

RESEARCH PLANNED FOR TREE USE IN LAND MANAGEMENT

Paper by Richard Moore (Forests Department, Busselton) for Department of Agriculture Advisors Conference, 11-15 March 1985

INTRODUCTION:

Sustainable land management is likely to involve the use of trees. This has been recognized by many land managers in Western Australia, particularly in the past two decades. For example, farmers have planted hundreds of kilometres of windbreaks in the Esperance region and a wide range of research projects with trees has commenced. The purpose of this paper is to outline the main areas of research which are currently underway with trees in land management. I define 'land' as farming land and discuss research being carried out in four regions - high rainfall, medium rainfall, South Coast and Wheatbelt. Map 1 shows their respective locations.

HIGH RAINFALL ZONE:

The high rainfall zone receives 750mm or more rainfall per year. Farmers plant trees to improve productivity of the farm, to diversify income, to provide shelter and for aesthetic reasons. Research projects fall into two main areas; widely-spaced pine with pasture and other timber trees for agroforestry.

1. Widely-Spaced Pine with Pasture

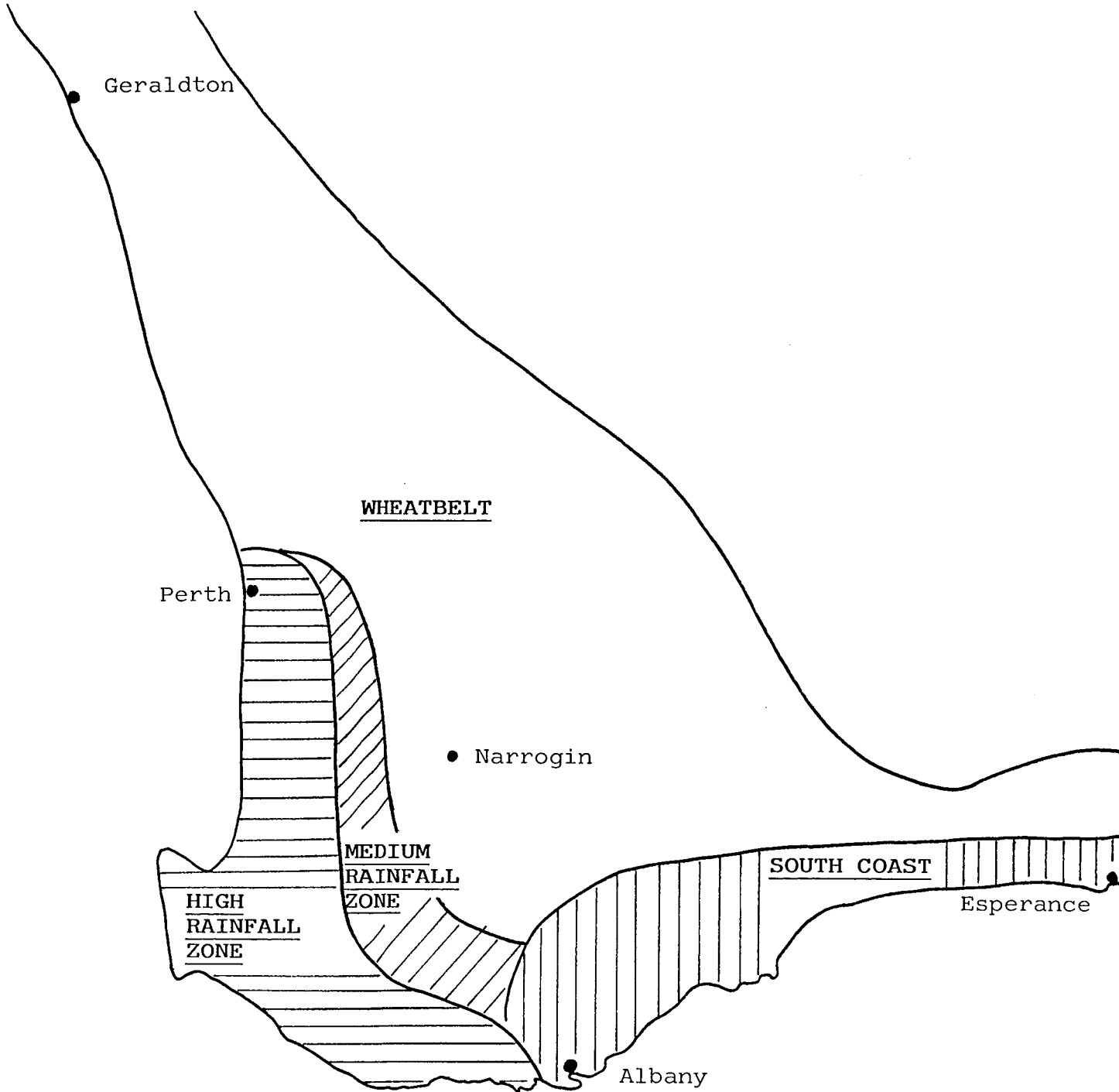
The Forests Department have been studying the combination of radiata pine and grazing for more than 10 years. The Department of Agriculture became involved in a co-operative trial on the Donnybrook Sunkland south-east of Busselton in 1980. The project aims to answer several questions:-

- i) What amounts of pasture and timber are produced and therefore how profitable is such a combination?
- ii) How should such a combination be managed? For example when and how should trees be culled and pruned? What are the practicalities of management for farmers?
- iii) What cost savings and gains in timber value can be obtained by using radiata pine, bred for agroforestry?

2. Other Timber Trees for Agroforestry

Testing a range of species for agroforestry has commenced because farmers want to grow a variety of trees and radiata pine

Location of four regions where research is being carried out for tree use in land management



can neither grow on all sites nor fulfil all timber needs.

There are two main trials:-

- i) The Forests Department has a trial south of Busselton which aims to determine the growth rate of a range of timber trees grown at wide spacing on grazed pasture and the practical problems of management. The species include six eucalypts and a poplar.
- ii) Bill Biggs has a trial on the coastal plain near Harvey which aims to determine the performance of a range of trees with wood chipping potential. The returns from growing trees will be compared with the returns from using the land to grow pasture.

Trees for shade, shelter and amenity values are also being evaluated in numerous farm plantings.

MEDIUM RAINFALL ZONE:

The medium rainfall zone receives 550-750mm of rain per year (See Map 1). Within this zone salinity is a serious problem especially as the majority of water supply catchments enter this zone. Therefore, research into salinity control has been heavily funded by several Government departments including Forests, Agriculture, Public Works, and the C.S.I.R.O. All projects seek to answer whether and to what extent trees lower ground-water tables. The types of projects fall into three groups, broadscale plantings of trees for salinity control, widely-spaced trees with pasture for grazing, and fodder trees.

1. Broadscale Plantings of Trees on Farmland for Salinity Control

The Public Works Department's reforestation scheme in the Collie Catchment has become a focal point for research into trees for salinity control. The plantings are generally dense and agriculture production amongst the trees is therefore almost nil. The important questions which research aims to answer include:-

- i) What species of tree establish and grow well? John Bartle (Forests Department) has established several arboreta to evaluate the suitability of over 70 tree species (mainly eucalypts) for rehabilitation work. To be effective at controlling salinity a suitable tree needs to have a high capacity to transpire (like Jarrah) and John has

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commenced measuring this parameter.

- ii) What proportion of farming land needs to be planted with trees to control saline discharge into streams? Ian Loh (Public Works Department) has two strategies to try to answer this question. They are ground water monitoring in control catchments and computer modelling. Eric Greenwood (CSIRO) is also investigating this question.
- iii) What density of trees is required to lower water tables? (Ian Loh and Eric Greenwood).
- iv) Where should trees be planted to be most effective - hill tops or lower slopes? (Eric Greenwood).
- v) What proportion of rainfall do trees intercept and therefore prevent entering the groundwater? (Jim Davies).

2. Widely-Spaced Trees with Pasture for Grazing

A series of agroforestry trials mainly involving widely-spaced pine and grazing, were established by the CSIRO and the Forests Department in the catchment of the Mundaring Dam in the late 1970's. Geoff Anderson (CSIRO) is measuring sheep carrying capacity under different densities, species, ages and arrangements of trees. He has also investigated the fodder potential of pine foliage and found it to be of value to sheep. Data on production levels of timber and pasture will be used to gauge the profitability of agroforestry in medium rainfall areas.

3. Fodder Trees

Research by Rick Engel with tagasaste (tree lucerne) in the Collie Catchment aims to determine its transpiration rate compared with eucalypts (E. globulus and E. wandoo) and with pasture. The project also aims to determine its fodder value and a method of management.

David Bicknell's research east of Manjimup with tamarix and tagasaste aims to answer similar questions.

SOUTH COAST (Albany - Israelite Bay)

This zone is characterized by 400 - 700mm rain per year, generally

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light sandy soils, relatively long growing season, and strong winds. The prime reason for planting trees is to control wind erosion. Farmers also plant trees to provide shelter for stock and crops and to produce timber. Research can be divided into three main areas; windbreaks, widely-spaced pine and direct seeding.

1. Windbreaks

Many farmers, in the Esperance Region in particular, have planted windbreaks during the past twenty years. Most are pines but some are eucalypts. Few have been managed correctly, and little attention has been given to their effectiveness. There is much need for research to attempt to provide answers to several questions. They include:-

- i) Which species, on what sites and by what method of establishment? These aspects are being researched by Klaus Tiedemann and Alan Walker of the Forests Department.
- ii) How effective are the various types of windbreaks at reducing wind speed?

Dan Carter's work, in the Esperance Region, aims to determine whether windbreaks can control wind erosion in dry years when pasture cover is low and which tree species and design are most effective at reducing wind speed. Dan is also collecting data on costs and benefits so that an economic study can be carried out.

2. Widely-Spaced Pine and Pasture for Cropping or Grazing (Slide)

Farmers in the Esperance Region want to grow crops but many soils are prone to wind erosion. Therefore, agroforestry involving trees in strips with areas in between for cropping, is a possible solution. To test this concept, a trial was established jointly by the Forests Department and the Department of Agriculture near Esperance in 1980. Two species of pine are being grown in strips from 5 to 38 metres apart and agricultural and timber yields will be measured. More recently, several farmers (for example, R. Silburn and T. & M. Overhue) have established this form of agroforestry, and some have extended the distance between strips of trees to about 200 metres.

3. Direct Seeding of Trees

Farmers are looking for ways to establish trees that are less

expensive than planting seedlings. Geoff Grewar, a farmer with new land east of Esperance, has successfully established belts of trees around his paddocks using his combine seeder to sow pine and eucalypt seed. He mixes seed (mainly a mixture of eucalypt species) with Superphosphate in a ratio of 1 cup to 1 bag and is able to sow several kilometres in a few hours.

His trials are now four years old and show considerable promise.

WHEATBELT:

The dominant features of the Wheatbelt are its vast plains and low rainfall (300 - 550mm per year). Farmers plant trees to control wind erosion, to provide shelter and for aesthetic reasons. Even though the Wheatbelt is the largest farming area of Western Australia, it has received little research into the use of trees compared with other farming regions. The main areas of current research are direct seeding, tagasaste and trees without fencing.

1. Direct Seeding

Cheap and effective methods for establishing trees on farming land must be developed before large areas of trees can be planted in the Wheatbelt. This is because farms are large, and vast numbers of trees are needed. Sowing seed into the ground with a seeding machine ('direct seeding') is a promising approach.

Research into direct seeding techniques is being carried out by Roger Edmiston (Forests Department) near Badgingarra, by Alex Hart (Forests Department) in the Eastern Wheatbelt, and by John Humphreys (Forests Department) and Tim Negus in the Narrogin area. The main aspects being studied are weed control (which weedicides and at what rate?) and sowing techniques.

2. Tagasaste

Tagasaste as a fodder/shelter tree is being evaluated in the Wheatbelt. Roger Edmiston (Forests Department) has a co-operative trial with a farmer near Badgingarra to determine establishment and management techniques for low rainfall areas. Hugo James, a farmer near Esperance, has about an acre of tagasaste which he has kept as a low shrub by carefully managing grazing. Time will tell whether this simple method is successful in

the long term. Research by Paul Downes (CSIRO) aims to determine nutritional value and effect on sheep health of tagasaste and several other fodder shrubs.

3. Trees without Fencing

Fencing, to prevent trees being grazed, is the biggest cost in tree planting and has stimulated two lines of investigation.

i) Stock repellents

Roger Edmiston (Forests Department) is evaluating the effectiveness of several stock repellents.

ii) Unpalatable shrubs

Alex Hart (Forests Department) is assessing the palatability of the Hyden wattle (Acacia ixiofolia) to stock. If it is unpalatable, as is suspected, it could provide low shelter without the need to fence. There are several other shrub species which need to be evaluated with respect to their palatability.

CONCLUSION:

The research into tree use in land management currently underway, should yield the following information. Researchers should;

1. have a clear understanding of the profitability and management of agroforestry involving widely-spaced pine in high and medium rainfall areas as well as along the South Coast. Furthermore the availability of improved clones should have improved its viability.
2. know whether and to what extent trees lower ground water tables. Specifically, we should know what species, at what density and where on the landscape trees should be planted to control salinity.
3. have a firm understanding of the practicalities of establishing and managing tagasaste on a farm. Its yield and transpiration rate compared with pasture will also be known.
4. be able to recommend species, design and management for windbreaks on most sites. This will be based on a knowledge of species performance, effectiveness of different types of windbreaks in

reducing wind speed, costs of establishment and management, and benefits in terms of shelter, erosion control and timber

5. be able to provide firm guidelines on 'direct seeding' techniques for both old and new land.
6. know whether stock repellents and unpalatable shrubs are effective alternatives to fencing to prevent trees being grazed.

APPENDIX 1:MAIN AREAS OF RESEARCH INTO TREE USE IN LAND MANAGEMENT

RESEARCH SUBJECT	PEOPLE INVOLVED
<u>Agroforestry</u> - widely-spaced pine with pasture for grazing on cropping	Geoff Anderson - CSIRO, Floreat Park Richard Moore - Forests Dept, Busselton John Wise - Dept of Ag., Busselton Tony Kubicki - Dept of Ag., Esperance Ralph Silburn - Farmer, Munglinup Tony Overhue - Farmer, Condingup Mike Overhue - Farmer, Condingup
- timber trees other than pine.	Richard Moore - Forests Dept, Busselton
<u>Direct seeding</u> - new land - old land	Geoff Grewar - Farmer, Esperance Alex Hart - Forests Dept, Como Roger Edmiston - Forests Dept, Como Tim Negus - Dept of Ag., Narrogin John Humphreys - Forests Dept, Narrogin
<u>Fodder trees</u> - tagasaste	Rick Engel - Dept of Ag., Narrogin Roger Edmiston - Forests Dept, Como Alex Hart - Forests Dept, Como
- other species	Paul Downes - CSIRO, Floreat Park
<u>Salinity control</u> - species, transpiration capacity.	John Bartle - Forests Dept, Dwellingup
- effect of reforestation	Ian Loh - Public Works Dept, Perth Eric Greenwood - CSIRO, Floreat Park Jim Davies - Dept. of Ag, Perth Rick Pepper - Dept of Ag, Perth
<u>Trees without fencing</u> - stock repellents	Roger Edmiston - Forests Dept, Como
- unpalatable shrubs	Alex Hart - Forests Dept, Como
<u>Windbreaks</u> - species, establishment	Klaus Tiedemann - Forests Dept, Esperance Alan Walker - Forests Dept, Manjimup Les Webster - Farmer, Esperance David Smallwood - Farmer, Esperance
- design, management and effectiveness	Dan Carter - Dept of Ag, South Perth Tim Negus - Dept of Ag, Narrogin Richard Moore - Forests Dept, Busselton Bill Biggs - Dept of Ag, Harvey David Bicknell - Dept of Ag, Manjimup