

Goats in Pinus Radiata Agroforestry

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Agroforestry is a new approach to land management which has evolved to integrate the production of tree species with existing agricultural systems. In fact it describes the production of two systems, on the same land. While one of the systems is usually a tree crop, the second may be an animal or crop.

Agroforestry developments using *Pinus radiata* have become popular over the last decade offering greater and more stable land use, together with an increased income earning potential.

An integrated cashmere/pine enterprise will provide the dual advantages of reducing agroforestry development costs while increasing income from cashmere production.

Over a number of years, cashmere goats have been grazed in established *Pinus radiata* plantations in the foothills of Victoria's eastern highlands. The country has an annual rainfall of 1000 mm, with long winters and is ideally suited to pine production. These trials have shown that the cashmere goat will selectively consume and thrive on larger quantities of pine needles than either sheep or cattle, thus utilising thinnings and prunings that are normally left to rot. In addition, the goats control competition to the trees and assist in fire prevention. In a complementary fashion cashmere goats require roughage in their diet for health and shelter for survival - both are provided by the pines.

Possible Options

The cashmere/pine agroforestry concept can be developed in a number of ways:

- to reduce costs in a normal plantation.
- to provide grazing in a traditional agroforestry style plantation.
- to convert a normal plantation to agroforestry style.
- or to establish a plantation midway between a normal plantation on the one hand and wide spaced agroforestry on the other, perhaps containing elements of both, where regular pruning provides an answer to seasonal feed shortages and tree density is sufficient to provide shelter in times of need.

Growing Good Trees

Pines grown in a traditional plantation are grown close together to encourage the trees to reach upwards to the light. This produces a tall straight trunk and small side branches that soon become shaded from the light and die from the bottom up as the tree reaches higher and higher. These side branches are encased by the growing trunk as it increases diameter and when the pine is milled they form the knots in the planks. Timber millers prefer clear-

wood or at worst small knots. Logs used for veneer without knots attract a premium price.

As trees in a plantation grow older the inter-tree competition for light, water and nutrients becomes greater and growth slows and will eventually stop unless this competition is reduced. In nature; drought, insects and disease eventually kill the weaker trees, thinning the stand and allowing growth to resume. A properly managed plantation requires regular thinning to maintain reasonable growth rates and healthy trees. Early thinnings often cost more to remove than they return in income.

First pruning on 4 y.o. trees grazed for the first time at 3y.o.

In agroforestry, pines are planted much further apart; only defective or badly shaped trees are removed over the life of the stand. There is little competition between the trees for light, water and nutrients and the trees increase their timber volume very quickly. Widely spaced, there is no stimulus for the tree to grow upwards to the light, in fact it will capture more light if it grows outwards and covers a bigger surface area. The result is a short squat trunk with an excessive taper and big side branches - a product which has little value as a sawlog

Bark damage to smooth bark trunk of young tree. Goats should be removed as soon as they have consumed all available needles.

The concept of agroforestry is to trick the tree into believing it is growing in a forest by successively cutting the lower branches from the trunk as the tree grows upwards, imitating the death of the lower branches in a forest as the light is blocked out. This has the added advantage of producing a trunk of clearwood free of knots - a premium timber.

The Role of the Goat

1. Reduction of Competition.

In many high rainfall areas suited to *Pinus radiata* growth blackberries, bracken, wattles, eucalypts and thistles, in addition to pasture grasses, provide competition and reduce timber growth. Cashmere type goats will control these weeds far more successfully than other animals.

2. Fire Control.

As well as controlling grass and woody-weed growth, goats will readily consume the needles and small twigs from waste thinning and prunings, greatly reducing ground fuel in the plantation.

3. Thinning & Pruning Assistance.

Goats should never be introduced into a plantation until the growing tips are well out of reach, (i.e. trees are about 2 metres high), generally around 3 years old.

Once introduced goats will strip all needles from the lower limbs encouraging upward growth of the tree and making the initial pruning to 1.5m substantially easier allowing it to be left and integrated with the second pruning the following year.

If left too long goats will start stripping the smooth bark from the trunk. Once the tree has grown large enough to develop the tough fissured bark then bark stripping is no longer a problem.

Bark stripping can be turned to advantage in a more densely planted plantation requiring an uncommercial thinning to waste. By around 6 years of age a well grown tree will have developed a tough fissured bark, only the smaller poorly grown trees will still have the smooth bark. These will be selectively ringbarked by the goats.

If management allows accidental bark stripping to occur it will heal with time unless the tree is severely damaged.

Growing Good Goats

As the goat is an important part of the total profitability of agroforestry, good nutrition for the animal is as important as good nutrition for the trees. Seek a stocking rate that is sustainable in the long term. In practice most plantations will sustain high initial stocking rates which must be

reduced as the trees grow. An ideal plan would develop in stages with some new plantings being done each year. Once initial browse has been consumed regular pruning of trees is required to supplement the goats' diet.

A management calendar should be developed co-ordinating tree husbandry practices with animal needs, such as pruning for feed at a time when shelter off-shears is required.

THE ROLE OF THE TREES

1. Provision of Shelter.

2. Provision of Regular Dietary Needs.

The tree can provide in part the protein, energy and roughage required for a well balanced diet. Young needles are high in protein, old needles high in roughage.

3. Provision of a Drought Reserve.

In times of need pruning and thinning operations can be stepped-up with the addition of small amounts of hay or grain to provide a maintenance ration.

4. Improved Animal Health.

Provision of regular pine browse will assist in internal parasite control, help prevent diseases such as enterotoxaemia and often provide much needed trace elements not always available in pasture.

Editorial Footnote: Recent reports state that whilst the foliage is palatable and nutritious, Pinus radiata may cause does to abort if eaten in large amounts during late pregnancy. However, this was not experienced by the author of this Goat Note.

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