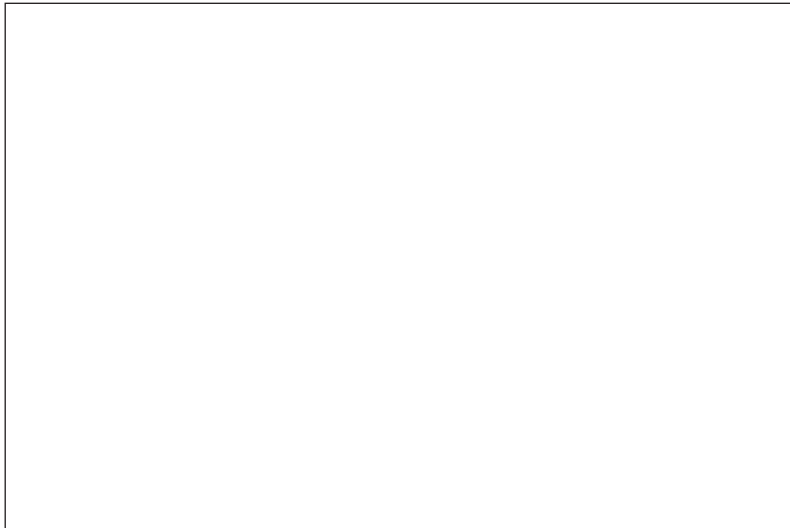

Farmers doing on-farm research

11

The contribution that farmers can make to farm forestry research and development in Australia has been largely overlooked. Research is too often seen as being about formal institutions, scientific journals, complicated statistics and large sums of money: the realm of professionals in lab-coats rather than farmers in gumboots. Linking the two groups is seen as the role of the extension agent: a practical professional, often young and always enthusiastic.



Farmers discuss wood quality of young eucalypts with Gary Waugh of CSIRO.

The Australian Master TreeGrower has sought to challenge this simplistic one-way approach to farm forestry research and development (researcher to extension agent to farmer). The program acknowledges the role that farmers play in the development and promotion of farm forestry technologies. It also encourages scientists to focus on building understanding of farm forestry design principles rather than trying to provide simplistic answers to complex multifaceted land management problems. Professional extension agents are encouraged to act as facilitators, educators and supporters who work to engage all the stakeholders in meaningful two-way dialogue.

Farm Forestry research is the systematic enquiry and investigation in order to discover the facts and principles related to growing trees on farms and marketing forest products and services. Useful research must be relevant, practical and sufficiently accurate for the intended purpose. As

farmers look to grow and manage trees in areas, or in ways, that are very different from conventional forestry, the limitations of our current knowledge and understanding become a real impediment to confidence. In this environment, any new knowledge or experience, no matter how rigorous the science, may be useful as long as it is treated cautiously and critically.

Those farmers who undertake research their own farms have the most to gain from the results. As demonstrated by the case studies, farmers who are able to critically and objectively evaluate their management are able to immediately use the knowledge gained to refine or adapt their farm forestry projects.

When the results are supported by conventional scientific research and understanding, farmers can be confident in their application. If the results appear to contradict current knowledge then there may be a need for scientists to review the methods or to undertake their own research to validate the results.

In any event, the potential contribution farmers can make, either alone or in partnership with scientists, in extending and improving our current knowledge of farm forestry is enormous. Realising this, will require farmers to learn the skills and adopt the discipline involved in designing, monitoring and evaluating research. This chapter provides some simple guidelines and examples on how farmers might engage in on-farm research. A broad definition of on-farm research may include any of the following:

1. Observation and exploration
2. Recording and documenting
3. Testing and adapting
4. Measurement and analysis
5. Comparison of treatments

1. OBSERVATION AND EXPLORATION

A group of professional foresters inspecting a four-year-old Blackwood plantation began debating whether the trees would contain any heartwood. No one in the group knew of any formal research into heartwood formation and colour in young fast grown trees. In response, the farmer picked up his chainsaw and took to a young pruned tree cutting it open lengthways to expose the radial face and old pruning wounds. Deep-brown heartwood occupied the first 3 years growth and the pruning wounds had healed well allowing clearwood to begin to form: A simple observation that extended the knowledge of those present.

There is always something to learn from observation and exploration. Careful inspection can provide explanations, warning signs or simply help build understanding. Digging a soil pit can help in determining the need for deep ripping or provide an explanation for poor growth. Examining pasture species or crop development beside a shelterbelt can indicate the extent of the tree roots.

Going out in the paddock during a heavy storm can provide insight into how a gully erodes. Noting the location of stock camps and observing animal behaviour during hot or cold whether can help farmers design effective shelterbelt systems. Searching references and talking with other farmers or professionals can help us interpret our observations just as seeing something for ourselves helps us understand what we have heard or read.

2. RECORDING AND DOCUMENTING



Digging a hole or cutting open a log can unearth knowledge.

Because of the dramatic impact that forestry can have on the physical, social and economic environment, planting and managing trees on farms has been described as like "writing a history on the landscape". Unfortunately, this history is often held in the memories of those who have witnessed the changes over time. Documenting observations, like measuring rainfall, adds weight to the story and allows others to share in the experience.



Farmers could record the grazing history of their forest areas as the trees grow.

Farm foresters are encouraged to keep a "Tree-Diary" in which they record their forestry activities and observations. Each project might be given it's own section of the book where notes are made about anything that might be of future interest such as the source of planting stock, site preparation or pruning history. Keeping track of the costs, including the number of hours spent working in the forest, can help a farmer judge the viability. It's hard to know what information will be of value in the future so the more that can be included in the diary the better. Taking lots of photographs is a simple way of documenting change, particularly if photo-points or landmarks are used.



Monitoring change: Five years of tree growing and home building.

3. TESTING AND ADAPTING

Farm Foresters have a reputation for trying new ideas or working to improve old ones. Testing new or alternative species, management options, equipment, pruning techniques, and potential forest products in a small way, without risking large amount of money or time, provides valuable experience and confidence before a large investment is made. Farmers commonly share these experiences with others, thereby helping them deal with similar problems.



A farmer relies on her tree-diary for support as she shares the history of her forest during a farm walk..



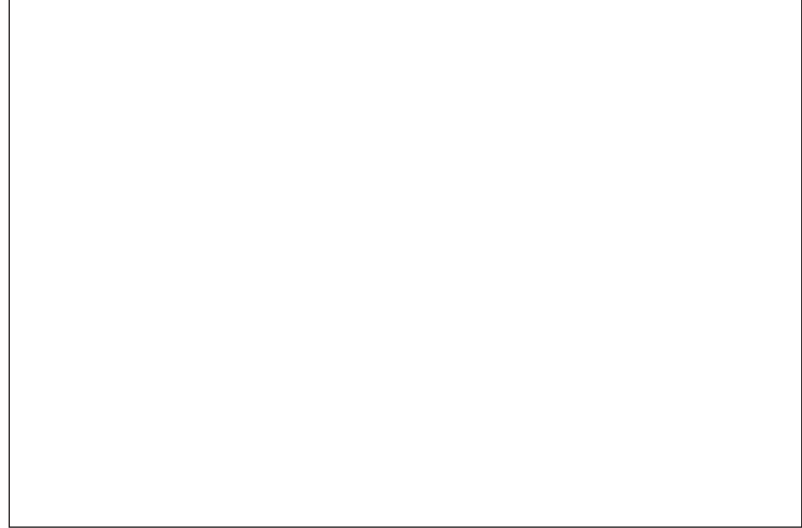
Testing an egg-based repellent as a means of protecting young pines from grazing.

THE FARMER'S FOREST



Francis Clarke (MTG) has designed and produced his own high pruning tool for pine.

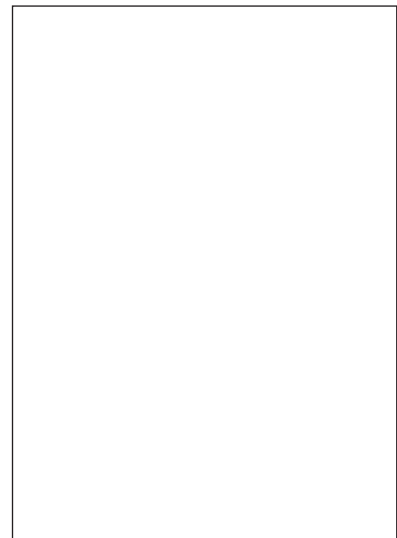
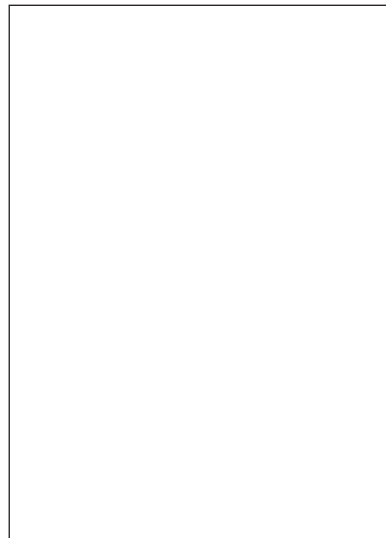
Many farmers have also taken to adapting existing agricultural equipment or building their own new tools for the establishment, management or harvesting of their forests. Direct seeders, planting machines, pruning tools and other farm inventions are commonly seen at field days. Some of the better ones go on to be commercially produced.



There are hundreds of multipurpose tree species suited to the tropics and very little knowledge about where and how they grow. Farmers need to do their own testing.

4. MEASUREMENT AND ANALYSIS

Measuring a forest using the methods described in Chapter 4 provide a snapshot in time; repeated measurements done over a number of years provide the farmer with a better understanding of how their forest is changing and its influence on the surrounding environment. Measurements can also be made of other variables that may indicate the impact of the forest on agricultural productivity or land degradation. This information can be analysed and used to make better-informed investment decisions that will enhance the value of the forest whatever its purpose.



Farmers measuring soil salinity and tree growth.

Like the MTG Tape there is a range of relatively cheap equipment that can be used to collect valid data on many aspects of farm forestry including soil chemical properties, water table depths, pasture yields, and wind speeds. Farmers may already collect information on crop yields and animal production that can be used to examine the impact that shelterbelts or other forestry projects may be having on production as they grow.

Agroforestry and farm forestry networks are now compiling results of tree measurements and other data from across their regions to improve their planning and development work. In order to compare results across a number of farms it is important to adopt standard measurement and documentation procedures. When done effectively, farmers are able to develop valuable databases that could be used to negotiate for funding support or assistance from industry and government.

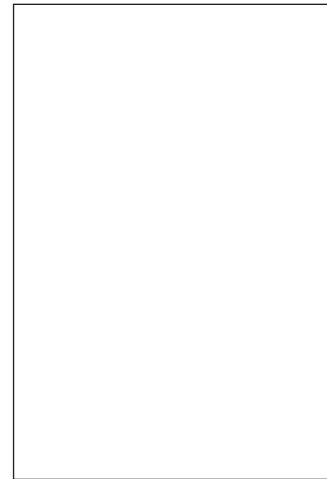
5. COMPARISON OF TREATMENTS

Most formal farm forestry trials involve the testing of hypotheses or the comparison of alternative treatments. In this case a carefully prepared experimental design is adopted to eliminate natural variability and allow statistical analysis to be used to test for any significant difference between treatments. Many such experiments have been established on farmland by research organisations in partnership with the landowners.

To be statistically and scientifically valid the trial must include at least three replications of each treatment. The replicates, or plots, may vary in size from just one tree to many hectares depending on the treatments being tested. For example, single tree plots might be used to test for genetic variability within a species; small plots containing 3 or 5 trees may be suitable for testing the early growth of a number of different species; small area plots are commonly used in establishment trials testing fertiliser, weed control and soil preparation options; large plots are required to test silvicultural options and agricultural productivity.

Replicated trials can get extremely complicated to design, manage, measure and interpret. However, farmers can use the same scientifically valid methods to undertake simple and inexpensive tests. For example, to determine if there is any advantage in ripping before planting a farmer could establish a replicated trial and monitor tree growth over the following years. By plotting the results they can judge whether the treatment is worthwhile or even undertake a statistical analysis to test for significant differences between the treatments.

The key is to minimise the number of treatments and the variability across the trial site so that any observations can be legitimately related to the treatment. The treatment plots should therefore be carefully located and protected from anything that may have an uneven effect across the site.



Replicated alley farming trial covering a large area of a farm in central Victoria.



A replicated establishment trial testing fertiliser, soil preparation and weed control options for pine and eucalypt. Photo (L) shows the total failure where there was no weed control.(R):A replicated tree species trial in the Adelaide Hills, S.A.

THE FARMER'S FOREST



Slide and Diagram: *Casuarina cunninghamiana* growing in a Nelder variable spacing trial in Queensland. The photo is taken from the high tree stocking rate out to the low stocking rate showing how pasture production increases as the tree stocking decreases.

To avoid any outside influence or edge effect a buffer, treated in the same way as the plot, might also be required.

One interesting trial design commonly used in agroforestry and farm forestry research is the variable spacing trial. Conventional spacing trials require a very large area of land because each plot containing a particular tree spacing option needs a large buffer to minimise the edge effect. Variable spacing trials simply involve a gradation from a high tree stocking down to a low stocking across a uniform site. Examples of these trials were presented in Chapter 6. Complex equations are available to help determine the effective stocking rate of each row of trees. The designs can be set out as parallel lines or like spokes of a wheel (Nelder). To be statistically valid there must be at least 7 trees at each stocking and the entire trial should be replicated at least three times. It is critical that there is a well-grown tree at every point of the design. Although not strictly valid a single trial is useful to demonstrate the effect of spacing on tree growth and pasture production.

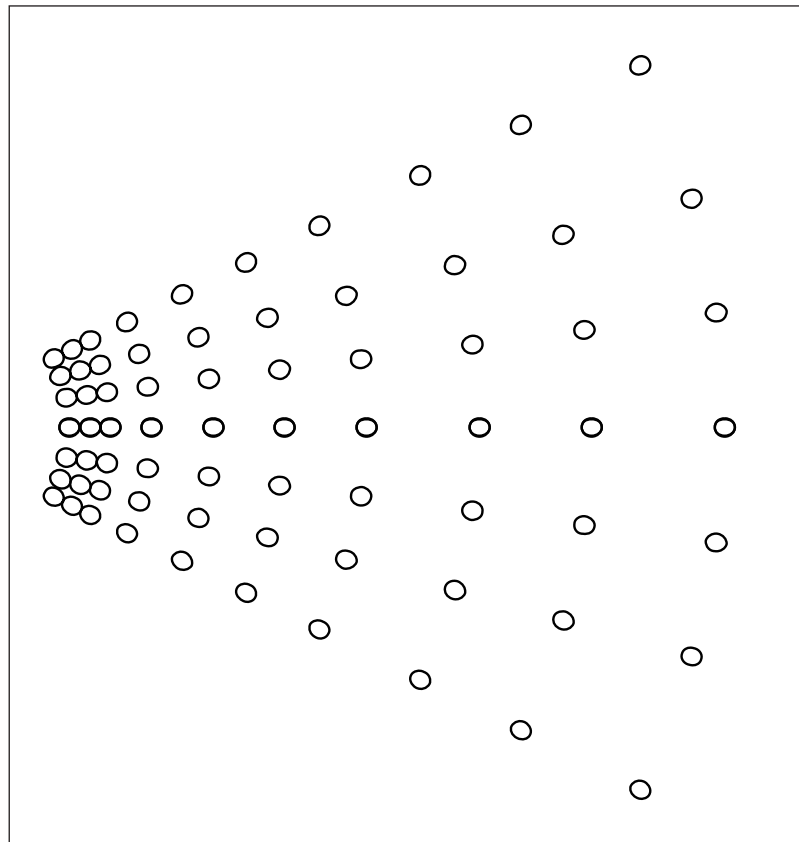


Diagram shows how a Nelder wheel might be set out.