SESSION 1
Paper (b)

FOREST RESOURCES : IMPLICATIONS OF THE NEW CROP

John Tustin,
Branch Head,
Production Forestry Division,
Forest Research Institute

1. INTRODUCTION

Plantings which took place after the first plantation boom in the late 1920's and early 1930's are usually referred to as "new crop". Most of this resource has been created since the early 1960's. At this time the national afforestation objective was re-oriented towards the creation of a substantial wood surplus for export. Major project areas were recognised on the basis of land availability, suitability for radiata pine, proximity to an export port and, to a lesser degree, the need for regional development. Forestry Development Conferences in 1969, 1974 and 1981 gathered public and political support for the planting and also fostered planning across the whole forestry sector. The result is a large semi-mature to young plantation resource with many implications for harvesting.

2. LOCATION AND EXPANSION OF THE HARVEST

The 1981 Forestry Conference provides the latest national overview of the forest resource. The paper of most relevance to this section is "New Zealand's Plantation Resource: Areas, Locations and Quantities" by Elliott and Levack. Tables 1 and 2 highlight some of the most important features which are :

(a) A four-fold increase in harvesting activity by the year 2015. The questions here are; how do we gear-up for this increase? and what needs to be done by all the various groups that comprise the logging industry? The papers by Carson, and Whyte and Alexander address some of the implications of this big increase in the harvest.

(b) Dispersal of logging activity from the relatively easy, pumice region to other regions where terrain, soil type, slope stability and climate will often make difficulties for the roading engineer, logging planner, logger and forest manager. For example; the relative importance of Rotorua Planning District falls from 67% of the total harvest to 30% by 2015; while regions such as Northland, Gisborne and Otago/Southland become substantial contributors.

(c) Linked with (b) above is the prediction of a steady increase in the proportion of the harvest taken from steep and unstable country by cable extraction methods. Elliott and Levack suggest this will be 44% of the total by 2015. This figure may be slightly high, but the direction of the trend is not an issue. It would be helpful to have a more detailed assessment of this aspect.

TABLE 1 : Geographical Change in Harvest

REGION	TIME PERIOD 1981-85	1996-2000	2010-15
	-----Per Cent of Total Harvest------		
Northland	3.5	11.0	13.0
Auckland[1]	6.0	8.0	9.0
Rotorua	67.5	40.5	30.0
Gisborne	-	1.5	12.5
Hawkes Bay	1.5	6.5	5.5
Wellington[2]	5.0	6.5	5.5
Nelson [3]	6.0	12.0	9.0
Canterbury	5.0	5.0	4.5
Otago Southland	5.5	9.0	11.0
Total Harvest (million m^3 per annum)	8.6	17.7	31.1
Mean Clear Felling Age (years)	45 yrs	29 yrs	30 yrs
Proportion Cable Logging (%)	21%*	33%	44%

1 Auckland = Auckland, King Country, Coromandel

2 Wellington = Wellington, Taranaki, Wairarapa, Manawatu

3 Nelson = Nelson, Marlborough, North Westland

* cf. In 1974; The F.R.I. survey of the logging industry indicated 14% of the exotic harvest was extracted by cable systems.

TABLE 2 : Importance of Regions by Period

RANKING	TIME PERIOD	
	1981-85	2010-15
1st	Rotorua	Rotorua
2nd	Nelson	Northland
3rd	Auckland	Gisborne
4th	Otago/Southland	Otago/Southland
5th	Wellington	Auckland
6th	Canterbury	Nelson
7th	Northland	Wellington
8th	Hawkes Bay	Hawkes Bay
9th	Gisborne	Canterbury

(d) All the additional harvest will be "export orientated" with the attendant need for cost competitiveness at every stage of production. However, there is considerable uncertainty over the location, scale and industrial processing mix that will need to be serviced by the broad wood flows that have been identified. This poses a problem for more detailed planning and leaves the issues of "lead distance" and "transport mode" unresolved; yet both are key economic variables.

3. CROP FACTORS

Another 1981 Forestry Conference paper "The Nature of the Resource" by Bunn is relevant to this section. It is not possible to discuss implications of "new crop" stands for harvesting in isolation. The yard-stick is provided by "old crop", the untended stands planted in the 1930's and which will continue to be the main resource base for industry until the late 1980's. However, "new crop" is difficult to define except in the broadest terms. Unlike the old crop, the new crop stands have received varying degrees of silvicultural treatment affecting their stocking, tree size, volume production, defect core, branch size and branch condition so they are much more variable, and their characteristics and values are more difficult to predict. The concept of a "transition crop" is useful, and has been applied to Kaingaroa radiata pine stands planted between 1940 and 1960. These stands will be cut between 1988 and 1994. Rotation age has become a vital factor in the cutting plans of some regions and in this situation the interaction between stand age, site index, stocking and pruning is important. These all combine to determine tree characteristics, logging productivity and costs, and the mix of log grades and values available. Notwithstanding these aspects, some broad generalisations can be made on the characteristics of new crop stands. These are :

(a) The age of the stands harvested will drop dramatically after the "old crop" cuts out. The replacement stands will on average be 20 or more years younger.

(b) The size of trees for harvest will also fall, e.g. from an average of 4 to 6 m^3 per tree for old crop stands to about 2 m^3 per tree or less for new crop. Breakage patterns will also change however, and to some extent this will act as a buffer against the fall in mean tree sizes. For example see Table 3 below :

TABLE 3 : Breakage and Average Piece Size

Crop	Age (yrs)	Mean Tree Volume (m^3)	Average Piece Size (m^3)	
Old	45	4.5	2.6	(Steep country)
Old	45	3.8	2.7	(Easy Country)
New	28	2.0	1.8	(Easy Country)

There also is some evidence that breakage will be less on some

soil types e.g. phosphate deficient clays. Obviously direction felling can have a big influence on the extracted piece-size and this is where loggers can help themselves, but only to a certain extent.

(c) The number and size of green branches over the merchantable length will increase dramatically. This will increase the work content of trimming considerably. Good data on this aspect is fairly scarce but the results of one F.R.I. study are shown in Table 4. (C. Terlesk, pers. comm.). Trimming in a new crop harvest consumed 43% of the bushman's time compared with nil in old crop. Additional trimming at the landing was very modest for both crop types. A feature of old crop has been the large proportion of dead branches along the merchantable length and these are broken and sloughed off during felling, breaking out and snigging. In new crop this will not happen with the large, green branches produced by current regimes.

(d) Many new crop stands will contain pruned butt sections. These and other higher value parts of the stem will represent an important return to the grower if they can be recognised, marketed and segregated. The task is not easy as the effectiveness of past pruning has been rather variable, and well defined log grades must be devised and agreed upon.

4. IMPLICATIONS FOR RESEARCH AND MANAGEMENT

(a) The large increase in population from more diverse and difficult operating environments will increase delivered wood costs. There will be strong pressure to find the "best" solution for each logging setting, and the penalties for not doing this will be more severe than in the past.

(b) A higher proportion of cable logging will also increase delivered wood costs. Computer-based planning tools should assist the matching of equipment to crop and terrain. Properly used they will help to minimise operational difficulties and costs. It will be important that logging planners are given the "work stations" and training to take advantage of these aids.

(c) Because there is a sizeable differential in logging costs between skidding and cable equipment, the economic opportunity of extending skidding techniques onto the intermediate terrain classes deserves rigorous examination.

(d) Because tree and piece size is a dominant factor in harvesting, the trend with new crop will be for costs to rise as piece size falls - whatever extraction method is used. The magnitude of this increase is likely to be at least 20% more than for old crop. See Table 4.

(e) The increased work content in removing (often large) green branches will accentuate the trend in (d) above. Research and development should anticipate requests to investigate alternatives to motor manual techniques for this operation. The possibility of harvesting and marketing branchwood for energy use will be of interest to some segments of our industry in the medium term.

TABLE 4 : Comparison of Old Crop and New Crop

	NEW CROP	OLD CROP
Case A		
Age (years)	29	48
Stocking (stems/ha)	360	500
Mean merchantable volume (m^3)	1.65	4.13
Mean Height (m)	40	47
Average merchantable length (m)	29	32
Branches per merchantable length	187	139
Live branches	64	36
Time spent trimming (%) - bush	43	0
- skid	5	8
Average haul volume (m^3)	5.4	15.8
Daily production (m^3)	250	330
Cost of Old Crop (%)	123	100
Case B		
Mean merchantable volume (m^3)	2.0	4.3
Cost of Old Crop (%)	120*	100
	155**	100

* With best equipment for tree size

** With no adjustment of equipment

(f) Overall, there does not seem to be much room for manoeuvre on the "cost" side of things, apart from greater attention to planning and training; and investigation of non-cable options on the "easier" steep country. The cost "cushion" supplied by the big old crop trees will be sorely missed as New Zealand forestry becomes increasingly export orientated.

(g) The outstanding economic opportunity with the new crop resource lies in the possibility of significantly increasing revenue. The elements behind this are :

- further development of log grading based on size and quality, and adoption of national grading rules;
- increasing emphasis on MARVL inventory as a marketing tool;
- more log sales (in preference to stumpage sales) and realistic value gradients for the log size and quality classes recognised;
- adoption of "value maximisation" as a goal for loggers and careful auditing of outturn to ensure the potential of new crop stands is realised;
- research and development in the area of log sorting, and centralised processing.

The limited research work carried out in this area to date has shown improvements of up to 25% increase in value can be obtained from "conventionally" efficient operations. Some of this opportunity lies in providing better instructions to the loggers on how and what to cut; and the rest of the opportunity lies in making sure that each stem is correctly processed. Whether New Zealand should move the log making process from landings in the forest, to more centralised sorting yards (possibly highly mechanised) is a suitable theme for a priority research programme in my opinion.

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