

Attitudes of landholders to farm forestry in tropical eastern Australia

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Summary

The area planted to farm forestry in the Wet Tropics region of north Queensland is small, despite favourable climatic conditions and the availability of many native species that grow rapidly and produce high-quality timber. This paper reports the results of a survey which explored landholder attitudes to farm forestry, including the reasons why landholders in the region plant trees, perceived obstacles to greater participation in farm forestry activities, and attitudes to various incentives designed to encourage planting. Landholders place much greater importance on environmental and personal satisfaction as reasons for planting trees than on commercial gain. The main impediments to planting more trees for commercial purposes were associated with economic and structural impediments, and satisfaction with the current land use. Economic incentives such as harvest security, tax deductions, local government rate remissions, planting grants, higher market prices and subsidised seedlings were considered to be more important than incentives associated with provision of information and joint venture arrangements. The results of the survey are discussed in the context of possible policy prescriptions that can be made at local, state and federal government levels to facilitate greater tree planting in the region.

Keywords: farmers' attitudes; farm forestry; agroforestry; incentives; disincentives; rural environment; non-market benefits

Introduction

The use of north Queensland rainforests for timber production became a controversial environmental issue from the early 1960s, with calls for conservation of particular areas becoming ever more frequent in the 1970s (Winter 1991; Carron 1993; Adam 1994). After heated public debate over the logging of tropical rainforests in the early 1980s, the Commonwealth Government unilaterally nominated these forests for World Heritage Listing in December 1987. This was despite vehement opposition from the Queensland State Government and local government authorities. World Heritage Listing in 1988 resulted in a complete cessation of logging activities in all public rainforest areas in the Wet Tropics, with a dramatic decrease in the availability of rainforest cabinet timbers from Crown land. Rainforest cabinet timbers are now obtained almost exclusively from those freehold rainforest areas that were not included within the listed area.

In recent years a number of incentive and assistance schemes have been available to landholders in north Queensland to help them establish small-scale forest plots. These schemes were designed to re-establish the timber industry in the region that was lost through World Heritage Listing. The two largest schemes were the Community Rainforest Reforestation Program (CRRP) and the Plantation Joint Venture Scheme (PJVS). The Queensland Department of Natural Resources (now Department of Natural Resources and Mines) administered the former, while the Queensland Department of Primary Industries — Forestry (DPI-F) managed the latter. Both schemes offered considerable benefits to participating landholders. The CRRP involved the establishment of plantations of mixed rainforest species on private land. Plantation establishment was undertaken by DPI-F staff even though administered by QDNR, and was heavily subsidised. Landholders were required only to prepare land prior to planting and to pay a levy that was considerably less than the actual planting costs incurred by the DPI-F. This scheme commenced in 1992/93 and ran in various forms until 1999. The PJVS, which commenced in 1996/97 and ran for two planting years in north Queensland, involved landholders and the DPI-F entering into a business-arrangement involving the sharing of costs and revenues.

Apart from the production of timber, both the CRRP and PJVS plantings provided environmental benefits. These included carbon sequestration, stabilisation and improvement of soil, and improvements in water quality. Furthermore, use of native tree species under both schemes has enhanced faunal habitat and helped restore local biodiversity previously reduced by land clearing for agriculture. Some of the areas planted serve as wildlife corridors between remnant patches of vegetation.

When this study was conducted, the agricultural sector in north Queensland had a diverse base of crops, dairying and grazing. Furthermore, the region is aesthetically pleasing; there is demand for land for lifestyle blocks for people in urban areas. There are also large areas of degraded farmland which have low profitability for cropping and grazing.

Given the large areas of degraded farmland requiring restoration in the Wet Tropics region, and the high cost of restoration plantings (as much as \$30 000 ha⁻¹), the use of large-scale environmental plantings is not financially feasible. Farm forestry using native species is the more cost-effective and is probably the only practical means of ameliorating environmental damage caused by

inappropriate clearing and farming practices. Farm forestry also has the potential to provide major economic benefits to farmers and the wider community. However, the existing area and current planting rate of farm forestry in the Wet Tropic region are small. This is despite favourable climatic conditions and availability of many fast-growing native species capable of producing high-quality timber.

There has been a lack of information about the attitudes of north Queensland landholders with respect to a number of issues relating to participation in forestry. The current study addresses this knowledge gap. First, previous studies of landholder attitudes in sub-tropical Australia were reviewed and used as a guide to identify the key issues and to guide the design of a survey of north Queensland landholders which explored the reasons why landholders plant trees, perceived obstacles to farm forestry, and attitudes to tree-planting programs including the CRRP and PJVS. The results of the survey are discussed and then reviewed in the context of possible policy prescriptions that can be made at local, state and federal government levels to facilitate tree planting in the region. Many of the problems faced by local landholders are shared by landholders in other parts of Australia and throughout the world. This survey can thus serve as a case study, providing information on a number of issues concerning small-scale forestry policy that are of general relevance to the development of farm forestry programs.

Previous studies of landholders' attitudes to farm forestry in tropical and sub-tropical Australia

A number of surveys of landholder attitudes have been conducted in the Obi Obi Valley in south-eastern Queensland (Harrison *et al.* 1994; Harrison and Sharma 1995), in north Queensland (Broome 1993; Eono and Harrison 1996) and in northern New South Wales (Emtage 1995). In addition, Specht and Emtage (1998) undertook a study of landholder attitudes in northern NSW, and Eono and Harrison (2002) surveyed attitudes of local government to tree planting.

These surveys revealed that environmental improvements are perceived by landholders to be the most important benefits of tree planting. These benefits include protection and restoration of land, wildlife conservation, catchment protection, farm beautification, provision of shade and windbreaks, and personal satisfaction from growing trees. While economic motives and diversification of farm business are ranked much lower, the number of trees planted for commercial timber production usually far outweighs those planted for environmental reasons.

There is a remarkably consistent pattern in these surveys, suggesting that similar motivations for tree planting are likely to be held by landholders in most, if not all, coastal regions in north-eastern Australia. This in turn suggests that tree-planting schemes incorporating environmental values would be more attractive to landholders than those designed solely or mainly to produce timber. This conclusion is supported by the resistance of some landholders in north Queensland to the planting of exotic pines because of their negative perceptions about the effects these have on the environment and on farm aesthetics (G. Sexton 1999, Co-ordinator, Community Rainforest Reforestation Program, Atherton, *pers. comm.*).

Byron and Boutland (1987) reviewed constraints to farm forestry and the choice of incentives to encourage farm forestry. They argued that the response to incentives, and the social and economic impact of those incentives, depend on the particular objectives of landholders and the resources available to them. Critical impediments to small-scale forestry were seen to include small farm size, higher priority accorded to agriculture, varying and sometimes limited forestry expertise, the long wait for returns, uncertainty about market prices, unfavourable taxation provisions for forestry investments, and a failure to develop systems or models of forestry that are compatible with landholder objectives.

The concentration on 'core' or industrial forestry practices by those providing incentives to small growers is probably the most important constraint to the success of many incentive schemes. Byron and Boutland (1987) identified a failure to appreciate landholders' objectives and the way forestry can complement their other farm activities as critical impediments to the development of incentive programs attractive to landholders (Byron and Boutland 1987).

Given the long payback period for timber production, it is predictable that landholders will place greater emphasis on the benefits of tree planting that they gain in the shorter term (i.e. those falling into the environmental, shelter and personal satisfaction scales). It is not surprising that landholders would be unwilling or reluctant to participate in forestry projects that do not place sufficient emphasis on these types of benefits in combination with economic benefits.

Further constraints to farm forestry are those associated with a perceived instability in land management policies, laws and regulations (Emtage *et al.* 2001). As they relate to native forestry and plantations, these have been in a state of constant change over the past 20 y. Emtage (1995) and Specht and Emtage (1998) identified 'sovereign risk' — in particular the potential prohibition of harvesting of trees planted on private land — as a serious impediment to farm forestry in northern New South Wales. Landholders are aware that public forests have been the setting of many conflicts (Gibbs 1992; Dargavel *et al.* 1995), including the banning of rainforest logging in New South Wales in 1982, the declaration of the Wet Tropics World Heritage Area in Queensland in 1988 and the proposed rescinding of the Regional Forest Agreement in Tasmania. Consequently many landholders are distrustful of land management policies initiated by governments, and believe there are likely to be changes in regulations in the future that will disadvantage them.

In summary, it appears from previous studies that most landholders in coastal areas of tropical and sub-tropical eastern Australia view trees as an important component of the landscape for conservation and aesthetic reasons, but are not convinced of their commercial viability. In many cases the landholders think that the legitimate place for trees is on areas unsuitable for cropping or grazing because they are steep or have poor soil. In this way landholders view farm forestry as complementary to their other activities. However, in north-eastern New South Wales and south-eastern Queensland few holders with a high degree of income-dependence on their land perceive commercial tree growing as a legitimate farming activity, or as a economically viable alternative to agriculture.

Survey methods

A survey of landholders was undertaken in the Wet Tropics of north Queensland in 1998, in the Atherton (A), Eacham (E) and Johnstone (J) Shires. Most of the Johnstone Shire is bordered on the eastern side by the Coral Sea and on the western side by the foothills of the Great Dividing Range. The Johnstone Shire has a very high annual rainfall; sugar cane and bananas are the main crops grown. The Atherton and Eacham Shires are on the Atherton Tablelands, an elevated and cooler area of lower rainfall (though adequate for rainforest species), where dairying has been a pioneering activity.

The survey canvassed landholder attitudes towards a number of issues related to tree-planting and farm forestry. These included the reasons that they considered tree planting important, the perceived obstacles to tree planting, attitudes towards various types of farm forestry incentive schemes and their ratings of regional benefits of forestry. Landholders were presented with a series of statements relating to each of these four areas and asked to rate the importance of each on a Likert scale of 1 to 5 (from unimportant through to highly important). Respondents were asked to indicate the single most important impediment to planting trees, and the single most important reason for doing so. They were also asked a number of questions relating to financial and physical characteristics of their farms and their personal characteristics including age and income.

Each of the shires provided access to their ratepayer database, providing a sampling frame and allowing ratepayers to be categorised according to the type of property held. The survey was concerned only with ascertaining the attitudes of landholders who had sufficient land to plant timber trees on a commercial scale. Hence, landholders in classifications not directly related to rural landholdings (including commercial, rural residential and urban categories), or with less than 10 ha, were excluded. A total of 500 landholders were selected by random sampling, proportionally stratified according to number of target landholders in each local government (shire) area (LGA). A questionnaire and covering letter were mailed to each selected landholder. After three weeks, follow-up letters were sent to those who had not responded. The overall response rate was about 45%, with little difference between shires, and was considered high given the postal survey method and length of the questionnaire (10 pages).

Data analysis

Analysis of variance (ANOVA) was used to test for differences in responses of landholders. Where significant differences ($P > 0.05$) occurred, the Bonferoni test for difference between means was used to compare means. ANOVA and post-hoc tests were used to identify significant differences in responses to statements between shires, and between statements within each of the four groups of statements (i.e. reasons landholders considered important for tree planting, perceived obstacles to tree planting, attitudes towards various types of farm forestry incentive schemes, and ratings of regional benefits of forestry).

R factor analysis (Hair *et al.* 1998) was used to identify the latent dimensions in each set of questions. That is, it was used to identify which responses to questions within each group were highly

correlated, and these questions were then combined to form a 'scale'. Principal Components Analysis was used to obtain factor solutions and orthogonal factor rotation was used to assist in the interpretation of the factors identified. The reliability of scales was assessed by calculating Cronbach's alpha statistic, with the generally agreed upon lower limit being 0.70 (Hair *et al.* 1998). ANOVA, multiple comparison of means and factor analysis were performed using SPSS Version 11.

Findings of the survey

Characteristics of the respondents

Distinct differences were detected in ownership status and farm sizes between shires. In the Eacham Shire a significantly higher proportion ($P > 0.05$) of properties are operated on the basis of a sole trader compared to the other shires. The average farm size in the Johnstone Shire was 112 ha compared with 82 ha for both the Eacham and Atherton Shires, which probably reflects the greater numbers of hobby farms in the Tableland shires.

In the Johnstone Shire, nearly 60% of farm income was derived from sugar cane production and a further 20% from annual crops (mainly bananas). The main on-farm sources of income for the Atherton and Eacham Shires are dairy and beef cattle. Annual crops (including maize) also provide about 14% of farm income in the Atherton Shire. The three shires differ significantly ($P > 0.05$) in the amount of income derived from non-farm sources. In the Johnstone Shire only 13% of income is from non-farm sources compared with 44% and 58% in the Atherton and Eacham Shires respectively. Due to more suitable climate and the location of markets and processing facilities, the highly profitable activities of sugar cane and banana production are concentrated in the coastal Johnstone Shire. Therefore, the high proportion of income from farming activities in this shire, as well as the larger farm size, is not surprising. The agricultural activities available to landholders in the Atherton and Eacham Shires are restricted in nature and size, due to climatic and site conditions.

Landholders' reasons for tree planting

When asked to rate the relative importance of a number of reasons for tree planting, landholders attached far greater importance to environmental and land protection benefits of trees than to commercial benefits (Table 1). Factor analysis revealed that landholders reasons for tree planting fall into three scales (Table 2). The first scale was labelled 'commercial' because of the grouping of questions with a strong focus on planting of trees for overtly commercial purposes such as to produce income or increase the capital value of the farm. The second scale was labelled 'personal satisfaction' because it groups questions with a strong focus on personal and non-financial benefits of tree planting such as a personal interest in trees, farm aesthetics, creating a fauna habitat and creating a legacy for their children. Benefits within this scale accrue primarily to the individual landholder. The third scale was labelled 'environmental' because of the strong focus on overt environmental benefits of tree planting in respect to catchment land and water protection. While landholders benefit to some extent, most of these environmental benefits accrue to the wider community. Many of the reasons for tree planting grouped under the 'personal satisfaction' scale also have an environmental

Table 1. Importance placed upon various reasons for planting trees by landholders in far north Queensland

Reason for planting	n	Mean rating*	Fraction (%) of times rated at	
			'1'	'5'
To protect and restore land	172	4.0 a	5	42
To protect the local water catchment	170	4.0 a	7	42
To attract wildlife and birds	169	3.6 b	8	31
Personal interest in trees	170	3.4 bc	12	26
To improve the look of the property	170	3.3 c	12	26
To increase the value of the farm	166	3.2 c	18	19
To create windbreaks	168	3.1 c	23	25
Legacy for children or grandchildren	166	3.1 c	24	26
To make money in the future	167	2.7	34	15
To diversify farm business	163	2.4 d	45	13
Superannuation or retirement fund	164	2.2 d	55	13
To provide fence posts	161	1.5	72	3

*Rating scale was 1 = not important, 5 = very important.

Means with the same letter are not significantly different from each other ($P < 0.05$). No significant differences were found between shires.

Table 2. Factor matrix of the reasons for planting trees by landholders in far north Queensland

Scale name	Scale mean	Reasons for planting trees	Factor		
			1	2	3
Commercial (0.815)	2.36	To make money	0.886	0.072	-0.060
		Diversify farm business	0.854	0.114	0.060
		Superannuation	0.759	0.285	-0.203
		Increase farm value	0.560	0.481	0.079
		Fence posts	0.547	-0.153	0.121
Personal satisfaction (0.731)	3.30	Improve look of property	-0.002	0.849	0.103
		Personal interest in trees	0.027	0.668	0.404
		Attract wildlife and birds	-0.108	0.627	0.535
		Legacy for children/grandchildren	0.421	0.537	0.000
		Create windbreaks	0.159	0.506	0.206
Conservation (0.866)	3.96	Protect water catchment	0.009	0.233	0.895
		Protect and restore land	0.036	0.191	0.894

The correlation of each reason for planting trees to each of three factors is shown. The reasons with the highest correlation to each factor are grouped and given a scale name which 'best' describes the questions within it. Cronbach's alpha is shown in parentheses with the scale name. Scale means are a composite of ratings for reasons for planting trees that make up the scale. All scale means are significantly different ($P < 0.05$).

component. However, the extent to which benefits accrue to the individual landholder is the main distinction between the 'personal satisfaction' and 'environmental' scales. The Cronbach alphas for all scales were high, ranging from 0.73 to 0.87.

Four of the five questions grouped under the commercial scale were rated as the four least important reasons to plant trees. The relative importance attached to the various reasons suggests that landholders are planting trees for either conservation or personal satisfaction reasons, with little importance attached to tree planting for commercial purposes. This is further reinforced by the scale means for 'conservation' (3.98) and 'personal interest' (3.30) being significantly ($P < 0.05$) higher than the scale mean for 'commercial reasons' (2.36) (Table 2).

Although there were few significant differences in the ratings of reasons for tree planting between the three shires, landholders in the Eacham and Atherton Shires did attach far greater importance

to tree planting for windbreaks than did Johnstone Shire landholders. This probably reflects different land-use patterns and environmental conditions between the shires; windbreaks are less necessary on the hotter coastal lands.

Impediments to tree planting

Landholders were asked to rate the importance of a series of possible impediments to planting of trees for commercial purposes (cf. planting for environmental and personal satisfaction). Responses are summarised in Table 3. The five most highly-ranked impediments are a mistrust of government following World Heritage Listing, a long wait for returns, fears that regulations may prevent future harvest, a lack of capital, and unwillingness to remove land from existing profitable use. Landholders placed little emphasis on lack of expert advice, risk of fire damage, land being unsuitable and failure of trees to establish well on their property.

Table 3. Landholder perceptions of obstacles to tree planting commercially on private land in far north Queensland

Impediment to greater tree-planting	Rating* by shire			Significance of differences	Mean rating, all shires	n	No. times mentioned as no.1 impediment	Fraction of times rated '1' (%)
	J	A	E					
Mistrust of government especially after World Heritage Listing	3.8	4.2	3.7	ns	3.8	166	52	14
Long wait for returns	3.8	3.5	3.2	ns	3.5 a	171	39	16
Fear that regulations may be introduced that prevent future harvest	3.6	3.3	3.4	ns	3.5 a	165	39	19
Finance required, lack of capital	3.6	3.1	3.3	ns	3.4 a	169	35	17
Do not want to remove land from existing profitable use	3.9	3.4	2.6	J > E	3.4 a	174	37	21
Low profitability	3.6	3.4	2.9	ns	3.3 a	159	27	15
Flexibility for future land use reduced	3.8	3.3	2.6	J > E	3.3 a	165	30	16
Labour required for planting and maintenance	3.1	3.3	3.4	ns	3.2 ab	165	30	21
Uncertainty about future timber prices	3.4	2.8	3.1	ns	3.2 ab	162	30	24
Lack of information about likely financial returns	3.5	2.9	2.7	J > E	3.1 ab	163	26	24
Low prices being received for timber currently being harvested	3.1	2.9	3.0	ns	3.0 ab	157	25	27
Risk of storm/cyclone damage	3.7	2.1	2.2	J > E, A	2.9 ab	165	22	24
Lack of information about appropriate species and likely markets	2.9	2.5	2.5	ns	2.7 b	159	18	36
Lack necessary machinery	2.1	2.4	2.4	ns	2.3 c	162	13	48
Risk of pest or disease damage	2.3	2.3	2.0	ns	2.2 c	163	7	38
Lack of expert advice on how to grow trees	2.2	1.7	1.7	ns	1.9 c	157	8	57
Risk of fire damage	2.1	2.1	1.5	ns	1.9 c	164	7	55
Land is unsuitable	2.0	1.7	1.8	ns	1.9 c	160	8	61
Trees do not establish well here	1.5	1.4	1.2	ns	1.4	162	1	78

*Ratings are on a scale of 1 (not an obstacle) to 5 (a very significant obstacle).

Means with a common letter are not significantly different from each other ($P > 0.05$).

Factor analysis of the impediment ratings revealed six distinct groups of impediments (or scales) for tree planting, as reported in Table 4. The first scale was labelled 'economic and structural impediments' because it included factors that are associated with either the uncertainty of future cash flows (future prices, long wait for returns, low timber prices, a lack of information about returns and uncertainty about profitability) or concerns that future government intervention will restrict plantation management and harvest. Factors that fall within the economic and structural impediments scale tend to dominate the ratings by landholders — the three highest-rated impediments fall within this classification. Labels attached to the other five scales relate closely to the questions for which responses fall into the respective scales.

Incentives for tree planting

Importance ratings were obtained for a number of incentives to encourage planting trees for timber production, as reported in Table 5. These incentives included secure harvest rights, tax deductibility of seedlings, rate remission by local government, tree-planting grants to farmers, higher market prices for timber and availability of subsidised seedlings. Factor analysis identified three scales (Table 6). The first group of incentives was labelled

'economic incentives' because all are associated with some form of financial assistance to landholders in the form of direct payments, savings on outgoings or guarantees to harvest timber. A second group of incentives were associated with the provision of information and include provision of information about silviculture, species and sites. Higher market prices for timber could also convey information to landholders in the sense that current prices provide a signal that growing timber trees is likely to be a profitable activity. The scale made up of these questions was labelled 'information incentives'. A third group of incentives was labelled as 'joint ventures', because the incentives involve various cost- and equity-sharing arrangements. Incentives classified as 'economic incentives' by factor analysis dominated the landholder rating of incentives. The joint venture incentives were found to be the least favoured by respondents.

Regional benefits of tree planting

Landholders in all three shires considered soil and water benefits to be the most important regional benefits of forestry (Table 7). Creation of employment and regional economic stability were rated the lowest. Factor analysis indicated that regional benefits associated with planting trees can be categorised into two main

Table 4. Factor matrix of landholders' ratings of obstacles to planting trees on private land in far north Queensland

Scale name	Scale mean	Obstacle	Factor					
			1	2	3	4	5	6
Economic problems (0.873)	3.33*	Uncertainty about future timber prices	0.80	0.14	0.22	0.02	0.10	0.08
		Fear that regulations will prevent future harvest	0.77	0.01	0.09	0.05	0.17	0.02
		Mistrust government especially after WHL	0.73	0.02	0.11	0.12	0.12	0.04
		Lack of information about likely returns	0.70	0.15	0.47	0.04	0.14	0.01
		Low current timber prices	0.70	0.10	0.36	0.00	0.09	0.14
		Uncertainty about future timber prices	0.63	0.36	0.21	0.29	0.02	0.05
		Long wait for returns	0.59	0.44	0.17	0.26	0.04	0.08
Satisfied/flexibility (0.816)	3.32*	Flexibility for future land use reduced	0.15	0.88	0.02	0.05	0.15	0.00
		Do not want to remove land from existing profitable use	0.08	0.82	0.01	0.11	0.12	0.06
Lack advice (0.636)	2.28	Lack of expert advice on how to grow trees	0.03	0.01	0.79	0.07	0.07	0.31
		Lack of information on species and markets	0.27	0.00	0.74	0.15	0.17	0.05
Lack labour, finance, equipment (0.664)	2.94	Labour required	0.02	0.06	0.18	0.79	0.05	0.11
		Finance required, lack of capital	0.24	0.32	0.02	0.70	0.01	0.08
		Lack of necessary machinery	0.02	0.12	0.00	0.64	0.33	0.31
Fire/pest risks (0.718)	2.06	Fire risk	0.08	0.17	0.05	0.19	0.81	0.09
		Pest risks	0.26	0.08	0.17	0.09	0.77	0.09
Poor land (0.660)	1.60	Trees do not establish well, unsuitable	0.03	0.02	0.14	0.08	0.10	0.87
		Land unsuitable	0.15	0.11	0.06	0.02	0.08	0.83

The correlation of each question to each of six factors is shown. The obstacles with the highest correlation to each factor are grouped and given a scale name which 'best' describes the obstacles within it. Cronbach's alpha is given in parentheses with the scale name. Scale means are a composite of ratings for obstacles which make up the scale. All scale means are significantly different ($P < 0.05$) except for those marked with an asterisk.

Table 5. Landholders' ratings of various forms of potential incentives to plant trees on private land in far north Queensland

Potential incentive	n	Mean rating*	Fraction (%) of times rated	
			'1'	'5'
Secure harvest rights	173	4.1 a	10	57
Tax deductibility of seedlings	172	3.9 a	9	48
Rate remission by local government	173	3.9 a	11	45
Tree planting grants paid to farmers	171	3.8 a	13	47
Higher market price for timber	172	3.8 a	12	45
Subsidised seedlings	172	3.8 a	11	40
Subsidised government tree planting schemes with no profit sharing	169	3.4 b	24	35
Ongoing advice to maximise quality and yield	172	3.3 bc	17	26
More support for Landcare groups	168	3.1 c	21	23
Greater knowledge of suitable species and growth rates	172	3.0 c	21	22
Joint venture — annuity until harvest	170	3.0	32	28
Joint venture — annuity for 5 y	170	2.5	40	14
Joint venture — profit sharing	169	2.2	50	12

*Incentives were rated on a scale of 1 (very little incentive) to 5 (great incentive). No significant differences were found between shires. Means with a common letter are not significantly different from each other.

groups — conservation and economic benefits (Table 8). Conservation benefits were found to be significantly more important than economic benefits ($P < 0.05$).

Discussion

The attitudes of landholders in north Queensland to impediments to tree planting for commercial timber production observed in

the north Queensland survey are similar to attitudes of landholders in the Obi Obi Valley. Obi Obi landholders rated the long payback period, uncertain harvest rights, shortage of capital and labour, and low profitability as the four most important impediments (Harrison *et al.* 1994; Harrison and Sharma 1995). These four impediments are also rated amongst the top six impediments by landholders in the north Queensland study.

Table 6. Factor matrix of the ratings given to various potential incentives for planting trees on private lands in far north Queensland

Scale name	Scale mean	Incentive	Factor		
			1	2	3
Economic incentives (0.869)	3.70	Rate remission	0.795	0.293	0.100
		Planting grant	0.767	0.183	0.263
		Subsidised seedlings	0.731	0.378	0.089
		Tax deduction for seedlings	0.728	0.321	0.042
		Subsidised government tree planting schemes	0.706	-0.001	0.201
		Secure harvest rights	0.623	0.390	0.112
		More support for Landcare	0.573	0.131	0.175
Information incentives (0.818)	3.35	Ongoing advice to maximise quality and yield	0.260	0.884	0.063
		Greater knowledge of species and growth	0.205	0.869	0.063
		Higher market price for timber	0.322	0.651	0.146
Joint incentives (0.857)	2.51	Joint venture — annuity for 5 y	0.198	0.088	0.925
		Joint venture — cost/profit sharing	0.187	-0.104	0.830
		Joint venture — annuity until harvest	0.149	0.329	0.801

The correlation of each incentive to each of the three factors is shown. The incentives with the highest correlation to each factor are grouped and given a scale name which 'best' describes the nature of incentives within it. Cronbach's alpha is given in parentheses under the scale name. Scale means are a composite of ratings for incentives which make up the scale. All scale means are significantly different ($P < 0.05$).

Table 7. Landholder ratings of regional benefits of forestry on private lands in far north Queensland

Benefit	Mean rating*	n	Fraction (%) of times rated	
			'1'	'5'
Water protection	4.2	176	3	52
Soil protection	4.2	179	2	54
Soil fertility	3.9	176	5	38
Stability of flora systems	3.8	174	5	38
Stability of fauna systems	3.8	173	5	37
Carbon sequestration	3.7	174	11	40
Creation of employment	3.6	176	8	30
Economic stability	3.5	175	8	27

*Incentives were rated on a scale of 1 (very little incentive) to 5 (great incentive). No significant differences were found between shires.

Table 8. Factor matrix of landholder ratings of regional benefits of forestry on private land in far north Queensland

Scale name	Scale mean	Regional benefit	Factor	
			1	2
Conservation benefit (0.915)	3.94	Flora stability	0.902	0.138
		Fauna stability	0.901	0.162
		Soil protection	0.900	0.026
		Soil fertility	0.783	0.316
		Water protection	0.775	0.029
		Carbon sequestration	0.708	0.271
		Economic benefit (0.911)	3.52	Economic stability
Creation of employment	0.121	0.942		

The correlation of each regional benefit to each of two factors is shown. The regional benefits with the highest correlation to each factor are grouped and given a scale name which 'best' describes the benefits within that scale. Cronbach's alpha is given in parentheses with the scale name. Scale means are a composite of ratings for regional benefits which make up the scale. Scale means are significantly different ($P > 0.05$).

The most highly rated factor in the north Queensland study — a mistrust of government especially after World Heritage Listing — is a factor that has local relevance to north Queensland. Mistrust of the government was also highly rated as an impediment to plantation development in the Northern Rivers region of New South Wales (Emtage 1995; Specht and Emtage 1998). The World Heritage Listing, although supported by most Australians, resulted in bitter community divisions and a sharp contraction of the local timber industry. Many north Queensland residents consider the listing to have been a political decision designed to gain votes from metropolitan electorates in Melbourne and Sydney at the expense of the local community. Even more than 16 y after the listing, considerable resentment appears to persist in rural communities that are most adversely affected by the decision and that have not benefited from increased tourism.

The general mistrust of government by many landholders, combined with specific concerns about harvest rights, have implications for policy-makers. Unless clear measures are introduced to alleviate these concerns, it is unlikely that large-scale planting for commercial timber production will be undertaken as part of on-going farm activities. It is also not surprising that secure harvest rights, along with favourable taxation treatment, are the most highly rated of the various forms of incentives available to encourage the planting of trees for commercial timber production on farms. A guarantee of harvest rights and taxation incentives were also found to be the most highly-rated incentives by landholders in the Obi Obi Valley (Harrison *et al.* 1994; Harrison and Sharma 1995) and in northern NSW (Emtage 1995; Specht and Emtage 1998).

Measures to address harvest right concerns could include the recording of areas planted on property title deeds and rate notices, assurance of compensation in the event that logging is not allowed or is restricted, and specific state and federal legislation that specifically allows plantation harvest as an 'as of right' activity. The need for secure harvest rights has been recognised by the Queensland Government, and the Department of State Development and Innovation (DSDI) is currently developing the Queensland Forest Practices System, which amongst other things will provide for a right to harvest. At the local level, favourable changes to rates charged by local government may act as an incentive for more tree planting by some landholders.

Landholders attached far greater importance to environmental and land protection benefits of trees than to commercial gain. This suggests that many of the options of environmental services credit schemes currently being widely discussed would have great appeal to many landholders. Invariably, payment for these environmental services would result in greater rates of planting. Such schemes provide cash flows in the early years and thus can have large positive impacts on the net present value of the farm forestry activity. Even if the plantings are not justified on a strictly commercial basis, the interest of farmers in planting trees for environmental and personal satisfaction reasons, combined with some payment for environmental services, could push many owners over the line to make a decision to plant more trees.

Various forms of assistance have been provided in the past by government departments to encourage farm forestry. Assistance

measures range from subsidised seedlings, provision of technical advice and other extension services, planting schemes under which government departments plant trees either free or at a subsidised cost to the landholder, tree planting grants paid directly to landholders, and various joint venture arrangements (Harrison *et al.* 1998; Herbohn *et al.* 2000). Payment of grants directly to landholders is clearly the preferred form of direct assistance measure, while joint venture arrangements are clearly least favoured. Similar opinions were also found in the Obi Obi Valley (Harrison *et al.* 1994). The lack of support is associated with a loss of control by landholders over the management of land planted under joint venture arrangements, restrictions on which species can be planted, and restrictions on the planting design. The benefits provided by joint venture arrangements do not appear to sufficiently compensate many landholders for the loss of control over their land. This indicates that the most successful assistance measures will be those that allow landholders to retain a substantial degree of control and flexibility in the management of their land. It is also possible that respondents to the survey were not fully aware of the flexibility that the PJVS does provide in regard to the work schedule and 'management control'. If this was the case, it indicates the need for promotion programs to ensure that potential participants are aware of flexibility of joint venture schemes such as the PJVS.

The extrapolation of implications of the survey to other regions, and especially preferred incentive arrangements, needs to be viewed in the context of the demographics of the regions. The Atherton Tableland has an established 'lifestyle' group of rural landholders who place a high value on environmental outcomes because in most cases the land is not their primary source of income. It is not surprising that similar opinions were found in the Obi Obi Valley survey of Harrison *et al.* (1994), given that this area has changed rapidly from a rural dairy agri-sector to a more affluent urban group, particularly around the Maleny Plateau. In other areas, such as the South Burnett, joint venture arrangements may well be more suited to the demographics of the region, and hence be more popular. This is supported by the observation that the PJVS was arguably a failure in north Queensland but a success in south-eastern Queensland.

Concluding comments

Surveys of landholder attitudes can provide important information for the design and implementation of forestry promotion and assistance schemes. It is important to know what landholders consider to be the important benefits of forestry, because this helps in the design of schemes that can be tailored to their needs. In the case of north Queensland landholders, environmental benefits and personal satisfaction were found to be the most important reasons for planting trees. In addition, it is important to identify the constraints to greater involvement of landholders in forestry. In north Queensland the main constraints are associated either with economic factors or with satisfaction in current land use. Understanding the constraints allows actions to be taken to overcome them, and in some cases lobbying for policy change and support measures.

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