

Socio-Economic Impacts of Land Use Change to Plantation Forestry: A Review of Current Knowledge and Case Studies of Australian Experience

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Introduction

In many countries, intensively managed plantations are being established on land that was previously used for agriculture. The shift in land use from traditional agriculture to tree growing may be associated with a range of social and economic impacts. These may include change in the size and composition of rural and town populations, shifting employment opportunities, changes in agricultural land price trends, and new demands on rural infrastructure such as housing and roads, and considerable cultural change, amongst others.

Widely differing and often contradictory claims about the social and economic impacts of land use change to plantations have been widely reported. However, few detailed studies have been undertaken to evaluate what socio-economic impacts actually occur when plantations are established. There is a need for ongoing study of the social and economic impacts of land use change to plantations, including study of whether different modes of plantation industry development have different types of impact.

However, identifying socio-economic impacts of land use change is challenging. In any rural area, it is common for multiple changes to be occurring simultaneously, of which land use change to plantation forestry forms only a small part. Distinguishing the effects of plantation expansion from other changes is highly challenging. There is a clear need to develop improved methods for evaluating impacts, which go beyond making broad claims unsupported by evidence, but which take into account the serious challenges associated with examining social impacts of plantations in rapidly changing rural communities.

This paper reviews common claims made about the social and economic impacts of land use change to plantations. The current state of knowledge about impacts is then examined, with a review of currently available studies examining social and economic impacts of land use change to plantation forestry. The extent of current knowledge, and the gaps in knowledge, are identified.

Evidence is then presented from current research being undertaken in Australia evaluating evidence against claims of positive and negative socio-economic impacts of plantations. The studies are examining impacts of land use change in regions where up to 20% of agricultural land has been converted to plantation forestry in the last 15 years, as well as in regions where mature plantations are being harvested and processed. The impacts of these changes on demographic characteristics of rural and regional populations, provision of services to rural areas, employment opportunities, and rural infrastructure is examined.

The paper concludes by providing an overview of research needs, and a new research program in Australia examining social and economic impacts of plantation expansion.

Common claims made about socio-economic impacts of land use change to plantation forestry

The rate of land use change to plantation forestry, or afforestation¹, has increased over the past three decades. While measures of the area of plantations have changed over time, and so are not directly comparable², the FAO (2001) estimated that between 1990 and 2000 the global plantation estate expanded by 143.4 million ha, much higher than the estimated 25.8 million ha of afforestation undertaken globally between 1980 and 1990. Plantation forestry expansion is occurring for a range of reasons in different countries, including pressure to reduce logging of natural forests, and the quality and consistency of wood and paper products able to be produced from plantations (Cossalter and Pye-Smith 2003; Kanowski 2005).

Afforestation has been accompanied in many regions by conflicting views about the social, economic and/or environmental impacts of establishing plantations:

Each year the area of fast-growing tree plantations in the world expands by around one million hectares. The planting of large areas of eucalypts, acacias, pines and poplars has sparked off bitter controversy ... Some claim plantations will destroy the environment and displace small farmers. Others say they will help protect natural forests and provide economic growth. Most of the public does not know what to believe. (Cossalter and Pye-Smith 2003: v)

Conflicting views about the impacts of afforestation have been recorded in most, if not all, regions in which the plantation estate has expanded in recent decades – in a review of literature on conflict over afforestation, Schirmer (2005) found instances of documented afforestation conflict in over 35 countries, including nations as diverse as Ecuador, Finland, India, Thailand and the United States of America.

The conflicting perceptions of afforestation by different groups often include multiple issues related to the impact of afforestation on rural communities, on the economy, and on various parts of the surrounding physical environment. Figures 1 and 2, reproduced from Schirmer (2005), summarise common conflicting claims and counter claims made about the social and economic impacts of afforestation in different countries. While they do not include every topic of contention over the impact of plantations, they highlight some of the common debates over plantation forestry³. Environmental impacts of plantations, another common source of debate in many communities, are not examined in this paper, as its focus is on understanding the extent to which it is possible to answer common questions about the social and economic impacts of land use change to plantation forestry.

¹ The FAO (2001) defined afforestation as: 'Establishment of forest plantations on land that, until then, was not classified as forest. Implies a transformation from non-forest to forest.'

² The comparability issues are due to differences in definitions used by the FAO when gathering data about plantations at different times (FAO 2001).

³ Figures 1 and 2 do not indicate the proportion of people expressing particular views, as few studies have examined this in detail, and those that have are not generally comparable.

Figure Error! No text of specified style in document. Commonly reported perceptions of the social impacts of afforestation

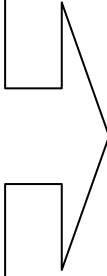
	Positive perceptions of afforestation	Negative perceptions of afforestation
<p style="text-align: center;">Perceptions of social impacts of afforestation on rural communities</p> 	Afforestation provides a dignified exit from farming for landowners (e.g. farmers) unable to maintain economic viability, by providing a land user willing to purchase land at a reasonable price	Afforestation of agricultural land leads to decline in rural population through the voluntary or forced removal of previous land users
	Afforestation can improve local/regional service provision by providing new employment opportunities and spending in local regions	Afforestation leads to population decline and this results in loss of local services (e.g. schools, local shops, local clubs) in rural regions
	Afforestation can revitalise declining rural communities by providing new industry and employment opportunities	Afforestation leads to loss of local culture and sense of identity as a result of changes to land use, population and/or landscape
	Afforestation provides increased quantity of employment in a region	Afforestation and plantation management provide less employment per hectare than other alternative land uses, and/or employment is located outside local regions
	Afforestation and plantation management provide increased quality of employment compared to alternatives	Afforestation provides decreased quality of employment compared to alternatives
	Well managed afforestation presents no greater risk to health and safety than other land uses, and may be safer than other land uses in terms of fire risk, chemical use and other risks	Afforestation and plantation management create increased health and safety risks for local residents, including fire risk, road safety issues, and health risks from chemical use, tree pollen or other management practices

Figure 1 Commonly reported perceptions of the economic impacts of afforestation

<p style="text-align: center;">Perceptions of economic impacts of afforestation on rural regions</p>	<p>Positive perceptions of afforestation</p>	<p>Negative perceptions of afforestation</p>
	<p>Well managed plantations can enhance the landscape and rural amenity and hence increase tourism</p>	<p>Afforestation impacts negatively on sensitive landscapes and vistas, and may damage cultural artefacts, and hence can adversely impact tourism</p>
	<p>Afforestation increases land prices by creating increased demand for agricultural land, creating higher returns for those wanting to sell land</p>	<p>Afforestation increases land prices, making it harder for farmers to expand their properties to remain viable</p>
	<p>Afforestation can increase property value by providing improved environmental outcomes and a valuable crop</p>	<p>Afforestation decreases land prices of nearby properties, as there is low demand for land bordering a plantation</p>
	<p>Afforestation of part of an agricultural property provides farm and rural land management benefits and a useful form of farm enterprise diversification, and can usefully replace agriculture where excess or unsustainable production is occurring</p>	<p>Afforestation takes up land needed for other uses such as agriculture, and reduces people’s ability to live/subsist off the land by reducing their access for various agricultural/subsistence activities</p>
	<p>Afforestation is a sustainable land use that may have positive impacts for the land it is established on and local catchments, through improving soil stability, improving water quality and/or improving wildlife habitat</p>	<p>Afforestation can adversely affect neighbouring or nearby land users via management activities such as run-off of chemicals, spread of weeds from plantations to nearby land, erosion, changing water quality/quantity and/or providing habitat for feral animals that can damage crops or farmed animals on nearby properties</p>

From Figures 1 and 2 it can be clearly seen that perceptions about the impacts of plantation differ. Given that there are conflicting perceptions about the types of social and economic impacts plantations have, there is a clear role for socio-economic research that can help inform debates about the impacts of plantations, by providing data to assist communities in assessing the extent and nature of socio-economic impacts of this common type of land use change.

This paper explores the extent to which the questions raised about impacts of plantations in Figures 1 and 2 have been answered in Australia, and highlights the need for more research in this area. While the paper from this point focusses on the Australian experience, it is likely that a similar lack of knowledge and research exists in other countries in relation to understanding the socio-economic impacts of land use change to plantation forestry.

How much do we know? Current knowledge about socio-economic impacts of plantations

A range of studies on the socio-economic impacts of land use change to plantation forestry have been undertaken in Australia, and it can be tempting to assume that because a study has examined social and economic issues, it has covered all the different topics listed in Figures 1 and 2.

However, this is generally not the case. Research into social and economic aspects of plantations – both in Australia, which this paper focusses on, and worldwide - has generally focussed on:

- Encouraging adoption of small-scale plantation forestry in the form of agroforestry and farm forestry. This type of literature does not aim to answer the questions about the impacts of plantations raised in Figures 1 and 2, and is not discussed further here;
- Some economic impact studies identifying the employment and expenditure generated by plantation forestry (see for example Prospect Consulting 2002; URS Forestry 2003, 2004; EconSearch 2005; MBAC Consulting 2005a,b; Schirmer *et al.* 2005). These studies have answered a limited number of questions about impacts, but often haven't examined the spatial location and flows of employment and spending associated with plantations – and hence haven't answered some key questions about employment, such as 'how does the employment generated by plantation forestry compare to that generated by alternative land uses' and 'is local employment generated by plantation forestry?'. Additionally, most studies have been carried out at a single point in time, and so have not identified how employment and spending generated by plantation forestry varies over time as well as over space in relation to the plantation resource;
- Perceptions studies identifying how different groups and individual perceive and view plantations (see for example Petheram *et al.* 2000). These studies help identify the questions often asked about socio-economic impacts of plantations, and the conflicting answers given by different groups to these questions, but do not provide independent evidence that can help in answering these questions. These studies do provide answers to questions about how land use change to plantations influence's people's connections with their community and landscape, questions that are inherently related to people's perceptions and interpretations of land use change; and
- A very limited set of studies have attempted to analyse statistical data to identify whether land use change to plantations results in changes to local and regional socio-economic conditions (see for example Petheram *et al.* 2000, Tonts *et al.* 2001 and Schirmer *et al.* 2005). These studies have faced considerable methodological challenges, particularly related to identifying whether socio-economic changes observed in a community can be causally linked to change in the area of plantations, or the nature of the plantation industry in the region. For example, answering the question 'does expansion of plantation forestry lead to changes in the population of the rural area where the plantations are being established?' is extremely complex. To answer the question requires identifying not just (a) how population has changed and (b) whether this change has moved in a consistent direction as plantation forestry has expanded. It requires also identifying the multiple other factors that may be impacting on rural population levels, and the extent to which plantation expansion versus these other factors has influenced change in the rural population.

Currently available research only allows a small number of the questions raised by Figures 1 and 2 to be answered – and only allows them to be answered for a small range of plantation forestry situations, and a small number of the many regions where plantations are being established.

The next section reviews what is currently known about some of the socio-economic impacts of plantation forestry, based on recent studies undertaken in Australia.

The evidence so far on socio-economic impacts

The following sections examine current evidence about the impact of plantation forestry in Australia on:

- Rural and town populations;
- Local and regional service provision;
- Employment;
- Other industries – tourism, traditional agriculture; and
- Land prices.

Health and safety issues, while commonly raised as topics of debate, are not discussed as they involve a range of specialised research areas from transport safety (when transporting plantation logs and processed products) to epidemiology, impacts of different chemicals, and fire behaviour – all areas not generally within the range of expertise of social scientists and economists. A wide range of research has been undertaken on these different issues in Australia.

Other important issues, such as the impacts of plantation forestry expansion on rural identity and sense of community, are not reviewed below. There is a considerable literature on this issue, which would require a paper of its own to explore. As this paper focusses mostly on examining those impacts for which it is possible to identify evidence beyond individual perceptions, this issue is not focussed on, but should be recognised as significant for many rural communities.

Rural and town populations

Two perceptions are commonly expressed about the impact of plantation industry expansion on rural populations. The first is a perception that expansion of large-scale plantations may accelerate rural population decline. Several qualitative and quantitative studies have found this to be a common perception in Australian rural communities (see for example Kelly and Lymon 2000, Tonts *et al.* 2001, Schirmer 2002, Williams *et al.* 2003). The second is a perception that the expansion of plantation forestry and associated industry has the potential to halt or reverse rural population decline, through provision of jobs and economic activity:

An increasing area of tree plantations may also help address the country's trade deficit in wood products and revitalise rural communities. (RIRDC 1999)

One recent Australian study examined population statistics over time to identify if a demonstrable shift in population size or demographics occurred when plantation forestry expanded in a region. Schirmer *et al.* (2005) examined population change in the Great Southern region of Western Australia. This region experienced the most rapid expansion of plantation estate of any region in Australia during the period studied, with over 127,000 hectares of plantations established between 1988 and 2001. Most of these plantations were established in three Shires in the region, with between 10% and 25% of agricultural land converted to plantation in the different Shires. Despite this rapid conversion of land to plantation, at the Shire scale

expansion of plantation estate did not exacerbate rural population decline – when population trends were examined, it was found that many nearby Shires with few or no plantations had experienced a greater decline in rural population than the Shires with a large area of plantations.

The region examined in this study was during the period studied undergoing rapid farm amalgamation, with farmers being forced to ‘get big or get out’ of farming. The results of the study suggest that when farmer populations are already declining due to ongoing processes of farm amalgamation, expansion of plantations does not increase the rate of population decline. This is most likely because in this type of region, when a farmer chooses to sell or lease their land, it is either sold/leased to another farmer who is expanding their property, or to a plantation company. In either case, the original farmer is likely to leave the land and not be replaced by another farmer.

It is important to emphasise that these results applied only at the scale of the local government area, and in the Great Southern region where agriculture is dominated by broadacre grazing and cropping. More work is needed to understand if these results apply in different regions and at different scales.

Local and regional service provision

The question of the impact of plantation expansion on service provision is only explored here in relation to Australia. Many types of service decline have been occurring in Australian rural communities in recent decades, particularly in inland areas. For example, residents of rural towns have commonly experienced withdrawal of banking services, closure of health services, and declining enrolments in small schools.

When trying to identify if plantation expansion affects service provision, the biggest challenge facing researchers is a lack of reliable data on levels of service provision over time. In addition, similar difficulties arise to those highlighted in the discussion above on population impacts; it is difficult to isolate whether expansion of plantations, versus other factors, play a role in changing levels of service provision.

Schirmer *et al.* (2005) examined whether expansion of plantation estate had affected service provision in the Great Southern region of WA. While little reliable data was accessible on service provision in the region over time, it was possible to examine trends in school enrolments in the region in detail. It was found that enrolments in small schools in small towns had declined by a greater amount in areas experiencing rapid plantation expansion (34% over 1991 to 2004) than areas not experiencing plantation expansion (17% decline).

However, the higher than average decline in school enrolments in plantation areas began *before* plantation expansion occurred in these areas – rates of school enrolment decline were high for most schools from the early 1990s, while plantation expansion predominantly occurred from 1996 onwards. This suggests that plantation expansion was a response to rural decline and associated land availability, rather than being a cause of decline.

This research provides only limited answers to the question of the impact of plantations on service provision in rural areas. Fully answering this question would require profiling accurately the ways plantation expansion may lead to change in different types of services, and how other types of change in rural areas also impact these services.

Employment – quantity and location

As discussed above, several studies in recent years have examined the extent of employment generated by plantation and native forestry in different regions of Australia. Relatively similar levels of direct employment were generated by plantations in the different regions examined in these studies. In mature softwood plantation regions, between 1.3 and 1.9 jobs were generated in different regions per 100 hectares of plantation, up to the point of processed wood products leaving the mill door⁴.

The majority of employment is generated by harvesting and processing (usually accounting for well over two-thirds of the employment generated up to the point of processed products leaving the mill door), while a smaller proportion of employment is generated by the growing of plantations. Therefore the total employment impact of plantation forestry in a region is likely to be highly dependent on where processing facilities are located. In the South West Slopes of NSW, for example, the establishment of several processing facilities in towns near the plantation estate (e.g. Tumut, Tumbarumba, Holbrook) has led to significant generation of employment, which is supporting population and economic growth in some of these towns (Schirmer *et al.* 2005b).

At present, Australia's hardwood bluegum plantations are only just reaching maturity. Within the next few years, as harvesting expands and new processing facilities are established, it will be possible to identify the full employment impact of this growing sector of Australia's plantation industry.

Perhaps the biggest question asked about plantation sector employment is 'is it local?' The answer to this question depends on how the term 'local' is defined. Schirmer *et al.* (2005a,b) found that in the two regions they examined, plantation sector employment was:

- generally located within 200km of the plantation resource, and often considerably closer;
- concentrated in regional centres (in this study, the centres were the city of Albany in the Great Southern region and the town of Tumut in NSW); and
- sometimes located in smaller towns as well as in larger towns. For example, many forest contractors were based in small rural towns rather than larger centres.

Other industries – tourism, traditional agriculture

The question of whether expansion of plantation forestry has impacts on other industries – including tourism and traditional agricultural industries – remained largely unanswered in the Australian context. The key challenges to accurately identifying how employment compares across different land uses are that:

- the efficiency of production of many agricultural industries has changed rapidly in recent years, changing the level of employment generated by different industries; and
- it can be difficult to identify compare points in the chain of production at which employment in different industries can be compared.

Petheram *et al.* (2000) compared the employment generated by a number of different land use industries in Western Victoria, and found that plantation forestry – depending on the extent of

⁴ Some other studies have estimated higher levels of employment, but these have usually included some 'double counting' of employment across sectors so their estimates have not been included here.

downstream processing – employed less than some alternative industries, such as dairy farming, but more than others, such as broadacre wheat growing.

Land prices

Perceptions about the impact of plantation expansion on land prices vary, ranging from beliefs that plantation expansion leads to rising land prices in rural areas, to concerns that it may lead to decrease in land values for some properties (see for example Schirmer 2002).

Three Australian studies have examined land price data in detail. Tonts *et al.* (2001) and Schirmer *et al.* (2005a) both found that rapid expansion of plantations could lead to increasing land values, due to higher demand for land. SMPLSRG (2005) found that land sold for plantation establishment in and around Bombala, NSW generally attracted a higher price over 1998 to 2004 than land sold for other purposes. They also found that the maximum prices paid for land in Bombala in any year were similar for land sold for plantation establishment and for other purposes.

Australian research - the Cooperative Research Centre for Forestry's 'Communities' project

In Australia, a new research project is underway to build on previous work and improve understanding of the socio-economic impacts of plantations in different situations.

The 'Communities' research project is being undertaken by four CRC research partners – the Australian National University, Southern Cross University, University of Melbourne and University of Tasmania. It includes several related research projects which will help to add to the body of knowledge on socio-economic impacts of plantation expansion in particular, and commercial forestry more broadly. The work being undertaken includes:

- A regular employment and expenditure survey of the forest industry in Tasmania, WA, the Green Triangle and Central Victoria;
- Analysis of statistics on land use, industry and socio-demographic change in forestry and non-forestry regions over time, to identify the socio-economic impacts of the forest industry; and
- A survey of landholders who have changed land use to plantations, to find out why they have made the decision to sell or lease their land for plantation establishment or establish a plantation themselves, and identify how this decision has changed their lives;
- Qualitative and quantitative surveys of values and attitudes towards commercial forestry over time, including analysis of how attitudes vary across regions in relation to spatial attributes such as settlements, density of plantation development, and location of plantations within a catchment;
- Studies examining past and current community engagement strategies and their effectiveness, and developing improved strategies for community engagement; and
- Development of participatory modelling tool to help different stakeholders engage in dialogue about trade-offs between production, water, biodiversity, visual amenity and other community requirements?

The Communities project will run from 2006-2012. Research is being undertaken in Tasmania, Western Australia and, in a related project, in the Green Triangle (SW Victoria and SE South Australia) and central Victoria.

Conclusions

The rapid expansion of plantation forestry worldwide has been associated with considerable debate about the social, economic and environmental impacts of different types of plantations. While a wide range of social and economic impacts are commonly discussed by both proponents and critics of plantation forestry, there is relatively little socio-economic research available to help inform debates over the impacts of plantations. In Australia, recent research is challenging some commonly held views about the impacts of plantations, while confirming other common views. Further research is needed, and is currently occurring through a seven year research project begun in 2005, funded by the Cooperative Research Centre for Forestry.

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