SESSION II
Paper (h)

AGROFORESTRY

R. L. Knowles
Forest Research Institute

DEFINITION

Agroforestry is defined as the managed production of both agriculture and forestry from the same area of land. In New Zealand the most common application is of sawlog crops of radiata pine, over livestock grazing perennial pastures. There is interest in other tree species, and there are other applications, such as managed grazing in the forest, and timber production from shelterbelts.

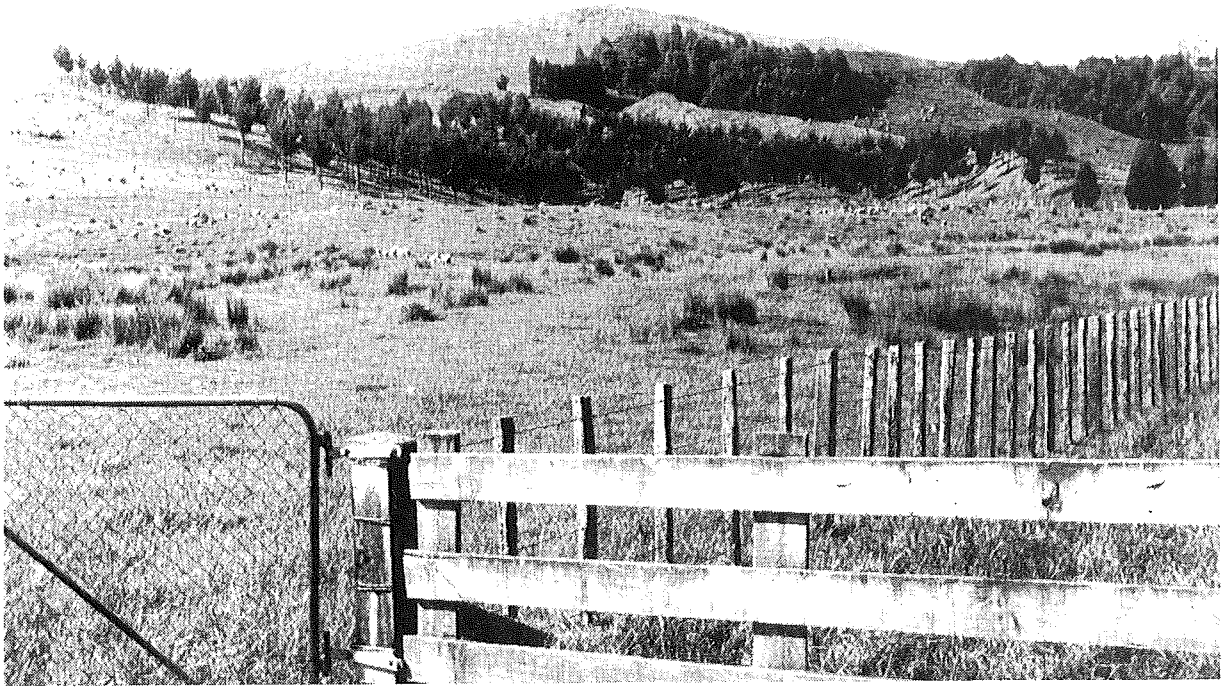
INTRODUCTION

The basis for agroforestry is that the combination of agriculture and forestry may earn more net revenue than either as a single land-use. Research trials begun in the early 1970s are now providing evidence that agroforestry, if carefully done and scaled to suit the landowners resources, could profitably diversify much of our hill country farmland (Knowles & Percival 1983; Arthur-Warsnop 1984). Planting 4% of farmland in agroforestry would represent an area equal to the existing state resource (600,000 ha). It would also represent a major shift in the future direction of forestry.

NEW CHALLENGES

A recently announced agroforestry policy (Anon 1985) described the concept as a challenge to the agriculturist, the forester, and the financier. What are these challenges? To the agriculturist, the idea that trees should not necessarily be allocated to land incapable of growing pasture, but respond to being managed and nurtured like any other crop, represents a major change in attitude. It should also be noted that most of the restrictions present in district schemes do not apply to farm-based agroforestry.

Foresters have become used to growing trees in large continuous tracts, and the industry likewise to controlling and harvesting such tracts at their convenience. But where is the scope for the future development of forestry in such a design? Two areas of land traditionally available to forestry - sand dunes and cutover bush - are no longer available for new planting, having been fully planted, or excluded for conservation reasons respectively. If we see agroforestry only as a series of unsurmountable problems of small scale, and lack of total control of the wood resource, then forestry will be missing out on a major opportunity. There are wide-ranging options for joint ventures



".....the idea that trees should not necessarily be allocated to land incapable of growing pasture...."

(LIRA Photo L354/3)

in agroforestry, linking the landowner with private, corporate and public funding.

DIFFERENCES BETWEEN AGROFORESTRY AND CONVENTIONAL FORESTRY

To examine the challenges agroforestry poses to all parties, including the logger, we have to look at how it compares with conventional forestry.

1. Land is not expected to be sold for agroforestry, but will continue to be owned and controlled by the farmer, who can expect to earn (when discounted) over half the revenues as understorey grazing that the site would earn without trees. This ratio is dependant on the timing of silviculture, and final crop stocking.

2. As a general rule, agroforestry sites are favourable for forestry. Preparation costs for example may be minimal. Neil Barr describes it as simply "shutting the gate".

3. Recent advances in tree breeding and propagation are particulary beneficial to agroforestry as they combine with low initial stockings (300 rooted cuttings/ha) and final crop stockings (100-150 stems/ha) to produce low silvicultural costs, and a viable understorey grazing component.

4. Thinning in agroforestry will invariably be early (as soon as malformation is discernable) and to waste.

5. The combination of more fertile sites and lower final crop stockings will result in relatively large tree sizes at clearfelling, with commensurately large branches in the upper unpruned logs. Appropriate delimbing techniques will be necessary.

"..... the combination of more fertile sites and lower final crop stockings will result in relatively large tree sizes.....with commensurately large branches....."

(LIRA Photo L354/17)

6. To realise the much higher estimated log values, the grower will require a market place free of distortion; and skilled loggers capable of making the right decisions regarding cross-cutting and segregation.

7. There may be demanding restrictions on site clean-up.

8. Some landowners may wish to use or adopt agricultural equipment for logging, and portable sawmills may have an economically viable role in offsetting long haul distances of some properties.

WHEN WILL WE SEE IT

The oldest deliberately established agroforestry stands have 5-10 years to grow till harvest. These earlier stands are aimed at final crop stockings of 200-250 stems/ha, are based on unimproved genetic material, and have often been belatedly pruned. However these stands, together with (largely unmanaged) shelterbelts should provide ample material on which to check predictions of final tree and stand characteristics, and logging methods and costs.

OTHER ISSUES

Some of the most favourable agroforestry sites will be planted in species such as Black Walnut (Juglans nigra). Such species will offer the logger unique opportunities in terms of the care needed to ensure maximum log value, and also the ability to absorb costs, albeit on a small scale.

Farmers wishing to do their own logging and sawmilling will require appropriate training schemes. There is also a need for a more general appreciation among advisors and landowners of the principles of logging planning, before the trees are planted. The same group will need to be kept aware of the latest technology developments. It is our intention that predictive agroforestry models be available so that 'best' decisions can be made regarding this land-use. There is an urgent need for the harvesting component of such models to be constructed and validated for the conditions, scale, and tree stockings appropriate to the concept. It is our hope that this seminar will go some way towards addressing that need.

TABLE 1 : TYPICAL REGIME

Agroforestry	Conventional Forestry
Initial stocking : 300 rooted cuttings/ha	1500 seedlings/ha
Low prune : 200 stems/ha	600 stems/ha
Then prune annually for next three years	Then two further prunings at two year intervals
Thin to waste at each pruning (four thinnings)	Thin to waste at low pruning and high pruning (two thinnings)
Final crop stocking : 100 stems/ha	400 stems/ha

TABLE 2 - COMPARISON AT CLEARFELLING (26 YEARS)

	Agroforestry	Conventional Forestry
Mean d.b.h. (cm)	68.1	44.5
Mean sawlog s.e.d. (mm)	446	319
Volume - Sawlogs	276	503
- Pulp	26	47
- Total Volume (m^3/ha)	301	550
Volume sawlogs s.e.d. > 300 mm	276	285
Branch index - 2nd log (cm)	8.2	4.9
3rd log (cm)	10.8	5.1
Estimated value ($/$m^3$)	58	19
Estimated growing cost ($/$m^3$)	23	22