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Agroforestry Update

Department of Agriculture, Victoria.
Department of Conservation, Forests and Lands.

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Agroforestry Update – an occasional newletter for agroforestry researchers, extension specialists and practitioners

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EDITOR'S COMMENTS

This edition of "Agroforestry Update" is the first to be produced by the Victorian group, in line with the practice of voluntary rotation of responsibility for its production. On behalf of all readers, we thank David Brett and Chris Borough for their excellent efforts in establishing and producing "Agroforestry Update" since its inception.

In the next issue, we intend to update the Directory of people active or interested in Agroforestry in Australia. Please complete and return the green page at the rear of this issue. Please provide a return with your name marked "no change" if the information included in "Agroforestry Update 1" is still current.

This issue contains four submitted papers from Australia and New Zealand. The next issue will be produced about August 1985. We invite your submission of items for that issue - whether papers, abstracts, new items about projects, personnel, conferences, field days, or any other aspect of agroforestry.

Like most things in life, "Agroforestry Update" will only be as useful as the effort that YOU put into it.

REPORT ON NATIONAL MEETING ON AGROFORESTRY IN AUSTRALIA CANBERRA, 6-7 JUNE 1984

Dr A G Brown, Assistant Chief, Division of Forest Research, CSIRO Canberra.

Editor's Note: This report has been submitted to both Standing Committee on Agriculture and Standing Committee on Forestry. In the next edition of Agroforestry Update we expect to be able to reproduce responses of SCA and SCF to the report.

INTRODUCTION

Following a joint examination of the potential benefits of agroforestry in Australia by State agricultural and forestry authorities a paper (Borough and Brett 1982) was prepared for consideration by the Australian Agricultural Council (AAC), the Australian Forestry Council (AFC) and their respective Standing Committees (SCA and SCF). Three recommendations made in this report were subsequently accepted by both AAC and AFC. In summary these were:

1. Each State or Territory should institute a joint policy on agroforestry.

2. Increased research was required, particularly that leading to reliable economic information becoming available.

3. States and Territories should evaluate their capability for agroforestry extension.

CSIRO suggested that working groups be established within each State and Territory and that a meeting be arranged between State and Territory representatives and Commonwealth observers to discuss matters of common interest and co-ordination of programs. The meeting of 6-7 June 1984 followed the acceptance of this suggestion (SCA 1 March 1983; SCF 15 November 1983). This document is a report of that meeting for SCA and SCF.

SESSION 1 - The Australian Position

Chairman Dr R Colman
Rapporteur Dr J Leslie

In this session the purpose of the meeting was outlined and a summary provided of actions taken at the national level. Position statements were received from each State and Territory and relevant Commonwealth instrumentalities. The following major points arose from this session.

1. There was a majority view that the Borough and Brett definition of agroforestry[1] was acceptable but 'simultaneous production' should be interpreted to refer to production on one area of land. There was a firm minority view that a definition should be adopted which clearly included rehabilitative (in addition to production oriented) tree planting in on-farm situations.

1: The management of land for increased net social benefit by the simultaneous production of farm and forest products.

2. Since the first agroforestry report to SCF and SCA in 1982 there have been significant independent developments related to trees in rural areas including the National Tree Program, the proposed Reforestation Program and the National Conservation Strategy. These developments have interacted with established institutional programs and with non-government initiatives such as Greening Australia.

3. The State working groups established in response to 1983 SCA-SCF decisions have necessarily had to develop mechanisms for promoting agroforestry research and extension within a wider and very dynamic context created by the above developments, which encompass the entire field of rural land management.

4. It was felt that the scope of the working groups should be explained to SCF/SCA and the lack of a group providing national coordination of land use applications of forestry in agriculture drawn to the attention of these Standing Committees.

5. Policies on agroforestry have been developed in all States, such policies generally forming part of broader policies which are positively directed at expanding the use of trees for commercial, conservation and amenity objectives. Such policies are supportive of research, extension and development activity in agroforestry.

6. Working group status reports indicate research is in progress on agroforestry systems incorporating Pinus radiata (WA, SA, Vic, NSW/ACT and Tas), P. pinaster (WA), P. caribaea (Qld), and Eucalyptus spp. (WA and Qld). Victoria is developing other agroforestry projects that include a wide range of native and introduced tree species combined with grazing, cereal cropping and row cropping. All reports identify scope for additional research in such areas as:

   . selection for adapted tree and forage species

   . clonal selection and propagation methods for individual species

   . management of agroforestry systems

   . water relations and ground-water hydrology

   . production economics and marketing (including exports)

7. Mechanisms for planning and executing joint research between agricultural and forestry scientists are operating effectively in all States but funds are quite limited. In Victoria, the 150th Anniversary Board has granted $210,000 to establish agroforestry projects.

8. Ongoing mechanisms for national research coordination and information exchange are necessary.

9. Working group reports indicated variation between States in the efficiency of coordination between relevant organisations and the effectiveness of extension. The role of groups such as the Victorian Garden State Committee, and the Farm Trees Groups formed under the aegis of the Victorian Farmers and Graziers Association, was seen as an important adjunct to government services.

10. Further effort is needed to clarify the respective roles of organisations collaborating in agroforestry extension, and to communicate those roles to users of extension services.

11. The effectiveness of extension is partly dependent on increasing the technical expertise of extension personnel across the continuum of forestry and agricultural technology embodied in agroforestry. Tertiary institutions might include greater reference to agroforestry in undergraduate courses, and perhaps provide special short courses for graduates. In view of the extent of agroforestry work in Victoria, Melbourne University is well placed to pursue this suggestion.

12. The effectiveness of extension is substantially limited by lack of technical information - particularly sound production and economic information.

13. There appear to be few situations in which agroforestry in Australia can be guaranteed to be economically viable in the long term. In rehabilitative applications of agroforestry, various forms of public funding and intervention are likely to be essential outside normal commercial pine and poplar-growing areas.

SESSION 2 - Technical Topics

Chairman Mr S Margetts
Rapporteur Mr C Midgley

Information on technical aspects of agroforestry was exchanged. The following summarises the talks of the five speakers.

1. Alternative Pinus species for use in the drier areas - D Spencer.

   Some lesser known species of Pinus have agroforestry potential. The implication is that there is a wide range of other species and cultivars that need to be assessed for agroforestry. For each 'short-listed' species extensive evaluation is necessary to determine optimal management practices.

2. Management problems and grazing strategies in agroforestry - G Anderson

   Innovative approaches to solve management problems associated with the growing of pines and pasture during the first 8-10 years can be developed. Grazing damage and the persistence of pruning debris can be overcome. Despite some problems requiring further research there is now a satisfactory data base for the more active promotion and extension of this land use in Australia. The main barriers to adoption are financial and educational in nature.

3. Production, management and economics of widely-spaced P. radiata with grazing - R Moore

   Agroforestry research in WA indicates that the combination of P. radiata and grazing is as profitable as plantation forestry. As well, agroforestry has the side effects of diversifying income, controlling erosion and salinity where these are of concern, and providing shelter, all difficult to evaluate in monetary terms. The research has also indicated that 100 trees per hectare may be an upper limit instead of the lower limit for practical, viable regimes in this region.

4. Evaluation of economic benefits and sewage effluent management - H Stewart

Agroforestry as a system can be put to uses such as lowering water tables in irrigation areas and lowering surface salinity levels by strategic planting of trees in catchments. The irrigation of trees with sewage effluent utilises both the water and nutrients, producing a valuable commodity. At the same time it overcomes the problem of disposing of sewage effluent in a safe and managed way.

5. Management of saline sites - P Lock

The potential of agroforestry systems to reclaim salt-affected areas is high. Whole-of-catchment approaches would require governmental support for research to determine the density and extent of tree cover needed, the characteristics of salt-tolerant trees and the economics of such reclamation.

The likely favourable ratio of benefits to costs of this research, and its potential social benefit, justifies increased support in research funding. There are substantial external benefits from the amelioration of degraded land.

SESSION 3 - Conclusions and Recommendations

Chairman Mr R Moore
Rapporteur Mr A Hincks

1. Research

The following areas were seen to need further research:

1. Suitable tree species: Systematic investigations of promising species are desirable. Species of established value require further development by appropriate breeding. The clonal option is important, and selection, field testing, and propagation methods should be pursued. This work, and the collection and dissemination of results, might be encouraged by the Australian Forestry Council.

2. The identification of compatible combinations of tree and crop or pasture species.

3. Shade tolerance of a wide range of crop or pasture species under trees. Initial investigations using shade cloth could be undertaken before moving to any field work. Departments of Agriculture may already have facilities for these studies.

4. Fertilizer needs of various combinations of trees and crop or pasture species.

5. Fodder trees: Feeding values and production; planting layout; mechanised harvesting techniques.

6. Repellants for game and vermin.

7. Management of agroforestry systems.

8. Economics of agroforestry systems.

(The matter of funding this research was not addressed by the meeting. Resources might be made available by some change in present priorities, or by attracting new funds. Agreement by SCA/SCF on priorities would assist in the latter.)

2. Extension

Participants recommended:

1. That each State agroforestry group provide a focal point in agroforestry extension, and the Commonwealth concentrate on complementary activities, eg. the preparation of national bibliographies. Effective extension should be sought within each State by interaction.

2. That the Standing Committees draw to the attention of appropriate tertiary institutions (forestry and agriculture) the potential of agroforestry as a form of land management.

3. That State groups endeavour to ensure that industry groups are informed about agroforestry so that such groups might, where appropriate, advocate the adoption of agroforestry.

4. That tree selection and propagation information be made available to landholders.

5. That, in view of the potential of agroforestry to ameliorate land degradation, the Standing Committees extend their collaboration to the Standing Committee on Soil Conservation.

3. Coordination of State and Commonwealth activities

Participants recommend that the Standing Committees:

1. Approve the formation of a national corresponding working group, with identifiable officer-bearers holding office for two-year terms, and having a composition similar to that of this meeting. (The meeting recommends that these office-bearers be drawn initially from Victoria and, for the second two-year term, from WA). This corresponding working group will maintain contact with the working groups in each State, and advise these of developments in agroforestry.

2. Approve the holding of workshops on specific issues on an ad hoc basis. At a later date a detailed proposal will be submitted for a workshop in WA in 1986 to review progress in agroforestry projects and developments in that State.

3. Approve the continuation of agroforestry working groups in each State and Territory, and ask each group to identify a contact person.

4. Ask the Australian Department of Primary Industry to undertake a national technical co-ordination role, and handle overseas contacts.

5. Approve the bi-annual publication of 'Agroforestry Update'. (Representatives of the Victorian Department of Agriculture and Forests Commission indicated that production could probably be undertaken in that State for the next two years).

6. Ask the CSIRO Division of Forest Research to maintain and periodically publish a list of agroforestry research projects as part of the Division's project to maintain 'Forest Research Projects in Australia'.

7. Ask the national working group to ascertain plans for future research so that, with the list of research in progress (6, above), a comprehensive picture of research in agroforestry is available.

8. Ask the CSIRO Division of Forest Research to develop a computer model to integrate information now accumulating on alternative agroforestry systems, and to define and model the effects of factors such as soil type, climate, tree species, density, arrangement, silviculture and type of agricultural system on the production and profitability of agroforestry enterprises. Potential contributors to the model are the BAE, WA and Victorian agroforestry groups and the NSW Department of Agriculture.

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AGROFORESTRY STUDIES IN VICTORIA

Stuart Margetts
Extension Director, Melbourne
Department of Agriculture, Victoria

Historically, agriculturalists and foresters often have developed what may seem to be opposing purposes in land-use, encouraging either widespread clearing for agricultural pursuits, or retention or replanting of timber species for a forest woodlot. However, the combination of both agriculture and forestry on one area of land has commonly fallen between either discipline. This practice, known as agroforestry, has gained increasing attention by landowners in recent years, and is recognised as having the potential to enhance the economic performance of farms.

There are many definitions of agroforestry, but the following one is steadily gaining acceptance:

Agroforestry: the management of land for increased net social benefit by the simultaneous production of farm and forest products (Borough C.J. and Brett D.A., a paper prepared for joint consideration by the Australian Agriculture Council and the Australian Forest Council, May 1982).

Experience in Victoria and elsewhere indicates that this form of land-use has many benefits - expanding economic productivity of the land, arresting erosion and salinity, and providing shelter for stock, wildlife and crops.

Increasing interest in agroforestry parallels a general enthusiasm for selective revegetation of farmland, evidenced by community projects like the National Tree Program, the Tree Growing Assistance Scheme, Greening Australia and the National Soil Conservation Program. These are only a few activities of the State and Federal Governments that encourage restoration of trees on farms while still maintaining sustained agricultural productivity.

Until now, economic uncertainty and the complexities of management, have inhibited the development of agroforestry.

Lack of information about the interaction between trees and agricultural crops has prompted the Victorian Government into action. It has allocated $210,000 from its 150th anniversary celebration funds for a joint study to be conducted by the Department of Agriculture and the State Forests and Lands Service of the Department of Conservation, Forests and Lands. The School of Agriculture and Forestry, University of Melbourne, and the Land Protection Service also are involved.

The Victorian Government's initiative shows its desire to reverse 150 years of tree decline and to develop economic systems of low density reafforestation.

A number of agroforestry studies will be established in a wide range of environments throughout Victoria. Special emphasis will be placed on the influence of agroforestry systems on key environmental indicators, such as predator-habitat, climate modification and water-table management.

Seven sites are currently being considered.

- Carngham (20 km west of Ballarat), rainfall 850 mm. 27 ha site of radiata pine established in pasture; 5 tree-density treatments replicated 3 times, sheep introduced summer 1984/85. The University of Melbourne has installed neutron moisture-meter access tubes to study the soil-water characteristics of the soil profile. Measurements have commenced. (Professor David Connor).

- Hamilton (south west Victoria, at Pastoral Research Institute, rainfall 700mm). 42 ha site plus 1.2 km of shelterbelt studies. Three fields of study are proposed:

  . 60 tree species assessed for agroforestry potential
  . 8 tree species, studies at various densities
  . a number of windbreak designs and species will be compared.

- Dundas Tableland (north-west of Hamilton), site not yet selected. 38 ha will be needed. Design and planning in progress. Field studies as for Hamilton.

- Kyabram (northern Victoria, Animal and Irrigated Pastures Research Institute) - irrigation. 20 ha site available. Site planning in progress. Likely combination of flooded gum and irrigated pasture for fat-lamb production.

- Myrtleford (north-eastern Victoria, Tobacco Research Station - irrigation). 6 ha site available. Likely combination: Populus species and high value crops. Strong interest in this district to find replacement enterprises for tobacco.

- Gippsland. Site investigation proceeding with development early in 1985. Likely tree species: radiata pine, mountain ash and blackwood, with potatoes, fodder crops and pasture for cattle.

  Rutherglen (Rutherglen Research Institute). Opportunity to examine a wide range of tree species (including honey flora) in association with agricultural field crops.

The project is proceeding under a joint management committee comprising:

Dr Wally White, Chief of Animal Research and Development, Department of Agriculture (Chairman)

Stuart Margetts, Department of Agriculture

Dr Fred Craig, Department of Conservation, Forests and Lands

Dr David Flinn, Department of Conservation, Forests and Lands

Ian Hamer, Department of Agriculture

A recent study on agroforestry[1] concluded that "under the most likely assumptions, agroforestry appears to be a more profitable enterprise at the Carngham site than conventional agriculture or woodlots, at discount rates of 13 to 17 per cent in nominal terms".

1: Garland, KP, Fisher, WW, Greig, PJ (1984). Agroforestry in Victoria Department of Agriculture Technical Report Series No. 93.

The study further concluded: "If quality premiums in sawlogs were to develop, then the profitability of agroforestry would improve (further) compared with agriculture and woodlot enterprises".

The study of agroforestry is attracting considerable attention in Victoria from the point of view of research and extension. Other States also are developing field studies with appropriate species and enterprise combinations. As data on economic and silvicultural management become available, agroforestry training will become increasingly more prominent in undergraduate agricultural and forest science courses.

In the long-term, Victorian and interstrate studies must remove the present uncertainties that rural communities have concerning agroforestry.

THE FOLLOWING DOCUMENT IS AVAILABLE FOR PURCHASE:

Garland, K P, Fisher, W W, Greig, P J (1984)

"Agroforestry in Victoria"
Department of Agriculture, Victoria. Technical Report Series No. 93, 114pp

The report consolidates existing knowledge on agroforestry including research and commercial experience in Australia and New Zealand, and assesses potential profitability of agroforestry enterprise in Victoria. The report includes detailed economic analyses and research proposals.

Cost: A$4.00 plus postage A$1.10 within Victoria
A$1.35 Interstate
A$2.00 New Zealand

Forward order, with cheques payable to "State Forests and Lands Service" C/- Bookshop, Department of Conservation Forests and Lands, 601 Bourke Street, Melbourne, Victoria, Australia. 3000.

AGROFORESTRY AND INCENTIVES

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New Zealand has been aptly described as a nation of farmers. Of our 26 million hectares of land, 54 percent is used for agricultural or horticultural production and only 4 percent or one million hectares is currently carrying exotic production forest.

This emphasis on farming has meant that historically most landowners have been involved in the clearance of land from forest to grass, and having done this job well, in some cases too well, the reintroduction of forest is foreign to many farmers' thinking. Experience and research over the years have shown that most landholdings, particularly in hill country areas, are not suited to a single land use and as a result "diversification" has assumed importance with the passage of time. "Agroforestry" with its linking of agriculture and forestry is closely associated with the desire to achieve diversification.

Although history shows that the Government interest in encouraging farm plantings began in 1858 it is a fact that agriculture and forestry have tended to pursue their own largely independent paths of development, and through experience and research have attained a level of sophistication in their technology which gives New Zealand some pre-eminence in the world scene. During this development period forestry for timber production has been dominated by the State and wood processing companies and it is only during the past one to two decades that agroforestry has become a recognised concept. With acceptance the opportunity now exists to bring this hitherto independently gained expertise together; of realising in the process real benefits of fine tuning the use of our land resources, in effect dropping the antagonism between the pasturalist and the forester.

Current status of agroforestry

Agroforestry involves all aspects of managing land where trees are in intimate association with agricultural systems. This includes managing trees jointly for wood production and shelter, shade, fodder, understorey grazing, erosion control or amenity purposes. One of the most interesting features of recent research is that changes in methods of afforestation for wood production have been progressively blurring the distinction between forestry and agroforestry. Since World War II considerable advances have been made by forest managers and scientists in the understanding and practice of intensive silviculture in New Zealand's forest plantations.

More livestock are being introduced into existing plantations and the resultant benefits of weed control, lessened fire risk and enhanced access are becoming readily apparent to forest managers. At the other end of the spectrum trees planted by farmers on land already providing significant pastoral returns offer the benefits of high total productivity and a more diverse source of income. The integration of the two land uses is a challenge to the farmer, the forester and the financier.

Targets and technology

New Zealand is currently into the second planting "boom". The first, in the 1920s and 1930s, has provided most of the plantation timber for industry to date. The second, which began in the early 1960s, has tripled the post-World War II forest area. A major conference involving the total forest industry in 1981 placed emphasis on targets for the forestry sector. The conference concluded that a forest estate of adequate size to provide a sound base for export industries should be rounded out to the final target by 1990 in most regions. Importantly, from the farm forestry viewpoint, it was concluded that an increased contribution of up to 30-40% of annual planting programmes by 1990 by the smaller grower should be encouraged, for social, economic, environmental and land use reasons.

This shift in production forest location from non-agricultural land to agricultural land with lower productivity has been accompanied by a change in research emphasis. This research has been hastened and assisted greatly by the computer model SILMOD (Silvicultural Stand Model) that has been developed by the Forest Research Institute, Rotorua, with funds provided by both the State and private sectors of the forest industry.

SILMOD is a comprehensive economic computer stand model that considers a large number of factors describing the forest site, the silvicultural regimes and sawmill processing. It is the first known model to define and simulate the effects of a comprehensive range of log qualitiative factors in timber grade mixes and potential profitability. Although some further work will be required on the growth section of the model to cope with the new high-fertility farm sites that have been subject to agricultural topdressing and can give up to 40 percent more basal area, the model is very flexible. It can be used in business environments with widely different management objectives for a range of radiata pine sites in New Zealand and for a range of silvicultural options. These may be with or without butt-log pruning, with or without production thinning and final crop stockings as low as 100 stems/hectare and as high as 700 stems/hectare.

The model has a major role to play in deciding optimum silvicultural regimes and rotation lengths for radiata pine on a variety of farming sites. Some of the more important findings noted to date on these sites are:

- Radiata pine can be grown profitably on 27-30 year rotations
- With or without grazing the ideal final crop stocking should be between 100 and 200 stems per hectare
- In association with lower final crop stockings, maximum clearwood production should be aimed for and knotty cores of less than 20 cm can be achieved
- Pruning of at least the butt log (6 m) must be achieved using stem diameter and crown depth as a prescriptive guide. Pruning should be to variable heights recognising individual tree growth and could involve 4 lifts as opposed to the standard 2 or 3 lifts
- Log diameter particularly under the clearwood regime is important as is utilisation plant location, the sawing pattern used and the sawmill conversion standard

- Intermediate forest grazing returns can substantially improve profitability on weed-free sites

Incentives and financial policies

The encouragement of landowners to consider forestry as a means of diversifying land use involves the consideration by government of both indirect and direct incentives. Most government effort in New Zealand has concentrated upon direct financial incentives with modification over the last 20 years. As such modifications will be of interest I will detail these first and follow with the indirect incentives currently receiving attention.

Direct (financial) incentives

Since 1962 New Zealand private forest growers have been offered a diverse range of financial incentives that have all been aimed at encouraging the growing of timber-producing forests. A summary of the major schemes with comments is as follows:

1. Forestry Encouragement Loans

   Loans were made available to farmers and local authorities between 1963 and 1970. They were restricted to a fixed amount of finance to cover direct operation costs over the crop rotation and bore a low rate of annual interest. The loan included an inexpensive loan repayment insurance scheme, and the total debt was registered against the land title under a comprehensive agreement. The agreement contained a management plan defining the operations to be completed by years in order to achieve a desired end product and a rebate applied to repayment based upon borrower performance. The loan was repayable at the commencement of clearfelling and allowance was made for repayment by instalments. Loans were approved under a detailed inspection and reporting system, and for larger areas (over 80 hectares) a cash flow analysis and ministerial approval was required.

   Comments

   The loan scheme, although in hindsight it was considered very generous, could not be classed as successful. The major reasons for its failure were:

   - Agreement registration against the land title meant that landowners viewed the loan as a mortgage and this was not acceptable to individualist farmers
   - The approval and legal documentation was cumbersome and time-consuming to administer
   - Registration created ongoing legal problems as with any encumbrance on land
   - Approved finance under the loan never kept pace with inflation and silvicultural operations became dependent upon greater personal finance input

2. Forestry Encouragement Grants

Between 1970 and 1983 government offered finance to non-company landowners under the Forestry Encouragement Grant Scheme. This scheme made available, up to a nominated per hectare maximum, 50 percent of qualifying operation and administration costs on an annual payment basis. No agreement registration or legal commitment was involved. Project approvals were required though authorities were extended with ministerial involvement only required on projects 400 hectares and over. Qualifying costs were based on being similar to the tax deduction system and covered virtually all costs other than capital items (for example, land, buildings and permanent roads).

The scheme was successful and by 31 March 1983 had approved 3,000 projects covering a proposed planting area of 110,000 hectares of which 66,000 hectares had been planted.

Annual grants paid in the 1982/83 financial year totalled $3,750,000.

Comments

- The scheme's maximum per hectare finance over the rotation was reviewed every five years to take account of inflation. The 1970 maximum of $600/2 was increased to $1,500/2 by 1980.

- The scheme provided all participating growers with an identical incentive irrespective of operation costs or personal tax rate.

- Advisory staff time was still taken up with scheme administration though not to the extent of earlier Forestry Encouragement Loans.

- Approvals and payment quality checks meant that government controls were exercised on private landowner's investments.

3. Deduction of forestry costs through the tax system

Forest companies up until 1983, and farmers planting trees for shelter, shade, erosion control or agricultural purposes, have been able to deduct forestry costs from income from any source for tax purposes. In New Zealand this form of government incentive applies to most major land uses, for example, agriculture and horticulture, and therefore there is a strong body of non-farmer opinion that all forestry should also be included within this policy. This would make major land-use incentives of equal value and remove the ambiguity and administrative difficulty of identifying the "forestry" and "agricultural" extent of agroforestry expenditure.

Reimbursement through the tax system is dependent upon the claimant's profits and resultant tax rate. Low income earners suffer under this system, high income earners benefit. The grant at a defined percentage of costs provides equality of incentive.

Comments

- The Inland Revenue Department is experienced in auditing financial claims and therefore administratively the scheme has significant benefits.
- No field checking of work quality is required so that advisory officers are able to concentrate upon advisory work.
- As farmers' incomes tend to be at lower annual levels, the tax deduction incentive to the major landowning group is inferior.
- Some farmers felt that the loss of a controlled incentive system would mean a drop in the level of advisory services.

4. Forestry Encouragement Grants Scheme 1983

Based upon the previous 20 years of incentive experience and in an effort to dispose of the diverse range of incentives available, government in 1983 introduced a revised Forestry Encouragement Grant Scheme. This new scheme combines the attributes of the grants legislation and the tax deduction system.

Comments

- Administrative controls are minimal so that advisory officers will be able to place emphasis upon advice and not concern themselves with the scheme.
- Government has recognised that it cannot control private companies' management of their own forests.
- Environmental groups are expressing concern at the supposed promotion by the scheme of indigenous forest clearance to favour exotic production forestry.
- Forest owners will be investing 55 percent of their personal funds so that self-control on expenditure will be exercised.
- No government controls are exercised on other land users qualifying for alternative tax deduction incentives.

Indirect incentives

Indirect incentives must be wide ranging and emphasis is currently being given to:

- The establishment of an experienced, professional and well staffed advisory service to provide free-of-charge services to the private sector
- Set up agroforestry demonstration areas throughout the country for advisory purposes using both private and Crown land
- Continue the development of closer liaison between various government advisory services and other agencies and interested organisations

- Use farm discussion groups and other similar existing and newly co-ordinated activities, jointly prepared publicity material and joint training programmes

- Extend agroforestry research to those areas identified as likely to give a high level of return in both the short and long term, for example, stock growth-rates and health, forage quality under forest grazing and shelterbelt management, other tree species in agroforestry, and market research

- Encourage local government, on reviewing their planning schemes i identify agroforestry opportunities and publicise the benefits of integrated land management systems

- Maintain competitive State sales procedures so that State timber continues to be sold on the open market; the allocation of State wood to overcome short-term supply difficulties can lead to marke distortions, adversely affect growers' profitability and distort benchmark State stumpage values

- Provide private growers with suitable co-operative legislation to permit profitable and controlled marketing

- Widen the statistical base in surveys such as annual returns from farmers, to more adequately cover agroforestry including shelterbelts.

Conclusion

Government has adopted a positive attitude towards private sector forestry in accordance with the 1981 Forestry Conference recommendations. Indications are that the private sector has accepted the revised grants scheme and it is expected that an expansion of the privately owned forest estate will occur during the remainder of the 1980s.

Future legislation improvements can be expected to focus on the taxation treatment of forest profits and immature forest sales. Current tax laws state that ALL commercial forest income is taxable in the year received with no spreading provisions, and (the sale of) immature forests are classified as the sale of a commercial forest. Also forest financial lending and investment will receive attention following the enactment of the Forestry Rights Registration Act in 1983. This Act allows a landholder and investor to register a joint venture agreement as a right against the land title using a photograph or diagram and without transferring the title to the land as in a lease.

Agroforestry as a means of diversification is receiving the direct attention of the farming community. With positive incentives, professional advice, and continued research, New Zealand can expect a positive response to its call for forest expansion and quality timber crops.

Reading List

Percival, NS and Knowles, RL
Combinations of Pinus radiata on pastoral agriculture on New Zealand hill country
NZ Forest Service Reprint 1666

Percival, NS and Knowles, RL
Agroforestry: expanding horizons
NZ Forest Service Reprint 1665

Hawke, MF and Percival, NS
Grazing management of agroforests on hill country
Ministry of Agriculture and Fisheries, Rotorua, NZ

Ministry of Works and Development
Central North Island Planning Study findings (1983)
Wellington, NZ

Tustin, JR, Knowles, RL, Klomp, BK
Forest farming in New Zealand
FRI, Rotorua, NZ

CUTTING-GROWN TRANSPLANTS FOR AGRO-FORESTRY AND THE IMPORTANCE OF PHYSIOLOGICAL AGE

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For the last three planting seasons I have been using cutting-grown P. radiata stock in wide-spaced rows over grass and already the marked differences in form are apparent.

1981 Planting

An area of about one hectare of fairly steeply-sloping clay face carrying a thick pasture of kikuyu grass and various clovers was planted, mainly in uphill rows 7m apart and 3.5m between trees, also, one double row of cuttings about 3.5 m apart with trees again at 3.5m distances. As a trial, one year seedlings were planted in triangles, squares and four-in-line at around 8 m centres, 1.2 m between trees. The grass was spot sprayed 1 month before planting and trees planted in the turf without any spit removal. The pasture had been fertilised regularly with lime, phosphate and some potash and copper over some 30 years.

Performance:

The first years growth of cuttings was not too impressive. A few calves got in and browsed some trees. The form of trees was variable - quite odd to my perception. The seedlings got away well, solid bunchy trees.

At year two the cuttings sent up leaders like bull rushes out of the thick kikuyu, quite remarkable. The fast spring growth was consolidated with more needles and small second order branches. In the autumn I then spent an hour or so with secateurs removing surplus branches of over-branched whorls and tipping the remaining branches to prevent them growing too much in diameter that is to the limit of 2.5 cm maximum at time of pruning. The remaining branches will be pruned possibly at year three after the tree has put on cambium over the branches initially pruned. The seedlings, then very bunchy, were "stability pruned" to prevent them toppling, standard practice in our windy coastal area. Leaders were sorted out and freed (form pruning). Except for the quickly done correction of over-branched whorls and the odd leader freed up or ramicorn removed, remarkably little work was done on the cuttings.

At year three the trees grew well in spite of competing with rampant kikuyu. The browsed trees (probably browsed because they were smaller initially) lagged markedly behind in growth but now have good leaders. Cuttings were taken off vigorous trees in late May and set in good duff - pumice mix soil.

The overall impression is very good indeed.

One rather hopes that the trees will pause in their upward thrust and put on more foliage. Internodes starting from around .5 m are pronounced and vary from 1-2 m, mostly bi-nodal. The seedlings at this stage are comparatively messy and have needed a good deal of correction pruning to sort out the stem. The high site quality (for pine) no doubt has contributed to the bushy early juvenile form. The cuttings, taken from 4-year-old trees, bypassed this awkward stage growing straight into the vigorous adolescent stage - leggy with pleasing form! The seedlings will certainly need the numbers in the groups to get one good tree, are vigorous and well foliaged but work engendering.

On performance then at year three, the cuttings win out hands down. I shall have to thin two out of three, which will all be good trees, to come down to the 150 stems per hectare planned for. When? That is a good question. Probably in another year, with attention to leader correction.

1983 Planting

I selected another slope adjacent to the access road into the house, very rich soil this but slumping and likely to affect the road. I purchased cuttings from Tasman Forestry Ltd's nursery. These were planted August 1983 using a different method. A spit of kikuyu turf was removed and heaved down hill some way. A tree planting head set on a one man posthole digger was used to bore the hole (20 cms diameter). This head leaves all the finely cut soil in the hole and makes for easy planting and distribution of the roots. This was not a success as with rain the soil in the hole became sloppy and the small trees toppled and had to be straightened later. Planting in 1984 will revert to the 1981 pattern. These trees were planted three in line 1.2 m apart and at 8 m centres and look very well away. Wet areas were planted with E. saligna (Bartletts NZ Strain) and A. melanoxylon (Victorian seed). These again are at wide spacings and will be form pruned especially the acacia. The Barr dictum is: "take care of the leader and the stem will take care of itself".

1984 Planting

Taking into consideration the performance of the 1981 planting we are completing about 30 ha of coastal hill country. This is rolling country well grassed kikuyu and clover with some very rich sheltered sites and exposed hill. This is to be planted at final spacings of 150 stems per hectare - 8 m x 8 m - or patterns thereof. Shelter belts of double line 3 m x 3 m Leyland Cypress will be planted on exposed ridges at say 100 m intervals. Alternate trees of this valuable timber tree will be clear pruned and the others fan-pruned. Wet swamps will be planted in Tasmanian blackwood (A. melanoxylon) and rich soils in E. saligna. Coastal bluffs will be planted in a non-productive belt of mixed E. botryoides, leyland cypress and P. radiata. Planting will be into sprayed turf for initial stability. The management will be strongly toward form pruning of every tree. Grazing with weaned lambs will be done around January 1985 with careful supervision and possible fortnightly spraying with 'Thiropell' repellent. Individual guards are being considered (in keeping with Dr Rory Harrington Ireland and Tasman Forests Ltd, Taupo). The ultra-wide initial spacing has been initiated with the spraying or guard-method in view. This should allow for early grazing with small not too agressive weaned lambs (L. Knowles, pers. comm).

Cutting-grown stock both of pine and cypress has led to a different form tree, much more windstable initially (Dr. W. Libby, pers. comm) than seedlings, easier of maintenance (less whorls and smaller branches) and from observation of 15 year trees (Tasman Forests Ltd - Taranera Forest) of much more rounded bole and very straight.

The 1981 cuttings were taken by FRI Rotorua from the best trees of a stand of 4-year-olds of orchard seed origin. There was nothing of the "stud" breeding about them that controlled pollinated stock will have, rather the selected "grade" sort that we farmers term the best commercial type of sheep and dairy cattle with no recognised background - except a bulk type selection. These 1981 trees are so outstandingly superior to seedlings at this stage that I am given to wondering whether this superiority is not due more to the physiological aging of the cuttings rather than selection for form - as significant as this later can be.

For instance, if we use cuttings from 1-2 year seedlings of superior control-pollinated stock, do we not sacrifice that very useful wind stability and sparse branching of the 4 year cuttings for a bunchy awkward juvenile young tree, superior in breeding no doubt, but of costly early maintenance. It seems also that by using cuttings of some age (say 4-7 years) that a degrading buttressing is eliminated in P. radiata and in Sequoia sempervirens. When growing logs for rotary peeling this buttressing is a cause of waste of valuable outer clear wood. My preference will be then for cuttings taken from trees of 4-7 years of age but of lesser breeding - until hedges of proven control bred clones start producing. I look forward to the crosses of the Guadulupe strain over our best Monterey clones.

And finally, I am willing to conclude that cutting-grown pine and redwood of some little physiological aging grow symmetrically rounded stems. I wonder now that Dudley Franklin and his team at Rangiora FRI are rejuvenating cuttings taken from selected C. macrocarpa whether the troublesome and wasteful buttressing of that most valuable timber-growing tree will at least be controlled to some degree. The cutting-grown leylands have much reduced buttressing even although one parent of that hybrid is C. macrocarpa.