

INTEGRATED FARM FORESTRY

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Abstract

Two-tier combination of pastoral farming and exotic forestry has been shown to be technically feasible. Research is proceeding into the long-term effects of trees on both pastures and livestock, and into land preparation and tree establishment measures appropriate to the technique. Further expansion on a management scale may be limited by financial, advisory, management and marketing constraints. However, combined land use promises higher financial returns, and less conflict in land allocation than traditional pastoral farming or exotic forestry.

BACKGROUND

In 1968, profitability studies prepared at the Forest Research Institute, Rotorua, showed clearly that site index and location affect the financial viability of radiata pine plantation forestry. They also demonstrated the profitability of adopting shorter sawlog rotations by maximizing growth on pruned final crop trees. Such management entails freeing crop trees from competition at an early age. This means intermediate yields from thinnings are forgone but the stands are sufficiently open to maintain a grass sward, enabling intermediate yields to be obtained from grazing. This realization has led to further refinements in the silvicultural regime, aimed at reducing shade, slash and costs by planting fewer trees at wider spacing, more timely pruning of fewer trees, and earlier removal of culls. Initial interest in this concept has come from the forestry sector, particularly from forest companies who have acquired grassland for planting, because they have appreciated the advantages of very early agricultural returns, easy stand access, simpler stand management, and reduced fire risk. More recently, however, agriculturists have shown interest also. They acknowledge the role that tree crops can have in diversifying and raising production, reducing market and biological risk, promoting soil stability, ameliorating the microclimate and, for farmers, in providing an asset which can be readily liquidated to pay death duties.

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CURRENT POSITION

At present, government departments, forestry companies, city businessmen, and farmers are all involved in management-scale application of the concept which may be defined as: "Any situation where trees and grazed pasture are grown together in an integrated management system, the prime objective being to increase long-term net profit per hectare". The *technical feasibility* of this type of management is evident from current trial work and successfully managed demonstration areas at all stages of development in the Bay of Plenty and elsewhere (see Fig. 1). However, most large-scale application of the concept is recent and stands older than about 7 years are not well represented. This has limited the collection of data on pasture production and animal performance under various radiata pine densities as they grow from age 7 to maturity (say, 20 to 30 years). The *economic viability* of the concept has, therefore, yet to be demonstrated and detailed financial evaluation requires more data on the agricultural aspects. Nonetheless, the prospects are promising. The high level of interest and investment in the concept plus increased research is based on the probability that net returns will be higher per unit area than from either forestry or agriculture alone. Even the secondary benefits already outlined may be sufficient on their own to justify joint land use as, for example, planting for soil stabilization plus wood production in the Poverty Bay/East Coast region and on the unstable seedlings associated with recent Tarawera ash showers on the northern boundary of Kaingaroa Forest. In both these areas tree planting at wide spacing could preserve and stabilize the farming infrastructure. The farm-forestry approach should not displace or disrupt agriculture if it is applied properly. Instead, forestry should complement agriculture by minimizing wastage of existing capital works and pasture and causing only gradual changes in pastoral-based production.

On a national level, several factors favour increased afforestation of low-altitude land of easy terrain that is close to ports and population centres. One factor is transport costs. Forestry has to transport about 40 times more annual production per unit area than agriculture. Each kilometre of transport saved is worth about \$2.45 per hectare in terms of land value to an afforestation project. Site quality is an even more important factor, with each metre increase in site index worth about \$32 per hectare. Thus, integrated farming and forestry has its most obvious and profitable application on deep free-rooting soils on land near to markets and ports. One other factor, relating specifically to forestry companies, deserves mention. Forest-based industry tends to be monolithic and requires a concentrated and assured wood supply. This must be grown and delivered to the processing plant or port as cheaply as

possible if cost structures are to be acceptably low and competitive export marketing facilitated. Thus large-scale land acquisition by companies must be judged according to the possible costs and benefits to the nation; it may well be in the national interest for some farm properties to be purchased and managed by forest companies. This is not to say that all the pasture land on an acquired farm property would be planted. Combined forestry and farming management is flexible because the balance between planted and unplanted pasture, and between grass and wood production on the planted portion, can be varied to suit the objectives (and competence) of the organization involved.

The scope the concept offers for regional development is obvious. The impetus may come from forest companies undertaking a major project, from farmers developing a regional timber resource, from government departments co-operating in land development, or from the cumulative effort of city investors. All these groups could have a role to play.

CURRENT RESEARCH

Formal research into the best means of integrating wood and pasture production is proceeding at the Forest Research Institute in co-operation with agricultural research, government departments, private companies, and interested individuals. An interdepartmental meeting in September 1973 recommended that the Forest Research Institute convene a working group of research workers, which held its first meeting in August 1974. This group will advise the research directors of the organizations represented (N.Z. Forest Service, Ministry of Agriculture and Fisheries, and DSIR) on research work that is required; bearing in mind the knowledge gaps which inhibit full evaluation of the concept, the applicability of current work to other parts of New Zealand, and the need for short-term answers to complement long-term trials. It will be important that adequate resources (especially finance) are provided by the appropriate research organizations to implement the group's recommendations. It sees the research priorities as being:

- (1) To assess the effect that trees grown at different spacings and stand densities have on pasture production throughout the life of the stand, and determine any side-effects that one crop may have on the other. A comprehensive trial established recently near Rotorua will give good answers in the long term, but some complementary trials in older stands, wherever suitable stands are available, would provide useful interim results.



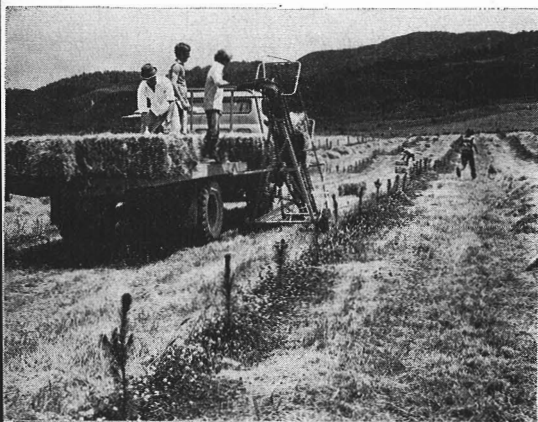
FIG. 1

Upper left: Lambs stocked at 25/ha grazing amongst radiata pine 9 months after planting.

Centre: Cows with calves grazing amongst 6-year-old radiata pine thinned to 400 stems/ha.

Lower left: Hay cropping between rows of radiata pine planted at 7 m centres.

Above: Sheep grazing amongst 12-year-old radiata pine thinned to 200 stems/ha and pruned to 11 m.



- (2) To intensify research on the land preparation and tree establishment phase. Much has been achieved already, but agriculturists are loath to accept the present constraint of leaving the pasture ungrazed, or only lightly grazed, until the trees grow beyond the reach of livestock, whilst foresters are loath to accept that some animal browsing damage can be tolerated in the interests of maintaining the quality of the grass sward. Indications that both pasture and trees can tolerate more "abuse" than is normally acknowledged warrant closer examination. Further studies planned include means of protecting seedlings from browsing, the recovery pattern of browsed trees, and the prospects of mitigating browsing damage by planting larger, sturdier seedlings.
- (3) To study aspects of pasture management, including means of manipulating its composition to permit earlier grazing, of controlling common pasture weeds after planting, and of determining the performance and palatability of different pasture species when grown under a tree canopy.
- (4) To extend the concept to other tree species.
- (5) To appraise more fully where in New Zealand the integration of forestry with farming would be most applicable and beneficial.

MANAGEMENT CONSTRAINTS

Lack of reliable researched data is not seriously impeding adoption of the integrated farm-forestry concept. Its promise has been sufficient to initiate several large-scale projects and more are planned. Some management aspects likely to be more disadvantageous, however, are the following.

(a) *Conservatism*

Land managers accustomed to regarding farming and forestry as distinct alternatives cannot easily accept them as complementary forms of land use. Examples of this are vigorous opposition by farming interests to the acquisition by forest companies of pastoral land ideally situated for forestry, the complete lack of interest of the same farming groups in adopting farm forestry themselves, and the attitude of some foresters who have persisted in smother-planting pastoral land.

(b) *Lack of Management Expertise and Advice*

Integration of forestry with farming is an intensive form of management that requires clear objectives, careful planning, and skilful execution. The present forestry advisory service would need to be up-graded and more closely allied with

agricultural advisory services if more land owners become interested in the concept. Reliable, technically-competent contractors are scarce, and co-operative management and marketing ventures have been slow to develop. Improved availability of forest management and marketing services could greatly accelerate acceptance and expansion of forest farming.

(c) *Financial Limitations*

Specific reservations that financing agencies may have will need to be resolved and taxation incentives outside the forestry encouragement grant scheme need to be made more equitable. The private individual not in receipt of a grant is currently at a disadvantage compared with grantees and companies. Amendments to existing legislation could help. For example, farm forestry expenditure could be made fully tax-deductible as a farm development expense. Also, the Rural Bank could institute farm forestry development loans to finance projects not covered by the grant scheme or soil conservation subsidies. Bridging finance, rather than subsidy, is needed and provision could be made for loan repayment prior to felling, if farm incomes were buoyant.

CONCLUSION

Integrated farming and forestry, though in its infancy in New Zealand, has been shown to be technically feasible. Its financial viability has yet to be demonstrated but prospects are promising. Research requirements are being identified and appropriate trials established. An equally concerted effort in the management field should dispel many traditional prejudices and resolve financial, advisory, management, and marketing constraints. The blending of two traditional and major land uses in New Zealand — pastoral farming and exotic forestry — has begun and promises higher returns per hectare, a more stable economy, more attractive pine forests and rural landscape, and, lastly, co-operation instead of the traditional conflict over best land use.

RELEVANT LITERATURE

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