clearfelled Area, 2000-2040



Source: MoF 1996.

Data from the companion report on national and regional employment changes associated with forestry and agriculture (Fairweather et al., 2000a) can be used to characterise the East Coast study area. The relative proportions of employment in forestry and agriculture, at 15 per cent to 85 per cent in 1996, are similar to the New Zealand ratio. Agriculture employs about five times as many people compared to forestry. The ratios of employment (full time equivalents, or FTEs) to unit area in productive use, expressed as FTEs/1,000 hectares, have decreased from 1986 to 1996 and are now at four for forestry and five for agriculture. While on-land forestry FTE/1,000 hectares is lower than in agriculture, as is the national figure, the processing forestry FTE/1,000 hectares is similar to the agriculture figure. This is unlike the national figure where the forestry processing FTE1/,000 hectares is much higher than in agriculture. These data show the relative immaturity of the East Coast estate, compared to the national average, in that the employment benefits to the East Coast up to 1996 have been mainly from on-land employment in forestry. If processing employment in forestry were to increase locally to come close to the average of mature regions then there is scope for considerable generation of employment. For example, if the 1996 Central North Island data of FTE/1,000 hectares at 16 (both on-land and processing) were to be achieved on the East Coast, then the estimated number employed in forestry on the East Coast's 1996 area of 138,248 hectares could be 2,211 persons compared with the 594 actually employed in 1996.

There are, however, a number of technical, marketing and financial factors which are likely to mitigate against such an increase. There are also social factors which influence whether such increases in employment that do occur, are taken up by local workers as opposed to imported contract labour. This latter issue will be discussed in a subsequent AERU report.

In comparative regional terms, the important point is that the East coast is a relatively immature forestry region compared with central North Island and New Zealand as a whole, and this is reflected in the bias towards direct employment.

3.3 Land Cover Changes on the East Coast

In this section, detailed land use changes derived from the GIS analysis are presented, and as noted in Chapter 2, the smallest units of analysis, the mesh blocks, have been aggregated into 22 'area units'.

The East Coast region comprises Gisborne, rural towns and the rural area. Gisborne contains nine area units, there is one area unit for each rural town (Ruatoria, Tokomaru Bay, Te Karaka, Patutahi, Manutuke, and Tolaga Bay) and there are seven rural area units. Any change in land use for primary production occurs in the rural area units. Table 2 shows land use for all the rural area units and Figure 12 shows a map of the East Coast which locates the area units.

The two area units of the East Cape and Tarndale, both having over 260,000 hectares, dominate the East Coast. Between them they account for almost two-thirds (66 per cent) of the East Coast region. On the other hand, Makaraka, Matokitoki, and Wainui, the three smallest rural area units, are all less than 2,100 hectares and combined account for less than one per cent of the East Coast region. Wharekaka and Tiniroto are two comparable, moderate sized rural area units with 128,753.5 and 145,243.0 hectares respectively. We note that our data probably contain an error because they show that Matokitoki has experienced an increase in total land.

The key findings of the comparative analysis of the base line data (representing the general situation during the 1970s) with the 1991 situation are: first, there has been a 29 per cent relative decrease in **indigenous forest** down to 17 per cent of the total area in 1991. Change in indigenous forest is most notable in the Wharekaka area unit, where it has been almost eliminated from the landscape, down some 91.4 per cent. Matokitoki has also experienced a significant decrease, losing 68.7 per cent of its indigenous land cover although the actual area is very small. The East Cape and Tarndale area units have also had notable decreases with similar losses of about one-fifth (22.0 per cent and 20.1 per cent respectively). The area units of Makaraka and Wainui had essentially no indigenous forest in the 1970s or in 1991. This suggests an overall trend of continued bush decrease during the 1970s and 1980s.

Second, **available land,** that is, land cover that is available for either agricultural or forestry uses, had increased by 8.9 per cent between the 1970s and 1991 so that it is about 83 per cent of the total area. The large decrease in indigenous forest in Wharekaka has resulted in the largest increase in available land, of some 22.8 per cent. East Cape and Tarndale have achieved moderate sized increases in available land of 6.9 per cent and 10.4 per cent respectively. Available land in Wainui has increased by a marginal 1.1 per cent, has remained constant in Makaraka, and decreased a marginal 0.5 per cent and 0.2 per cent in Matokitoki and Tiniroto respectively.

Figure 12: Map Showing the Location of the Rural Area Units

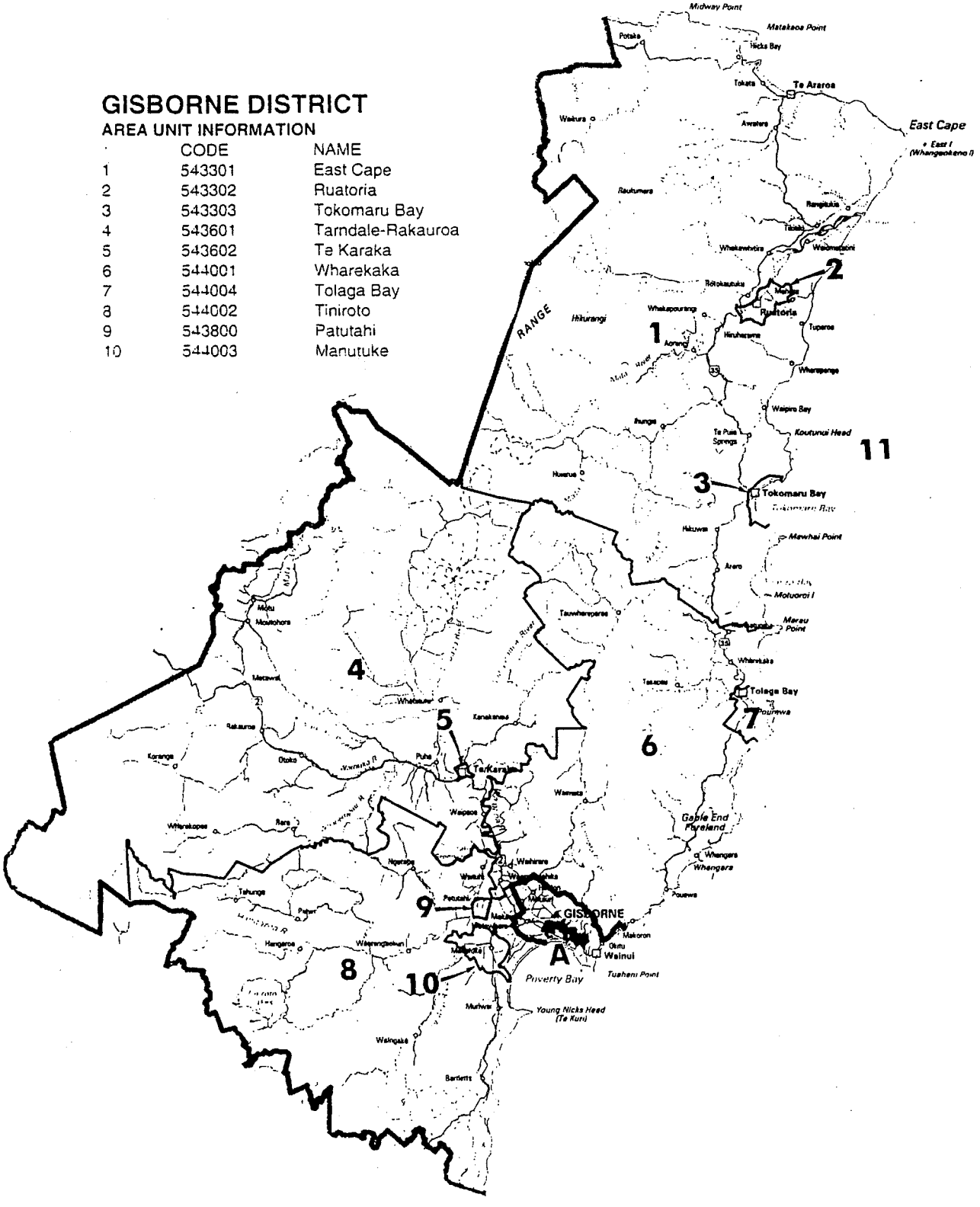


Table 3: Land Cover Change by Rural Area Unit, East Coast, 1970s-1991

Area Units	Total Area			Indigenous			Available Area		
	1970s	1991	% Change	1970s	1991	% Change	1970s	1991	% Change
East Cape	278,616	278,616	0	73,666	57,484	-22	204,950	221,132	8
Tarndale	264,431	264,431	0	88,791	70,987	-20	175,640	193,444	10
Makaraka	2,023	2,023	0	0	1	0	2,023	2,022	0
Matokitoki	1,877	2,301	23	52	16	-69	1,825	2,285	25
Wainui	1,436	1,436	0	0	0	0	1,436	1,436	0
Wharekaka	128,753	128,753	0	26,058	2,240	-91	102,696	126,513	23
Tiniroto	145,243	145,243	0	5,761	7,330	27	139,482	137,913	-1
East Coast	822,379	822,804	0	194,328	138,059	-29	628,052	684,745	9
% Total				24	17		76	83	

Area Units	Scrub					
	1970s	% AA 1970s	1991	% AA 1991	% Change	AA% Change
East Cape	120,766	59	39,659	18	-67	-41
Tarndale	97,127	55	10,855	6	-89	-50
Makaraka	0	0	0	0	0.0.	0
Matokitoki	523	29	9	0	-98	-28
Wainui	0	0	0	0	0	0
Wharekaka	50,797	49	6,484	5	-87	-44
Tiniroto	80,121	57	6,638	5	-92	-53
East Coast	349,334	56	63,644	9	-82	-46

Area Units	Forestry					
	1970s	% AA 1970s	1991	% AA 1991	% Change	AA % Change
East Cape	26,914	13	43,651	20	62	7
Tarndale	16,384	9	22,519	12	37	2
Makaraka	0	0	0	0	0	0
Matokitoki	0	0	129	6	0	6
Wainui	0	0	0	0	0	0
Wharekaka	12,419	12	27,599	22	122	10
Tiniroto	6,190	4	14,018	10	126	6
East Coast	61,908	10	107,915	16	74	6

Area Units	Farming					
	1970s	% AA 1970s	1991	% AA 1991	% Change	AA % Change
East Cape	56,854	28	137,822	62	142	35
Tarndale	62,129	35	160,070	83	158	47
Makaraka	2,023	100	2,022	100	0	0
Matokitoki	1,302	71	2,147	94	65	23
Wainui	1,389	97	1,436	100	3	3
Wharekaka	39,357	38	92,430	73	135	35
Tiniroto	53,027	38	117,258	85	121	47
East Coast	216,082	34	513,186	75	137	41

Third, although **scrub land** was the dominant land cover type in the 1970s with 56 per cent of available land in this category, by 1991 this had decreased dramatically. The four main area

units of East Cape (58.9 per cent), Tarndale (55.3 per cent), Wharekaka (49.5 per cent), and Tiniroto (57.4 per cent) had virtually half of their land in scrub in the 1970s. One-quarter of the Matokitoki area unit (28.7 per cent) was in scrubland, while the exclusively agricultural area units of Makaraka and Wainui had an absence of scrub. By 1991 there had been an apparent major change in the level of scrubland by area unit and over the East Coast in total. All of the five area units with a presence of scrub in the 1970s appear to have experienced large reductions in this type of land cover – by more than two-thirds in all cases. However, these changes may be exaggerated due to the method of assessing the type of vegetative cover of the 1970s. Further, to some extent scrubland is still used for farming, typically for extensive grazing. In effect, the apparent decrease in scrub land may not be as significant as these data indicate. Agricultural statistics show that total sheep numbers in 1971 were 2,509,931 and for 1991 were 2,211,491 indicating that there had not been any dramatic change in the total farmed area.

Fourth, in the 1970s **forestry** was a relatively minor land cover type on the East Coast, with just 61,907.8 hectares, representing just on one-tenth (9.9 per cent) of the region's available land, but this changed dramatically by 1991. The four area units of East Cape (13.1 per cent), Wharekaka (9.3 per cent), Tarndale (12.1 per cent), and Tiniroto (4.4 per cent) contained all of the forestry present in the 1970s, meaning Makaraka, Matokitoki and Wainui were forestry–free. Forestry underwent a major increase by 1991, rising by 74.3 per cent to cover 107,915.1 hectares of land. In percentage terms Wharekaka (122.2 per cent) and Tiniroto (126.4 per cent) experienced the highest rate of forestry growth, both more than doubling between the 1970s and 1991. Significant increases have also been experienced in the East Cape (62.2 per cent), up almost two-thirds, and in Tarndale (37.4 per cent), up over one-third. By 1991 forestry had made its first appearance in Matokitoki, although this was only 129.4 Ha, while Makaraka and Wainui remained forestry–free. In terms of the proportion of available land in forestry, the East Cape (19.7 per cent) and Wharekaka (21.8 per cent) were the two biggest contributors to East Coast forestry, with one-fifth. Tarndale (11.6 per cent) and Tiniroto (10.2 per cent) came next with one-tenth, while Matokitoki's (5.7 per cent) new forestry development meant a sliver of its land was planted forest. Forestry development on the East Coast between the 1970s and 1991 resulted in a 5.9 per cent increase in its share of the available land, to total 15.8 per cent by 1991.

Fifth, the rise in forestry was, however, rather overshadowed by the apparent growth in and continued dominance of **farming**. The data suggest that, based upon pastoral land cover, agricultural land use appeared to more than double between the 1970s and 1991, increasing by 137.5 per cent, and by 1991 accounted for virtually three-quarters (74.9 per cent) of East Coast available land. The dominant farming area units are Makaraka (100 per cent) and Wainui (100 per cent), which in both the 1970s and 1991 were both exclusively farming, thus have not changed in land use characteristics over two decades. All the other area units have significant area of farm land in 1991, which is indicative of the dominance of agriculture as a land use.

In summary, several critical points emerge from the above analysis of the land cover and land cover change statistics for the seven rural area units of the East Coast region between the 1970s and 1991. First is the 56,693 hectare increase in available land deriving from the decline in indigenous cover. Second is the apparent reduction in scrub land and corresponding increase in pastoral farm land. Some shift to pastoral farm land from scrub land probably occurred under pre-1984 incentives schemes such as Livestock Development and Encouragement Loan.

Third is the overall increase in agricultural land. If we consider both scrub land and pastoral farm land to be used for agricultural purposes then the combined total area for these two categories is 565,416 hectares in the 1970s and 576,830 hectares in 1991, an increase in agricultural land use of 11,414 hectares. Fourth, forestry land has increased by 46,007 hectares to 1991. The sum of the increases in forestry and agricultural land is 57,421 hectares, which is similar to the increase of 56,693 hectares of available land noted above, due to clearance of indigenous forest

For the period under analysis, therefore, the overall trend was continued clearance of indigenous forest, and its conversion into either agricultural or forestry land, and the continued clearance of scrub. Forestry land increased by some four times the increase in agricultural land. However, the gross figures do not indicate the specific spatial relationship between indigenous forest and scrub clearance and new forestry plantings. It cannot, for example, be assumed that the 4/5 of the land lost to indigenous forest cover was converted to forestry. From the spatial distribution of new forestry, it appears instead that most forestry is converted from pastoral land use, and that most conversion of indigenous forestry was into pastoral land.

3.4 Socio-economic Associations with Land Use Change

In this part of the report, each socio-economic variable is analysed in its own section. Within these sections the order of discussion is: (a) changes in the Gisborne, rural towns, and rural sub-categories and the East Coast region; (b) changes in Forestry, Farming, and No Change mesh blocks; and (c) a brief summary of the most important points of each variable's data. The tables also include New Zealand data for urban, rural towns, rural areas and the total for comparison. It is important to note here that the possibility does exist of some discrepancy between the population totals and the sum of other variables that have sub-categories, owing to the statistical error and/or rounding in the census data. For example, the total of the ethnic group sub-categories may not necessarily equal the total population figures, nor the sum of the four age groups.

Population. Overall, Table 4 shows that the net East Coast population was virtually stagnant, with only a 0.2 per cent increase to 1996. This is in contrast to the New Zealand data at the bottom of the table which show population gains for all main categories of at least seven per cent or more. Gisborne has had a marginal population increase between 1986 and 1996 of 0.4 per cent. A more significant figure is the growth in rural towns of 1.6 per cent. However, some rural towns gained population (especially Tolaga Bay) while some lost population. The rural areas also show variability in change with Tarndale-Rakauroa, an inland area unit, declining most and Wainui, near to Gisborne, increasing most.

This general stability in population overall suggests that the Gisborne, rural towns, and rural population changes are not the consequence of a dramatically altered birth rate. The decrease in population in rural areas of 0.9 per cent supports the possibility that these overall population changes are indicative of a quasi-urbanisation movement. The increase in rural town population suggests that – if these increases are an urbanisation process – the first movement is from rural areas and into the towns, rather than straight to the dominant city.

The contrast between the region's stability and the overall New Zealand growth of nearly 11 per cent implies a relative decline in the region. Investigation of birth rates would be useful to ascertain whether there was a net population outflow from the East Coast for the study period. Another factor may be the possible effect of overseas immigration.

Cross reference to the land cover data shows that forestry mesh blocks have low population and have declined most at 13.2 per cent. Farming mesh blocks contain most of the rural population and declined only half as fast as Forestry mesh blocks at 7.4 per cent, but again this is significantly faster than the overall rural rate of decline. Both Forestry and Farming counter the overall but marginal 0.2 per cent increase in East Coast Population. The No Change mesh blocks made up for the losses in Forestry and Farming, with a significant 15.6 per cent increase. These No Change mesh blocks are located near Gisborne, and probably have some subdivision activity, and therefore the increase may be due to urbanisation / urban expansion. They are also where more intensive farming and horticulture are located.

In summary, the majority of the East Coast population resides in Gisborne, that is, about 30,000 persons out of 46,000. The rural areas have most of the remaining population (about 12,000) and the rural towns have the remainder at about 4,000. Between 1986 and 1996 there was only a marginal increase in population. There was variation in growth among rural towns and rural area units. Forestry mesh blocks contain low population but lost relatively more people to 1996 than did the farming mesh blocks. The no change mesh blocks near Gisborne gained population. Generally, people have moved away from forestry, farming and rural areas to some rural towns and to the rural mesh blocks near Gisborne.

This section has addressed the overall population situation for the East Coast. Now it is appropriate to examine employment as it is most likely that the population changes have been driven by employment changes.

Table 4: Population Change, 1986-1996

Area Unit /Category	1986	1996	Change	%
Mangapapa	4,317	4,296	-21	-0.5
Te Hapara	4,218	4,389	171	4.1
Gisborne Airport	2,853	2,847	-6	-0.2
Whataupoko	3,684	3,633	-51	-1.4
Gisborne Central	3,204	3,378	174	5.4
Kaiti North	4,875	4,785	-90	-1.8
Kaiti South	3,087	2,991	-96	-3.1
Tamarau	2,436	2,424	-12	-0.5
Riverdale	1,146	1,191	45	3.9
Gisborne	**29,820**	**29,934**	**114**	**0.4**
Ruatoria	894	861	-33	-3.7
Tokomaru Bay	561	474	-87	-15.5
Te Karaka	567	600	33	5.8
Patutahi	369	348	-21	-5.7
Manutuke	726	738	12	1.7
Tolaga Bay	735	894	159	21.6
Rural Towns	**3,852**	**3,915**	**63**	**1.6**
East Cape	3,069	3,102	33	1.1
Tarndale - Rakauroa	2,382	1,884	-498	-20.9
Makaraka	765	894	129	16.9
Matokitoki	249	363	114	45.8
Wainui	1,143	1,377	234	20.5
Wharekaka	2,001	2,031	30	1.5
Tiniroto	2,388	2,238	-150	-6.3
Rural	**11,997**	**11,889**	**-108**	**-0.9**
E. Coast Total	**45,669**	**45,738**	**69**	**0.2**
Forestry	729	633	-96	-13.2
Farming	7,293	6,753	-540	-7.4
No Change	3,558	4,113	555	15.6
NZ Rural	406,377	445,029	38,652	9.5
NZ Rural Towns	75,960	81,531	5,571	7.3
NZ Urban	2,779,365	3,090,399	311,034	11.2
NZ Total	**3,261,702**	**3,616,959**	**355,257**	**10.9**

Employment. Table 5 shows that the East Coast experienced a 24.9 per cent decrease in Full Time Employment and a 17.4 per cent increase in Part Time Employment. As a consequence of this latter rise the loss in Full Time Equivalent Employment was reduced by 20.7 per cent. For New Zealand as a whole, there was a 3.9 per cent increase in FTEs. These figures are stark confirmation of an economic downturn in the East Coast. Gisborne city dominates the region's employment, and experienced a significant loss in Full Time Employment, down 26.3 per cent, between 1986 and 1996, much more than the 1.9 per cent decline in rural centres nationally. There was, however, a partial offset through a 10.2 per cent rise in Part Time Employment, but this was not enough to prevent a 22.6 per cent decrease in Full Time Equivalent Employment.

The biggest loss in employment in the rural towns came in Full Time Employment of 33.3 per cent, down one-third. This reduction probably reflects the closure of state services and banking facilities in the late 1980s. Again, a rise in Part Time Employment, this time of 16.8

per cent, has offset the full-time employment losses, but not enough to prevent a reduction by more than one-quarter in Full Time Equivalent Employment, down 28.4 per cent. The East Coast rural area lost FTEs much more than the New Zealand figure for rural centres (-1.9)

The rural areas recorded the smallest decrease in Full Time Employment, but this was still down by 19.1 per cent, or almost one-fifth. In contrast, they also experienced the biggest increase in Part Time Employment, up over a third at 35.6 per cent. There was, however, an overall reduction in Full Time Equivalent Employment of 13.9 per cent, which again is in contrast to the national figure of a 9.5 per cent increase. To some extent then the rural areas have been least affected by economic downturn certainly in terms of full time job losses. The area units close to Gisborne (Makaraka, Matokitoki and Wainui) have had an increase in FTEs possible due to urban expansion or developments in intensive agriculture and horticulture.

Table 5: Change in Total Numbers Employed, 1986-1996

Area Unit / Category	Full time		Part Time		FTE	
	Change	%	Change	%	Change	%
Mangapapa	-456	-26	48	13	-432	-22
Te Hapara	-360	-24	57	17	-332	-20
Gisborne Airport	-303	-30	-21	-8	-314	-28
Whataupoko	-132	-9	81	24	-92	-6
Gisborne Central	-324	-24	72	33	-288	-20
Kaiti North	-630	-34	12	3	-624	-31
Kaiti South	-480	-43	-9	-4	-485	-39
Tamarau	-261	-31	-15	-7	-269	-29
Riverdale	-12	-3	33	34	5	1
Gisborne	-2,958	-26	258	10	-2,829	-23
Ruatoria	-150	-48	21	41	-140	-41
Tokomaru Bay	-93	-46	-18	-32	-102	-44
Te Karaka	-75	-34	6	14	-72	-30
Patutahi	-9	-6	3	10	-8	-5
Manutuke	-48	-17	-9	-13	-53	-17
Tolaga Bay	-90	-37	48	89	-66	-24
Rural Towns	-465	-33	51	17	-440	-28
East Cape	-504	-46	66	29	-471	-39
T'dale -Rakauroa	-303	-32	30	17	-288	-28
Makaraka	-12	-3	51	71	14	4
Matokitoki	42	39	21	70	53	43
Wainui	96	21	75	61	134	26
Wharekaka	-57	-7	60	32	-27	-3
Tiniroto	-177	-17	57	29	-149	-13
Rural	-915	-19	360	36	-735	-14
East Coast Total	-4,338	-25	669	17	-4,004	-21
Forestry	-108	-35	6	12	-105	-31
Farming	-801	-28	156	27	-723	-23
No Change	60	4	201	59	161	10
NZ Rural	4,344	2.6	25,206	92.3	16,947	9.5
NZ Rural Towns	-2,085	-7.7	3,036	58.9	-567	-1.9
NZ Urban	-27,072	-2.5	128,541	68.1	37,199	3.2
NZ Total	-24,813	-1.9	156,783	70.9	53,579	3.9

The Forestry mesh blocks showed a greater decline in Full Time Employment, down over one-third by 35.0 per cent, almost twice the rural rate and nearly half the East Coast rate of

decline. A considerably smaller rise in Part Time Employment of only 11.8 per cent, which is only one-third of the rural and two-thirds of the East Coast rates of increase, is peculiar to these Forestry mesh blocks. The effect of the low increase in Part Time Employment does little to offset the impact of the reduction in Full Time Employment on Full Time Equivalent Employment, which is down just under one-third at 31.4 per cent. This decline is two and a half times the rural and half as much again as the East Coast rates of decline.

The Farming mesh blocks had a decrease of 27.8 per cent in Full Time Employment, one-quarter less than the reduction in Forestry mesh blocks, but still higher than the rural and East Coast rates. Farming's Part Time Employment increase of 26.8 per cent is less than the rural rate but more than the East Coast rate overall. Despite the similarity of these figures there was a 22.8 per cent decrease in Full Time Equivalent Employment, considerably higher than the rural and somewhat more than the East Coast rate.

The No Change mesh blocks were the only rural locales to experience a growth in Full Time Employment, up 4.1 per cent. This increase is unique across all other categories. Moreover, these No Change mesh blocks also experienced considerable development in Part Time Employment, up over one-half by 59.3 per cent, significantly ahead of the rural increase of 35.6 per cent and three and a half times the East Coast increase of 17.4 per cent. As a consequence of these two factors being positive, there is a unique increase in Full Time Equivalent Employment of one-tenth, or 9.8 per cent. This rise runs counter to the 13.9 per cent rural decrease and the 20.7 per cent East Coast decrease.

The employment data, measured in FTEs, roughly parallel the population data presented in the preceding section.

Table 6 shows the comparative trends. The overall population is static, but there is a shift from full time to part time employment, and an overall decline in FTEs. Forestry mesh blocks show the greatest declines in both population and employment. The only significant growth areas are on the intensively farmed plains close to Gisborne.

Table 6: Comparative Changes, 1986-96

	Popn. Change	Full Time Employment	Part Time Employment	FTE
Gisborne	0.4	-26	10	-23
Rural towns	1.6	-33	17	-28
Rural	-0.9	-19	36	-14
East Coast total	0.2	-25	17	-21
Forestry	-13.2	-35	12	-31
Farming	-7.4	-28	27	-23
No change	15.6	4	59	10

Agriculture and Forestry Employment. Total FTEs employed in the agriculture and forestry industries on the East Coast is down by one fifth at 20.7 per cent. This is against the national trend of a small increase of 3.9 per cent and for other rural towns with a decrease of 1.9 per cent (Table 7). Gisborne is up nine per cent and contrasts sharply with declines of more than a quarter in both rural towns, down 28.3 per cent, and in rural areas, down 29.9 per cent. Notable also is the fact that overall FTEs for the East Coast have increased

Employment in the agriculture and forestry industries in the forestry mesh blocks has declined 34 per cent, which is slightly greater than the rural area overall, and more than half as much

again as the East Coast overall. Farming mesh block change is consistent with the overall rural decline. In contrast, the No Change mesh blocks have increased by ten per cent.

Table 7: FTEs Employed in Agriculture and Forestry, 1986-1996

Area Unit/	Agriculture and Forestry FTEs			
Category Totals	**1986**	**1996**	**Change**	**%**
Mangapapa	141	159	18	12.8
Te Hapara	142.5	172.5	30	21.1
Gisborne Airport	82.5	331.5	249	301.8
Whataupoko	109.5	133.5	24	21.9
Gisborne Central	105	112.5	7.5	7.1
Kaiti North	171	246	75	43.9
Kaiti South	105	87	-18	-17.1
Tamarau	88.5	88.5	0	0.0
Riverdale	37.5	175.5	138	368.0
Gisborne City	**982.5**	**1071**	**88.5**	**9.0**
Ruatoria	94.5	46.5	-48	-50.8
Tokomaru Bay	57	31.5	-25.5	-44.7
Te Karaka	87	78	-9	-10.3
Patutahi	46.5	58.5	12	25.8
Manutuke	121.5	97.5	-24	-19.8
Tolaga Bay	76.5	156	79.5	103.9
Rural Towns	**483**	**346.5**	**-136.5**	**-28.3**
East Cape	564	315	-249	-44.1
Tarndale-Rakauroa	753	489	-264	-35.1
Makaraka	99	804	705	712.1
Matokitoki	49.5	39	-10.5	-21.2
Wainui	55.5	70.5	15	27.0
Wharekaka	546	109.5	-436.5	-79.9
Tiniroto	721.5	537	-184.5	-25.6
Rural	**2,788.5**	**1,954.5**	**-834**	**-29.9**
East Coast Total	**4,254**	**3,372**	**-882**	**-20.7**
Forestry	348	230	-119	-34
Farming	3,161	2,249	-912	-29
No Change	1,634	1,796	161	10
NZ Rural	177,789	194,736	16,947	9.5
NZ Rural Towns	29,757	29,190	-567	-1.9
NZ Urban	1,179,990	1,217,192	37,202	3.2
NZ Total	**1,387,536**	**1,441,118**	**53,582**	**3.9**

Note: Supermap does not provide forestry and agriculture mesh block data separately and this precludes analysis by mesh block land cover change.

The decreases in agriculture and forestry industries employment in rural areas and the contrasting increase in Gisborne suggests that this industry has been centralised into Gisborne and is becoming more process oriented.

Table 8 shows the agriculture and forestry data broken into separate industries. Overall, forestry has declined less than farming at seven per cent compared to 22 per cent. However, forestry FTEs decreased to 1996 in Gisborne while farming increased. In the rural towns and the rural areas, forestry has not declined as much as farming.

Table 8: FTEs Employed in Agriculture and Forestry, 1986-1996, Separated

Area Unit /	Forestry FTE				Agriculture FTE			
Category Totals	1986	1996	Change	%	1986	1996	Change	%
Mangapapa	65	51	-14	-20.9	77	99	23	29.4
Te Hapara	60	51	-9	-15.0	83	119	36	43.6
Gisborne Airport	32	36	5	14.3	51	75	24	47.1
Whataupoko	65	45	-20	-30.2	45	83	38	83.3
Gisborne Central	47	51	5	9.7	59	65	6	10.3
Kaiti North	65	74	9	14.0	107	96	-11	-9.9
Kaiti South	30	26	-5	-15.0	75	62	-14	-18.0
Tamarau	36	38	2	4.2	53	51	-2	-2.9
Riverdale	14	14	0	0.0	24	33	9	37.5
Gisborne City	**411**	**384**	**-27**	**-6.6**	**572**	**681**	**110**	**19.2**
Ruatoria	48	32	-17	-34.4	47	27	-20	-41.9
Tokomaru Bay	33	26	-8	-22.7	24	15	-9	-37.5
Te Karaka	24	12	-12	-50.0	63	48	-15	-23.8
Patutahi	5	18	14	300.0	42	47	5	10.7
Manutuke	6	6	0	0.0	116	89	-27	-23.4
Tolaga Bay	18	26	8	41.7	59	39	-20	-33.3
Rural Towns	**134**	**119**	**-15**	**-11.2**	**350**	**264**	**-86**	**-24.5**
East Cape	116	87	-29	-24.7	449	267	-182	-40.5
Tarndale-Rakauroa	75	33	-42	-56.0	678	462	-216	-31.9
Makaraka	12	20	8	62.5	87	72	-15	-17.2
Matokitoki	0	6	6	~	50	33	-17	-33.3
Wainui	9	26	17	183.3	47	48	2	3.2
Wharekaka	27	44	17	61.1	519	387	-132	-25.4
Tiniroto	24	30	6	25.0	698	513	-185	-26.5
Rural	**263**	**245**	**-18**	**-6.9**	**2,526**	**1,782**	**-744**	**-29.5**
East Coast Total	**807**	**747**	**-60**	**-7.4**	**3,447**	**2,693**	**-755**	**-21.9**
NZ Rural	3,108	2,375	-733	-23.6	94,472	79,257	-15215	-16.1
NZ Rural Towns	1,125	558	-567	-50.4	4,625	4,374	-251	-5.4
NZ Urban	6,947	5,877	-1070	-15.4	35,562	36,233	671	1.9
NZ Total	**11,180**	**8,810**	**-2370**	**-21.2**	**134,658**	**119,864**	**-14794**	**-11.0**

Notes:
1. The numbers given here do not match exactly the data provided earlier in the regional tables because in this table we have used the Supermap industry classifications which are a broader basis of classification.
2. Data for Farming, Forestry, and No Change Mesh Blocks are unavailable from Supermap3.

Gender. Overall, Table 9 shows that the East Coast has a Gender ratio (male to female) of 49:51, which is the expected biological ratio, and this has not changed between 1986 and 1996, although there has been a nominal decrease in males and a slightly bigger increase in females. The ratio for New Zealand as whole is also 49 percent for males and 51 per cent for females. While Gisborne has experienced an absolute decrease in males and increase in females between 1986 and 1996, this has not altered the gender ratio, which remains at 48:52. In rural towns the absolute change has been the inverse trend to Gisborne, with males increasing and females decreasing. This change has resulted in a two per cent swing to a gender ratio, also the inverse of Gisborne, of 52:48. In rural areas the gender balance has remained constant at the same ratio of 52:48, despite an increase in males and a decrease in females.

Forestry mesh blocks show a one per cent swing in the gender ratio to 56:44, despite the fact that the male decrease was slightly larger than the female decrease. This forestry gender ratio is clearly at considerable odds with both the rural ratio (four per cent difference) and the East Coast ratio (seven per cent difference), perhaps indicative of the type of work available in these locales. Farming mesh blocks experienced a greater decrease in both males and females than Forestry, but this did not effect the gender ratio, which remained constant at 52:48. This is the same ratio as for the rural ratio, but is a three per cent difference from the biological and East Coast ratio, again suggesting that the type of work available in these rural areas effects the gender balance. The No Change mesh blocks countered the decrease in males and females in the Forestry and Farming regions with sizeable increases in both genders. This growth resulted in a two per cent swing in the Gender ratio from 50:50 to 52:48, a consequence of the increase in males being notably larger than the increase in females. Like the farming gender ratio, this is the same ratio as for the rural ratio, but is a three per cent difference from the biological and East Coast ratio, further evidence that the character of rural employment possibly effects the gender balance.

Table 9: Change in Gender, 1986-1996

Area Unit /	1986				1996				Change		Change	
Category	**Males**	**%**	**Females**	**%**	**Males**	**%**	**Females**	**%**	**Male**	**%**	**Female**	**%**
Mangapapa	2,073	48	2,235	52	2,073	48	2,220	52	0	0	-15	0
Te Hapara	2,016	48	2,187	52	2,010	46	2,394	54	-6	-2	207	2
Gisborne Airport	1,377	48	1,479	52	1,407	49	1,440	51	30	1	-39	-1
Whataupoko	1,767	48	1,905	52	1,758	48	1,884	52	-9	0	-21	0
Gisborne Central	1,545	48	1,686	52	1,620	48	1,749	52	75	0	63	0
Kaiti North	2,349	48	2,520	52	2,226	47	2,559	53	-123	-1	39	1
Kaiti South	1,566	51	1,533	49	1,461	49	1,536	51	-105	-2	3	2
Tamarau	1,179	48	1,254	52	1,203	49	1,230	51	24	1	-24	-1
Riverdale	555	48	591	52	561	47	621	53	6	-1	30	1
Gisborne	**14,427**	**48**	**15,390**	**52**	**14,319**	**48**	**15,633**	**52**	**-108**	**0**	**243**	**0**
Ruatoria	462	51	438	49	435	51	426	49	-27	0	-12	0
Tokomaru Bay	282	51	273	49	261	55	210	45	-21	4	-63	-4
Te Karaka	282	50	285	50	315	59	219	41	33	9	-66	-9
Patutahi	186	51	180	49	171	49	177	51	-15	-2	-3	2
Manutuke	369	51	360	49	360	49	378	51	-9	-2	18	2
Tolaga Bay	354	49	372	51	444	49	453	51	90	0	81	0
Rural Towns	**1,935**	**50**	**1,908**	**50**	**1,986**	**52**	**1,863**	**48**	**51**	**2**	**-45**	**-2**
East Cape	1,575	52	1,467	48	1,647	53	1,458	47	72	1	-9	-1
T'dale - Rakauroa	1,251	53	1,110	47	1,017	54	858	46	-234	1	-252	-1
Makaraka	393	50	387	50	477	53	429	47	84	3	42	-3
Matokitoki	123	51	120	49	177	49	183	51	54	-2	63	2
Wainui	561	49	588	51	705	51	678	49	144	2	90	-2
Wharekaka	1,032	52	966	48	1,065	52	966	48	33	0	0	0
Tiniroto	1,275	54	1,104	46	1,149	51	1,086	49	-126	-3	-18	3
Rural	**6,210**	**52**	**5,742**	**48**	**6,237**	**52**	**5,658**	**48**	**27**	**0**	**-84**	**0**
East Coast Total	**22,572**	**49**	**23,040**	**51**	**22,542**	**49**	**23,154**	**51**	**-30**	**0**	**114**	**0**
Forestry	411	55	330	45	351	56	276	44	-60	1	-54	-1
Farming	3,792	53	3,429	47	3,534	52	3,207	48	-258	0	-222	0
No Change	1758	50	1782	50	2133	52	2004	48	348	2	222	-2
NZ Rural	215,133	53	191,244	47	232,824	52	212,205	48	17,691	8.2	20,961	11
NZ Rural Towns	37,700	51	37,260	49	41,193	51	40,338	49	2,493	6.4	3,078	8.3
NZ Urban	1,361,523	49	1,417,869	51	1,502,514	49	1,587,900	51	140,991	10.4	170,031	12.0
NZ Total	**1,615,356**	**50**	**1,646,373**	**50**	**1,776,531**	**49**	**1,840,443**	**51**	**161,175**	**10.0**	**194,070**	**11.8**

This impact, to reiterate, of the nature of rural employment altering the gender ratio in those areas is a tentative suggestion to explain these differences between rural and non-rural areas. It seems a plausible hypothesis but cannot be verified from these statistics.

Ethnicity. Overall, the East Coast European population has apparently decreased by more than one-sixth, or 17.3 per cent, while the Maori population has increased by one-eighth, a 12.2 per cent increase (Table 10). At this point it is critical to note that this increase / decrease could be the cause and effect of the same process, with the possibility that a growing number of Maori, hitherto self-identified as European, have begun to assert their Maori ethnic identity. Certainly this would help explain the large discrepancy between European decline and Maori incline *vis-à-vis* the virtually stagnant total East Coast population. A possible secondary explanation behind the large decline in European numbers but small change in overall population is to attribute this loss to the gain in Not Specified, suggesting that the practice of not declaring one's ethnicity is a largely European phenomena. These changes have occurred nationally with a 2.1 per cent decrease in the percentage European and a 29.3 percentage increase in Maori, with a similar pattern for New Zealand urban, New Zealand rural towns and New Zealand rural.

Table 10: Change in Ethnicity, 1986-1996

Area Unit / Category Totals	European				Maori			
	1986	1996	Change	%	1986	1996	Change	%
Mangapapa	3,153	2,613	-540	-17.1	1,101	1,368	267	24.3
Te Hapara	3,285	2,709	-576	-17.5	837	1,329	492	58.8
Gisborne Airport	1,674	1,155	-519	-31.0	1,140	1,533	393	34.5
Whataupoko	3,213	2,895	-318	-9.9	396	540	144	36.4
Gisborne Central	2,352	2,025	-327	-13.9	780	1,032	252	32.3
Kaiti North	2,649	2,067	-582	-22.0	2,142	2,223	81	3.8
Kaiti South	1,476	1,005	-471	-31.9	1,575	1,629	54	3.4
Tamarau	1,020	552	-468	-45.9	1,359	1,530	171	12.6
Riverdale	825	750	-75	-9.1	321	387	66	20.6
Gisborne	**19,647**	**15,771**	**-3,876**	**-19.7**	**9,651**	**11,571**	**1,920**	**19.9**
Ruatoria	144	60	-84	-58.3	735	774	39	5.3
Tokomaru Bay	141	69	-72	-51.1	408	393	-15	-3.7
Te Karaka	186	132	-54	-29.0	369	438	69	18.7
Patutahi	189	153	-36	-19.0	171	183	12	7.0
Manutuke	273	261	-12	-4.4	432	426	-6	-1.4
Tolaga Bay	279	192	-87	-31.2	444	588	144	32.4
Rural Towns	**1,212**	**867**	**-345**	**-28.5**	**2,559**	**2,802**	**243**	**9.5**
East Cape	522	408	-114	-21.8	2,466	2,541	75	3.0
Tarndale - Rakauroa	1,314	1,026	-288	-21.9	1,038	744	-294	-28.3
Makaraka	606	693	87	14.4	123	150	27	22.0
Matokitoki	225	300	75	33.3	18	45	27	150.0
Wainui	1,029	1,077	48	4.7	102	219	117	114.7
Wharekaka	1,362	1,248	-114	-8.4	615	612	-3	-0.5
Tiniroto	1,668	1,431	-237	-14.2	660	657	-3	-0.5
Rural	**6,726**	**6,183**	**-543**	**-8.1**	**5,022**	**4,968**	**-54**	**-1.1**
East Coast Total	**27,585**	**22,821**	**-4,764**	**-17.3**	**17,232**	**19,341**	**2,109**	**12.2**
Forestry	375	276	-99	-26.4	624	594	-30	-4.8
Farming	3,570	3,000	-570	-16.0	3,054	2,904	-150	-4.9
No Change	2697	2826	129	4.8	888	939	51	5.7
NZ Rural	342,993	349,926	6,933	2	55,824	69,372	13,548	24.3
NZ Rural Towns	58,770	57,135	-1,635	-2.8	15,435	18,786	3,351	21.7
NZ Urban	2,248,275	2,186,865	-61,410	-2.7	333,429	435,147	101,718	30.5
NZ Total	**2,650,038**	**2,593,926**	**-56,112**	**-2.1**	**404,688**	**523,305**	**118,617**	**29.3**

Gisborne has had a dramatic decline in the number of Europeans, down one-fifth at 19.7 per cent between the 1986 and 1996. This decrease has been countered by a similar increase in Maori of 19.9 per cent. The comparable but opposite character of these two figures suggests that, given the overall stability of Gisborne's population, this result may be due to people giving different responses to the 1986 and 1996 census question.

Rural towns have had a decrease in their European population of 28.5 per cent, while the Maori population has again increased, but this time by only 9.5 per cent. These figures suggest that the quasi-urbanisation process of rural – rural town movement identified under 'Population' is a predominantly Maori phenomenon, while Europeans are also migrating, but from these towns rather than to them.

In the East Coast's rural areas European numbers have fallen by 8.1 per cent, a much slower rate of decline than in the urban centres, but still eight times faster than the overall rural population decline. The Maori rate of decline in rural areas is close to the overall population rate of decline, down by just 1.1 per cent. This figure suggests that Maori are more likely to stay in an area despite decreases in available employment, whereas Europeans may be more mobile. This is quite plausible in cultural terms, and at the same time is supportive of the above hypothesis that quasi-urbanisation into rural towns is a largely Maori phenomenon.

The rate of decline in Forestry mesh blocks for the European population is 26.4 per cent, some three times greater than the European decrease for rural areas. The rate of decline for the Maori population of 4.8 per cent is also much faster than the Maori decrease for rural areas, this time by a factor of four. There is a similar pattern of change in Farming mesh blocks. The European population has declined by 16.0 per cent, so this is somewhat slower than the rate in Forestry mesh blocks, but still twice as fast as the overall rural rate. The decline in the Maori population is virtually the same as for Forestry mesh blocks at 4.9 per cent, but again this is much faster than the overall Maori rural rate of decline. The No Change mesh blocks counter the general trend of decline in Forestry and Farming mesh blocks. Here, the European population has increased by 4.8 per cent while the Maori population has similarly increased by 5.7 per cent.

The main point from these data is the accelerated rate of decline in European and Maori emigration from Forestry and Farming mesh blocks *vis-à-vis* the rural decrease. The rise in the Not Specified category may exaggerate this decrease somewhat, but the respective European and Maori rates of decline are nevertheless of interest.

Age Group. Table 11 shows that the East Coast age group figures for the 0-19 years age group has declined 6.6 per cent, slightly faster than the 6.0 per cent decline in the 20-39 years age group. There has been an increase of 17.7 per cent in the 40-59 years age group and a 14.1 per cent increase in the 60+ years age group. Clearly the population is ageing as young people (less than 40 years old) decrease in number while people older than 40 years increase in number. Nationally there are no decreases in any age group although the 0-19 years age group is static. Rural centres and rural areas also decline but not to the same extent as on the East Coast.

Similarly, the average age in Gisborne's population has increased. There has been a 3.5 per cent and 3.4 per cent decrease in the 0-19 years and 20-39 years age groups, respectively. There has been a 9.8 per cent and 11.0 per cent increase in the 40-59 years and 60+ years age groups, respectively. This decrease – increase pattern is repeated in both the rural towns and rural areas, although the rates of change are more pronounced. This pattern matches the

national pattern for rural centres and rural areas but they have lower levels of losses in the two younger age groups and higher levels of increases in the two older age groups.

These data suggest a number of demographic processes, for example a drop in the birth rate, emigration of young people from the region in search of tertiary education and/or employment, and the immigration of retirees. The ageing population is also consistent with the overall static population figures.

Table 11: Change for Main Age Groups, 1986-1996

Area Unit /	0 - 19 yrs		20 – 39 yrs		40 – 59 yrs		60+ yrs		Net	
Category Totals	**Change**	**%**	**Change**	**%**	**Change**	**%**	**Change**	**%**	**Change**	**%**
Mangapapa	-93	-6	-3	0	60	7	123	21	87	2
Te Hapara	93	8	63	6	-57	-6	81	8	180	4
Gisborne Airport	123	12	135	18	-102	-17	-81	-16	75	3
Whataupoko	-48	-4	-90	-9	159	21	15	2	36	1
Gisborne Central	27	3	-90	-9	168	34	42	6	147	5
Kaiti North	-225	-11	-171	-12	132	15	126	22	-138	-3
Kaiti South	-42	-4	-51	-5	-27	-5	105	28	-15	-1
Tamarau	-213	-19	-99	-13	192	60	108	73	-12	-1
Riverdale	3	1	3	1	21	10	-3	-1	24	2
Gisborne	-375	-4	-303	-3	546	10	516	11	384	1
Ruatoria	-33	-8	-24	-8	21	16	15	21	-21	-2
Tokomaru Bay	-60	-28	-45	-25	9	9	18	38	-78	-14
Te Karaka	6	3	9	5	-9	-9	15	42	21	4
Patutahi	-21	-14	-15	-14	0	0	6	15	-30	-8
Manutuke	-18	-6	6	3	-3	-2	33	48	18	2
Tolaga Bay	15	5	30	14	90	88	69	79	204	29
Rural Towns	-111	-7	-39	-3	108	17	156	44	114	3
East Cape	-192	-14	-6	-1	180	34	69	27	51	2
T'dale - Rakauroa	-312	-31	-213	-29	78	20	15	11	-432	-19
Makaraka	42	17	15	6	54	25	-6	-6	105	13
Matokitoki	0	0	15	17	48	73	12	31	75	26
Wainui	87	27	69	18	165	92	-45	-19	276	24
Wharekaka	-57	-8	-165	-22	186	50	48	29	12	1
Tiniroto	-210	-22	-216	-26	135	28	99	63	-192	-8
Rural	-642	-13	-501	-13	846	38	192	17	-105	-1
East Coast Total	**-1128**	**-7**	**-843**	**-6**	**1500**	**18**	**864**	**14**	**393**	**1**
Forestry	-90	-30	-84	-26	33	31	3	7	-138	-18
Farming	-684	-22	-444	-19	387	29	171	34	-570	-8
No change	174	14	27	2	405	57	3	1	609	17
NZ Rural	-5,958	-4	-2,832	-2	35,616	43	11,184	31	38,640	10
NZ Rural Towns	-1,605	-6	-417	-2	4,572	31	3,042	28	5,592	7
NZ Urban	7,464	1	91,206	10	150,072	27	62,376	14	311,118	11
NZ Total	**-99**	**0**	**87,957**	**8**	**190,260**	**29**	**77,232**	**16**	**355,350**	**11**

In the rural towns the decrease is highest in the 0-19 years age group at 6.8 per cent, while the decline in the 20-39 years age group is 3.3 per cent. Countering this loss is a 16.7 per cent and 44.4 per cent gain in the 40-59 years and 60+ years age groups, respectively. Again, these data possibly support a number of demographic processes, including a drop in the birth rate, young emigration in search of tertiary education and/or employment, the effect of the closure of state services and banking facilities on employment, and the immigration of retirees. The cyclic character of these changes should also be noted, for example the decline in the 20-39 years age group will have an obvious impact on the birth rate. The possibility that retirees are

moving from rural areas to rural towns is a potential explanation of the increase in this age group.

At 13.4 per cent the rate of rural decline in the 0-19 years age group is twice that of both the rural towns and overall East Coast rates. Even more pronounced is the rate of decline in the 20-39 years age group, which at 12.6 per cent is almost four times faster than the rural towns rate and more than twice as fast as the overall East Coast rate. These data reinforces the hypothesis of decline in the younger age groups due to lack of employment and educational opportunities in the East Coast in general and the rural areas in particular. This rural decline is again countered, however, by a 37.8 per cent increase in the 40-59 years age group, a rate twice as fast as both the rural towns and overall East Coast rates, and four times as fast as the Gisborne rate. A possible explanation for this dramatic change is the movement from city living to lifestyle blocks possibly located in 'rural' areas on the fringes of Gisborne. The rural increase in the 60+ years age group of 17.4 per cent is higher than both the Gisborne (interestingly, given the conventional hypothesis that retirees retire into cities rather than remain on rural farms) and East Coast rates, but considerably less than the rural towns rate. This figure seems to suggest that those of retirement age are NOT leaving the land and retiring to rural towns or Gisborne, as happens elsewhere in New Zealand.

The Forestry mesh blocks show a 29.7 per cent rate of decline in the 0-19 years age group, which is more than twice as fast as the rural and more than four times as fast as the East Coast rates. There is a similar decrease in the 20-39 years age group of 26.4 per cent, which is again twice the rural and four times the East Coast rates. These two rather large decreases strongly suggest that Conversion to forestry has an adverse impact on the young population. In contrast, the 40-59 years age group experienced a 30.6 per cent increase, which is slower than the rural but faster than the East Coast rates. There has been a moderate increase of 7.1 per cent in the 60+ years age group in the Forestry mesh blocks, which is significantly lower than the rural increase and only half of the East Coast rate.

The rate of decline amongst the farming mesh blocks for the 0-19 years age group is 22.3 per cent, somewhat slower than the corresponding rate for Forestry, but notably faster than the rural rate, and more than three times the overall East Coast rate. This result suggests that, at the very least, farming is not conducive to retaining young people in rural East Coast. Combined with farming's 18.6 per cent decrease in the 20-39 years age group this raises the possibility that pastoral farming is discouraging younger people from remaining in rural areas. This decrease is 50 percent higher than the rural rate and more than three times as fast as the overall East Coast rate. In contrast, however, Farming registered a 29.1 per cent increase in the 40-59 years age group, slightly less than the rural but significantly faster than the East Coast rate. Farming's largest category increase of 34.3 per cent occurred in the 60+ years age group. Rather surprisingly this rise is double the rural rate 20 percent higher than the East Coast rate.

One interpretation of these contemporary trends is that there is an ageing cohort of farmers whose children are leaving the locality for alternative careers elsewhere. This would be consistent with national trends in the more remote rural areas.

The No Change mesh blocks represent a significant contrast to in the previously noted decline in the two younger age groups. Here, the population in the 0-19 years age group has risen a considerable 14.3 per cent. There has also been a rise, although a considerably smaller one, in the 20-39 years age group of 2.3 per cent. Like Forestry and Farming, the No Change mesh blocks have experienced a significant increase in the 40-59 years age group of 57.2 per cent, which is 20 percent more than the rural rate and more than three times as fast as the East

Coast rate. Unlike Forestry and Farming, however, the No Change mesh blocks have not experienced any notable change in the 60+ years age group, which has remained virtually stagnant with only a 0.6 per cent rise. This result suggests that it is not retirees who are attracted to these areas, but instead small holders with families. This matches patterns elsewhere in New Zealand (Swaffield and Fairweather, 1998).

The crucial point here is the large decreases in the first two age groups in both Forestry and Farming mesh blocks, which tends to suggest that neither land use is particularly amenable to maintaining a young population. The inference of this figure is that employment opportunities are limited and therefore those of working age migrate elsewhere. Conversely, the rises in this age bracket in the No Change mesh blocks suggests that the more intensive small holdings and horticultural land uses, and urban expansion, are associated with an increase in young people.

Furthermore, the fact that both forestry and farming are associated with these decreases in younger people, albeit at somewhat different rates, suggests that a shift from farming to forestry cannot be blamed solely for the change in population profile.

Education. Overall, Table 12 shows that the East Coast experienced a 7.7 per cent rise in the Tertiary Qualification category, a 26.1 per cent rise in the Secondary Qualification category, and a 14.8 per cent fall in the No Qualification category, showing a general trend of an increasingly educated population. For New Zealand there was a 24 per cent gain in tertiary qualification and a 42 per cent gain in secondary qualifications, while rural centres had gains of 15 per cent and 45 per cent. Gisborne had a slight increase in the number of inhabitants with a Tertiary Qualification, up 3.9 per cent. There was, however, a major increase in the Secondary Qualification category, up nearly one-quarter at 24.4 per cent. These gains were offset by a 13.1 per cent decline in those with No Qualification.

There was a similar increase in Tertiary Qualification of 3.3 per cent in rural towns, and likewise a massive increase in Secondary Qualification of 42.8 per cent. Again, these rises balanced a decrease in No Qualification of 9.7 per cent. As with Gisborne, the conclusion is that the East Coast's rural town population is becoming more educated.

The proportion with a Tertiary Qualification in rural areas is up almost one-fifth at 19.5 per cent, those with a Secondary Qualification is up over one-quarter at 26.5 per cent, and those with No Qualification is down one-fifth at 20.8 per cent. Thus the trend of rising education levels continues in the rural context, and indeed to the greatest extent of the three sub-categories. The national rural figures are 30 per cent and 40 per cent respectively for tertiary and secondary qualifications.

The East Coast figures, showing significant increases for rural areas, rural towns and overall, are nonetheless lower than the comparable New Zealand national figures. So while the region is becoming more educated, it is not doing so as fast as other regions. There is also a greater representation of secondary, rather than tertiary, qualifications.

In terms of particular land use change, the Forestry mesh blocks show a major shift from No Qualification, down 26.6 per cent, to Secondary Qualification, up 65.2 per cent. The decrease in No Qualification and corresponding increase in Secondary Qualification follows the general trend for both rural and East Coast changes, but far outstrips these more moderate shifts. The Forestry mesh blocks do go against the rural and East Coast trend in Tertiary Qualification, with a decrease of 4.7 per cent. In combination, the dramatic increase in

Secondary Qualification and so far unique decrease in Tertiary Qualification suggests that forestry attracts trade oriented workers rather than professionals.

Table 12: Change in Level of Education, 1986-1996

Area Unit / Category	Tertiary		Secondary		None	
	Change	%	Change	%	Change	%
Mangapapa	72	8	171	24	-228	-14
Te Hapara	66	8	207	29	-222	-12
Gisborne Airport	-48	-10	87	22	-291	-23
Whataupoko	-30	-3	93	11	-144	-15
Gisborne Central	90	14	231	39	-159	-12
Kaiti North	12	1	108	14	-291	-16
Kaiti South	9	2	117	29	-144	-11
Tamarau	24	8	129	46	48	5
Riverdale	27	13	54	26	-69	-17
Gisborne	**222**	**4**	**1,197**	**24**	**-1,500**	**-13**
Ruatoria	12	10	15	13	-51	-15
Tokomaru Bay	-27	-29	15	23	-75	-29
Te Karaka	-9	-13	36	86	-33	-13
Patutahi	-3	-5	36	75	-15	-10
Manutuke	-6	-5	36	41	-54	-19
Tolaga Bay	51	65	57	61	72	23
Rural Towns	**18**	**3**	**195**	**43**	**-156**	**-10**
East Cape	90	26	87	21	-192	-15
Taradale - Rakauroa	36	12	27	8	-327	-35
Makaraka	30	20	72	52	-33	-11
Matokitoki	60	143	36	92	-6	-7
Wainui	69	18	132	60	-60	-20
Wharekaka	111	32	81	24	-117	-17
Tiniroto	-6	-1	78	17	-195	-23
Rural	**390**	**20**	**513**	**26**	**-930**	**-21**
East Coast Total	**630**	**8**	**1,905**	**26**	**-2,586**	**-15**
Forestry	-6	-5	45	65	-87	-27
Farming	180	18	327	30	-648	-24
No Change	210	25	120	18	-192	-16
NZ Rural	22,125	30	28,593	40	-120	0
NZ rural Towns	2,022	15	5,145	45	588	2
NZ Urban	151,032	24	214,959	42	-17,880	-2
NZ Total	**175,179**	**24**	**248,697**	**42**	**-17,412**	**-2**

The Farming mesh blocks produced an 18.3 per cent increase in Tertiary Qualification, a figure comparable with the rural change but easily exceeding the East Coast change. There was also a 29.9 per cent increase in Secondary Qualification, a rise ahead of both the rural and East Coast changes. Again, these two gains were balanced by a loss of 23.8 per cent in the No Qualification category. The Farming mesh blocks therefore conform to the general conclusion that the East Coast population is becoming more educated.

The same conclusion can be drawn for the No Change mesh blocks, where Tertiary Qualification has risen 25.2 per cent, or one-quarter more than the rural and three times more than the East Coast overall. Secondary Qualification has increased 17.7 per cent, or somewhat slower than both the rural and East Coast rates. Finally, No Qualification has decreased 16.2 per cent, notably slower than the rural but marginally more than the East Coast rate. The effect is the same as previously though, namely that the No Change mesh blocks population is also becoming more educated.

Income Support. Table 13 shows that the East Coast recorded a 6.9 per cent increase in the One Income Support category, a 65.2 per cent decrease in the Two Income Support category, a 7.0 per cent increase in the No Income Support category, and a 94.2 per cent increase in the Not Specified category. These figures are similar to the New Zealand figures except that nationally there had been a 29 per cent change in no income support.

Table 13: Change in Numbers on Income Support Benefits, 1986-1996

Area Unit / Category Totals	One		Two or More		None		Not Specified	
	Change	%	Change	%	Change	%	Change	%
Mangapapa	114	10	-249	-63	45	3	60	59
Te Hapara	21	1	-144	-43	81	6	162	200
Gisborne Airport	87	10	-195	-62	-78	-9	21	32
Whataupoko	-291	-26	-132	-59	339	24	63	95
Gisborne Central	123	12	-99	-39	27	2	78	96
Kaiti North	87	7	-345	-70	-24	-2	183	130
Kaiti South	120	15	-192	-61	-177	-19	186	270
Tamarau	144	29	-195	-72	48	7	186	200
Riverdale	-63	-19	-81	-77	126	32	27	180
Gisborne	342	4	-1,632	-60	387	4	966	135
Ruatoria	69	34	-60	-71	-42	-17	3	13
Tokomaru Bay	33	22	-36	-57	-36	-21	-18	-75
Te Karaka	30	24	-36	-60	12	7	6	25
Patutahi	9	11	-15	-50	30	26	-9	-43
Manutuke	12	8	-39	-62	9	4	30	143
Tolaga Bay	108	57	-36	-50	12	6	69	177
Rural Towns	261	29	-222	-60	-15	-1	81	53
East Cape	369	52	-222	-64	-96	-11	51	49
T'dale - Rakauroa	21	5	-213	-85	-57	-7	18	21
Makaraka	-45	-21	-36	-67	117	38	12	67
Matokitoki	12	24	-24	-100	81	79	9	75
Wainui	-75	-21	-57	-73	255	59	21	54
Wharekaka	15	4	-186	-89	207	29	54	78
Tiniroto	-69	-14	-195	-83	189	22	12	12
Rural	228	9	-933	-78	696	17	177	41
East Coast Total	**831**	**7**	**-2,787**	**-65**	**1,068**	**7**	**1,224**	**94**
Forestry	27	24	-87	-83	-18	-7	0	0
Farming	276	20	-609	-79	120	5	69	25
No Change	-90	-9	-219	-76	600	47	90	83
NZ Rural	2,430	3	-27,111	-77	57,291	37	6,063	47
NZ Rural Towns	3,276	17	-4,557	-67	5,472	21	1,731	76
NZ Urban	27,333	4	-111,138	-57	304,269	28	53,079	68
NZ Total	**33,039**	**4**	**-142,806**	**-60**	**367,032**	**29**	**60,879**	**65**

The parallels between the East Coast and national patterns for most categories suggests that most of the change can be attributed to structural change in benefit management and eligibility. However, there are some contrasts; for example nationally the no support category increased by 29 per cent overall, and 37 per cent rurally, compared to only 7 per cent on the East Coast and a decrease in rural towns. The East Coast rural towns experienced a dramatic rise in the One Income Support category, which is up 29.1 per cent. Unlike Gisborne, however, rural towns experienced a fall, albeit rather marginal, of 1.3 per cent in the No Income Support category. This figure further reinforces the hypothesis that the overall rural downturn has tended to concentrate decreases in employment and an increase in social welfare payments in rural towns in this region. The rural areas appear to be less dependent on

income support with a large decrease in the two or more category and an increase in the none category.

Turning to specific land uses, forestry mesh blocks grew in One Income Support and fell in None (i.e., no income support), whereas farming had a similar rise in One Income Support but an actual although small increase in None. The no change mesh blocks experienced a large gain in the None category. These data suggest that the no change mesh blocks, with their increase in population, have fewer welfare dependents.

Superannuation. Overall, the East Coast experienced a decrease in the number of households with one or more superannuants of 7.1 per cent (Table 14) which is more than the national change of 1.0 per cent. The number of Gisborne superannuants declined 6.4

Table 14: Numbers of Households with One or More Superannuants, 1986-1996

Area Unit / Category Totals	One or More Superannuants			
	1986	1996	Change	%
Mangapapa	384	393	9	2.3
Te Hapara	654	576	-78	-11.9
Gisborne Airport	306	252	-54	-17.6
Whataupoko	429	387	-42	-9.8
Gisborne Central	423	414	-9	-2.1
Kaiti North	306	294	-12	-3.9
Kaiti South	255	222	-33	-12.9
Tamarau	87	96	9	10.3
Riverdale	57	81	24	42.1
Gisborne	**2,901**	**2,715**	**-186**	**-6.4**
Ruatoria	45	51	6	13.3
Tokomaru Bay	30	36	6	20.0
Te Karaka	27	27	0	0.0
Patutahi	24	18	-6	-25.0
Manutuke	54	36	-18	-33.3
Tolaga Bay	63	69	6	9.5
Rural Towns	**243**	**237**	**-6**	**-2.5**
East Cape	177	162	-15	-8.5
Tarndale - Rakauroa	84	72	-12	-14.3
Makaraka	75	57	-18	-24.0
Matokitoki	15	21	6	40.0
Wainui	135	105	-30	-22.2
Wharekaka	99	90	-9	-9.1
Tiniroto	123	120	-3	-2.4
Rural	**708**	**627**	**-81**	**-11.4**
East Coast Total	**3,852**	**3,579**	**-273**	**-7.1**
Forestry	27	21	-6	-22.2
Farming	321	312	-9	-2.8
No Change	330	273	-57	-17.3
NZ Rural	23,526	24,570	1,044	4
NZ Rural Towns	6,774	7,269	495	7
NZ Urban	263,934	259,485	-4,449	-2
NZ Total	**294,234**	**291,324**	**-2,910**	**-1**

per cent between 1986 and 1996, while for New Zealand rural centres the figure was a gain of 7.3 per cent. The East Coast rural towns dropped 2.5 per cent and in the rural areas fell 11.4

per cent. These East Coast data are in contrast to earlier age group evidence that the East Coast population is getting older, for which an increase rather than a decrease in superannuants would have been expected. This requires further investigation.

There appears to be no discernible pattern in the effect of forestry or farming on the number of Superannuants in these mesh blocks. For while forestry has a sizeable decrease and farming only a marginal decrease, the No Change mesh blocks, which are stable and dominant agricultural locales, have also had a significant decrease in superannuants.

Chapter 4
Conclusion

4.1 Summary

The primary objective of this research was to describe relationships between recent trends in land use change and associated change in rural community characteristics. This report compares East Coast land cover in the 1970s to 1991 (the only times for which data are available) and categorises all rural mesh blocks in terms of the dominant character of land use change. The mesh blocks with increases in forestry, increases in farming and with no change were analysed in terms of a number of basic social and economic variables. In addition, the mesh block data were compared to census data on Gisborne, the rural towns and the rural areas. Socio-economic characteristics were shown using census data for 1986 and 1996, allowing for a lag in between land use change and community restructuring.

Results from the East Coast analysis show that the East Coast Wood Supply Region contains 8.3 per cent of New Zealand's total exotic forest area and 5.8 per cent of the total volume. However, there has been an increase in planted area recently and projected yields are significant. To date the indirect employment generated by forestry is low and at a level similar to agriculture.

The East Coast population was static to 1996. The population of the region is concentrated in Gisborne and most of the remainder is in the rural areas. Rural towns have increased in population slightly. Forestry mesh blocks have few people and have decreased in population while farming mesh blocks have most of the rural people and have also lost population, but not quite at the same rate. The no change mesh blocks have increased in population.

Employment overall has decreased with fewer full time and more part time jobs. Rural areas have the lowest decrease in FTEs. Forestry mesh blocks have a large decrease in FTE followed by farming mesh blocks. The no change mesh blocks have an increase in FTE. Employment in agriculture and forestry has decreased overall but it has increased in Gisborne. Forestry mesh blocks have the largest decrease in agriculture and forestry employment.

The overall East Coast gender ratio is unchanged between 1986 and 1996 but there are relatively more males in rural towns and rural areas. This difference is accentuated in forestry mesh blocks.

Declaration of ethnicity appears to be changing, with nominally more Maori and fewer Europeans, although this is less pronounced for rural areas. Forestry mesh blocks have the largest decrease in Europeans but also a decrease in Maori. The no change mesh blocks have gains for both European and Maori.

There are now fewer young people and more older people on the East Coast, and this is even more so for rural areas. Forestry mesh blocks have the largest decrease in young people and the lowest increase in old people. Farming mesh blocks have an age distribution similar to rural areas. The no change mesh blocks buck the trend and have very small increases in young and old age groups.

There has been an increase in levels of educational qualification generally and this is more pronounced in the rural areas. Forestry mesh blocks have a decrease in tertiary qualifications and a large increase in secondary qualifications. In contrast, farming and no change mesh blocks have an increase in tertiary qualifications, which are greater than the regional figure.

The distribution of people drawing different types of benefit has changed, but the total number is similar over time. Rural towns have a large increase in people on one benefit while rural areas have the lowest increase. The no change mesh blocks have fewer people on benefits. The number of people on superannuation has decreased and this was accentuated in the forestry mesh blocks.

The data on types of rural mesh blocks show a consistent pattern of gradation from the forestry to the no change mesh blocks. The forestry mesh blocks, which have only a low population, display a number of indicators of social and community decline. These are also evident in the farming mesh blocks, but not to the same degree. In contrast, the no change mesh blocks have increasing population and many positive features often in contrast to the entire East Coast area.

4.2 Discussion

The literature review of previous studies of the employment and community effects of forestry, reported in Fairweather et al. (2000), noted two contrasting socio-economic dimensions of land use change from agriculture to forestry. On the one hand, there are predictions of net increases in employment stemming from forestry expansion (Aldwell, 1982, 1984; Butcher, 1997). On the other hand, there has been widespread community concern about the impact of employment losses upon rural communities (Scott et al., 1997). The national and regional analysis in Fairweather et al. (2000) showed that forestry and agriculture on the East Coast appeared to create fewer FTEs/1000ha than nationally and in most other regions. Furthermore, while forestry generated higher FTEs/1000ha than agriculture nationally, the FTEs tended to be located in towns, rather than on the land. This was also the case in the East Coast.

The more detailed regional analysis in this report, with its focus upon a wider range of indicators within rural mesh blocks that have experienced significant change to forestry or to agriculture, has indicated that these effects on employment are also reflected in other social indicators. That is, there has been a decline in a range of indicators of community well being over the period 1986-1996 in both 'forestry' and 'farming' areas, but that the effects have been more marked in areas changing to forestry.

Perceptions of rural community decline are therefore valid, but the relationship between forestry and agriculture is not as simple as some commentators suggest. That is, a shift from pastoral farming to forestry appears likely to accentuate rural job losses and other associated changes in community profile, but cannot be blamed for all of the decline. Population decline has become apparent across both sectors.

The endemic character of rural depopulation and community decline in the latter part of the 20th century is reinforced by taking an historical perspective. Most of the features described above, of outward migration of young people from rural areas, for example, were documented during the 1960s, and were recognised then as factors to be considered in afforestation studies (Robb et al., 1966). In addition to this background of population decline, Forest Service restructuring contributed to forestry job losses in the region.

The companion report (Fairweather et al., 2000) throws some light on the structural reasons for this differential impact, by highlighting the differences between the proportions of direct (on land) employment, and indirect employment (processing) in each sector. It confirms the intuitive observation that a shift to industrial-style forestry plantations tends to lead to cyclical land-based employment and to greater detachment from the land itself. There is greater emphasis upon industrial processing employment. Hence rural communities in areas with large-scale conversion of pasture to forestry are likely to experience the most negative effects of the change - a decrease in family-based farms and emigration of younger people. These changes also become evident in rural towns which do not have forestry processing or servicing activities.

Preliminary evidence from the other parts of this study indicate that a range of factors mean that even with the limited on-land employment in forestry (planting, pruning, felling) workers are increasingly being brought in from other forestry based regions. Such employment as is being created in the region tends to be concentrated in and around Gisborne, associated with the JNL processing plant and other support and transportation infrastructure.

On the face of it, therefore, while forestry development is generating economic activity within the region as a whole, which would not otherwise be there, the benefits of that activity are not distributed evenly to all communities. Benefits that do occur are becoming concentrated within Gisborne, as is the trend for pastoral land use.

This pattern of concentration is entirely consistent with broader structural analysis of the effects of economic globalisation and rationalisation on regions and communities within New Zealand (Le Heron and Pawson, 1996), which demonstrates the increasing spatial differentiation of economic activity under more open market structures.

This analysis of past relationships between land use change and socio-economic indicators, for the period 1986-96, does not attempt to formulate or explore alternative afforestation strategies that may have different socio-economic effects. It is possible to speculate that different ownership and management structures could result in somewhat different patterns of employment and effect, but this would require further comparative analysis of areas with such alternative structures.

For the East Coast, in the current form of the sector, forestry is understandably a mixed blessing. Overall, it creates jobs and activity which diversifies the region's base, but the benefits of this diversification are unevenly distributed.

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