

Some Research Experiences in Socio-economics of Non-industrial Forestry in the Philippines

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ABSTRACT

This paper examines the findings of a socio-economic research project carried out to examine the financial performance, adoption progress and impediments to adoption, of a range of Australian tree species in the Philippines. This ACIAR-supported project was an extension of research into transfer of Australian tree production technologies to the Philippines by Australian scientists, with a focus on trees from the genera *Eucalyptus*, *Acacia*, *Grevillea* and *Casuarina*. The socio-economic research indicated that financial performance of acacias, though perhaps not other Australian species, is comparable with that of traditional species such as *gmelina* and *mahogany*. Some uncertainty exists with regard to likely growth and financial performance of eucalypts because site index data are not available, and while early stand growth has been impressive there was a lack of data on which to model later growth. A wide variety of potential impediments to adoption of farm and community forestry, and Australian species in particular, was noted.

Keywords: Australian tree species; tree production technologies; stand yield modeling; financial performance.

INTRODUCTION

A research consultancy titled *A Financial and Social Analysis of Adoption of Small-Scale Forestry Including Australian Timber Species in the Philippines* was carried out with ACIAR funding during 1999, the findings of which are reported in Harrison and Herbohn (2000a). The purpose of this research was to investigate the economic performance and adoption progress and prospects for Australian

tree species – particularly eucalypts and acacias but also grevilleas and casuarinas – in the Philippines. This study complemented silvicultural research conducted under ACIAR Project SST 96/110 entitled *Tree Production Technologies for the Philippines and Tropical Australia* and predecessor ACIAR Project 92/08 *Tree Establishment Technologies in the Philippines*. The silvicultural research projects were concerned mainly with industrial forestry, and involved trial sites in Mindanao, Bohol, Cebu, Leyte and Luzon. Experience in these projects suggested the need to carry out financial modelling to demonstrate the returns to Philippines landholders from farm forestry, and to examine the socio-economic factors which may come into play in transfer of Australian forestry technology to the Philippines. It was anticipated that yields from farm forestry would be lower than those of trial sites and industrial forestry.

Compelling reasons were noted for reforestation in the Philippines. Timber shortage and consequent high expenditure on imports are a drain on the balance of payments. Social factors also act to increase the government priority on expanding forestry, including the need to make affordable timber available to families for housing, and the need to protect the copra industry that is at present threatened by the clearing of coconut palms to produce cocolumber. Reforestation is needed to relieve logging pressure on native forests, and redress the environmental problems from excessive earlier forest clearing, e.g. to reduce soil erosion, lowland flooding and sedimentation of watercourses. Farm and community forestry has the potential to assist the livelihood of low-income families, and create additional urban employment. These observations are consistent with the Philippine Master Plan for Forestry Development (DENR, 1990).

This study was a relatively small one in terms of budget and time. A brief project proposal was developed and the research proceeded as a 'research contract' rather than 'research project'. A specific set of research objectives was developed. These may be expressed, in slightly expanded form, as:

- Understanding industrial and community forestry systems in the Philippines.
- Predicting yields of traditional and Australian tree species in industrial and farm forestry.
- Carrying out financial modeling of traditional and Australian tree species in industrial and farm forestry.
- Understanding the establishment and operation of Community Based Forest Management (CBFM).
- Identifying the potential impediments to non-industrial forestry.
- Examining progress in adoption of Australian tree species.
- Identifying further research needs in non-industrial forestry in the Philippines.

In the following sections the methods used to achieve these objectives and the main findings in relation to each of them are examined in turn.

UNDERSTANDING INDUSTRIAL AND COMMUNITY FORESTRY SYSTEMS IN THE PHILIPPINES

This understanding was achieved by study of documents from the previous socio-economic project, and two-week visits to the Philippines by Steve Harrison and John Herbohm, and by the honours students Tyron Venn and Brendan Nixon, in each case accompanied by Dr Sharon Brown (research officer in the ACIAR project SST 96/110). Visits were made to Bukidnon Forests Inc (BFI) at Malaybalay, Alson and Sons at Davao, ViSCA, the community forestry project at Alcoy in Cebu, the Philippines Council of Agriculture, Forestry and Natural Resources Research and Development (PCARRD), DENR offices of the University of the Philippines at Los Baños (UPLB), and various timber and furniture processing plants. Some complementarities were gained regular visits to Luzon on a concurrent livestock project.

OBSERVED GROWTH PERFORMANCE OF AUSTRALIAN TREE SPECIES

The field trials under ACIAR project FST 96/110 have involved eucalypts, acacias, grevilleas and casuarinas. ACIAR site-species matching and nutrient trials have revealed that eucalypts and acacias, with appropriate silvicultural technology, can achieve spectacular early growth in the Philippines. Early growth observations of Australian and traditional species at Matalom and Ormoc revealed some impressive performances. For example, *Acacia mangium* achieved a height of about 15 m and diameter over 25 cm at the two sites at three years of age. Also, the eucalypt species achieved heights of 9-18 m and diameters of 12-20 cm at this age. These mean heights and diameters are averages for nine trees of the best performing provenance, measured at ground level.

PREDICTING YIELDS OF TRADITIONAL AND AUSTRALIAN SPECIES IN INDUSTRIAL AND FARM FORESTRY

One of the project tasks was to develop models of yield and financial performance of Australian tree species and to compare these with traditional species grown for timber production. Five of the most promising Australian species included in this study were *Acacia mangium*, *Eucalyptus camaldulensis*, *E. pellita*, *E. tereticornis* and *E. urophylla*. For comparative purposes, four commonly planted traditional species are examined, namely *Eucalyptus deglupta* (Bagras), *Gmelina arborea* (Gmenina or Yemane), *Paraserianthes falcataria* (Albizia or Falcata) and *Swietenia macrophylla* (Mahogany). The performance of these species was examined under both industrial and small-scale plantation management regimes.

Difficulties arose in obtaining yield data on which to base stand yield models. Measurement of trees in the ACIAR trials had been discontinued at the time of

the visits, due to budgetary constraints. Data from trial observations were supplemented with information from a number of countries, in an innovative approach to stand yield modeling under sparse data. A non-linear panel data version of the Chapman-Richards model (Clutter *et al.*, 1983) was utilised to estimate yields of Australian species in this study (Venn *et al.*, 2001). The constrained maximum likelihood method was adopted to fit the models in Microsoft Excel using the Solver facility. From the ACIAR trials, Philippine and international literature, stand yields of sawlogs, house poles and fuelwood were collated by age for each species. The yield of each product has been modelled separately, with dummy variables used to account for heterogeneities in growth between the five Australian species and management regimes. It was found that preliminary yield models for *E. tereticornis*, *E. pellita* and *E. urophylla* did not acceptably reflect observed yields or expert opinion for these species in the Philippines. Consequently, the scarce yield data of all Australian eucalypts were pooled and a model for an 'average Australian eucalypt' developed.

Little has been published in the Philippines, or elsewhere, about timber yields from small-scale tropical hardwood plantations. Adlard (1992) and Niskanen (1998) reported that yields from small-scale plantations of *E. camaldulensis* are 41% and 25% lower than industrial yields in India and Thailand respectively. A 33% yield reduction factor has been applied to estimate small-scale yields from industrial yields for all traditional and Australian species except *A. mangium*, for which a separate small-scale yield model was developed. The stand yield modelling in this study faced a number of limitations, as discussed by Venn *et al.* (2001).

Table 1 presents predicted yields from the stand yield models developed by Venn *et al.* Separate estimates have been made for industrial and non-industrial plantings, with allowance for lower level of silvicultural intensity for the latter. Traditional species, *Acacia mangium* and eucalypts appear to have similar yields, the exception being the slower growth of mahogany.

Predicted Performance of Australian Species

In general, the growth figures used for Australian species in terms of mean annual increment (MAI) were approximately the same as those of traditional species. Unfortunately, there was a shortage of trials in which both traditional and Australian species have been grown, hence it was not possible to compare performance on the same site. The very rapid early growth of eucalypts suggests that the yield models for this species may have been conservative, some possible explanations being:

- International data, used because of lack of growth data for older stands in the Philippines, was in some cases drawn from degraded sites, and hence may have led to underestimation of the potential growth of older trees.
- There was a lack of information about the site characteristics of the Philippine

- plots upon which yields for Australian and traditional species are based.
- There is some evidence that the comparison being made is of traditional species on superior sites versus Australian species on average sites.
- There was a lack of information about the performance of Australian tree species on problem sites. It is generally considered that there are a range of sites where particular eucalypt species would perform adequately, but traditional species would fail, but no information has been obtained to support this view for the Philippines.
- Some of the Australian eucalypts have relatively high resistance to wildfire. This is not reflected in the growth models, which do not take account of probability of plantation damage from extreme events.

Table 1. Predicted yields of Australian and traditional species grown under industrial and farm silvicultural management regimes in the Philippines

Item	Species					
	<i>A. mangium</i>		Avg. Aust. eucalypt		<i>G. arborea</i>	
	Industry	Farm	Industry	Farm	Industry	Farm
Clearfall age (years)	13	9	15	10	8	8
Total yield (m ³ /ha)	322	76	280	75	161	107
Mean annual increment, MAI (m ³ /ha/year)	25	8	19	8	20	13
Sawlog yield (m ³ /ha)	210	9	100	18	49	33
Rural house construction pole yield (m ³ /ha)	91	51	152	44	96	64
Fuelwood yield (m ³ /ha)	21	16	28	13	16	10

Item	Species					
	<i>P. falcata</i>		<i>S. macrophylla</i>		<i>E. deglupta</i>	
	Industry	Farm	Industry	Farm	Industry	Farm
Clearfall age (years)	8	8	25	20	15	10
Total yield (m ³ /ha)	219	146	244	133	359	199
Mean annual increment, MAI (m ³ /ha/year)	27	18	10	7	24	20
Sawlog yield (m ³ /ha)	0	0	107	39	124	42
Rural house construction pole yield (m ³ /ha)	203	136	102	72	188	126
Fuelwood yield (m ³ /ha)	16	10	35	22	47	31

Note: The timber of *P. falcata* is unsuitable for sawlogs. The yield of logs greater than 20 cm small-end diameter under bark (sedub) has been included with rural house construction poles.

Much of the land likely to become available for tree planting in the Philippines in the future will be degraded public land, which is unsuitable for establishment of many traditional species (Williamson, 1993). Eucalypts, on the other hand, are '[o]ften . . . established on so-called 'wasteland' for rehabilitation of degraded sites where almost nothing else will grow' (Eldridge *et al.*, 1994, p.

3). Therefore, when ACIAR researchers established trials on the windswept site at Juanay, Cebu, with its shallow soils and high pH, which is typical of land available for forestry on the island, most traditional Philippine plantation species were not considered. Under these difficult growing conditions, the best provenances of *E. camaldulensis* and *E. tereticornis* attained heights of 10 m and 12 m, and diameter at breast height (DBH) of 10 cm and 13 cm respectively, five years after planting, approximately equivalent to an MAI of between 6 m³/ha/yr and 10 m³/ha/yr). One of the hardier traditional species, *Pinus indicus*, completely failed on this site. With the ability to 'capture' a site within a year of planting, *A. mangium* is one of the better species choices for reforestation on *Imperata* sites.

FINANCIAL MODELING OF TRADITIONAL AND AUSTRALIAN SPECIES IN INDUSTRIAL AND FARM FORESTRY

There is little consensus on which of smallholder and industrial management regimes are more profitable. Niskanen (1998) found small-scale plantations of *E. camaldulensis* more profitable than industrial plantations of this species in Thailand, which he attributed to savings in variable costs (mostly labour). On the other hand, Niskanen and Saastamoinen (1996) concluded that industrial plantations of *S. macrophylla* were more profitable than plantations of the same species on smallholdings in the Philippines. This variability in financial superiority of management regimes is the result of complex interactions between many factors, including yield, cost and supply of labour, and level of influence or control over markets, prices and transport. According to Niskanen and Saastamoinen (1996), lower growth and yield of timber trees in community-based reforestation was the major factor responsible for the difference between returns from industrial and farm forestry in the Philippines and Thailand.

Financial models were developed for the six species, based on the financial model developed for Australian tropical timbers by researchers in the Rainforest Cooperative Research Centre, and stand development and management budgets developed at BFI in Malaybalay. Table 2 summarises estimates of financial performance for a range of species.

With the exception of *A. mangium*, financial performance of the Australian species appeared to be poorer than that of traditional species, except for mahogany (*S. macrophylla*) which has a long rotation. The higher predicted returns of farm forestry relative to industrial forestry in some cases is a consequence of the lower expenditure on inputs in the former. Again, it is suspected that the comparison between traditional and Australian species may be conservative with respect to eucalypts, bearing in mind the reservations about yield predictions, site tolerance and particular products for which they are suited (including lumber, poles, woodchip and fuelwood).

UNDERSTANDING THE ESTABLISHMENT AND OPERATION OF CBFM

Informal survey methods were used by Nixon *et al.* (2000) to obtain information about Community Based Forest Management. This included visiting a small number of CBFM sites and having discussions with a number of DENR officers and community members, chosen by convenience sampling rather than random sampling. Some of the difficulties in establishing community forestry were noted. It is apparent that the more successful CBFM sites have had considerable outside funding and other assistance. Availability of seedlings appears to be an important factor in species selection (Herbohn *et al.*, 2000), although some CBFM groups have successfully developed seedling nurseries, and some had the capacity to produce eucalypt seedlings. Nixon also examined accounting and reporting systems in CBFM, the quality of which may have an important role to play in the success of these programs.

Table 2. Predicted NPV, LEV and IRR of industrial and small-scale plantations of Australian and traditional species in the Philippines

Financial criterion	Discount rate (%)	Species					
		<i>A. mangium</i>		Average Australian eucalypt		<i>G. arborea</i>	
		Industry	Farm	Industry	Farm	Industry	Farm
NPV (pesos/ha)	12	70,800	5,800	24,300	8,000	14,000	42,700
	15	40,600	2,300	5,300	3,700	7,700	32,600
	18	19,900	-300	-7,000	400	2,600	24,600
LEV (pesos/ha)	12	91,800	9,000	29,700	11,900	23,500	71,700
	15	48,500	3,200	6,000	4,900	11,500	48,400
	18	22,500	-400	-7,700	500	3,500	33,500
IRR (%)	na	22.5	17.6	16.1	18.5	19.8	38.0

Financial criterion	Discount rate (%)	Species					
		<i>P. falcataria</i>		<i>S. macrophylla</i>		<i>E. deglupta</i>	
		Industry	Farm	Industry	Farm	Industry	Farm
NPV (pesos/ha)	12	41,300	65,900	9,700	18,400	72,100	70,000
	15	28,000	51,400	-7,000	6,100	42,600	51,300
	18	17,600	39,900	-15,800	-879	22,500	37,200
LEV (pesos/ha)	12	69,400	110,600	10,400	20,500	88,200	103,300
	15	41,700	76,300	-7,200	6,500	48,600	68,100
	18	23,900	54,400	-16,000	-900	24,500	46,000
IRR (%)		45.8	44.6	13.5	17.5	23.6	37.8

IDENTIFICATION OF THE POTENTIAL IMPEDIMENTS TO NON-INDUSTRIAL FORESTRY

While large areas of government-controlled upland are available for expansion of forestry, a surprisingly large number of potential impediments in relation to industrial and small-scale forestry have been noted. These are summarized in Table 3, drawn from Venn *et al.* (2000) which documents references to these impediments. Important among these for farm forestry are property rights issues (especially concerning land tenure) uncertainty about returns, the long payback period and shortage of finance and of labour at some critical periods of the year. For industrial forestry, uncertain land tenure - in relation to ancestral domain claims and illegal settlers - and risk of wildfire and windstorm are important impediments. Insurgency and labour disputes can also arise in some areas. Considerable organisation and finance is required to establish new community forestry projects.

Table 3: Impediments to farm and community forestry

Profitability concerns	Lack of information about profitability Difficulty and cost of tree protection Expectation of low returns Long payback period and high private discount rate
Resource inputs	Land and climate constraints Lack of labour Unavailability of seedlings Lack of knowledge and extension information Lack of access to finance
Market constraints	Lack of timber markets Lack of market recognition of Australian species Timber properties of Australian species Market distortions of crop subsidies
Property rights constraints	Landlord-tenant relationships, uncertain timber rights Insecure property rights to land and trees Impediments to log transport Other government regulations and disincentives
Attitudinal impediments	Preference for multi-purpose trees Accessibility of nearby natural forest Negative attitudes to Australian species Negative extension information

Some particular impediments were observed in relation to Australian tree species. Negative attitudes to Australian eucalypts are apparent in other tropical countries (Harrison and Roy, 2000), sometimes associated with social rather than technical factors (e.g. industrial plantations on formerly common property land),

and anecdotal evidence suggests some negative attitudes to exotics, including Australian eucalypts and Gmelina, in the Philippines. Unavailability or higher price of seedlings for Australian species was frequently encountered as a reason for not adopting these species in small-scale forestry.

PROGRESS IN ADOPTION OF AUSTRALIAN TREE SPECIES IN THE PHILIPPINES

In general, the rate of adoption of Australian species in farm forestry appears slow. Some plantings of *Acacia mangium* were noted. Widespread growing of Gmelina, often in very small stands such as fence-line plantings, is apparent. Discussions with timber merchants indicated that Australian eucalypts and acacias attract lower timber prices than traditional species. In industrial forestry, considerable use is being made of eucalypts (especially *E. camaldulensis*). Eucalypts and acacias have been adopted to some extent in community forestry. It would appear that some of the Australian species offer promise in agroforestry systems, such as alley cropping. *E. camaldulensis* appears promising in this regard, and incidentally is a useful species where wet soils must be tolerated. *Acacia mangium* is sometimes grown as nurse species with Abaca. Casuarinas appear well suited for problem areas such as sandy and saline soils and windy areas, hence having high potential for environmental plantings.

The use of Australian tree species will probably increase progressively over time. These species have some potential for lumber, but could introduce a need for additional timber curing facilities and skills. The high suitability of eucalypts and acacias for hardwood pulp, for paper, rayon and other products, and the suitability of these species for fuelwood and poles, should also lead to assured markets.

FURTHER RESEARCH NEEDS IN NON-INDUSTRIAL FORESTRY IN THE PHILIPPINES

A number of potential areas for further socio-economic research into forestry – particularly non-industrial forestry – in the Philippines have been identified as a result of this study, reported in Harrison and Herbohn (2000b, pp. 188-189). These research areas do not need to be confined to – or even involve – adoption of Australian tree species. The findings of this project played an important part in the planning of the current ACIAR Smallholder Forestry project.

One of the important findings was that lack of seedlings appears to constrain tree planting. Another was the need to strengthen landholder property rights in forestry, as well as taking measures to overcome other impediments. Some negative attitudes to Australian tree species were noted although these are subsidiary to other more general constraints to forestry development. Studies to identify landholder attitudes and favoured assistance measures with respect to forestry were suggested. The scarcity of data for yield modeling of Australian

species suggests that further measurements should be made at trial sites established under ACIAR project SST 96/110. However, more recent inspection of the trial at Matalom suggests that further diameter and height measurements would not be a reliable guide to growth potential, since with lack of thinning this trial has 'locked up', with considerable suppression of growth in some trees.

With regard to land suitability, the report stated 'While there is a general view that a large area of land is available for forestry in the Philippine uplands, this view does not appear to have been well tested. A land suitability study could be undertaken in a particular island – possibly Leyte – to determine what area is suitable for growing which species. This might involve a geographical information systems (GIS) approach, using layers for soil type, current vegetation and conservation value, areas under control of government and not subject to indigenous domain claims, accessibility of markets, and so on'.

It was noted that community forestry programs in the Philippines 'offer considerable promise for sustainable landuse, empowerment of villagers, training in silvicultural and furniture production skills, and production of timber and value-added products'. However, the note of caution was sounded that 'the circumstances under which new community forestry programs become established and succeed is not entirely clear, and it would appear that those which have been most successful have benefited from considerable external assistance. Research into factors leading to success of these programs, and perhaps support for particular community programs, is an area in which Australian agencies could provide meaningful assistance . . . '.

Attention was drawn to the need to examine sources of finance for non-industrial forestry, with the comment that '[a]nother area where information is lacking is sources of finance to support farm and community forestry. Sources could involve for example family and local money lenders, rural banks, special government funding, NGOs and other agencies (as donations or equity sharing) and foreign aid'. There is considerable information about rural credit in developing countries, although not much that specifically concerns such a long-term investment as forestry.

A section titled '*Redevelopment of a timber industry following extensive land clearing*' suggested that '[a] more generic study of timber industry development could be carried out, which might subsume some of the above research areas. The rationale would be that there is a dire need for reforestation, and research has shown that timber trees (including the Australian species) can grow spectacularly, but the level of plantings remains low, and there is continued depletion of coconut plantations. Such a study could consider the wider implications of reforestation, in terms of local employment and other benefits, and watershed protection'. Research into timber marketing, and carbon credits and other supplementary payments to grower were also suggested.

CONCLUDING COMMENTS

The previous ACIAR socio-economic forestry study provided estimates of stand yield and financial performance from a variety of traditional and Australian tree species, explored the role of community based forest management, and identified a number of impediments to expansion of non-industrial forestry. Various areas where further research appears warranted were identified, including redevelopment of a timber industry following extensive land clearing, with a focus on Leyte. That study, which was probably more important for raising questions than providing answers, established the basis for current project ASEM/2000/088.

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