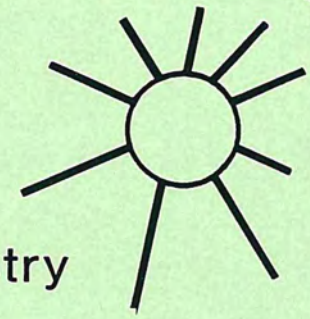
Agroforestry Update



Newsletter for Agroforestry

Researchers and Practitioners

Department of Conservation and Land Management

Department of Agriculture

C.S.I.R.O

Western Australia

8

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Agroforestry Update: An occasional newsletter for agroforestry practitioners, research workers and extension specialists.

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Contents

EDITORIAL

The response to the questionnaire sent with the last issue of "Agroforestry Update" was very pleasing. Of the 228 sent, 70 (34%) were returned, many with helpful comments. The main messsage was that "Agroforestry Update" serves a useful purpose and should be continued. Other suggestions included:

1. List Australian and New Zealand agroforestry research publications.

2. Prepare a register of R & D projects (see Peter Swain's article in this issue).

3. Prepare similar register for Assistance Schemes.

4. Include more case studies and practical type articles.

5. Increase circulation by sending copies to rural libraries, Farm Tree Groups (Victoria) and Soil Conservation Committees.

We are keen to obtain articles on the broad range of agroforestry topics. Bearing in mind suggestion 4 above, case study type articles would be especially welcome.

Thanks to all those who responded to the questionnaire and who have contributed to this edition.

Thanks also to Department of Agriculture's Word Processing Centre and Publication Section, South Perth.

SOME IMPRESSIONS OF AGROFORESTRY IN AUSTRALIA

WHERE DO WE GO FROM HERE?

by Peter Swain
Department of Primary Industries and Energy, Canberra

Richard Moore invited me to give my impressions of agroforestry in Australia following my visits to Victoria and Western Australia earlier this year. As some readers will know, I am from the UK agricultural extension service "ADAS" on a two year attachment to the Department of Primary Industries and Energy in Canberra. I have been looking at the existing and potential role of farm forestry (woodlots as well as agroforestry).

I thought it might be interesting to debate where the future niche for farm forestry might lie. At the risk of listening to a pommy teaching grandmothers how to suck eggs, readers might like to hear my views!

Agroforestry has received very good press, and initial financial support for research in Australia as in other countries. It appeals to environmentalists who distrust mono-cultures and see agroforestry as a step towards minimum input sustained yield husbandry; it appeals to rural communities because it provides an alternative to what they see as the pine plantation invasion by State and forestry companies; and it appeals to progressive leading farmers who feel that they need to support something positive to counter the over-exploitation of the land. Research programmes on agroforestry are well underway in Victoria, Western Australia and other States; results are now coming through.

But where is agroforestry going and where is its niche? My view is that wood lots and agroforestry will not progress very far if designed and promoted to satisfy direct agricultural and timber production objectives on their own. Competing large scale market orientated mono-cultures of trees and agricultural commodities score through economy of scale and uncluttered single purpose objectives. Farm forestry must provide more but where is the evidence?

We need to ask two separate questions about farm forestry:

1. What is in it for the community?
2. What is in it for the farmer?

Governments and local authorities are concerned with looking after the community interest by maintaining revenues from exports, the amenity of the countryside, looking after land resources and safeguarding water supplies. Farmers are concerned with maintaining their income, pride in their husbandry and providing for their next generation.

All fairly obvious, but how often do we think through the converse. The great majority of farmers are simply not interested in long-term timber production. If you need proof look at the results of attitudinal and motivation studies at home and abroad.

So where does this lead us? I am convinced that the key to the future of farm forestry lies in multiple objective woodlots and agroforestry. My visits to different states in Australia brought home to me the scale of the insidiously, encroaching environmental problems facing both the community and farmers. We are all well aware that trees can modify the environment in beneficial ways,

but I am disappointed at the paucity of information available to farmers on how trees can manipulate saline water tables, the impact of different tree densities on water catchments and the role of agroforestry in controlling soil erosion. Farmers are accused of just trying to cover up salt discharge areas with trees rather than treat the cause by tackling the primary recharge areas. But who defines for the farmer where these areas are, let alone gives sound advice on the relative impact of different planting regimes. And who can persuade a farmer to plant up his land when the sole beneficiary will be his neighbour. To my mind a lot more research is required on the environmental benefits of farm forestry, not in isolation but as an integral part of agroforestry research. Answers are urgently needed. Extension services must be adequately resourced to give front line advice.

It is all too easy to impose our own thoughts as reasons why farmers plant trees. The first step is simply to ask them.

The replies that I received fell into just three categories:

1. To provide shelter for livestock;

2. to utilize unproductive land that is an affront to farming pride and a harbourage for vermin and weeds e.g. poor soils, steep slopes and native bush;

3. to combat land degradation, particularly the encroachment of salt.

This leads me to postulate that the immediate future for agroforestry is in providing farmers with a tool to maintain agricultural production, and to provide the public sector with a tool to maintain resources and the environment.

The skill comes in devising systems where the tools also yield a profit, or where the tools have a low net cost.

On my travels I noted a number of exciting developments:

(a) Multi-purpose shelterbelts

Rod Bird's paper on economic modelling to the Bicentennary International Forestry Conference about timber production from a network of farm shelterbelts, coupled with the current research at the Pastoral Research Station and David Bicknell's work in Esperance are a direct response to a real farming need. The belts provide shelter for stock (and the soil?) with revenue from the timber that can be discounted to pay for establishment and perhaps a profit besides.

(b) Pines and eucalypts on pasture

Encouraging results are coming through on the performance of the agricultural and tree components of pine based agroforestry. Similar work on eucalypts has been started. Unfortunately, environmental impact information lags behind. Richard Moore's calculation of the extension of the range of commercial pines onto poorer land and lower rainfall areas, through the adoption of low density planting, is a great plus for agroforestry.

(c) Water catachment management

The co-operation in Western Australia between the Department of Conservation and Land Management and the Water Authority in looking at ways to devise share farming afforestration projects with farmers augurs well. The Water Authority recognizes the enormous benefit of trees in catchment management and is considering how to encourage such plantations in order to keep water courses potable. But have we the evidence to prove that agroforestry can do the same job as conventional plantations? If it is necessary to plant sites of marginal viability, can a case be made for a subsidy to reflect the community benefit?

(d) Saline water table management

Unfortunately I saw very few convincing experiments on the control of saline water tables by tree planting. An exception was the small trial by the Agriculture Department at Narrogin in Western Australia. Soil profile pits and dip tubes indicated that 8 year old eucalypts (several species) at densities of 80 and 160 stems per hectare reduced the local saline water table by some 1.5 metres. A challenge would be to find a timber species and manage it for multiple objectives. What is the impact of even lower planting densities?

(e) Community land protection and tree planting groups

I saw the work of several community based groups in Victoria. They are doing good work in raising the level of awareness of the need for tree planting. But I wonder whether they are right to put so much store in native species. As I see it, the land degradation problem is so big that all avenues should be explored. If Radiata pine, commercial eucalypts or carobs providing fodder will do the job at a profit, or reduced cost, then they must be seriously considered.

(f) Joint ventures and share farming

Private joint ventures usually offer the farmer the prospect of a share of the proceeds of timber sales from woodlots without having to finance the planting. Sites are invariably native uncleared bush or unproductive farmland for Radiata pine or short rotation Tasmanian bluegum woodlots. State share farming schemes do not accept native woodland but they are able to offer an annual annuity. Unfortunately current high agricultural commodity prices are reducing the land offered for these schemes. If you can apply share farming principles to agroforestry then the possibilities become very exciting. Subsidy can be justified to cover some non-commercial elements if there are clear community benefits.

(g) Farmer motivation survey

Henry Esbenshade, at the University of Western Australia, is undertaking a major survey of tree planting on farms in southern Western Australia. A total of 1,200 farms in three rainfall bands are being sampled. The survey is extremely detailed and will provide valuable information on very important questions e.g.:

- who is planting trees?
- where?
- how many?
- why?

- what species?
- future intentions?
- what action or incentives would trigger more planting?
- what are farmer preferences for information and advisory sources?

In looking ahead we must constantly bear in mind the needs of farmers and examine the barriers to the uptake of farm forestry. The table below gives my own suggestions:

Summary of barriers to the uptake of farm forestry

Reasons	Some solutions
Lack of awareness, information and advice	Promotional and advisory work by adequately staffed, resourced, trained and directed extension services. Integrate agricultural and forestry advice, particularly on budgeting. Cure knowledge gaps with research.
Lack of income during pre-commercial phase	Develop agroforestry with continuous agricultural production e.g. very early grazing. Joint ventures and share farming. Short rotations.
Lack of finance for tree planting	Joint ventures and share farming. Planting grants to reflect community benefits.
Lack of secure timber markets	State and private joint ventures. Later, develop co-operatives. Increase royalties for clearwood.
Loss of flexibility of cropping	Concede but ameliorate with short rotations and agroforestry layouts to facilitate field work.
Damage to trees by livestock	Exaggerated; e.g. New Zealand experience suggests very early grazing of Radiata pine possible. Farm scale demonstrations required. Care in showing damaged trees on research sites. Use of electric fencing.
Unwilling to commit good quality farmland to agroforestry or woodlots	Develop demonstrations on sloping or poor land.
Management complexities caused by agroforestry combinations	Develop simple farm based systems with practical easy to follow steps e.g. simple pruning gauge and "best of group" thinning rules. Demonstration areas needed.

My reading of the rural scene is that two heads of steam are developing towards:

(1) A significant new planting programme for expanding the forestry industry and to compensate for reduced access to native forests;

(2) concerted action to alleviate the mammoth land and water supply degradation problems.

Farm forestry, including agroforestry, can do much to meet both objectives but only if research, extension and policy initiatives are also finely tuned to meet the need of farmers who control the land resources. It would be a pity for agroforestry to loose a substantial slice of the action; what do you think?

MEAT FLAVOUR OF ROMNEY LAMBS GRAZED UNDER PINUS RADIATA

This paper, by N.S. Percival and M.F. Hawke, MAF (Rotorua)
A.H. Kirton, MAF (Ruakura), C. Hagyard, MIRINZ (Ruakura
was presented at the Animal production Society Conference, in February 1988

by Neil Percival

ABSTRACT

Livestock grazed under radiata pine are known to eat both fresh and decaying pine needles. A study was made to find out if the meat quality characteristics of lambs grazed under P. radiata were affected.

Groups of Romney wether lambs were grazed for 49 days under P. radiata of 100 and 200 stems per ha and on open pasture (no trees). In addition, two groups were stall fed for 21 days with 23 and 21% of their intake as fresh or decaying pine needles respectively. All the lambs were slaughtered on the same day. Meat samples from each were subjected to a range of meat quality tests.

Meat from the lambs grazed under the trees, or consuming fresh or decaying needles was different in colour in its preparation, but there were no effects on its flavour, aroma, texture, juiciness or pH. It was concluded that there are no meat taints associated with lambs grazed under radiata pine.

Keywords: Romney, lamb, meat, tainting, flavour, Pinus radiata, pine, fresh/decaying needles, agroforestry.

FORESTRY SHAREFARMING TO TREAT LAND/WATER DEGRADATION IN WESTERN AUSTRALIA

by John Bartle
Research Branch, Department of Conservation and Land Management, Perth

The need to develop farming systems which do not contribute to land and stream salinity has been a major motivation for agroforestry research in Western Australia. Such farming systems require two major features:

- must be capable of nearly complete utilization of rainfall to deplete the local groundwater systems which drive the salinity problem,
- must be economically competitive with conventional agriculture since such large areas are affected by salinity that it is beyond the State's capacity to subsidize extensive rehabilitation.

In recent years, the eutrophication of coastal plain wetlands and estuaries has emerged as a major problem. This problem arises from the leaching of fertilizer phosphorus from poor sandy soils into drainage water, and, like salinity, is driven by the water surplus available under present farming practices.

Some idea of the scale of these problems can be gained from the statistics that more than 50% of the previously fresh (< 500 mg/L total salts) water resources of the south west of Western Australia has been degraded by salt and all coastal plain waterbodies in farmland areas suffer incipient to serious eutrophication. More than 1 million ha of farmland with reasonable forestry potential (i.e. > 600 mm rainfall) are affected.

In an attempt to develop a forestry solution to these problems CALM has, for more than a decade, been involved in a project to identify tree species and genotypes with superior water use characteristics. Alcoa of Australia has been a major sponsor of this work since it has also been designed to identify species suitable for rehabilitation of bauxite mined land in the Northern Jarrah Forest where salinity risk also occurs.

The project is based on five major species screening trials distributed across typical salt prone and mined sites. Some 70 eucalypt species were included with an average of two seed lots for each species. A plot size of 0.5 ha was chosen to permit rigorous evaluation of water use performance. The selection of species was biased to slow growing inland species, thought likely to be better adapted to the quite harsh Darling Plateau environment, and more likely to mimic the slow growing, deep rooted native species with their generally outstanding capacity to maintain transpiration during the arid summer. However, some more rapid growing forest species with commercial potential were also included.

During 1985-7 detailed evaluation of growth performance and water use characteristics was undertaken. Some slow growing, high water use species were identified, most notably E. microcarpa and E. sideroxylon, the former able to sustain its performance on salt affected soils over shallow saline groundwater. It was also noted that some species with good wood volume production also had good water use, most notably E. botryoides, E. globulus and less so, E. viminalis.

From this work some 20 species indicating promising growth and/or water use have been selected for comprehensive seed collection over their native range. These collections, now completed by CSIRO, are being planted out in provenance and family trials throughout the south west.

The major famland tree planting operations in Western Australia has been for the rehabilitation of the Wellington Catchment and for the establishment of pine plantation in higher rainfall (non-saline) forest areas.

The Wellington Catchment project commenced in 1976. Since then the State has purchased and planted more than 5,000 ha using mainly slow-growing non-commercial species. The low timber returns and high purchase cost of the land have made this operation very expensive (approximately $1,000/ha). However, the operation was considered imperative to arrest the rapid decline in water quality of the Wellington Reservoir.

For many years the State and private investors have been buying high rainfall farmland at the rate of about 1,000 ha/annum for establishment of pine plantation. The State has augmented private land purchase with clearing native forest to achieve the planned rate of pine establishment of 2,000 ha/an. However, in the early 1980s the cost burden and increasing community objection to farmland purchase, along with the political decision to discontinue the clearing of native forest, meant that CALM had to seek an alternative method of pine planting on farmland. A study was commissioned which indicated that pine production was economically competitive with other extensive agricultural enterprises, but that the distribution of costs and returns over time excluded it as an option for most farmers to undertake independently.

CALM therefore developed a method by which the risk and uneven cash flow of pine cropping was eliminated. It was called the Softwood Sharefarming Scheme. Under the Scheme the State and the farmer contract to share establishment and management costs. The State underwrites expected future revenue and, after covering its costs, pays the farmer the discounted revenue surplus as an annual payment. The Scheme was first introduced in the non-saline forestry area around Manjumup. After a slow start at Manjumup it was extended into the lower-rainfall salinity-prone Albany area. It generated considerable interest. Farmers saw it as an attractive addition to their cropping choices. Land management researchers saw its potential for treatment of water quality problems. However, the Western Australian pine industry is competitive on the local market which only requires about ?,000 ha/an of plantings. Land with reasonable forestry potential (> 600 mm rainfall per annum), much of which has pressing water quality problems, exceeds 1 million ha. To open the potential to extensively plant trees across this area to gain a water quality benefit would require a major new timber industry.

The logical industry is short-rotation eucalypts for pulp. The species screening work had shown that some species had promising records of performance both in water use and growth. A rapid evaluation of widely scattered existing plantings of E. globulus confirmed generally reasonable yields. Investigation of world market opportunity also revealed considerable promise. The sound commercial prospects and substantial likely secondary benefits have given the State confidence to undertaken full scale feasibility study for a major pulpwood industry. As a further expression of confidence some 2,000 ha of sharefarming plantings of E. globulus have been undertaken in 1988.

At this early stage plantings are all plantation form mainly for legal and practical convenience. However, it is likely that the full development of forestry sharefarming will only be realized with development of a wide range of options including agroforestry. A major grant under the Commonwealth National Afforestation Programme has been awared to develop the potential of eucalypt cropping as an integral part of farming systems.

AGROFORESTRY DEMO FARM AT BAMBRA

From "Weekly Times", February 17, 1988.

It has been said that farmers learn best by example. If that is the case the agroforestry demonstration farm being developed at Bambra in the Otway Ranges should encourage hundreds of farmers to try agroforestry.

The 42 hectare farm is owned by Rowan and Claire Reid.

Rowan, a qualified forester, is known to many farmers as the co-author of "Agroforestry in Australia and New Zealand". His idea to develop a demonstration farm arose out of his frustrating search for examples of different agroforestry systems in Victoria.

"Good examples of agroforestry are so scarce that most farmers still can not picture how an agroforest might look. What we hope to achieve here is a collection of different agroforests involving many native and exotic tree species. There are nut trees, timber trees, fodder trees and trees for shelter, fire protection, soil erosion control and wildlife all planted on a working sheep farm" he said.

The Reids graze Drysdale carpet wool wethers and are training them to agroforestry. "Presently we are using a single electric wire loop around trees with good success."

"The biggest problem with protecting young trees is the cost of the guard. The electric loop is very cheap especially if two trees are planted in the one loop. This idea suits timber species since heavy culling is necessary to ensure a good stand. Our first culling will simply involve selecting the best of each pair."

Although the farm was only purchased last Februray already over 2,000 trees have been planted from more than 40 species.

Timber species include radiata pine, eucalypts, black walnut, Californian redwood, poplars, silky oak and blackwood. Grafted chestnuts, pecans, walnuts and almonds as well as fruit trees are planted for food and tagasaste, honey locust and willows for fodder.

For farmers interested in trying any type of agroforestry Bambra Agroforestry Farm will provide a good guide as to how to, or even how not to, proceed.

Note: Although the farm is not yet open to visitors on a regular basis an informal field day is planned for May 8. Anyone interested is invited to contact Rowan on (052) 88-7247 or write to Bambra Agroforestry Farm, Aireys Inlet Road, Bambra 3241.

ARRIP AND ABOA

by Peter Swain
Department of Primary Industries and Energy, Canberra

Yes, it is me who is responsible for the inserts in "Update"! This is not junk mail and I hope that I can persuade readers to use the Australian Rural Research in Progress (ARRIP) and the Australian Bibliography of Agriculture (ABOA) data bases to record agroforestry current research and the results.

John Kellas has some entries already and I have sounded out a few others who agree that we need some sort of register for agroforestry R & D.

ARRIP and ABOA are complimentary systems that have been developed by DPIE and CSIRO. They are described in the leaflets enclosed. Each can provide a nationwide link for research, extension and policy staff, if a little trouble is taken to submit a summary of research projects to a common format. For research in progress the green ARRIP forms should be completed and returned to Liz Lovie at DPIE in Canberra:

Mrs E. Lovie
Rural Research Secretary - BRR
Department of Primary Industries & Energy
Ground Floor
National Farmers Federation House
Brisbane Avenue
BARTON ACT 2600

Phone: (062) 71 6380

Publications resulting from research projects should be entered on ABOA; again Liz is a contact point and she will be pleased to answer any queries on both systems.

The good news is that Liz has kindly agreed to provide an annual print out of agroforestry items, which could be distributed with "Update". Of course people can access the system at any time through CSIRO AUSTRALIA as described in the enclosed details.

I hope you agree that this is worthwhile. May I suggest that we aim to get entries of all current research projects to Liz by the end of 1988. I will arrange for draft print-outs to be returned for comments early in the New Year.

AGROFORESTRY RESEARCH IN VICTORIA

A POSITION STATEMENT BY THE AGROFORESTRY JOINT MANAGEMENT COMMITTEE

by J.D. Kellas
March 1988

INTRODUCTION

Traditionally landholders have seen trees as a barrier to agricultural production. However in recent years the removal of trees from the rural environment has been associated with land degradation via erosion and dryland salinity. The Government of Victoria, through a number of initiatives, including the Timber Industry Strategy and the Conservation Strategy, is helping halt further land degradation and to enhance the environment by sponsoring or supporting tree planting schemes on both private and public land.

One of the initiatives has been to support a research programme in agroforestry. Agroforestry is defined as a land management system which integrates both agricultural and forestry production simultaneously from the one land unit. However agroforestry is not a widely adopted management system in Victoria due to:

(1) uncertainties about profitability and marketing,
(2) perceived management problems in successfully handling the complex interaction between soil, agriculture and forestry,
(3) lack of objective information about the interaction between trees and agricultural crops on specific categories of land to enable farmers to select appropriate agroforestry combinations,
(4) lack of appreciation of the diverse role and benefits of agroforestry in terms of:

- economic stability,
- complementary products,
- environmental protection and control,
- better use of poor land, and
- aesthetics.

To overcome these problems, the Government through the Department of Agriculture and Rural Affairs (DARA) and the Department of Conservation, Forests and Lands (DCFL) established the Agroforestry Joint Management Committee in 1983 with the purpose of developing a research programme to investigate the suitability of a large number of tree species under various agroforestry systems. Initial funding was provided in 1984 by Victoria's 150th Anniversary Board.

THE RESEARCH PROGRAMME

The research programme has involved the establishment of six major projects at strategic locations across Victoria embracing combinations of grazing and cropping with pines, eucalypts, poplars and other tree species. In total, 40,000 trees have been planted, representing more than 90 native and exotic species.

Each of the major projects is briefly described and some early results of an otherwise long-term programme are presented.

1. Hamilton

Over 22,000 trees have been planted on the Pastoral Research Institute and at seven sites on private farms in the Western Disrict. These trials aim to determine:

- suitable species for a range of local soil types,
- suitable species for salt-affected discharge sites,
- effective shelterbelt designs and management systems,
- the influence of tree density on grazing productivity, and
- the influence fof shelterbelts on agricultural production.

Early results indicate that a number of species showed considerable tolerance on the salt-affected sites. The most successful species (with more than 70% of plants surviving) at this early stage are grey buloke (Casuarina glauca), flat-topped yate (Eucalyptus occidentalis), the Lake Albacutya, Murray River and Silverton provenances of river red gum (E. camaldulensis) and the shrubs kangaroo paperbark (Melaleuca halmaturorum), swamp paperbark (M. ericifolia) and moonah (M. lanceota).

In addition, excellent survival and early growth of many species has been recorded at other sites in both windbreaks and in normal wide-spaced plantings.

2. Carngham

Located on former farmland, purchased by the Government for the establishment of radiata pine plantations, this trial consists of five treatments containing a range of tree densities with fenced areas for stock grazing. The treatments are:

(a) grazing control - no trees,
(b) 100 trees per hectare (spacing 8m by 12 m),
(c) 277 trees per hectare (spacing 4 m by 9 m),
(d) 277 trees per hectare (5 rows with spacing 4 m by 9 m, then a 10 row gap), and
(e) 1,650 trees per hectare (spacing 2 m by 3 m) - plantation.

This trial is being done in collaboration with the Forestry Section of the Faculty of Agriculture and Forestry, University of Melbourne, and aims to determine:

- long term economic productivity of agroforestry densities compared with agriculture and traditional forestry,
- tree influences on soil water relations,
- the canopy influences on rainwater interception,
- pasture influences on tree growth, and
- pasture productivity in relation to tree proximity or density.

Results show that diameter growth is not affected by tree spacing but height increases with increasing tree numbers. For example the average height of trees in the 1,650 trees per hectare plantation was 5.2 metres compared with 3.6 metres in the 100 trees per hectare treatment. Results for animal production for 1987 are incomplete, but sheep could not be maintained within the plantation treatment due to lack of pasture, and browsing damage to trees has been sustained.

3. Kyabram

Located on DARA's Animal and Irrigated Pastures Research Institute are two trials; the first is a trial screening 15 tree species for their suitability for growth under irrigation and the second is a parallel row spacing trial using flooded gum (E. grandis).

Research will determine:

- the influence of tree density on agricultural production,
- the influence of tree density on groundwater level (in co-operation with the Institute for Irrigation and Salinity Research at Tatura), and
- suitable species for timber production under irrigation.

The species screening component has now been concluded. Of the 15 species planted, flooded gum (E. grandis) and two poplar clones (Populus deltoides and P. deltoides x nigra) had survival percentages greater than 80%. The height growth of these species was 2.3, 2.0 and 4.7 metres respectively at age two years.

The area used for the species screening trial is being converted to a demonstration agroforest with trees being planted along the checkbanks and protected by an electric fence to permit grazing of the intervening pasture.

4. Rutherglen

Two aspects of agroforestry are being investigated on DARA's Rutherglen Research Institute (R.R.I.); these will determine the most suitable tree species and the influence of shelterbelts on dryland cropping.

The component parts are:

- the screening of twelve tree species,
- the determinating of crop productivity in relation to north-south, and
- east-west oriented shelterbelts, and
- the effect of shelterbelts on soil water relations.

After two years, seedling survival has generally been very good (average 87%) with the tallest trees being river red gum (E. camaldulensis) with an average height of 2.0 metres.

5. Myrtleford

This trial will:

- identify the best poplar clone for agroforestry (deciduous or semi-evergreen),
- systems for developing mint for oil production, and
- effect of tree density on row crop production.

After two years the average height and diameter of the semi-evergreen poplar clone was 6.3 metres and 6.2 centimetres respectively compared with 4.1 metres and 4.9 centimetres for the deciduous clone. Mint oil production in the first year was equivalent to 16.5 kilograms per hectare, but yield in the second year was affected by a rust disease on the mint.

6. Neerim South

This trial is established on farmland purchased during construction of the Tarago Reservoir. It consists of spacing trials of mountain ash (E. regnans) and radiata pine with new pasture establishment between the rows.

The trial will help determine the interaction of tree density and pasture production in a high rainfall environment.

To date establishment of the trees has been hindered by establishment losses associated with wildlife browsing.

EXTENSION AND EDUCATION

The need for a co-ordinated approach to this area has been recognized with the formation of the Agroforestry Extension Subcommittee comprising representatives from DATA, DCFL, the Victorian Rural Industries Training Centre, The Victorian College of Agriculture and Horticulture, the Australian Forest Development Institute, the Potter Farmland Plan, two agroforestry consultants and a journalist.

The Submcommittee will actively promote agroforestry principles and practices throughout Victoria through publications, field days, training courses and will liaise with landholders and research organizations to encourage an exchange of information and to identify directions for agroforestry research.

The sub-committee reports to the Joint Management Committee.

AGROFORESTRY COMPUTER INFORMATION SYSTEM

The Timber Industry Strategy identified the need to provide a system to provide landholders with authoritative information to evaluate agroforestry. Two approaches are being followed:

1. Financial benefit of trees on farms

Together, DARA and DCFL have obtained a $49,500 grant from the Australian Special Rural Research Fund to evaluate, in economic terms, the private and social costs and benefits of trees on farms in Victoria. Bill Loane an experienced resource economist with the IAC and CSIRO Division of Forest Research, has commenced this work.

The results of the study should quantify the financial returns to farms and provide encouragement for further tree planting. The social benefits will indicate to Government whether and where further financial inducements for tree planting are warranted.

2. Appraisal of the New Zealand Ministry of Forests agroforestry computer model

During February 1988, a team from the Forest Research Institute described and demonstrated the New Zealand forest management model, which incorporates an agroforestry component, to government and non-government bodies. The model is currently being appraised to determine the suitability of the New Zealand system for Victoria against developing a Victorian system sometime in the future.

SUMMARY

- Government policies and actions strongly support agroforestry as an integrated approach to land management,
- a comprehensive series of long-term research and demonstration trials have been established in Victoria by the Agroforestry Joint Management Committee,
- these trials will require continued financial support to fully realize their potential,
- an Extension Subcommittee of both government and non-government representatives is to actively promote agroforestry through extension and education programmes,
- the economic costs and benefits of trees on farms is being evaluated, and
- the suitability of the New Zealand agroforestry model to Victorian farms is being evaluated.

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AGROFORESTRY RESEARCH FOR RATIONAL LAND USE MANAGEMENT ON ATHERTON TABLELAND

by G.B. Applegate[1], G. East[2] and A.L. Bragg[1]

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Since 1913 the Queensland Department of Forestry (QDF) has undertaken many species trial plantings on various parts of the Atherton Tableland in an effort to identify suitable species for growing in commercial plantations. Recent advances in site preparation techniques and weedicide technology has suggested that further work would be useful in order to explore more fully the potential of some of the promising species from the early trials. Further trials are required to update management and tree maintenance techniques and look at suitable agroforestry systems where these species/provenances might meet designated management objectives in different locations or circumstances. In order to complement this work some process orientated research designed to examine comparative water relations, effect of radiation on shade tolerant and intolerant species and the effect of vapour moisture deficit on tree growth may also be beneficial.

The Forest Research Branch of the QDF initiated agroforestry trials in 1982 on the Atherton Tableland using Pinus caribaea var hondurensis. The aim of the trial was to demonstrate establishment methods and monitor tree growth for a specific farm management objective.

Subsequently the programme was extended to inlclude a wider range of tree species.

Agroforestry trials current on the Atherton Tableland are:

- Pinus caribaea var hondurensis (PCH) grown in improved pasture grasses in a beef cattle production area. PCH grows fast on rich basalt soils and provides shade for cattle. It produces construction timber and the thinnings are useful following CCA treatment for landscaping and exterior use.

- Araucaria cunninghamii (Hoop Pine) grown in frosty sites, or sites covered in woody regrowth or grass. Hoop Pine can be successfully established on frost-prone sites, provided a special weed control prescription is followed, and temperatures do not fall below -9°C. The prescription involves maintaining a minimum of 75% of the ground bare of weeds and free of dead organic matter, from the time of planting to the end of the third winter. Successful establishment is achieved at high cost (Queensland Department of Forestry, unpublished data).

  The Coen and New Guinea provenances of hoop pine (which have generally denser foliage and larger needles than south Queensland orchard stock) are well adapted to controlling woody weed regrowth and grasses after the trees have become established. These trees also provide shade and they are usually unpalatable to cattle.

- Eucalypts grown in improved pastures. Species grown are: E. phaeotricha, E. tereticornis, E. grandis, E. microcorys, E. pellita, E. cloeziana and the natural hybrid of E. grandis x E. tereticornis. Eycalypts grow fast in a competition-free environment. If these eucalypts prove successful in the agroforestry situation, then durability class A species (E. microcorys, E. tereticornis and E. cloeziana) would have the potential to provide valuable posts and rails from thinnings and poles from mature trees. The seven taxa listed may also be able to grow large enough to produce sawn timber, and would provide necessary shade for livestock.

- Valuable rainforest species grown for timber in pasture grasses or for rehabilitation of degraded forests. Species under test are:

  Cedrela odorata (exotic)
  Toona australis
  Elaeocarpus angustifolius
  Flindersia schottiana
  Flindersia brayleyana
  Agathis robusta

Many of the rainforest species are shade tolerant and have the potential to be open grown and used in the rehabilitation of land or for the expansion of existing degraded rainforest. Some of these species may also produce useful cabinet timber in an agroforestry system.

Two of the species, Cedrela odorata and Toona australis were planted into pits prepared by the Tree Planting Auger and UV resistant plastic tubing (Growtube) will then be erected around them. Although 'Growtube' has been used successfully to promote tree growth in the more temperature parts of Australia, it has not been tested under experimental conditions on the Atherton Tablelands using rainforest species.

Once research has developed new techniques on tree establishment and defined species, the next logical step in placing trees on farms is to develop a framework whereby information can be transferred and used practically by the farming community. The approach begins on a catchment basis by planning, in consultation with the land-owners, appropriate land use strategies transcending cadastral boundaries. This is followed by whole farm planning whereby particular land is allocated to those uses for which it is best suited, and trees strategically located to maximize their benefits. At present the Department of Primary Industries (D.P.I.) provide a whole farm planning service as part of the soil conservation programme and an extension of this to include a design for the strategic location of trees provided by QDF personnel could be very useful for the landholder who wishes to undertake agroforestry.

If agroforestry is to have an impact on the Tableland, and the nefits are to be widely acknowledged, the research results will need to be adopted by many private landholders and implemented over large areas. Large numbers of suitable tree species are already available at concessional rates from the Forestry Department to landholders who are looking for shade, shelter woodlots, or who want to rehabilitate degraded forest or to enrich existing rainforest by planting species which have the potential to produce high quality cabinet timber.

Increasing the agroforestry plantings will be assisted by the promotion of existing extension services provided by the Department and the distribution of suitable trees to landholders under the current Windbreak Planting, Rehabilitation Planting and Forest Plot Schemes.

NEW CONSULTANCY SERVICE BY MAF/MOF IN NEW ZEALAND

by Martin Hawke
Ministry of Agriculture and Fisheries, Rotorua

Over the past year, the MAF and MOF in New Zealand have got together to set up a joint consultancy service. The services are wide ranging and it will involve consultants and specialists from either or both Ministries. The advantage to the clients is that they will benefit from access to more indepth expertise than either Ministry could provide alone. The consultancy deals with all aspects of trees planted on farmland.

The people involved in the initial planning stages have been:

(a) MOF - John Cawston, Senior Consultant, Rotorua
- Charlie Schell, Senior Consultant, Wellington

(b) MAF - Tonya Greig, Consultant, Whakatane
- Neil Percival, Scientist, Rotorua
- Martin Hawke, Senior Technical Officer, Rotorua

The scope of the consultancy service will include:

- whole farm and/or forestry management,
- land use planning,
- financial forecasts/cashflow/economic assessments,
- partnership/joint ventures/company operation,
- investment opportunities/tax incentives.

A start has been made, with joint proposals submitted on several properties. In some cases, contact with potential clients will lead to more detailed farm or forestry programmes. While the spade work has been initially done in Rotorua, the consultancies will operate throughout New Zealand using appropriate personnel.

A training programme for consultants has been set up to cover aspects which are very relevant in our commercial environment - e.g. tax incentives for farmers and foresters, company operation and structure, partnerships, investment syndicates. Consultants will also receive intensive instruction on agroforestry.

CURRENT WORK AT TIKITERE FOREST FARMING RESEARCH AREA

by Martin Harke
Ministry of Agriculture and Fisheries, Rotorua

1. Feed quality studies

Over the past two years, seven experiments have been run investigating the feeding value of pasture growing under radiata pine. Young sheep were fed a range of intakes on open pasture and under radiata pine at 50, 100 and 200 sph. These short term (30 day) experiments were intensively managed and measured. Results suggest that there is lower stock performance with increasing tree density for the same pasture feed intake. There are seasonal differences and pasture management is implicated in determining levels of performances. The overall results are nothing new but for the first time we can put a handle on the extent of the effects. The project results will be written up and published.

2. Understorey pasture growth studies

The Rate of Growth comparisons continued in 1987 and 1988, measuring open pasture, 100 sph as wide and even spaced trees and 100 sph as twin rows (2 rows, 28 m apart). We have also looked at the shelter effects of the twin row treatment on pasture production. Remembering that the twin row trees are 14 years old, compared with the rest at 15 years old, there is a big difference in pasture production. In 1987, the 100 sph even spacing pasture grew 35% of open pasture, compared with 61% in the twin rows. The shelter or competition effects of the twin rows show that the open area between the twin rows grew at 79% of open pasture compared with alongside the trees at 53% of open pasture.

These comparison demonstrate well the 'trade-off' between tree density and tree spacing arrangement.

3. Cyclone Bola visits Tikitere

Early in March, much of the North Island suffered from the effects of this cyclone. Worst hit areas were the East coast and Taranaki, where the results were devastating. At Tikitere, about 5% of the tops were blown out, but this varied more with aspect and soil type than tree density. Only 15 trees were blown over (about 0.1%). These are the facts - perhaps seen from a foresters view point only. Agriculturally, fences, gates, pasture cages and water tanks have all been damaged (from falling tops) and all our access tracks were blocked.

TREES AND FARMING ON THE SOUTH COAST - A FARMER'S VIEW POINT

by G.R. Grewar

Editors note: *This paper was given to the National Agroforestry Workshop in Western Australia, October 1986. Geoff Grewar farms on the eastern edge of the Esperance sandplain, and is committed to controlling land degradation with trees.*

I preface my remarks by stating that this is not an academic paper, it is a farmer's view formulated from experiences on a south coastal property in Western Australia.

There is one message I wish to pass on, that agroforestry is with us as a new science, as a new tool to expand the horizons of our agricultural/forestry system. While it is with us it is not being co-ordinated, or implemented, or even encouraged to the extent it should. Private and government organizations are playing around with its peripheries, bankers seem never to have heard of it, and certainly would not assist a farmers going broke implementing new technology with a long lead time before profits start to filter through. Those of us dedicated to this new system of farming are on our own, we do our own research, fund entirely our own projects, receiving limited help from a small band of scientists conscious of the advantages that could accrue from this new technology.

Let us co-ordinate all the research now done in isolation, let us link all the islands of information, let us launch agroforestry as the next revolution in primary production. There is hardly a valley in the Western Australian wheatbelt that is not waterlogged or saline, there is hardly a patch of sand on the south coast that has not been moved by the wind. We have bared our landscape and are now watching it slowly die. We can reverse all this and take production to new and greater heights than has been formerly imagined.

The south coastal agricultural area exends from Albany to the east of Esperance, a 500 to 600 km long strip of varying width but approximately 35 to 40 km. The area is a vast peneplain of flat to gently undulating topography. The soils are sandy surfaced overlying gravel or clay at generally shallow depth. Approximately 80% of the area has a sand depth of 0 to 40 cm, 15% has sands extending up to severeal metres, 2% has saline drainage lines, salt seeps or lakes, 3% has rocky and skeletal soils.

In more recent times, under a drier climatic regime, cyclic salt has induced solonization in some soils. There is a marked profile differentiation and the clays are poorly structured and only slowly permeable to water.

Our climate is not an extreme Mediterranean one. Two thirds of our rainfall occurs during the seven months of winter, it is generally reliable. high winds are a feature of our climate and are especially devastating prior to and during the passage of fronts or summer tropical low pressure systems.

Wind erosion has been serious during our short agricultural history and salination is starting to appear on our drainage lines and broad valleys. We have upset the balance of nature by clearing the deep rooted perennial heath scrub.

A change in farming practise, brought about by chemicals for weed control, has reduced the severity of wind erosion in our cropping cycles. However, it is not the complete answer.

Many of us are now looking at integrating trees and shrubs into our farming to obtain additional benefits; stock shelter, improved production of crops and pastures resulting from an improved micro-climate, fodder to give a more even spread of high quality green feed into the summer and autumn months, and for nutrient recycling.

When we sat down and weighed up the costs and problems of providing shelter belts (with a million or more trees) throughout our property we realized very early that seedling planting was financially impossible except with Pinus species when soils were suitable. We experimented with direct seeding in 1975 and continued this work for several years before we were convinced that these techniques held the key to cheap planting. We formulated principles for new land plantings which basically are - good burn, good fallow, good seed bed preparation - sowing shallow in August/early September. We now plant our shelters two to three years prior to development of the land from the bush. These windbreaks are 280 metres apart and have a SW/NE axis to intercept at right angles our most destructive winds.

Refinements of the direct seeding techniques are necessary on old pasture land where weeds, insects and soil factors have a deleterious affect on germination and early growth. Success has been achieved and we are encouraged by the use of machines which scalp off the surface soil, either graders or opposed disc machines.

Our windbreaks in section contain 40 feet of Eucalypts, Acacias, Casuarinas, Callitris etc. plus two rows of Pinus pinaster seedlings planted on the lee side.

Approximately 1,200 hectares of our farm is now shelter belt protected with a further 800 hectares in various stages of protection. Possibly over 200,000 trees have been planted.

We use a great diversity of species and varieties in our shelter belts in the hope that natural selection over different soil types will ensure a continuous windbreak 50% permeable to winds from ground level to 50 feet. We suffer a loss of profile due to stock grazing at lower levels by not fencing our shelter belts.

While there are some unsolved points in our technology there is generally nothing stopping the implementation of wide scale shelter belt planting on any farm in the region. The deficiency lies in the will of farmers and more especially in the will of financiers and politicians.

We must have dual purpose shelter trees,

(a) for protection of the agricultural/pastoral environment and
(b) for the diversification of income from timber or timber products.

I am fanatical on this latter point for it represents the survival of farmers now and in the future.

We seek a shelter tree of high value to grow in a dry Mediterraenan type climate; can we grow rosewoods, high quality cabinet timber, structural timber, peeler logs? Can we utilize the coppicing ability of our fastest

growing tree, the Sugar gum, for scrimber? It is small consolation to know we can grow a few fence posts and poles - but it is cheaper and better for us to use steel anyway. We can product firewood and charcoal, but our market is 700 kilometres away and therefore unprofitable.

It is significant to me that we have 125-150 mm of rainfall which falls in summer months November-April that is not utilized by our annual pastures. In fact, it drains away to waste and assist in bringing a saline water table closer to the surface. In our 500 mm rainfall we are effectively only utilizing half for our crops and pastures. Trees and fodder shrub species could use the other half and hopefully, thereby considerably increase our farm income. We can carry 7 to 8 dry sheep equivalent per hectare using effectively 250 mm of rainfall; can we carry an additional 7 to 8 dry sheep equivalents with the other 250 mm, utilizing Tagasaste, fodder Wattles, Mulberries, Rhagodia species or any other indigenous or exotic variety that may be available?

We have planted many and varied types of acacias, Cassias, Leuceana, Honey Locust etc. to test their adaptability and fodder production, but there is none that appears to have the potential of Tagasaste. This could well be the wonder plant for agroforestry in much of Western Australia.

Researchers could have a field day breaking this species into many different cultivars suitable for different situatiosns.

From a practical point of view we ourselves want two types. One a tall growing heavy producing strain that can be mechanically harvested for livestock feeding (to replace some of our traditional hay and grain feeding).

We want another type; a lower growing (1 metre) browse shrub with dense branching in a form able to prevent sheep ringbarking the main trunk area. Such a type could be rotationally grazed. Its advantages would be in the provision of good quality out of season feed, low shelter at lambing time and importantly a means of preventing ingestion of worm larvae normally obtained from low grazed pasture species.

To establish an agroforestry system embracing shelter belts, woodlots, fodder shrub areas requires a great deal of money. Fencing should be considered a necessity, however the costs on most farms would limit this possibility. There is an alternative, removing livestock from the whole paddock for 3 to 5 years and only growing crops, but this means foregoing income from grazing.

We have wasted our time here unless we can convince government and private organizations that the cost of intensive agroforestry is in the National interest and it therefore needs government initiatives, possibly tax incentives, low interest loan schemes etc. It is not entirely fair to expect the farmer to bear the burden, he is only a temporary custodian.

We need politicians to become realists and wake up to the fact that Australian agriculture is fragile and that it needs new technology and innovation to enable it to last into the next century. Politicians live in cities, few have a kinship with the rural situation, the few that represent the dwindling country electorate are powerless against the numbers of the cities. This nexus must be broken, for if it is not, desertification will follow through from over-exploitation of our fragile resources and a Saharan landscape will be witnessed from our city walls. I am not being overly dramatic when I say this, we have history to show us the result of a once thriving agricultural system of the Middle East - now dead.

We need our bankers to cease their blinkered vision on the annual cash flow. Implementation of agroforestry practises needs a cash flow over a decade or more. My richest neighbours have never planted a tree, their paddocks blow from exploitative farming, their bankers hold them up as successful farmers who can make their books balance. The threat of foreclosure hangs over the innovative, conservationist farmer - what an indictment of modern Australia! Short term thinking must cease, it will be too late too soon.

Your work as researchers is useless and wasted unless you can change the thinking of those ignorant of what your work holds in store. Influential people in government and business must be told the stark facts and pushed and prodded until they radically change their thinking.

Do not expect a few farmers to do it all, we are so broke and so pressured by financial shortfalls that we simply cannot.

Agroforestry is a new science, we need scientists devoted to its discipline with training in both agriculture and forestry. We need a chair of agroforestry in our universities for the training of future scientists. We need research centres. They could be on private property; I would be willing to co-operate with my own.

Our most pressing need is co-ordination to bring the whole science and its protagonists together, a person or group able to talk turkey with politicians, bankers and those of influence and power and lay it all out on the line. If we keep muddling along as we all have done for the past decade we will be into the next century before we make real progress.

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PROGRESS IN FOREST GRAZING STUDIES

by Martin Hawke
Ministry of Agriculture and Fisheries
Rotorua

A series of experiments in the northern North Island have shown there is a large scope for the introduction of a grazing component to many plantation forests. There are estimates of 70,000 ha of forests being used for grazing. Trial results indicate positive tree growth effects developing at low tree stockings, where a forage legume (Maku lotus) has been introduced. Superphosphate is required for pasture establishment, and yields of 3,500-5,000 kg DM/ha from Lotus has been measured in 5-6 year old radiata stands. While slash has substantially reduced livestock carrying capacity, the effects of the trees on the yields of lotus based pasture have been small. Significant tree basal area responses have developed in the grazed forests.

THE CARROLL TREE TUBES

by Bill Biggs
Westralian Sand Ltd., Capel, Western Australia

The sand mining operation requires the opening up of 30-60 ha per year of land. A similar area becomes available for rehabilitation each year depending on the forward progress and depth of mining operation.

The areas mined are deep sand profiles and support a natural Jarrah/Banksia association, or if cleared for agriculture, a poor pasture with a short growing season.

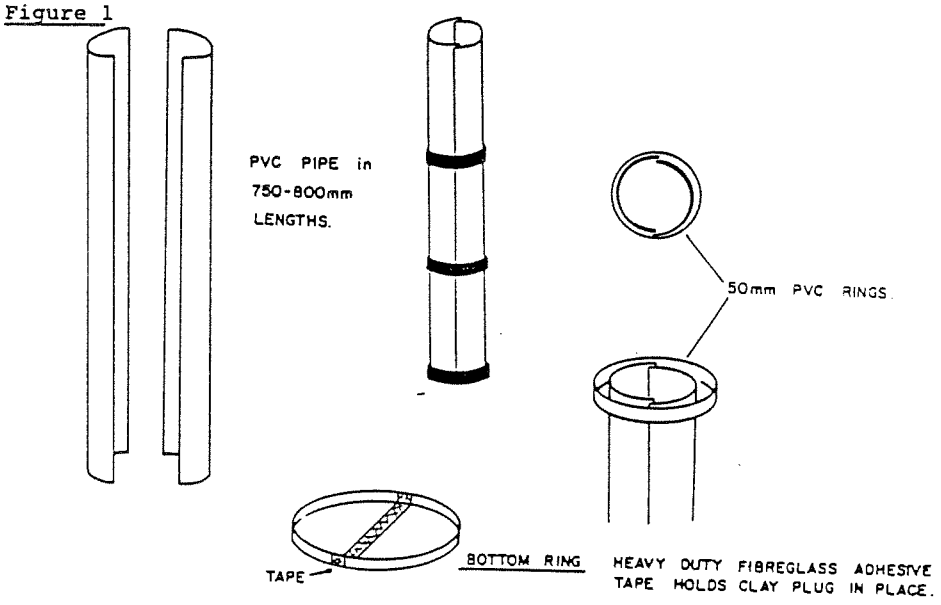
In our rehabilitation programme, Westralian Sands is planting windbreaks and shelter belts to replace trees and shrubs removed in the mining operation. Roley Carroll was unhappy with the survival rates of the small seedlings in these conditions and he developed his Tree Tubes so that seedlings would develop substantial root systems prior to planting out allowing their ready access to soil moisture.

Seedlings grown in long tubes could be planted out at virtually any time of the year providing there is moisture in the soil within the depth of the tube. Planting starts on the top of the rise during winter and generally we follow the moisture down the slope as the season progresses, leaving the wetter low areas and swamp margins for summer when they are not water logged. This enables planting to take place whenever land becomes available for rehabilitation.

DESCRIPTION OF THE TREE TUBES

The tubes are 750 mm lengths of 50 mm diameter Class 6 PVC pipe cut in half longitudinally and then the two halves held together with rings cut from 50 mm diameter PVC pipe as shown in Figure 1. The length of the tube can be tailored to suit the depth of moisture at any particular planting site. The PVC pipe is easily cut on a circular saw.

Figure 1



PLANTING TECHNIQUE

A hole is dug with a 75-100 mm hand auger to the depth of the tube. The retaining rings are removed from the tube taking care not to damage the plant and also holding the two halves of the tube together. The tube is then inserted in the hole and the space around the tube backfilled with moist soil ensuring that no air pockets are left around the tube. If water is available the soil can be washed down around the tube, this has the advantage of ensuring that the plant is not water starved in the first few days.

The two sections of PVC are then removed one at a time and the soil given a final compaction around the root mass.

Although planting rates are slower with this method, survival rates are very high and planting can be done at virtually any time of the year.

The planting rate has been speeded up using a petrol driven post hole auger.

BENEFITS OF THE CARROLL TREE TUBES

Some of the advantages of being able to plant at any time are:

1. Plant wet areas in spring when risk of water-logging has passed.
2. Spread out planting labour requirements.
3. Plant rehabilitation areas as they become available.
4. No watering required if the soil is moist at depth of tube.
5. Root growth can be easily inspected at any time.
6. A 750 mm tube holds the same amount of soil as a 150 mm plastic nursery pot therefore there is no requirement for large quantities of soil to develop good root systems.

SUMMARY

The Carroll Tree Tubes have overcome the problems of planting trees on sandy sites. They spread the work load of planting over practically the whole year and also enable the nursery to produce plants right through the year. These tree tubes have been used successfully now for 3 years and will be used widely on our minesites in the future, in conjunction with the seasonal planting programme.

EAST PERENJORI CATCHMENT TRIALS

by Roger Edmiston
Department of Conservation and Land Management, Perth

INTRODUCTION

These trials were instigated by the East Perenjori Soil Conservation District in conjunction with the Departments of Agriculture and Conservation and Land Management to test the use of possible commercial plant species to utilize water intake on the deep, acid, wodgil soils at East Perenjori.

RAINFALL

The mean annual rainfall for the Perenjori catchment is 337 mm. Rainfall for the planting and seeding year 1987 was 189 mm.

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1987	0	0	19.4	11	33.4	34.4	35	29.4	3.5	136	11	0	189
1988	0*	20	23	25									257

* A local thunderstorm contributd 20 mm at the observation farm but this was very local and minimal to nil rain fell on the trial plots.

SOIL TYPE

The planting was carried out on two wodgil sites, considered to be problem soils because they are vulnerable to wind sand water erosion, have highly acidic subsoils and are potential recharge areas for ground water contributing to salinity further down the catchment.

Site 1

These are sandy soils developed on the catchment slopes and comprise yellow brown loamy sands to sandy loams over ironstone gravel which may extend to 3 m in depth. The soil pH using the calcium chloride method is topsoil 4.6, subsoil 4.0.

Site 2

Is deep loamy sands increasing in texture to sandy clay loams. Soil pH is topsoils 4.3 subsoil 4.1.

Vegetation

The natural vegetation of the area prior to clearing was called a wodgil community and comprised species of Acacia, Grevillea, Thryptomene, Phebalium, Melaleuca, Allocasuarina and Euycalyptus leptopoda with a maximum height of approximately 5m.

SOIL PREPARATION AND WEED CONTROL

Site 1

Ripped to a depth of 40 cm in the spring of 1986 and sprayed three weeks prior to planting with a combiantion spray of Simazine and Sprayseed at the rate of 1 L/ha of each.

This did not give total weed control and a follow up spray of Roundup at 0.8 L/ha was applied ten days later.

Site 2

Was ripped to a similar depth two months prior to planting and sprayed with Simazine 0.8 L/ha and Sprayseed at 1.5 L/ha three weeks prior to planting and seeding.

SELECTION OF SPECIES

Site 1

In assessing plants with a possible economic potential two possibilities were considered.

(a) That Dr Allan Barton's work on oil eucalypts at Murdoch University and his seed collection from high yielding parent plants be utilized and trials of the more suitable oil species for the area be planted to assess establishment, growth rates and potential oil production.

Eucalyptus

angystussuna
calycagona
loxophleba var gratiae
kochii var plenissima
spathulata var grandiflora
kochii var kochii
oleosa var borealis

(b) Potential fodder plants, that appeared suited to the area were assessed from existing literature and these together with indigenous species that were grazed by stock were selected.

All plants were raised at CALM's Hamel Nursery in peat jiffy pots (30 per tray).

Acacia brumalis
saligna
salicina
pendula
aneura
murrayana
hemiteles
palustris
coolgardiensis
maitlandii
Melaleuca cordata
Tamarix aphylla
Tagasaste

Site 2

To compare the establishment to tagasaste by direct seeding and *speedling stock.

*Speedlings: plants to 15 cm tall grown in root training pots 2.5 x 2.5 x 5 cm

PLANTING

Site 1

Seedlings were hand planted early June 1987 using a planting spear. The bottom of the peat pot was removed at time of planting. Ninety seedlings of each species were planted in two randomized plots of 45 plants of each. Some Acacia species were very small at time of planting and Melaleuca cordata (an indigenous species) had a fungal problem, which resulted in a smaller number being planted.

All seedlings were watered in with approximately 2 litres of water per plant.

Agras No. 2 Plus fertilizer was applied three weeks after planting at the rate of 60 gm/plant placed 15 cm from the plant and the same depth in the soil. Agras No. 2 plus is an NPK fertilizer containing trace elements.

Site 2

Ten 200 m rows of tagasaste were direct seeded at the end of May 1987 using 700 gm of scarified and inoculated seed.

Nine 200 m rows were planted with speedling stock the first week in June using a planting machine. Spacing was at 1 m intervals. Alternative rows of speedlings were watered after planting but survival was the same under both treatments.

Four weeks after seeding the germinants were fertilized as a side dressing 8 gm/m length of row with a second application of 12 gm/m length six weeks later with Agras No. 2 Plus.

Speedling stock was fertilized three weeks after planting with 10 gm/plant applied on the surface 15 cm from the stem. A second application of 30 gm/plant was applied six weeks later using the same fertilizer.

ASSESSMENT

Plants were assessed on a monthly basis until the end of April when it was considered that sufficient rain had fallen and the temperature modified to a level that would ensure continued survival.

Site 1 Oil eucalypts

	1a	1b	1c	1d	1e	1f	1g
No. planted	90	90	90	90	90	90	90
Survived	79	72	83	69	72	82	78
% survival	88	80	92	77	80	91	87

1a = *E. angustissima*
1b = *E. calycagona*
1c = *E. loxophleba* var *gratiae*
1d = *E. kochii* var *plenissima*
1e = *E. kochii* var *kochii*
1f = *E. oleosa* var *borealis*
1g = *E. spathulata* var *grandiflora*

Fodder Plants

	2a	2b	2c	2d	2e	2f	2g	2h	2i	2j	2k	2l	2m
No. planted	90	90	80	90	90	90	90	90	90	90	69	90	90
Survived	90	85	76	61	68	70	76	83	61	37	27	53	9
% survival	100	94	95	68 SP	76 G	78 SP	84	92	68 SP	41 SP	39 SP and fungal	59 G	1 G

SP = very small plants
G = grazed by rabbits

2a = *Acacia brumalis*
2b = *Acacia saligna*
2c = *Acacia salicina*
2d = *Acacia pendula*
2f = *Acacia murrayana*
2g = *Acacia hemiteles*
2h = *Acacia palustris*
2i = *Acacia coolgardiensis*
2j - *Acacia maitlandii*
2k = *Melaleuca cordata*
2l = *Tamarix aphylla*
2m = Tagasaste

Site 2 Tagasaste

The direct seeding (DS) was assessed for losses as each metre of row without an established seedling. Speedlings (S) which were planted at one metre spacing were similarly assessed.

	DS	S	DS	S	DS	S	DS	S	DS	S
Total	200	200	200	200	200	200	200	200	200	200
Survived	170	181	161	185	183	183	178	190	165	193
% survival	85	91	81	93	92	92	89	95	83	97

	DS	S	DS	S	DS	S	DS	S	DS
Total	200	200	200	200	200	200	200	200	200
Survived	162	181	178	181	109	182	157	192	133
% survival	82	91	89	91	55	91	79	96	67

CONCLUSIONS AND RECOMMENDATIONS

Plant establishment was particularly good on both sites, considering the extremely low rainfall and hot dry summer. Plant losses were high with six of the fodder species due to very small plants and grazing by rabbits. The Tagasaste was completely eradicated on site one by the rabbits and Tamarix and Acacia aneura were grazed but managed to recover.

Future work required will be the continued monitoring of growth performance of the various species on these site types at 3 monthly intervals.

At approximately age two or three, depending on growth, the oil eucalypts should be harvested and tested for oil content and their coppicing performance assessed.

Fodder plants need to be assessed for palatability, digestibility and nutrient levels.

Tagasaste (site 2) should be maintained at sheep height by controlled grazing and its suitability as a fodder plant in this low rainfall area assessed.

EUCALYPT AGROFORESTRY TRIALS IN WESTERN AUSTRALIA

by Richard Moore
Department of Conservation and Land Management
Busselton

Research being carried out from Busselton, Western Australia into the combination of widely - spaced eucalypts and pasture could lead to the development of economic farming systems to control salinity. In this type of agroforestry trees are managed to produce high quality sawlogs in conjunction with pasture for cropping or grazing.

Trials with eucalypts at wide-spacing commenced in Western Australia in the late seventies. In 1981 a trial with Eucalyptus diversicolor, E. maculata, E. globulus, E. paniculata, E. oreades and E. muellerana was established. At this stage these studies show that eucalypts can be pruned with no apparent adverse effects and that pasture grows beneath the trees.

In 1987, a new series of eucalypt agroforestry trials was established. Three locations were chosen to cover a wide range of site types in the South west. The sites and their main features are:

(1) Busselton - sandy soil, 800 mm rain per year
(2) Dinninup - sandy loam, 550 mm rain per year
(3) Manjimup - loamy soil, 1,100 mm rain per year.

Three species were selected, E. saligna, E. maculata and E. microcorys and three provenances of each were planted. These species were chosen because they have performed well in Western Australia in terms of growth rate and tree form. They are also recognized timber species and as a group they cover a range of timber densities from relatively low density for E. saligna to high density for E. microcorys.

Trees were planted in lines 15 metres apart. Along the lines the trees were two metres apart, giving a total of 333 trees per hectare. The plan is to cull three out of four trees during the first five to six years to leave a final crop of 83 trees per hectare. Thus, a selection ratio of 1:4 is being used. Crop trees will be pruned to eight to ten metres. Agricultural production is expected to be reasonable for much of the rotation at this spacing and density. Anecdotal information suggests that some species of eucalypts have an inhibiting effect on pasture growth. This aspect will be monitored.

One of the main uncertainties of fast grown eucalypt sawlogs is their marketability. Part of the problem is that techniques for sawing and drying the timber need to be developed. However, this aspect is being studied by other researchers (see Agroforestry Update No. 7). Meanwhile, the trials which have been establsihed should enable methods of management to be developed and provide data about tree growth. With this information the practicability and economics of farming with widely-spaced eucalypts can be determined.

AGROFORESTRY - A THEME AT THE A.F.D.I. CONFERENCE

by Richard Moore
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The use of trees in agriculture was one of the main themes of the Bicentennial Forestry Conference held at Albury - Wodonga in April this year. Agroforestry researchers, extension officers and practitioners from many parts of Australia and from overseas had gathered together to exchange ideas and information. Therefore, anybody who would like recent information on aspects of the integration of trees and farming, may find the conference proceedings useful reading. Some of the main papers to be presented on agroforestry include:

1. John Ive and K. Cocks: Rural Land Degradation - the Role of Trees in Ecological Solutions. (This paper provides a clear description of the extent of land degradation in Australia.) In Vol. I of V.

2. Andrew Campell: Farm Trees, a Planning Challenge. In Vol. II of V.

3. John Mackay: Shelterbelts - their Design, Establishment and Management Including Harvesting. In Vol. II of V.

4. Rod Bird: Financial Gains of Trees on Farms through Shelter. In Vol. II of V.

5. Kevin Ritchie: Species Selection for Farm Shelter. In Vol. II of V.

6. Ian Ferguson: Agroforestry as an Economic Venture in Australia. In Vol. II of V.

7. Richard Moore: Aspects of Agroforestry Research in Western Australia. In Vol. II of V.

8. Bill Sharp: The Challenge of Revegetation of Rural Australia, Maintaining a Sustainable Agricultural Future. In Vol. II of V.

9. Bill Sharp and Rob Youl: Responsibilities for Revegetation in the Australian Community. In Vol. II of V.

10. Robert Peisse: New Approaches in Protecting Trees from Browsing Animals. In Vol. II of V.

11. David Holmgren: Trees on the Treeless Plains - Design Guidelines for the Revegetation of the Volcanic Landscapes of Central Victoria. In Vol. III of V.

12. Lloyd Marshall and Henry Esbenshade: Potential of Carobs in Sandy Limestone Country in Australia. In Vol. IV of V.

There were many other excellent papers which relate to agroforestry.

Limited numbers of the proceedings are still available from the Australian Forest Development Institute.

PO Box 802
Albury
NEW SOUTH WALES 2640 (Ph. 060/411 266)

The cost is $12 per volume plus postage.

FARMER SUES OVER GREENIES

by Kerri Hartland
The Weekly Times
May 18, 1988

Conservationists in Scotland have told a leading farmer he cannot plant trees on his farm to protect sheep from harsh weather.

And the farmer is now set to get a huge payout, rumored to be worth about one and a half times the value of his entire farm, as compensation.

John Cameron, who is the meat committee chairman with the International Federation of Agricultural Producers (IFAP), is angry that conservationists are able to dictate agricultural policy to governments.

In an interview with The Weekly Times, he stressed he was not concerned about the substantial compensation payout, but would be willing to give it up at any stage if he was able to plant his trees.

Mr Cameron wanted to plant trees to act as shelter blocks for his 12,500 sheep during the bitterly cold Scottish winters.

However, the conservationists said that planting the trees would lead to the destruction of some species of butterflies.

Mr Cameron said he was more than willing to negotiate on the type of trees and where the trees would be planted, bu the conservationists just gave a flat no, to any suggestions.

Because he was unable to plant the trees, he requested compensation for damage to his sheep.

Mr Cameron said he would be forced to provide extra feed to the sheep in winter and would not get the advantage of fencing.

"I did not want to do anything new or innovative in planting trees. But I found I was being denied the rights to do what I wanted to do on my own farm."

Mr Cameron said that if he had been able to plant the trees his farm would have been one of the finest hill farms in Scotland.

In an address to the World Farmers Congress in Adelaide, Mr Cameron emphasized he was totally in favor of farmers producing a clean and healthy product, but opposed the way in which conservationists could dictate policy to governments.