A review of the status of commercial tree growing on farms in Australia.

FARM FORESTRY — HOW THINGS STAND

DIGBY RACE — The Johnstone Centre, Charles Sturt University, Albury, New South Wales.

ALLAN CURTIS — The Johnstone Centre, Charles Sturt University, Albury, New South Wales.

Abstract

Natural resource managers in Australia are turning to farm forestry for its potential to address important environmental, economic and social issues at regional and national levels. However, the adoption of farm forestry as a farming enterprise remains low with less than 3 per cent of commercial farmers establishing trees for commercial timber production, which represents less than 5 per cent of Australia's plantation area. In this paper, the authors draw upon their experience in farm forestry and natural resource management (including a recent evaluation of the DPIE - Farm Forestry Program) and upon a literature review, to provide a critical review of farm forestry in Australia. An overview is presented of the potential for farm forestry, current levels of adoption, government approaches to farm forestry, and in particular, a discussion of the socio-economic factors affecting farm forestry adoption. The authors conclude with a review of approaches likely to enhance the development of viable regional farm forestry industries.

Key Words: Farm forestry, agroforestry, Farm Forestry Program, socio-economic factors, natural resource management.

Farm forestry is increasingly promoted as a national strategy likely to deliver important benefits in terms of assisting the move to more sustainable agriculture, enhancing regional development and cutting the current account deficit.

Farm forestry has the potential to provide substantial benefits to regions (McDonald, 1993), principally in the form of reduced environmental costs by arresting land degradation, but also in terms of diversifying farm incomes, and contributing to industry development and employment. The Murray-Darling Basin Commission (MDBC) believes farm forestry, integrated with traditional agricultural practices, can play a substantial role in addressing a variety of land and water degradation issues (Powell, 1995). Current research suggests that in high rainfall (>800 mm) agricultural areas, perennial pastures alone will be insufficient water users to prevent groundwater recharge, whereas strategically located high density tree plantings (>300 trees/ha) may be more effective (Clifton et al., 1993). Integrating trees with agriculture can also increase production due to the positive effects of sheltering livestock, pastures (Bird, 1993) and crops (Haines and Burke, 1993). Farm forestry also has the potential to be an important timber source contributing to import replacement - Australia currently has a balance of trade deficit of nearly two billion dollars in timber products. Recent calculations by CIE et al., (1996) indicate 'The value of farm forestry to Australia could be $3.1 billion a year once a sustainable harvest is reached ...'. Farm forestry could also make an important contribution to expanding timber supplies and thereby reduce pressure on native forests in Australia and south-east Asia. Farm forestry using native species could also make an important contribution to the protection of biodiversity by improving the quality of vegetation on private land and supporting neighbouring high-value conservation areas (e.g. ecological buffer zones).

Australian Journal of Soil and Water Conservation Vol. 9 No. 2, May 1996

29
of marginal agricultural land is highly suitable for timber production (NPAC, 1991). Further investigation found 286700 ha of this land is available for hardwood plantations within a 100 km radius of existing processing facilities (RAC, 1992), suggesting that the development of farm forestry is a realistic option for regional Australia (IC, 1993). The potential for regional farm forestry is highlighted by information that farmers in low rainfall cereal cropping areas of Western Australia have established 3800 ha of eucalypt oil industries (Garraway, 1995). Plantations on cleared agricultural land offer substantial commercial advantages over native forest for timber production by having a higher level of productivity, more centralised resources with lower transport costs to processors, better control over timber quality, and better resource security (RAC, 1992).

Approximately 75 per cent of the world’s industrial timber volume is harvested from only ten countries, five of which are within the Pacific Rim (Ryan, 1994). Additionally, many Asian countries with rapidly developing economies have almost exhausted domestic timber supplies: Japan already is a major world importer of timber products. Ryan (1994) recently estimated that by the year 2000, the Pacific Rim consumers will be facing an annual timber shortfall of 325 million m³, equal to about 20 per cent of the current world trade in industrial wood. From Australia’s perspective, the Pacific Rim region will provide considerable export opportunities.

Recent technological developments enabling sawn timber production from 20 year-old eucalypt plantations rather than 60 year-old native forest timber (e.g. Eucalyptus nitens, Shining Gum; E. maculata, Spotted Gum) have improved the potential returns from farm forestry (Kirby and Waugh, 1994) and contributed to increased optimism about the viability of farm forestry in Australia. However, Ferguson (1995) is more cautious as to whether fast-grown eucalypt plantations can produce timber of sufficient quality to compete with hardwood timber from native forests. The potential value of plantations is highlighted by information that just 0.7 per cent of Australia’s forest area grows plantations yet it produces 54 per cent of the industrial wood supply (Turner and Gessel, 1990, cited in Mather, 1993). Furthermore, farm forestry presently represents less than 5 per cent of Australia’s plantation area (ABARE, 1991, cited in Ferguson, 1995) of 1 million ha (Newman 1994). A national survey indicated that 35 per cent of Australia’s commercial farmers had recently planted trees, with less than 3 per cent of the trees for commercial timber production (ABARE, 1995).

Additionally, a review of the Department of Primary Industries and Energy’s (DPIE) Farm Forestry Program (FFP) indicated that the program had funded the establishment of 1300 ha (mainly as demonstration sites) and had stimulated a further 500 ha of plantings during 1993-95 (Curtis and Race, 1995). From these figures, it seems reasonable to believe that the adoption of farm forestry can be increased.

BACKGROUND

During the 200 years since European colonisation of Australia, priority has been given to establishing agricultural industries rather than managing native forests for sustainable use. Consequently, a large proportion of the best timbered forests occupying well watered, fertile and undulating land were cleared. Today, native forests largely remain on land which is too steep, stony, infertile or remote for agricultural development (McDonald, 1993). Indeed, timber harvesting has been closely linked with land clearance for agriculture and Newman (1994) suggests land clearance has contributed about 50 per cent of sawn timber and pulpwood supplies.

Commercial reforestation began in Australia during the middle of the nineteenth century with South Australia and Victoria commencing trial plantings in the 1860s and 1870s respectively. Yet it was not until after the 1950s that the main expansion in plantation area occurred (Ryan, 1994). The declining value of traditional agricultural commodities is suggested by Inions (1995) as prompting the rural community to examine alternative enterprises to maintain farm viability, one of which is farm forestry.

It should be noted that there are many individual and organisational stakeholders contributing to the development of farm forestry (e.g. landholders, industry, government). For example, all states offer industry and/or government joint venture schemes with landholders, where the two parties generally agree on proportional cost-profit arrangements. What follows is a brief discussion of several major farm forestry initiatives.

The Joint Venture Agroforestry Program, initiated by the Federal Government and industry in the early 1990s, funded a project which developed a national strategy framework for farm forestry in Australia, released in February 1996 (AACM et al., 1996). The Joint Venture Agroforestry Program, involving Rural Industries, Land and Water Resources, Forest and Wood Products Research and Development Corporations, and the MDBC also fund the investigation and development of a range of farm forestry topics. These include: socio-economic factors affecting adoption; tree selection and management; harvesting, processing and marketing of forest products; interactions between trees and agriculture; environmental rehabilitation and sustainability; insect control; growth modelling; regional and national strategies; and policy analysis. The research projects investigating many of the above areas are conducted by the CSIRO, state agencies, universities, industry, consultants and others.
research cooperatives (e.g., CRC for Temperate Hardwood Forestry, Trees for Profit, Southern Tree Breeders Association).

The Commonwealth DPIE manages a major farm forestry initiative, the Farm Forestry Program (FFP). The objective of the FFP is to promote commercial wood production on cleared agricultural land, so as to provide a wood resource for industry, to improve the skills base of landholders in plantation management, and to stimulate regional economic development (DPIE, 1995a).

The FFP aims to do this by supporting the development of a network of integrated regional farm forestry demonstrations, extension and training activities, and through improved linkages between industry and the farming community. Commonwealth funding of about $8 million has been provided for the establishment of the FFP and North Queensland Community Rainforest Reafforestation Program. The FFP involves Commonwealth expenditure of $3.7 million on 27 projects over the period 1993-1996. Additional Commonwealth funding of $2 million has been secured for the FFP in 1995/96 (DPIE, 1995b), with further funding of $15 million allocated for beyond 1995/96 under the Wood and Paper Industries Strategy released in December 1995.

Government intervention and the expenditure of public funds to develop private farm forestry appears to have been justified in terms of the perceived long-term viability of the industry and a range of community benefits expected to flow from farm forestry. Given that forestry is a long-term industry and the complex and somewhat risky nature of farm forestry, it seems reasonable to assume that limited government intervention was not expected to produce sufficient trees to establish a viable farm forestry industry in strategic regions in the three year time frame of the FFP. Indeed, there was no indication in program documentation of tree planting targets to be achieved. In their evaluation of the FFP, Curtis and Race (1995) examined DPIE documentation (DPIE, 1993; DPIE 1995a; DPIE, 1995c) and held discussions with program staff, clients and other stakeholders. These authors determined that the key assumptions underlying the FFP were that a program involving limited government funding would catalyse the development of a viable and self-sufficient farm forestry industry by:

- increasing awareness of farm forestry;
- changing landholder attitudes about farm forestry;
- raising skills and knowledge of farm forestry; and
- linking key farm forestry stakeholders (landholders, industry and government) in the various regions, frequently through emerging community groups such as those formed under Landcare.

Some of the key findings from the FFP evaluation were:

- the FFP sought to address a comprehensive range of farm forestry topics through an appropriate mix of projects;
- the FFP made a distinctive and important contribution to the emergence of farm forestry as an identifiable and legitimate farm enterprise;
- despite some obvious successes with viable farm forestry industries have not yet emerged in any region;
- most projects had undertaken activities that could be expected to have made a strong contribution to raising the awareness of farm forestry;
- most projects had established linkages amongst key farm forestry stakeholders likely to contribute to the development of farm forestry;
- a large proportion of project activities focused upon raising awareness of farm forestry without any systematic approach to developing landholder knowledge and skills, which appear essential to increasing farm forestry adoption; this had reduced the impact of the program; and
- large numbers of demonstration sites had been established with inadequate consideration for monitoring, evaluation and dissemination of findings (Curtis and Race, 1995).

The MDBC is also funding farm forestry projects and is currently investigating the prospects for farm forestry in three broad zones, medium rainfall (600-800 mm) dryland, high rainfall (>800 mm) dryland, and irrigated areas. Much of the MDBC’s work is focussing on the medium rainfall dryland area where dryland salinity is a serious problem and where farm forestry may be able to provide major public benefits such as lower water tables and improved river water quality. Five regions within the Murray-Darling Basin have been selected for study, which will provide: an overview of natural resource degradation issues and the potential of farm forestry in addressing these issues; and an economic and social feasibility assessment which identifies impediments and develops plans for the delivery and implementation of MDBC initiatives (Powell, 1995).

Most state governments have developed farm forestry programs in higher rainfall areas which link the resources of landholders (e.g., labour, land, equipment) with government wood production using joint-venture arrangements. For example, the Department of Conservation and Land Management (CalM) WA has joint-venture programs establishing Pinus pinaster, P. radiata for particle board, sawlogs and veneer logs; Eucalyptus globulus for pulpwood; and Eucalyptus spp. for eucalypt oil to be used for the industrial solvent market. By mid-1995, these CalM farm forestry programs had established 27,500 ha with the rural community (fnns, 1995). Also in WA, the industry scheme, Burnings
Treefarms, has established over 11,000 ha of E. globulus for pulpwood production. In 1993, the NSW State Forests began establishing a range of eucalyptus in 1994 to support the hardwood sawlog industry using a joint-venture agreement with landholders. Such agreements proportion the contributions of each party and are used to determine revenue shares at the time of harvest. Tasmanian has a considerable forest industry based on government, industry, and private plantings. An estimated 27,000 ha of P. radiata and 34,000 ha of eucalyptus have been established, with 75% per cent having industry involvement through joint-venture or marketing agreements (Rolley, 1993, cited in Dunchue and Sinclair, 1994). In Victoria, the Department of Conservation and Natural Resources (CNR) recently announced a joint-venture farm forestry program which will invest $1.2 million/year for three years in the north-east (dryland) and north central (irrigation) regions of the state. The CNR program will focus on establishing up to 800 ha/year of eucalyptus, primarily for sawlog production, using shared arrangements with landholders on agricultural land.

**DISCUSSION**

**Will it Pay?**

While there is growing recognition that the decision by landholders to adopt farm forestry involves the complex interaction of economic, environmental and social factors, it is argued by Trescorp (1993) that ‘the strongest stimulus and the greatest obstacle is the economic argument’. Although it is difficult to give accurate economic forecasts of farm forestry profitability due to its long-term nature and there are few case studies to draw upon, analysts have estimated that eucalypt pulpwood plantations in Western Australia in areas with favourable rainfall and reasonable soils will provide 5.5-9 percent internal rate of return (IRR) for a ten year rotation (Ferguson, 1995). Some analysts suggest as high as 15 percent IRR when farm forestry is integrated with agricultural production (Eckersley et al., 1993). Kellas (1992) calculated IRRs for Victorian systems using Eucalyptus globulus (Blue Gum) and *Pinus radiata* (Radiata Pine) of 5.9-8 percent, which compared well with typical agricultural IRRs of 2.3-5 percent (Bird, 1993). Eckersley et al. (1993) calculated net annual returns for Western Australian eucalypt pulpwood forests of $100/ha, which compared favorably with a gross margin of $50/ha for sheep and less than $100/ha for beef production on the same land. Gordon (1996) calculated that generally it would not be financially viable for wheat-sheep farmers (i.e. 300-600 mm rainfall/year area) to develop farm forestry for commercial timber alone. However, in the higher rainfall area (>600 mm/year), farmers could make a positive return just from farming trees for wood... (with the return even) higher when shelterbelts are used to provide the wood...*. At the national level it has been estimated that the multiple benefits of farm forestry could have a net return to farmers of $2.7 billion/year (CIE et al., 1996).

Financial returns on the investment (i.e. commonly >10 years) is of concern not only in Australia, but throughout many European countries and the USA (Pearce, 1994). Equipment and planting arrangements contribute to an establishment cost that is generally valued between $1000 and $1600/ha (ABARE, 1995; Eckersley et al., 1993; Lyons, 1993), which is significantly higher than establishment costs for perennial pasture which range between $200 and $250/ha (Francis and Marcar, 1993). Even where cash establishment costs can be limited by using farm labour and equipment, Eckersley et al. (1993)

- *Landholders have developed practical ways to integrate livestock with commercial tree production.*
profitability of farm forestry can be further complicated by the use of predictive economic models. Ferguson suggests that such models should be used cautiously as they have an "inherent bias of optimism because they are almost invariably drawn up by researchers in the field (including this one), advocates and extension workers". Credit support and joint-ownership schemes, particularly with landholders paid annuities, are increasingly seen as some of the avenues through these impediments.

Rewards for Whom?

In many areas of the uplands of the Murray-Darling Basin, shallow soils and relatively low rainfall mean that farm forestry is uneconomic for landholders and industry, but the general public could enjoy substantial benefit from improved river water quality and enhanced biodiversity. The challenge in such cases is to develop ways of passing the levels of private and public benefits and to establish co-financing arrangements for farm forestry based on the level of benefit received (Powell, 1995). Where climatic and soil conditions are favourable, those promoting farm forestry as a strategy to solve a variety of economic and environmental problems need to be careful to give adequate consideration to the relationship between landholders and industry. Burch et al. (1992) argued that agribusiness corporations, which largely control the supply of farm inputs and the processing and marketing of farm outputs, have dramatically altered the social organisation of agriculture. "Furthermore, the farm family has been progressively integrated into the corporate structure of the agribusiness corporation, with farmers assuming a subordinate and dependent role as a production unit in industrialised agriculture."

In the case of farm forestry, such a relationship may force small-scale tree growers to become "price takers" with their profit margins squeezed. If this occurs, many of the suggested benefits of farm forestry will not flow to farmers or their regional communities. These problems may be accentuated in Australia by the nature of the timber industry where processors often enjoy a regional monopoly, with competition limited by product specialisation and long distances, and therefore high transport costs. Small-forest grower cooperatives have been forming in some regions (e.g. north-east Victoria, Tasmania) since the late 1980s to better coordinate disparate small timber supplies and add to regional competition (Henderson and Leech, 1994).

Large plantations require fewer permanent workers than farms and the prospect of industrial forestry on farmland has increased concerns about depopulation of rural areas. When rural populations fall below critical thresholds, shops, schools, hospitals and other community services can be forced to close (Corcoran and Dent, 1994). Towns in these areas become less attractive for urban residents and decline. Curtis and Race (1995) highlighted the following concerns on this issue, in the following comment: "... we want people for neighbours, not pine trees!"

Decision-making by Landholders

Prinsley (1991) points out that although it was emphasised as a key research area, social research has received very little attention from those researching farm forestry in Australia.

This situation is typical of the limited attention to social research on key natural resource management issues (Rickson et al., 1987). However, there is some evidence that this is changing (ANCA-LWRDRC, 1995; MDABC, 1994). Given that there is a small body of literature on the adoption of farm forestry in Australia, much of the following discussion draws heavily upon international research and literature on the adoption of agricultural practices.

From interviews with about 100 informants, Curtis and Race (1995) identified a number of social factors affecting farm forestry adoption. These included:

- increased time commitments required for managing farm forestry;
- landholder fears about timber market uncertainties; and
- the trend for increased numbers of landholders with greater off-farm income and less reliance upon on-farm income, hence a reduced commitment to long-term on-farm investment of time or funds.

Indeed, for many marginally viable farmers, farm forestry does not represent a sufficiently reliable or quick return. The following comment illustrates this view: "... I doubt we'll be farming here in 20 years, as we won't have the money to buy the other kids out. So there doesn't seem to be much point going to the trouble of managing a lot of trees for timber for someone else's benefit. We'll probably sell up here and go buy a smaller place near town."

For younger landholders or where the next generation has an interest in carrying on the farm, there appears to be greater interest in farm forestry. The following comments illustrates this point: "... we have an 18 year old son who is interested in the farm, so hopefully we're adding something to his future."

ABARE (1995) also found broadacre farmers who were planting trees were younger, operated smaller areas and had higher farm income compared to those who were not planting.

Together with external factors, farm family dynamics can constrain the capacity of landholders to adopt new practices, such as farm forestry (Munton et al., 1992). The amount of off-farm work and income, inheritance practices and the size of families affects the ability of a farming business to expand, change or diversify farm production. For example, if a farmer can attain full financial control of a prosperous farm before the age of 30, say through inheritance, then long-term options (e.g. farm forestry) are more likely to be considered. It has been noted that one of the most important advantages of a family in the farming business is its flexibility to alter expenditure, and internalise capital and labour costs (Errington and Gasson, 1994). This may benefit farm forestry by keeping cash outlays to a minimum through the family providing most of the labour (e.g. planting, pruning, thinning), which would otherwise cause those costs to be carried until trees are harvested. Conversely, farmers that are struggling financially and have several dependant family members may be far less likely to adopt a long term and still largely uncertain enterprise such as farm forestry. Even if landholders agree with the technical information given to

*It is important to consider what products will result from farm forestry.*

This can be achieved through the use of linkages, which the following comments illustrates: "... if you're not going to carry the risk of management, you're not going to carry the risk of loss. That's one of the big problems. If you can grow something, make money on it on-farm, then the next stage is to make the move to forestry."

*"If you can grow something, make money on it on-farm, then the next stage is to make the move to forestry."*
them about the benefits of farm forestry, they may not be in a position to practise it. Vanday (1992) suggests that farmers often have conflicting ideas to those of technical advisers about the use of their time, capital, amount of off-farm work, priorities at different stages of life and the ideal ways to manage their farm. In times of uncertainty (economic or otherwise), farmers may wish to maintain flexibility, and so are less inclined to make long term investments (e.g. 10-30 years) with enterprises such as farm forestry. Although governments provide some financial incentives to encourage its adoption, these seldom cover the full costs and risks borne by farmers.

**International Forces**

Australia is a very small participant in the global timber market, consuming about 0.5 per cent of the world market (Wright, 1994). The Australian government is committed to reducing tariffs on imported wood and paper products to 5 per cent or below by 1996 (IC, 1993) which will further expose farm forestry in Australia to international prices. Additionally, Australia has signed an international agreement that by the year 2000 we will only trade in tropical timber that has come from sustainably managed forests (C'wealth, 1992). In many developing countries, pressure to convert natural resources that can be exported to deliver improved livelihoods has involved excessive harvesting of timber and clearing for agriculture. For example, when real returns from world oil trade fell during the 1980s, Indonesia experienced slow growth and... in this economic climate the development of timber production for exports has emerged as a major priority. Timber products extracted from Indonesia's 'nests are an essential and growing source of export earnings' (Pearce et al., 1990). Also there has been a high rate of deforestation of the Amazon forests in Brazil (i.e. 10 per cent cleared during 1975-85; Mahar, 1988, cited in Pearce et al., 1990). A strong argument can be made that unsustainable forest practices in third world countries place downward pressure on global timber prices. In a global timber market, these forces impact upon Australian public forest timber pricing and upon assessments of the economic viability of farm forestry.

**CONCLUSION**

Since the 1980s there has been increased community awareness of the need to integrate trees with agriculture to address natural resources degradation in Australia (Incha, 1995). However, with unfavourable soils and rainfall in many areas, and uncertain economic returns for a long-term and often complex undertaking, it is understandable that farm forestry adoption has been slow and viable regional farm forestry industries have not emerged despite some government support. Nevertheless, development programs have made important contributions to achieving the potential of farm forestry and continued government support is warranted. In many instances, returns from growing forest products may not be sufficient motivation for adoption of farm forestry and where there are important community benefits, the authors suggest there is a legitimate role for governments in subsidising it. The difficulty here is in apportioning the costs of these benefits between individuals and the community.

Government funding for support of farm forestry, particularly at a national level, needs to be better coordinated, perhaps with formal links between DPIE, MDBC and the Joint Venture Agroforestry Program. A coordinated approach at this level would encourage a more efficient allocation of funds and better dissemination of research findings.

Farm forestry in Australia tends to produce small volumes of timber causing economic returns to the grower to be less than optimum, with the absence of regional markets a major disincentive. However, grower cooperatives have formed in some regions and are likely to offer part of the solution to the marketing problems of small and discontinuous timber volumes. Government and/or industry offering more flexible credit, joint-venture arrangements and sharing establishment costs would reduce a major impediment to farm forestry adoption.

Until now, a large proportion of government program funds have focused upon raising awareness of farm forestry, without a systematic approach to increasing landholder knowledge and skills. Program activities need to reflect the reality that farm forestry is a long term, somewhat risky and complex undertaking and that extension/communications theory suggests awareness raising will be insufficient to create the conditions in which widespread adoption of farm forestry occurs. Such training projects must involve skilled and experienced people/organisations to develop and trial courses covering the range of farm forestry management topics. Additional topics requiring in-depth discussion, coordination and development at regional and national levels include:

- developing effective links between labour market initiatives and farm forestry projects;
- management of remnant vegetation on private land for multiple benefits;
- developing guidelines for 'best practice' farm forestry;
- working through world forums to promote the adoption of 'best practice' native forest management;
- harvesting rights for trees established for farm forestry; and
- forestry rights legislation enabling separation of ownership of trees and land.

In summary, the development of farm forestry has considerable potential to yield important economic, environmental and social benefits for regional communities. These benefits may include better catchment
management, the multiplier effects of incomes spent in regional communities derived from processing activities, improved farm income, and the social impacts of increased rural employment and associated opportunities for the youth of regional Australia. It appears reasonable to expect continued debate over issues surrounding harvesting of native forests. It is here that farm forestry, as an adjunct to plantation development, can play an important role in forging a new alliance between commercial realities and conservation imperatives.

ACKNOWLEDGMENT
The authors would like to acknowledge the valuable comments made by John Powell on an earlier draft of this paper.

REFERENCES


Department of Primary Industries and Energy (1995c). Plantations and Farm Forestry, Information brochure, Forests Branch, ACT.


Eckersley, P., Elin, G. and George, R. (1993). Bluegums as a real option, miscellaneous publication 31/93, Department of Agriculture, WA.


Francis, J. and Mcnear, N. (1993). Dryland salinity: productive use of salt affected land, information note from Department of Conservation and Land Management - NSW and CSIRO Division of Forest, ACT.

Gordon, J. (1996). The contribution of farm forestry to the environment, Proc. of the ABARE Outlook Conference - Farm forestry workshop (February), ACT.


Pearse, P.H. (1994). Farm forestry and agricultural advisory services: the need for a coherent and consistent policy, IEA Workshop on Forestry, Agriculture and the Environment; Madrid, Spain.


