

MANAGEMENT IMPLICATIONS FOR PRODUCTION FORESTRY IN GOOD LAND USE

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INTRODUCTION

The steep, mountainous terrain which covers a large part of New Zealand restricts the area which can be used by rural industries. Most of the productive land is occupied largely by pastoral farming, although fewer than 20% of New Zealand's relatively small population live outside urban centres.

Primary industries can continue to expand either by developing the remaining unused land resources or by more intensive use of land already under production. Inevitably there will be increased competition for land between farming and commercial forestry interests.

Most of the early exotic forests were planted on land not needed or unsuitable at that time for farm development, and therefore a conflict of interest was not evident. Later the two industries began to compete for the same class of unused or underdeveloped land, and more recently the forest industry has bought and planted farm properties in an advanced stage of development. This innovation is symptomatic of the fast-diminishing reserve of unused land, but is also a reaction against the commonly accepted tenet that exotic plantations should be relegated to weed-infested, steeper slopes.

Although land acquisition by the State is controlled by inter-departmental Land Use Committee procedure, so far few restrictions have been placed on purchases made by afforestation companies and individual forest owners. However, legislation is available under the Town and Country Planning Act 1953 for regional and district authorities to impose controls on the use of private land. In its proposed District Scheme, Marlborough County Council makes forestry a Conditional Use of land in most rural areas so that "matters of location, access, transport, effects on the environment, and particularly the preservation of amenities, can be considered in the planning stages".

Catchment commissions and boards are making greater use of Section 34 of the Soil Conservation and Rivers Control Amend-

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ment Act, 1959, which gives them authority to control any work carried out by land occupiers which may cause soil erosion or flooding and interfere with water-courses. So far the regulations have been used almost entirely in the field of logging, but guidelines are being prepared to provide broad codes of practice for all forestry and land development operations. Central Government and regional authorities will in future almost certainly exercise greater control over the allocation and use of rural land. This policy may not be welcomed by production foresters or other custodians of rural land, but much greater care must be taken of, and higher yields obtained from, the country's limited land resources. Care of land and increased crop yields, although not always complementary, are both components of good land use.

INCREASED YIELDS OF WOOD

One obvious way to increase wood volume is to ensure that merchantable trees are grown on a higher proportion of the forest estate and that unproductive and waste land is kept to a minimum. Failed and understocked areas in exotic forests are not acceptable. They can be avoided in most instances by thorough site preparation, careful planting with well-grown nursery stock and adequate releasing from competing weed growth. The additional cost is money well spent.

There is no doubt also that valuable land is lost to production by over-roading during the establishment phase and by the provision of wide, unused compartment boundaries and ineffective firebreaks. Two-lane roads formed to logging traffic standards early in the rotation can sterilise significant areas of land for many years, and the roads may not in fact be used for their intended purpose.

As well as increasing the effective stocked area of a forest, productivity can be improved by increasing growth rates. Fertilisers have been used on a management scale in New Zealand forests for about 20 years, but mainly to correct growth disorders caused by various soil nutrient deficiencies. The treatment of unthrifty stands has been particularly successful on phosphate-deficient soils in the Auckland district and on deeply weathered and highly-leached Moutere gravel and granite soils in Waimea County, Nelson. Forest health and vigour have improved markedly in treated areas in both localities.

Aerial topdressing with fertilisers to promote increased growth rates is being practised more widely on sites where previously volume yields were regarded as satisfactory. Trials

throughout the country indicate that many forest areas can profitably produce more wood. Ground cultivation in association with fertilisers can increase yields still further.

Suggestions have been made that selected forests could be used for the disposal of sewage and some pulpmill effluents, a practice which has been tried overseas and which could help to reduce pollution of rivers and coastal waters as well as increase forest growth rates.

The N.Z. Forest Service, and some forestry companies have active tree-breeding programmes which are designed mainly to improve vigour and form and thus increase yields of usable wood. So far the programmes have been restricted almost exclusively to *Pinus radiata*.

Production foresters are frequently criticised for their reliance on monocultures in commercial afforestation schemes. Critics expect foresters to plant and manage mixed forests, in which at least some of the species in the mixtures are broadleaved trees. If it is accepted that one meaning of good land use is maximum production from each hectare of forest, then it is difficult not to adopt monocultures with one of a few well-proven, introduced species. Similarly, maximum production can be used to justify the conversion of millable indigenous forest to exotic plantations, assuming of course that the other criteria for increased wood production can be met successfully.

Good land use cannot be achieved fully without complete utilisation of the forest crop. The establishment and development of the pulp and paper industry and the export of wood chips markedly increased the volume of wood extracted from thinning and logging areas, but limited markets in some districts, high handling costs and conservatism within the industry leave room for further improvement. In many indigenous forests only veneer logs and the better quality sawlogs are utilised and even in the best-managed exotic forests short ends, untrimmed broken tops and occasional full-length logs can be found on most cut-over areas and around loading sites.

FOREST OPERATIONS

Good land use and high productivity are synonymous, but cultural and associated operations carried out to attain high productivity can create environmental problems. In common with many other large industries, production forestry is being increasingly criticised for some of its activities, activities which have been accepted as normal practice for many years. Some criticism is justified and often the practices complained

of can be modified or eliminated with little or no loss in productivity and at no significant increase in cost.

Many foresters are already questioning entrenched procedures in their own profession, but others are unable to appreciate the need for change. This negative attitude is more difficult to overcome than the problem of increased costs which some changes will cause. It is wrong, however, to pander to every emotional outburst by arbitrarily altering work methods before firm evidence of significant harmful effects is available.

(a) *Burning*

Fire is one of the main tools used for land clearing by both farmers and foresters. Critics object to its use, because first it results in air pollution and, secondly, it destroys litter and humus, causing nutrient loss and exposing the land to soil erosion.

Bracken, scrub species and indigenous second growth cover a high production of land available for conversion to exotic production forest. This vegetation physically impedes planting and later competes with the young trees. On easy or moderately steep slopes, scrub vegetation can be cleared mechanically, although many foresters prefer to burn first, partly to improve driver visibility and partly to reduce the quantity of unwanted material. On slopes where tractors cannot operate effectively or safely, costly and labour-intensive hand clearing is the only proven alternative to burning. Heavy gravity rollers show promise, but limited availability has made reliable evaluations impossible over a wide range of sites.

The use of fire for planting-site preparation could be reduced, but at present effective alternatives are not available for all classes of land. In production forests the environmental hazards of burning are probably overstated. Much of the land being afforested was reverted farmland which was probably subjected to burning at least every 3 or 4 years. In most forests a single burn at the beginning of the first rotation of trees is all that is needed.

(b) *Cultivation*

Different methods of land cultivation are used, alone or in conjunction with burning, to prepare areas for planting. The objective is to eradicate competing vegetation, or reduce its vigour, and to loosen compacted soils, thereby promoting faster tree growth and lessening the need for releasing.

Discing and ripping can follow the contour on easy slopes, but on steeper ground machinery must be worked at right-

angles to the contour. Under these conditions line-dozing and root-raking are commonly carried out. The terms are imprecise but, generally, line-dozing is the use of a bulldozer to sweep planting lines through scrub and surface vegetation. In practice, the blade usually bares the mineral soil and the bulldozed lines become drainage channels which may scour badly and cause significant soil loss. In root-raking, the blade may be used to crush the vegetation but essentially roots are ripped out or loosened by forward or rear-mounted tines. The method reduces surface run-off, particularly if the cleared vegetation is windrowed along the contour at intervals down the slope.

(c) *Herbicides and Pesticides*

Various chemicals are used in forestry to (1) assist in preparing land for planting, (2) release young trees from competing weed growth, and (3) control insects, pathogens and animal pests. Land preparation and releasing can be carried out by hand cutting, possibly at no extra cost, but it would be almost impossible to recruit and retain sufficient labour to complete work on schedule.

Without chemicals, production forestry under present-day conditions would be much less efficient. Admittedly, at least some of the materials used can be harmful to animal life, but application rates are very low and treatment with any one chemical is usually needed no more than once during each rotation of trees. (Aerial spraying with copper fungicide to control *Dothistroma* needle blight may be needed more frequently.)

Chemical control should not be used indiscriminately. Care should be taken to avoid all water-courses and to confine application to the treatment area. Sometimes the season of treatment can be altered to lessen the chance of damage to crops on neighbouring properties.

(d) *Fertilisers*

Topdressing of farmland with superphosphate is considered to be an important cause of eutrophication in many inland waters, where increasing levels of nitrogen and phosphorus are seriously degrading trout habitat. Fears have been expressed that the large-scale use of fertilisers in production forests will have similar effects.

Information is not yet available from New Zealand sources, but overseas measurements show that small increases in nitrates occur after fertilising forest catchments with urea or sulphate of ammonia.

In pasture management, maintenance dressings of superphosphate are applied annually, or at slightly less frequent intervals, using rates of 150 to 500 kg/ha. Forests are unlikely to be treated so frequently, although application rates may be higher than those used in agriculture. Nitrogenous fertilisers as well as superphosphate may form part of the treatment. One or, at the most, three dressings may be applied during a 25- to 35-year rotation of radiata pine.

A forested catchment should retain and re-cycle a greater proportion of the added nutrients than a comparable hill country pasture, but more research is needed before this can be verified. Nevertheless, care must be taken to confine fertilisers to the treatment area and to avoid direct application to water-courses.

(e) *Logging and Utilisation Thinning*

Harvesting of the tree crop, although carried out at infrequent intervals, probably infringes against the principles of good land use more than any other forest operation. Not only is the forest canopy partially or totally removed, but the ground vegetation, litter and soil are disturbed and considerable earth movement takes place during the construction of tracks, roads, landings and skid sites. Harvesting increases the rate of water run-off, and can cause soil erosion and the silting and pollution of water-courses.

In some districts logging already operates under local catchment board by-laws, which are authorised by Section 34 of Soil Conservation and Rivers Control Amendment Act 1959. These by-laws require that outline logging proposals be approved by the catchment authority before tree felling begins. Restrictions are placed on road alignment, skidder track and loading site location, stream crossings and other similar features. The protective measures are not difficult to comply with and result in no large increase in costs, provided that logging operations are carefully planned beforehand and the restraints are not arbitrarily and unnecessarily imposed. Probably the greatest problem is to accept the fact that logging operations are being legally and closely scrutinised from outside the industry.

The popularity of rubber-tired skidders is partly responsible for adverse criticism of logging techniques by soil and water conservation interests. These versatile machines have an important role in forest harvesting, but in many districts they are used on steep slopes which could be logged more efficiently and with less risk of soil erosion by high lead or skyline haulers.

Foresters are also accused, with some justification, of blocking water-courses with felling debris and spoil from roadworks and loading site construction. Dry water-courses are sometimes used as extraction routes. In order to prevent this type of damage the reservation of riparian strips along all water-courses has been advocated. Not only does the forest in these reserved areas remain standing, but roadworks and the operation of machinery are forbidden. In indigenous production forests, and in exotic forests where remnant indigenous stands lie adjacent to water-courses, this protective measure is commendable; but few commercial exotic stands are suitable as permanent riparian reserves. The same results can be achieved by using hauler extraction and siting roads and landings on ridges or, where valley extraction is essential, by more careful planning and supervision of logging operations.

MANAGEMENT CONSIDERATIONS

With few exceptions, most mature stands of exotic trees harvested so far have had little beneficial silvicultural treatment, but many younger stands are being subjected to a bewildering array of regimes and schedules. Foresters are attempting to grow wood either for specific purposes, which, it is predicted, future markets will need; or, in cases of uncertainty, for all markets which may eventuate.

Fundamentally, forest owners not associated with processing plants are looking for maximum profits from their enterprises, although this object may be tempered by an enthusiasm for trees and forestry. Owners utilising their own raw materials are more concerned with the continuity of adequate wood supplies to the associated wood processing plant. Forest profitability need not be the major consideration. The State, on the other hand, has an obligation to provide for local consumers and industry and to export the surplus, either directly or indirectly, in processed form. Again maximum profit need not be the over-riding criterion.

None of these objectives conflicts with the concept of good land use in the productive sense. Financial gain is a legitimate business objective, and in order to achieve it most forests must be managed to produce high volumes of usable wood.

The possibility of forest owners growing minor species with low productive capacity and limited commercial use, and thus wasting valuable land, is fairly remote. There is a chance, however, that owners will adopt silvicultural regimes which do not contribute greatly to the needs of regional development projects.

At present there are no legal restraints which can compel a forest owner to practise a specified method of management or silvicultural regime. It could perhaps be argued that in the interests of good land use there should be. In fact, the State already exercises some degree of control over many private and local body forests through the various forestry encouragement schemes.

MULTIPLE LAND USE

If land can be used simultaneously for more than one purpose then it is good land use to do so, provided that the predominant use is not adversely affected. Production forests, both indigenous and exotic, are well-suited to some recreational activities. Wood production is not affected by hunting, tramping, picknicking and similar pursuits, but the risk and cost of vandalism must be carefully considered before forests are opened to the public.

Trees either singly or *en masse* are visually attractive to most people, but indigenous forest with its varied composition and structure is preferred to "regimented" pines. Even the latter, however, can improve the landscape. In most exotic forests roadside planting of ornamental conifers and deciduous trees is common practice. So far little attention has been given to the siting of species boundaries and the alignment of roads and firebreaks, so that they blend more easily into the landscape, while at the same time effectively fulfilling their primary purpose of servicing production forests.

Forest farming has become fashionable in recent years, particularly where developed farmland has been acquired for afforestation. Stock can be grazed before canopy closure and again following the regeneration of ground flora, but a deliberate attempt to encourage pasture growth throughout the rotation may be poor land use. A farmer, trying to diversify production by growing trees, can graze sheep or cattle in his forest to bring in early cash returns. Net profit over a rotation of trees may be similar whether he grows trees only, runs sheep or cattle only, or combines trees and stock. But if unused land is allocated to forestry to support a large, regional wood-processing plant, it seems both unethical and bad management to adopt a silvicultural regime which encourages continued grazing but at the same time reduces the yield of wood.

Most, if not all production forests have a soil protection and water retention role, but in some forests this role is more important than wood production. In these circumstances, management and silvicultural practices must favour protection. Recent plantings on highly erodible soils north of Gis-

borne and plantations established on coastal sands are two examples of these dual-purpose forests.

CONCLUSION

In general, production forestry interests are practising good land use and major changes in methods are unnecessary. There is, however, some validity in the charges made by environmentalists. With better planning, more care in the way operations are carried out, and an acceptance of the rights of other interests in land management, foresters can continue with a clear conscience to grow a vital raw material.