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A case study of socio-economic returns from farm forestry and agriculture in south-east Australia during 1993–2007

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ABSTRACT

In Australia, a national policy was launched in 1997 to enhance regional wealth and international competitiveness of forest industries through a sustainable increase in plantations. An element of the policy was the development of a commercial forestry and farm forestry culture. In this context, farm forestry was intended to provide the opportunity to integrate smaller-scale plantations into agricultural landscapes on private land. Against this background, a study was undertaken to analyse the socio-economic returns from farm forestry in a case study in south-east Australia. Financial information during 1993–2007 for livestock grazing and 8 ha of blue gum (*Eucalyptus globulus*) was analysed to compare the profitability of farming and farm forestry. During this period, a full cycle of blue gum (14 years) to produce pulp logs was completed with a forestry company under a tree farming agreement. The blue gum was integrated with the livestock enterprise by planting the trees in belts that were mostly 10 rows or 30 m wide positioned 250–300 m apart and located strategically on productive agricultural land along land-class boundaries. For the blue gum farm forestry, the net present value to the farmer expressed in 1993 dollars was $1236/ha compared to $768/ha for livestock grazing during 1993–2007. The farmer reported they had successfully integrated farm forestry as a land-use, and that the farm forestry had provided important environmental benefits and social benefits. The farmer was committed to farm forestry being part of the diversified farming business into the future, with the management of a second crop of blue gum on the farm underway.

1. Introduction

In Australia, a national policy, Plantations 2020, was launched in 1997 as a strategic partnership between governments (Federal, State and Territory) and the plantation timber growing and processing industries. The underlying strategy was to enhance regional wealth creation and international competitiveness through a sustainable increase in Australia's plantations, based on a national target of trebling the area of commercial tree crops from 1 M ha (as at 1997) to 3 M ha by 2020. A further aim of the policy was to convert the annual $2 billion trade deficit in wood and wood products into a trade surplus (PVIC, 1997).

Plantations 2020 focussed on overcoming impediments to the expansion of plantation forestry (PA, 2002). A key element of the framework (PVIC, 1997) was to facilitate the development of a commercial forestry and farm forestry culture in each of the 15 national plantation regions that would attract a broad spectrum of investors.

To achieve this, a specific action of Plantations 2020 was to inform farmers of the profitability of plantations as part of an on-farm production system (PA, 2002). Further impetus for farm forestry was provided in 'Farm Forestry: National Action Statement', which detailed the objectives and actions agreed by the Federal, State and Territory Governments and the forest and wood products industry to develop farm forestry, to complement Plantations 2020 (DAFF, 2005). In the National Action Statement, farm forestry was defined as '… the combination of forestry activity with cropping and or livestock production', and can take many forms including smaller-scaled plantations on farms, timber belts, wind breaks, alleys and wide-spaced plantings (DAFF, 2005).

The strong policy support for farm forestry (independently or jointly owned and managed small-scale commercial plantations) evolved from recognition of its multiple benefits to landowners. These include timber production and farm enterprise diversification without reduced livestock carrying capacity when farm forests are strategically planted (DSE, 2003), biodiversity enhancement (Race and Freudenberger, 2003; Salt et al., 2004), enhancement of landscape amenity (Herbohn and Harrison, 2004), and reduced livestock mortality and increased livestock production from provision of shelter (Race and Freudenberger, 2003).

The nexus between the national policy to expand plantations and farm forestry was that farm forestry provided the opportunity to integrate smaller-scale plantations into agricultural landscapes on

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private land, diversifying income and providing other benefits for farmers and maintaining regional communities while providing wood resources for regional industries (DAFF, 2005).

However, since the launch of Plantations 2020, expansion of planted forests in southern Australia has been dominated by blue gum (*Eucalyptus globulus*) established in industrial plantations on farm land. The primary objective has been the production of pulp logs on short rotations (e.g. 10–12 years) to produce wood fibre for the production of paper. During 1997 to 2009, Australia's plantation estate increased from 1.2 M ha to 2.0 M ha, a net annual increase of about 71 000 ha per annum on average (Gavran and Parsons, 2010).

A recent inventory estimated that the national plantation estate included 155 000 ha of farm forestry plantations. Most of the increase in farm forestry since 2001 was due to the inclusion of plantations established by managed investment schemes on leasehold farm land where a working farm continued to operate (URS Forestry, 2008). Excluding areas planted by managed investment schemes on leased farm land, only 33 000 ha of farm forests had been established since 2001 (URS Forestry, 2008). This continued the trend of slow uptake during the 1990s despite strong promotion of farm forestry as a way of generating a wide range of socio-economic and environmental outcomes at a regional scale (Race, 1999; Schirmer et al., 2000).

A study of financial returns from farm forestry in Australia (Fritsch and Hudson, 2008) had six case studies in which the investment in farm forestry was funded by the landowner, but only one had realised returns from a full rotation. In that case, located in Western Australia, a blue gum plantation harvested for pulp logs produced '… an adequate reward for investor risk on a stand-alone basis' (p. 16), and had a higher net present value than the alternative land-use of beef cattle breeding. This study highlighted that actual results on the economics of farm forestry in Australia remained scarce.

Against this background of government and industry policy to expand planted forests but with most expansion being in the form of industrial plantations, and a poor understanding of the economics of farm forestry, a study was undertaken to analyse the socio-economic returns from a farm forestry case study in the State of Victoria in south-east Australia. Given that the detail of the socio-economic contribution of farm forestry for an individual property is seldom available in the published literature, this study focused on the farming property of the Stewart family operated principally by A. Stewart (a co-author) supported in the management of farm forestry on the property by his brother H. Stewart (the senior author). The benefit of analysing this property as a case study was the access to a comprehensive longitudinal data set of cost, price and yield information for the farming and farm forestry enterprises provided by A. Stewart, and the interactive reflection on the changing perceptions of farm forestry within the family over time. The specific objectives of the study reported in this paper were to:

1. compare the economic returns from farm forestry and agriculture (livestock grazing) during 1993–2007 in a case study; and
2. learn of the social benefits of farm forestry to the farmer (A. Stewart).

2. Methods

2.1. Case study data

As well as providing access to a comprehensive data set, the case study analysis enabled close interaction with an experienced farmer with first-hand knowledge of farm forestry, with the farmer recently completing a complete growing cycle of a farm forestry crop integrated into the livestock grazing enterprise. This provided an opportunity to examine the relative financial performance of farm forestry and agriculture.

A new business plan was implemented in 1992 for the 229 ha farm in southern Victoria (38° 22′ S, 143° 54′ E), driven by a goal to sustainably produce forest and livestock products through the integration of commercial trees and habitat trees into the farming system. The agriculture was mixed livestock grazing on perennial pastures, principally to produce sheep meat from prime lambs mainly for the domestic market with wool and sheep skins as co-products. During the period of the case study, the stocking rate on the property was about 18 DSE/ha.[1] This was in the range of the potential carrying capacity for well-maintained and well-fertilised pastures of 18–22 DSE/ha for farms in southern Victoria where the average annual rainfall was 700 mm (Saul, 2006, p. 5), which was similar to the long-term rainfall for the farm (BM, 2010).

In 1993, the farmer entered a joint venture by way of a tree farming agreement with Midway Ltd ('company') to grow 8 ha of blue gum for production of pulp logs. The crop was harvested in 2007 when the trees were 14.2 years of age, and the company exported the chipped pulp logs from its facility at Geelong to a Japanese paper mill.

Negotiation with the company allowed the farmer to configure the blue gum plantation in six belts of trees that were mostly 10 rows or 30 m wide ('timberbelt' plantation) positioned 250–300 m apart and located along land-class boundaries, rather than in block plantings as normally practised in commercial forestry. All timberbelts were established in 1993 on the same land-class — brown and yellow kurosols, characterised by a strong texture contrast between the surface horizons (sandy loam) and the sub-surface horizons (medium clay) (Isbell, 1996) on undulating to steep terrain.

Under the tree farming agreement, the company's contribution was establishment of the plantation (at a deemed value of $1650/ha in the first year in 1993 dollars), and the farmer's contribution was provision of land fenced to exclude livestock and plantation protection (at a deemed value of $110/ha/year for the life of the project in 1993 dollars). Interest compounding annually at the 12-month bank term deposit rate[2] notionally accrued on the deemed value of the contributions by both parties, such that the shares of the harvest revenue were 55.6% to the company and 44.4% to the farmer. The price for the trees was the 'market price of the trees at the time of felling' (i.e. the fair and reasonable market value of the trees, taking into account such factors as the price being paid by the company and other purchasers for trees of similar type). The term of the agreement was the earliest of 15 years or the completion of harvest, and at the end of the agreement ownership of the tree stumps reverted to the farmer.

The timberbelts were established in 1993 using standard forestry practices (cultivation, chemical weed control and application of fertiliser) at a stocking of 1333 seedlings/ha (2.5 m by 3.0 m). There were no silvicultural treatments after the second year. The planting configuration provided 2.9 km of shelter for the grazing enterprise, but it came at a higher cost for fencing to the farmer than a normal plantation layout because the timberbelts had five times the perimeter of a square plantation block of equivalent area.

At three years of age, survival measured on a series of experimental plots was 93%. In 2006, the company conducted an inventory when the trees were 12.8 years old to assist with the planning of the harvesting. The mean stocking measured on eight plots (each 0.04 ha) was 911 trees/ha. Thus, the stocking of the final crop was 68% of the initial stocking, indicating that competition had caused substantial mortality between ages 3 years and 12.8 years. Mean statistics for growth of the plantation at age 12.8 years were tree height of 17.0 m, basal area of 29 m^2/ha, and total standing

[1] The dry sheep equivalent ('DSE') is a standard unit frequently used to assess the carrying capacity of a given farm or area of grazing land (McLaren, 1997). The standard DSE unit used in the Department of Primary Industries in Victoria is the amount of feed required by a dry, 50 kg sheep to maintain its weight (DPI, 2009, p. 66).

[2] Data used for each year was the deposit rate for the month of April which was the average of term deposit rates of the four largest banks in Australia for a deposit of $10 000 for 12 months. Data from Reserve Bank of Australia at: http://www.rba.gov.au/statistics/tables/index.html#interest_rates.