THE ROLE OF FORESTRY IN THE DEVELOPMENT OF THE NORTHLAND REGION

R. C. LLOYD and D. W. GUILD*

Abstract

Massive exploitation of kauri timber and gum played a dominant role in the early economic development of New Zealand. Northland, which held the greatest part of this resource, reaped little lasting benefit; by the 1920s it was left with a legacy of poorly developed farm land on difficult soils and a system of transport favouring rivers and the sea. With the aid of modern farming methods and fertilisers, however, agriculture has become a major industry of Northland, and there are also important contributions from a cement works, a fertiliser works, a freezing works, and assorted other industries. But despite all this activity there is a great amount of reverted problem-soil land, cleared of its original forest cover and now lying idle or being used to little advantage. With the addition of this area to the current exotic estate (which has the potential to more than fulfil Northland’s requirements of sawlogs) a large export industry would result, bringing much benefit in terms of employment and improved land use. The export potential of exotic wood is estimated as the equivalent of 2.5 million m³/annum of sawlog material and 0.3 million m³/annum of smallwood arisings by the year 2012, jointly valued at $68.7 million f.o.b./annum on present-day prices. At the same time, conservation management of remaining kauri and other native forest would provide a continuing resource of special quality timber, and would ensure protection of erosion-prone land and river catchments.

KAURI EXPLOITATION

Although it could be argued that the exploitation of kauri in the early days was not "forestry", nevertheless it was forest utilisation and, as such, played an immensely important role in the development of Northland¹ and New Zealand. Furthermore, other timber species in Northland were so insignificant

---

*Respectively Principal Forester and Senior Forester, N.Z. Forest Service, P.O. Box 249, Kaikohe.

¹ Northland in this paper is taken as covering the Northland Development Region, an area which includes the 7 counties to the north of Rodney — see Fig. 1.
by comparison that there is little mention of them in the literature.

King Kauri

No forest tree played a more important role in the economy of New Zealand during the early days of colonisation than
kauri (*Agathis australis*). From the time that it was first discovered, in 1772, until the decline of the industry around 1908, kauri — and its by-product gum — was the principal contributor to the nation's wealth. Not only did it yield much-needed revenue — despite very low royalties — but it provided the main source of employment in many localities throughout Northland, Auckland, and the Coromandel Peninsula. For well over a century kauri was practically the only natural resource to be tapped to the full and its exploitation, at first for spars and later for logs and sawn timber, promoted an industry that had no rival until the first decade of the 20th century. By that time agricultural and pastoral products were assuming an increasingly important role.

**Early Abundance**

At the time colonisation of New Zealand began there was around 1.5 million hectares of “kauri forest” according to an early Forestry Department publication (Hutchins, 1919). Of this, some 70% grew in Northland — map of vegetation *circa* 1840 (Wendelken, 1976) — and although the kauri component was not dominant throughout there were rich areas where kauri was virtually the only tree species present in the upper forest canopy.

The first felling of kauri by Europeans probably occurred in 1772 in the Bay of Islands, carried out by a naval party under the French explorer Du Fresne to obtain new spars. For the first half-century after this there was a sporadic trade in spars for which the tree proved so excellent, but it was not until 1820 that an organised British Naval expedition was sent to exploit its possibilities more fully. The success of this expedition was followed by a steady procession of ships, first to Whangaroa Harbour and, later, Hokianga and Kaipara Harbours.

By 1828 an industry producing whole logs and baulks was well established on the shores of Hokianga Harbour, and shipbuilding began at Horeke in the 1830s. Mills were well established within the three main harbours and on both sides of Northland by 1840, and Kaipara soon rivalled Hokianga as the major outlet for kauri. Apart from kahikatea, other timber species were soon almost completely eclipsed by the popularity of kauri.

Kauri “gum”, originally a product from the soil of kauri forest, but later obtained from bleeding live trees, became a second major industry in the 1850s.
Massive Exploitation

Kauri timber and gum, providing the necessary assets in the form of materials and capital for rapid economic development, readily attracted settlers to New Zealand. Northland supplied most of the timber used in buildings throughout the country in the first half-century of European settlement, and there were also considerable demands for export to Australia and the United Kingdom. This yielded much overseas exchange during the colony's initial growth. Although this made a major contribution towards the early prosperity of New Zealand, the true value of kauri was never obtained. Too much was taken out too fast, with consequent oversupply at unrealistic prices. One instance illustrating the way in which the resource was undervalued is that of a group of Canadian immigrants who obtained, for a fee of ten shillings, a licence from the Crown to fell and extract as much timber from Puketi Forest as they wished.

During the peak of kauri timber production, towards the latter half of the last century, it was milled at a rate of over 236,000 m³ (sawn) per annum, of which over 94,000 m³ (sawn) per annum was exported.

Production of kauri gum reached its peak around 1900, when an estimated 7000 diggers were at work. By 1924 more than £20 million had been received from the sale of gum since the inception of the industry in 1845 (Anon., 1924).

Devastation of Forests and Land Clearing

To the early settlers, supplies of kauri timber must have seemed inexhaustible. Areas of clear land suitable for agriculture were almost non-existent, and most early timber sales were granted with the prime object of clearing the land for settlement and agricultural pursuits. An example of this was the Crown's acquisition of most of the Puketi Forest from its Maori owners in 1859 for the sum of £240. It was not purchased as a timber resource but for subdivision and settlement by farmers. Luckily this plan was never fulfilled.

Timber working was destructive, with practically no action being taken to safeguard or provide for future timber crops. As well, bush burns provided a quick but destructive way of converting forest and scrub land into farms or, in some instances, removing the impeding forest so diggers could get at gum more easily.

Uncontrolled fires in the 1880s, originating from varying causes and motives, burnt for many months on unbroken fronts of several kilometres. The greatest losses occurred at Puhinui where two fires (1881 and 1887) devastated some
7000 hectares. Hutchins (1919) valued part of the losses (a 2000 hectare area of pure kauri) at £4 million, comprising £2.5 million for the mature trees and £1.5 million for the "capitalised" value of the younger trees.

**Consequences**

Lack of foresight, and greed for quick profit, resulted in lamentable mistakes. Much of the land cleared was quite unsuitable for farming as practised in those days, on account of the difficult soils (the gumlands, ironstones, and sand country) and was gradually taken over by fern and scrub. Often clearing extended on to hilly terrain that should never have been stripped of its protective cover, thus increasing run-off and inducing serious erosion and generally changing the balance of the environment. On top of this the kauri timber and gum industries did not promote good internal development, as Northland was exploited for its wealth with the benefits going to other parts of the country. A consequence was that the region relied on the sea for its transport and communications routes far longer than most other areas of New Zealand.

**HIATUS**

*Wane of Kauri Timber and Gum Industries*

In the early 20th century the kauri timber and gum industries were waning as the accessible supplies rapidly declined. The cut of kauri timber fell dramatically between 1926 and 1934. Production rose again in 1935 in the post-depression boom, but by 1940 had fallen to 1934 levels and, apart from minor fluctuations, continued to fall to 842 m³ (sawn) in 1975 — see Fig. 2.

By 1975 the total area of mature kauri had been reduced to little more than 6000 hectares (see Table 1) — a mere 0.8% of the original area of kauri forest in Northland.

**TABLE 1: AREA OF MATURE KAURI IN NORTHLAND**

<table>
<thead>
<tr>
<th>&quot;Ownership&quot;</th>
<th>Reserved³</th>
<th>Unreserved</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Service</td>
<td>3064</td>
<td>2741</td>
<td>5805</td>
</tr>
<tr>
<td>Other</td>
<td>434</td>
<td>—</td>
<td>434</td>
</tr>
<tr>
<td>Total</td>
<td>3498</td>
<td>2741</td>
<td>6239</td>
</tr>
</tbody>
</table>

¹ 1975 Forest Service survey. Figures provisional. May be more mature kauri than is shown under "Other" ownership.
² Scenic reserves, forest sanctuaries, water conservation areas and local body reserves, etc.
Gum production also dwindled after the 1930s, by which time the richer gumlands had been worked over as many as three times to extract successively poorer grades of gum. No other Northland industries have yet contributed so much to the New Zealand economy.

Rise of Farming

During the time that timber and gum production began to wane many workers in these industries bought land and started farming. By 1921 there was three times more land under sown pasture than in 1901. The pattern of farming tended to be dairying on the lowlands and valleys and sheep farming on the hill country.

In spite of greatly improved technology for farm development on Northland soils, the fluctuating fortunes of agriculture have been such that the potential for land development today is still considerable. In 1964 the area of undeveloped and reverted scrubland, most of which was considered capable of development, was 415,000 hectares, equivalent to 79% of the area under cultivation (M.O.W., 1964).

Agriculture-based Industries

Although agriculture has not yet reached its full potential, farming and processing of farm produce are undoubtedly the major industries in Northland at present. In 1974 the region's dairy factories processed about 13% of New Zealand's total milk fat bringing a return of about $37 million.
The development of cattle and sheep farming for meat production led to the establishment of the Moerewa freezing works in 1921, which, in the year to 30 June 1975, processed, mainly for export, 135,200 cattle and vealers, 146,000 bobby calves, 556,000 sheep and lambs, and 6,000 pigs. These figures represent a 62% increase in production since 1961.

There has been a significant increase in the amount of beef farming in recent years, mostly at the expense of sheep farming. The number of dairy cattle has been steadily growing, although the number of holdings has halved since 1950.

Other Industries

The Portland cement works, established in the early part of this century, has now expanded to become the largest in the country, with an annual production capacity of 420,000 tonnes of cement.

Whangarei is the regional base for high-precision manufacturing and engineering, including shipbuilding.

The Marsden Point oil refinery and the Northland fertiliser works are two more examples of large industry in Northland.

As well, flourishing industries in fishing, industrial minerals, glass manufacture, citrus and sub-tropical fruits, and tourism have done much to diversify the region's development potential.

INTRODUCTION OF MODERN FOREST MANAGEMENT

Concern for future timber supplies and preservation of native forest was manifested well before the decline in kauri exploitation.

Exotic Forests

Hutchins (1910) mentions the unsuccessful attempts to replant part of Puhipuhi State Forest with native and introduced trees after the great fires of the 1880s. Eventually, successful establishment was achieved with some eucalypt and pine species the oldest of these dating from about 1904. Wendelken (1976) states that exotic plantations had been established near Whangarei by the Forest Branch of the Lands and Survey Department in association with the School of Forestry by 1890. These were among the first exotic plantations in Northland.

During the New Zealand-wide boom plantings of exotics in the 1930s, non-State planting in Northland was more than double that of the State, but during the war the overall rate declined then rose gradually again after 1945.
The last decade has seen a very rapid increase in the rate of planting by the State and private concerns — see Fig. 3.

The major part of the afforestation undertaken by the Forest Service stems from a large-scale sand stabilisation and afforestation project begun in 1962 at Aupouri Forest bordering Ninety Mile Beach.

In the 1975 season the Forest Service planted 2312 ha in Northland, most of which was new planting on previously unworked areas. In the private sector, apart from the fairly considerable areas being planted by large and small companies (estimated at 1146 ha for 1975), farm foresters are currently planting about 340 ha a year under the forestry encouragement schemes. Thus, some 3800 ha were planted in Northland in 1975, bringing the total area of exotic plantings in Northland as at October 1975 to 27 500 ha.

Coupled with the increased planting rate over recent years has been the increase in seedling production at local nurseries. The Forest Service nursery at Sweetwater, near Kaitaia, began raising seedlings in 1965 (McKinnon and Nicholson, 1974), and by 1975 was raising and lifting over 9 million (mostly radiata pine) a year.
Site and Soil Problems

As with agriculture, considerable research effort has gone into site improvement for forestry. Intensive site preparation and fertilisation were not undertaken until comparatively recently, with the result that most of the early plantings on "problem" soils were dismal failures. This led to careful species siting, using the southern pines — particularly slash pine (*Pinus elliottii*) and loblolly pine (*P. taeda*) — on phosphate-deficient sites, with radiata pine (*P. radiata*) being reserved for the best sites. Problem soils — mainly the podzolised gumland soils — were avoided where possible.

Superphosphate was found to be an acceptable corrective treatment for trees suffering from phosphate deficiency, and aerial topdressing became a normal management tool in the mid 1960s. This revitalised many unthrifty stands, and must have restored confidence in the prospects for exotic forestry in the region.

The difficulties of the gumland soils are currently being studied with some degree of success. Podzolisation involves the leaching of nutrients from the "A" horizon and deposition in the "B" horizon — sometimes the formation of a hard pan — with the resulting problems of poor internal drainage, low soil pH, extremely low natural soil fertility, and sometimes impediment to root penetration from hard pans. Research indicates these problems may be overcome by cultivation in the form of ripping and/or bedding and compound fertilising, particularly nitrogen plus phosphate. If this proves successful it will allow the use of radiata pine on sites hitherto classed as unsuitable for forestry.

Management of Indigenous Forest

After the long exploitation of indigenous forest in New Zealand, some steps in conservation of the resource came with the beginning of the State Forest Service in 1919. Barton (1975) gives a historical review of Government policy on the management of kauri forests.

The special plight of kauri was given earlier consideration than other indigenous species, with the result that the "revised kauri policy" of 1973 preceded a "proposed indigenous forest policy" by two years. The kauri policy, it is hoped, will be the beginning of a new, vital and sustained programme of kauri research and management.

In the short period since the kauri policy was introduced, a small team of Forest Service personnel has revived earlier research, introduced new projects, and recommended on various aspects of management. Research has not been confined
TABLE 2: AREA OF SECOND CROP KAURI IN NORTHLAND — 1975 SURVEY

<table>
<thead>
<tr>
<th>“Ownership”</th>
<th>Dense</th>
<th>Scattered</th>
<th>Total</th>
<th>Reserved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Service</td>
<td>1753</td>
<td>7679</td>
<td>9432</td>
<td>21</td>
</tr>
<tr>
<td>Non Forest Service</td>
<td>14603</td>
<td>39185</td>
<td>53788</td>
<td>5162</td>
</tr>
<tr>
<td>Total</td>
<td>16356</td>
<td>46864</td>
<td>63220</td>
<td>5183</td>
</tr>
</tbody>
</table>

1 Forest Service survey — figures provisional.
2 Includes a high proportion of fire induced natural regeneration.
3 Scenic reserves, forest sanctuaries, water conservation areas, etc. This figure has been included in the preceding columns.
4 Includes all land other than that administered by N.Z. Forest Service.

to the perpetuation of the small area of manageable mature kauri. It has included silviculture of the considerable area of pole stands and younger natural regeneration (see Table 2), and the development of special techniques for raising kauri seedlings in a nursery and establishing them as forest growth.

Positive policies for protection, preservation, research, management, and regeneration of the remaining resource of other indigenous species were recently formulated by the Forest Service (Conway, 1975) and are now being put into practice on State forest land.

Both policies are, however, binding for State forest only.

IMPACT OF EXOTIC PLANTINGS

Wood Production and Use

The effect of exotic forestry on Northland has yet to be fully felt. Owing to the small area of early plantings, production of sawlogs from this source to date has been small, but the trend towards displacement of indigenous with exotic milling timber over the past twenty years is shown in Fig. 4 and Table 3.

This change of emphasis (due mainly to the lack of availability of indigenous species) has resulted in the modernisation of many of the sawmills and their equipment in recent years. At present, although there is some movement of timber in and out of the region, local supply and demand are closely matched (see Table 4) and there is no surplus of wood of sawlog quality for export either outside the region or overseas.

However, quantities of thinnings in the form of smallwood are becoming available as the large areas of plantings made in the 1960s reach thinning age. At the moment the only
Fig. 4: Sawn output of indigenous and exotic timber in Northland, 1955-6 to 1974-5.

Table 3: Sawmill Production in Northland 1955-1974

<table>
<thead>
<tr>
<th>Year of Cut</th>
<th>No. of Mills</th>
<th>Total Production</th>
<th>Indigenous</th>
<th>Exotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955/56</td>
<td>71</td>
<td>15.1</td>
<td>24.1</td>
<td>39.2</td>
</tr>
<tr>
<td>1956/57</td>
<td>73</td>
<td>16.5</td>
<td>17.2</td>
<td>33.7</td>
</tr>
<tr>
<td>1957/58</td>
<td>73</td>
<td>17.2</td>
<td>21.7</td>
<td>38.9</td>
</tr>
<tr>
<td>1958/59</td>
<td>69</td>
<td>18.2</td>
<td>20.8</td>
<td>39.0</td>
</tr>
<tr>
<td>1959/60</td>
<td>80</td>
<td>21.9</td>
<td>17.7</td>
<td>39.6</td>
</tr>
<tr>
<td>1960/61</td>
<td>71</td>
<td>27.8</td>
<td>18.4</td>
<td>46.2</td>
</tr>
<tr>
<td>1961/62</td>
<td>66</td>
<td>29.3</td>
<td>17.7</td>
<td>47.0</td>
</tr>
<tr>
<td>1962/63</td>
<td>60</td>
<td>30.0</td>
<td>11.8</td>
<td>41.8</td>
</tr>
<tr>
<td>1963/64</td>
<td>58</td>
<td>32.6</td>
<td>10.9</td>
<td>43.5</td>
</tr>
<tr>
<td>1964/65</td>
<td>52</td>
<td>27.6</td>
<td>12.0</td>
<td>39.6</td>
</tr>
<tr>
<td>1965/66</td>
<td>49</td>
<td>26.0</td>
<td>11.3</td>
<td>37.3</td>
</tr>
<tr>
<td>1966/67</td>
<td>49</td>
<td>29.0</td>
<td>12.7</td>
<td>41.7</td>
</tr>
<tr>
<td>1967/68</td>
<td>48</td>
<td>23.8</td>
<td>9.4</td>
<td>33.2</td>
</tr>
<tr>
<td>1968/69</td>
<td>43</td>
<td>26.4</td>
<td>8.5</td>
<td>34.9</td>
</tr>
<tr>
<td>1969/70</td>
<td>47</td>
<td>23.8</td>
<td>9.4</td>
<td>33.2</td>
</tr>
<tr>
<td>1970/71</td>
<td>46</td>
<td>24.5</td>
<td>11.1</td>
<td>35.6</td>
</tr>
<tr>
<td>1971/72</td>
<td>46</td>
<td>24.1</td>
<td>8.7</td>
<td>32.8</td>
</tr>
<tr>
<td>1972/73</td>
<td>38</td>
<td>24.8</td>
<td>8.7</td>
<td>33.5</td>
</tr>
<tr>
<td>1973/74</td>
<td>43</td>
<td>35.2</td>
<td>5.4</td>
<td>40.6</td>
</tr>
<tr>
<td>1974/75</td>
<td>40</td>
<td>38.9</td>
<td>5.9</td>
<td>44.8</td>
</tr>
<tr>
<td>Average over 20 years, 1955-74</td>
<td>25.6</td>
<td>13.2</td>
<td>38.8</td>
<td></td>
</tr>
<tr>
<td>Average over 10 years, 1965-74</td>
<td>27.6</td>
<td>9.1</td>
<td>36.7</td>
<td></td>
</tr>
<tr>
<td>Average over 5 years, 1970-74</td>
<td>29.5</td>
<td>8.0</td>
<td>37.5</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Sawmill production of timber</td>
<td>87.0</td>
<td>79.2</td>
<td>74.6</td>
<td>83.4</td>
</tr>
<tr>
<td>Inward movement of timber</td>
<td>27.2</td>
<td>25.6</td>
<td>41.4</td>
<td>55.2</td>
</tr>
<tr>
<td>Inward movement of logs</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Outward movement of timber</td>
<td>15.8</td>
<td>12.6</td>
<td>18.6</td>
<td>17.6</td>
</tr>
<tr>
<td>Outward movement of logs</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Net inward (+) and outward (--) movement of wood</td>
<td>+11.4</td>
<td>+13.0</td>
<td>+22.6</td>
<td>+37.6</td>
</tr>
<tr>
<td>Total local consumption</td>
<td>98.4</td>
<td>92.2</td>
<td>97.4</td>
<td>121.0</td>
</tr>
</tbody>
</table>

1 Sawn volume was converted back to round volume by assuming a sawmill conversion factor of 50%.  
N.B. Net outward movement of wood in 1971 and 1972 is directly attributable to a short-lived export sawlog boom, when a total of 72.4 thousand tonnes of sawlogs were shipped to Japan from the port of Whangarei.
outlet for this produce is in the form of fencing material to the eleven treatment plants in the region, and supply considerably outstrips demand, with the result that the poorer stands are thinned to waste.

One of the more important outlets for wood which would otherwise be waste from sawmilling is the pulp-chip industry. At least one large sawmilling company has found it worth while to debark all saw logs and chip and sawmill residues for export to Auckland for pulping.

Since kauri has become relatively scarce, all commonplace uses (which can readily be catered for by substitute species) have been abandoned in favour of the specialised end uses to which kauri is particularly suited. The best known of these, of course, is boatbuilding. It is a mistake, however, to think that all kauri is used for this. Some unsuitable material finds its way to less demanding uses. There is also a continuing demand for kauri shingles, particularly for historic buildings, while kauri shakes from prime heartwood are being used on modern buildings.

Some slab waste from indigenous sawmilling — particularly kauri — has been finding a market in the rapidly expanding cottage industries, where it is used to make anything from salad bowls to wooden jewellery.

Employment

Forestry is playing an important role in providing employment in areas of low or dwindling population. Total full-time employment in forestry, logging, and wood and wood products industries is compared with employment in all other industries in Table 5. The import of these figures is that employment in forestry and allied industries in Northland was close to the national average in November 1972 but had steadily moved ahead of this by October 1975. The effects of increased planting, then, are already being felt.

On top of this, there are those engaged on forestry work under a special employment scheme for registered unemployed. In 1975 a total of 78 man-years were utilised by the Forest Service in Northland under the scheme — this amounted to about 40% of the total labour employed by the Forest Service in the Northland region.

Indirect Benefits

The indirect benefits of forestry in Northland are not to be ignored.

Aupouri State Forest, with a potential productive area of 25 480 ha, was established for stabilisation of sand dunes and
### TABLE 5: TOTAL FULL-TIME EMPLOYMENT (MALE AND FEMALE) IN FORESTRY AND ALLIED INDUSTRIES

<table>
<thead>
<tr>
<th></th>
<th>New Zealand Totals</th>
<th>Northland Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forestry, Logging, Wood and Wood Products</td>
<td>Forest as a Percentage of All Industries Surveyed</td>
</tr>
</tbody>
</table>

1 Based on half-yearly surveys of employment undertaken by the Department of Labour.
the consequent protection of farms being threatened by the inland invasion of raw sand.

Planting on unstable greywacke hill soils at Glenbervie is reducing water run-off, sedimentation, and soil slips which occur under other forms of management. (There are many other areas in Northland that could benefit from afforestation.)

The demand for recreation in Northland’s forests is limited to the more populous or tourist areas but will no doubt spread in time. The Forest Service is investigating means of developing the recreation potential of all its forests, particularly those on the Maungataniwha Range and immediate vicinity.

A good proportion of the new area being afforested annually is land under Maori ownership. In many cases this land has lain idle for decades, bringing little or no return to its owners. Under the terms of the Maori Affairs Amendment Act of 1967, several incorporations have been formed for the purpose of leasing this land for afforestation.

FUTURE FORESTRY DEVELOPMENT

Indigenous Management Potential

The potential for kauri management is hard to assess. Although the area of second crop kauri in Northland is 63,220 ha (Table 2), only 15% of this is under Forest Service administration. It is unlikely that many private owners will be able to afford the luxury of kauri management. In fact, many good stands of second growth kauri have been cleared in recent years in the path of “development”. To dampen the situation further, less than 20% of the stands under Forest Service administration are defined as “dense” — i.e., pure kauri. (About 40% of these dense stands are in Russell State Forest.)

The Forest Service hopes to pursue an active policy of acquisition of second-crop kauri land, but the limited finance available for land purchase and the difficulty in apportioning the finance between land for kauri management and land for exotic establishment has resulted in little progress in this field.

The alternative means of extending the kauri estate is to undertake artificial establishment, either by planting new areas or by enriching existing kauri forest. The Forest Service has, in fact, embarked on such a programme by potting over 100,000 new seedlings last season, as well as using its total reserves of plantable (three-year-old) seedlings to plant four hectares at Raetea State Forest.
Exotic Forest Potential

The area of established exotic forest in Northland is already greater than required for self-sufficiency in sawlog and fencing material, but the future of this type of forestry in the region really depends on building up an export industry (i.e., movement of produce out of Northland to other regions within New Zealand as well as overseas). It is by such an industry that forestry can most assist with the development of Northland. The ultimate benefits will depend on:

(1) The eventual size of the exotic forest estate.

(2) The speed at which this can be established, and therefore brought into production.

(3) The end uses for which the forests are grown.

Land Available for Exotic Afforestation

With the aid of the recently compiled Land Resource Inventory Worksheets for Northland (M.W.D., 1975), all land between Class IV and Class VII (M.O.W., 1974) was assessed as land potentially available for exotic afforestation, excluding land:

(1) Classified as high producing pasture (P1) and not known to be poorly farmed.

(2) Classified as having a wetness limitation — i.e., where waterlogging is common and occurs either as a result of impeded drainage within the soil, or for reasons of the topographical or physiographical location.

(3) Gazetted as scenic reserve or forest sanctuary.

(4) Carrying indigenous forest under all categories of ownership.

1 Class IV land — has severe limitations for arable use. In Northland, this class of land is severely limited by excessive wetness and low fertility very difficult to correct.

Class V land — only a very slight erosion hazard under pastoral or forestry use.

Class VI land — fairly stable hill country where soil erosion can be minimised by good management — it is usually well suited to grazing and forestry.

Class VII land — not usually well suited for grazing as it requires special soil conservation practices, although in some cases it may be moderately well suited to forestry.
Thus the resource for potential afforestation represents land currently planted, plus land under scrub, weeds, or reverting pasture and should cause no anxiety to farmers or environmentalists. The gross area of this resource is 294,000 ha, including 27,500 ha already under exotic forest. The land concerned is under various tenures — freehold, Crown leasehold, undeveloped Crown land, multiple-ownership Maori land, local body land, etc. Not all would be procurable and not all would be suitable — e.g., roads, houses, swamps, small lakes, rivers. Even if 40% of the gross area was written off for the above reasons, there still remains a net land resource of 176,400 ha, or an unplanted resource of 148,900 ha. Both private companies and the State are currently active buying or leasing this land for exotic afforestation.

Rate of Afforestation

The annual rate of planting has climbed rapidly over the last ten years (Fig. 3). There is every indication that this trend will continue while plantable land at reasonable prices remains available. To determine roughly when the net land resource might be fully planted it has been assumed that the annual planting rate shown in Fig. 3 will continue to increase at the same rate until the unplanted resource is eliminated in 1996 and the annual new planting rate reaches about 9500 ha a year.

Wood Production and End Use

The potential output of wood products from the net land resource will depend on the end uses for which the forests are grown. The most recent investigation of future markets for New Zealand's wood exports was done for the 1975 Forestry Development Conference. Briefly, the points of relevance to future marketing of Northland's exotic resource are:

1. Over 97%, by value, of New Zealand's forest exports is shipped to countries in the Pacific.
2. Australia and Japan are by far the most important markets in this area.
3. Not only is the Pacific a major trading sphere for wood and wood products, but demand is expected to expand rapidly during the next decade.
4. All wood raw material — chips and logs — and conventional wood products — sawn timber, plywood, particle board, fibreboard, pulp, newsprint, and paper products — will find a ready market overseas in the foreseeable future.
The eventual product types and destinations depend on factors far outside the scope of this paper. However, an estimate of the potential production in broad groupings, and an indication of its effect on regional development can be attempted.

The following forecasts assume the whole exotic estate is planted in radiata pine, and that the mean growth potential of this species on the net area of 176,400 ha suitable for exotic afforestation equates to a site index of 27.8 metres (40% site index 26 and 60% site index 29). The theoretical potential maximum sustained annual yield from this region is therefore as follows:

(1) Sawlog regimes (25-year rotations) should be capable of producing a mean annual increment of 15.296 m³/ha of utilisable sawlog material, plus 1.960 m³/ha of smallwood arisings. This represents a potential annual yield of 2.7 million m³ of sawlogs and 0.346 million m³ of smallwood arisings available by the year 2012.

or

(2) Pulpwood regimes (16-year rotations) should be capable of producing a mean annual increment of 25.537 m³/ha of utilisable smallwood. This represents a potential annual yield of 4.5 million m³ of smallwood available by the year 1992.

Management of Northland's forests is most likely to be a combination of these two generalised regimes. The above calculations assume normal silvicultural practices, including top-dressing with phosphates to correct deficiencies, plus one thinning in the sawlog regime. If thinnings could be extracted economically, or if tree growth and utilisation efficiency could be improved, the amount of wood available would increase accordingly.

Most of this wood would be available for export. Local requirements for sawlogs have been calculated as follows:

Estimated New Zealand domestic demand of sawn timber in 1935

\[ = 4,590,000 \text{ m}^3 \text{ roundwood equivalent, or } 1.2676 \text{ m}^3/\text{head of population (Szumidlo and Francis, 1974)} \]

Estimated population of Northland in 1986

\[ = 114,000. \]

This represents an estimated local consumption of 0.144 million m³/yr of sawlogs, increasing by about 0.010 million m³ every five years.

Thus the surplus for export (assuming the sawlog regime)

\[ = 2.5 \text{ million m}^3/\text{yr of sawlogs and 0.346 million m}^3/\text{yr of smallwood arisings by the year 2012.} \]
Stimulus to Region

In terms of regional development this scale of forestry activity would have considerable effect. At present-day values — $25/m^3 f.o.b. for export sawlogs and $18/m^3 f.o.b. for export pulpwood (W. R. J. Sutton, pers. comm.) — the f.o.b. value for 2.5 million m^3 of export sawlogs would be $62.5 million per annum, while the f.o.b. value for 0.346 million m^3 of smallwood would be $6.2 million per annum. A higher degree of processing prior to export would stimulate greater industrial development, and possibly greater export earnings, offset by more risk of pollution and higher use of local energy, material, financial, and manpower resources. Nevertheless, it is most likely that the produce would be processed to some degree before export, and therefore the gross earnings could be greater than $68.7 million per annum.

There would be a large number of job opportunities both directly and indirectly concerned with the industries. In 1974 forest-based industries in New Zealand used 8 219 000 m^3 of roundwood (F.D.C., 1975a), and a total of 28 670 men and women were employed in the forestry and logging, and wood and wood products sectors of the industry (Table 5). If the same ratio of “people employed” to “roundwood usage” is used, the number employed in this industry in Northland could be as high as 9927; or 48% of the current employment in Northland. Such an industry must also stimulate internal transport and communications, and port development.

Current land-use patterns would be changed with the afforestation of land that is at present undeveloped or poorly farmed. Afforestation will provide a higher degree of protection from soil erosion than is being achieved under current management. This should have significant downstream benefits in the form of reduced flooding, improved water quality, and more regulated water flows.

CONCLUSIONS

The massive exploitation of kauri forests prior to the 1920s had two major results. First, it provided a welcome source of revenue for the developing nation, and, secondly, it left Northland with a heritage of deforested land vulnerable to erosion and difficult to farm. Even today, significant areas of Northland are only poorly developed or are reverting to scrub and weeds.

Exotic forestry and indigenous forest management are in an embryonic state in Northland. Their effect to date on its development has not been great, but there is a considerable potential for exotic forestry to expand into a major industry.
Northland ranks high in Government priorities for regional development and this was well recognised at the 1975 Forestry Development Conference (F.D.C., 1975b). It is the opinion of the writers that, because of the large resource of suitable land in Northland, forestry provides a greater potential than any other industry for development of the region. Although the quantities of wood and mix of products will be a result of complex social, economic, and political forces, there is scope for forestry to create an export industry in Northland which will do much to re-establish the region's importance in the New Zealand economy. Apart from the strictly economic benefits, it is considered that the forest industry will greatly improve the job opportunities in Northland, while forest plantings on poorly farmed or reverted land will reduce the amount of sedimentation from erosion-prone soils.

REFERENCES
M.W.D., 1975. Land Resource Inventory Worksheets — N1-33, one inch to one mile series.