CONFERENCE PROCEEDINGS

Marketing of Farm-grown Timber in Tropical North Queensland

Edited by J. Suh, D. B. Smorfitt, S.R. Harrison and J. L. Herbohn

Rainforest CRC

Cooperative Research Centre for Tropical Rainforest Ecology and Management

MARKETING OF FARM-GROWN TIMBER IN TROPICAL NORTH QUEENSLAND

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PREFACE

Forests have been one of the basic renewable natural resources of Australia and yet nationally we are now a major timber importer and a minor timber exporter. The Australian share of the world's forest area is about two percent. Out of 157 million hectares of general forest area, about 1.2 million hectares is State or private plantation forest. Queensland is the major producer in tropical Australia, having about one sixth of the national plantation area, or about 0.2 million hectares, of which ninety percent is government owned.

The north Queensland region has a history of utilisation of rainforest cabinet timbers for furniture production and other high-value products. However, due to reduced timber availability, particularly following the World Heritage listing of the Wet Tropics rainforests, the supply for rainforest cabinet timbers has contracted sharply. In spite of efforts made to encourage farm forestry based on planting high-value rainforest timbers, adoption has been relatively slow.

The Cooperative Research Centre for Tropical Rainforest Ecology and Management (Rainforest CRC), which commenced operations in 1992, has provided support for research on a wide variety of aspects of rainforest ecology and management in tropical north Queensland. It has been the ambition of researchers in the socio-economic program of the Rainforest CRC to put together a collection of papers summarising current knowledge of timber marketing in the region. A conference on marketing of farm-grown timber in tropical north Queensland, which was held at The University of Queensland in Brisbane in June 2003, provided an opportunity to bring this ambition to fruition.

This monograph, a record of the conference, seeks to provide views on numerous aspects of market opportunities and constraints that the north Queensland timber industry faces. This monograph is timely, highlighting a number of the major issues confronting the north Queensland timber industry if it is to establish a viable, robust and sustainable industry. The discussion covers market facilitation, market surveys, timber marketing experiences from the other regions, and future prospects.

I applaud the efforts of Steve Harrison and John Herbohn who organised the timber marketing conference program, and Jungho Suh and David Smorfitt for working with the co-organisers in editing this volume. They join with me in thanking all the other contributors, for putting together this insightful collection of research papers on revitalisation of the timber industry in north Queensland.

Professor Nigel Stork
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1. TIMBER MARKETING IN A REVITALISED NORTH QUEENSLAND FOREST INDUSTRY: OVERVIEW OF MAJOR ISSUES

S. R. Harrison, J. L. Herbohn, D. Killin, J. Suh and D. B. Smorfitt

As the harvest of timber from native forests has contracted in north Queensland, the traditional supply chain from forest to final consumer has to a large extent broken down. As a result, landholders and non-farmer investors cannot assume that timber markets will automatically exist when they have trees ready for harvest. A wide variety of research has been carried out that is relevant to timber marketing in north Queensland. Surveys of timber millers, cabinet-makers and their staff, and purchasers of timber products, as well as financial modeling of timber milling, have been used to derive information about timber markets in north Queensland. Research has been undertaken on supply chain and market analysis, attitudes of timber processors and final consumers, institutional arrangements for market facilitation and market development.

INTRODUCTION

North Queensland has a long history of timber harvesting and marketing, originally based on exploitation of the large red cedar resource, as reflected for example in *Red Gold: The Tree that Built a Nation* (Vader, 2002). A regulated industry evolved for rainforest cabinetwoods with the creation of a Forestry Department at the turn of the twentieth century. This involved a well-functioning supply chain with timber sent to regional and southern markets. Particularly in the 1980s, the allowable cut was progressively reduced, and the industry contracted (e.g. see Lamb *et al*. 2001; Harrison *et al*. 2003). World Heritage listing of the Wet Tropics rainforests in 1988 brought about a sudden cessation of timber extraction from most of the tropical rainforest area. After inscription of Queensland's Wet Tropics World Heritage Area (WTWHA), a relatively high rate of harvesting from private native forests continued for a time, in part associated with sugar industry expansion. Plantations of exotic pine and some native conifers grown by the Department of Primary Industries – Forestry (DPI Forestry) have allowed some timber milling to continue in north Queensland, the main commercial operation being Ravenshoe Timbers Pty Ltd. In spite of this activity, forestry in the north has been an example of what economists call a *declining industry*, with low harvest volumes leading to collapse of the traditional supply chain.

Since the World Heritage listing, there has been much interest in revival of the north Queensland timber industry and various reforestation programs have been initiated, including the Community Reforestation Program (CRRP), the DPI Plantation Joint Venture Scheme and Trees for the Atherton and Evelyn Tableland (TREAT). These programs, and efforts by the regional plantation committee, Private Forestry North Queensland (PFNQ), and the North Queensland Timber Cooperative (NQTC), have been aimed at expanding the timber industry.

For some time it has been the ambition of researchers in the socio-economic program of the Cooperative Research Centre for Tropical Rainforest Ecology and Management (Rainforest CRC) to bring together a collection of papers summarising current knowledge of timber marketing in north Queensland. To facilitate this, a workshop on timber marketing was held in Brisbane in June 2003. In this report arising from the workshop, reasons for an interest in timber marketing in north Queensland are first reviewed. Various areas in which research

relevant to timber marketing have been carried out are identified. Also, some comments are made about future market research directions.

SOME REASONS FOR AN INTEREST IN TIMBER MARKETS IN THE NORTH

Markets for products are difficult to predict and seldom assured. A manufacturer planning a new product would carry out market research. However, even with the best market intelligence, there can be no guarantees of a viable market. Consumer tastes and spending patterns change, prices and supplies of existing substitute products may change, and new and innovative products may come onto the market. The uncertainty about future markets is especially high for new products with long production lead times. Future markets for rainforest cabinet timbers and other high-quality timber species currently being considered in north Queensland are a case in point. Predicting what markets may exist twenty to fifty years into the future for trees currently being planted is no simple task. This is especially so for new or lesser-known species, for which there are thin or non-existent established markets.

For small players, such as farm foresters, there are many elements which affect their ability to access markets and over which they can have direct control, e.g. the species they plant, the way in which they manage the plantings and the timing and nature of harvest operations. All of these factors are likely to influence their access to markets. However, a critical component of being able to develop or access markets is having sufficient resource within a region to make it worthwhile for processors to establish operations and sell products domestically or, alternatively, to access international markets. Access to either market requires sufficient regional timber turnoff to be able to guarantee continuity of supply. This is something over which individual small-scale foresters have little control, especially at the establishment stages of a new timber industry within a region.

One approach in dealing with the uncertainty about future markets is to accept the belief that a market will be available. This optimism can be supported from experiences in New Zealand a decade ago, when markets and processing facilities developed for radiata pine once the resource matured (Capill, 2000). This is not to suggest that simply planting trees will automatically result in a future market developing. The degree of marketing success will be greatly influenced by effective strategic planning, including the identification of *best-bet* species and markets, identifying the best locations for the resource to be established, from both site-species matching and locational efficiency perspectives, and the staggering of planting to facilitate continuity of supply to customers.

An alternative to the optimistic view that markets will develop is that landholders planting tropical hardwoods in north Queensland at present to produce timber for sale forty years into the future are investing with the blind and misguided faith that markets will develop. In southeast Queensland, the hoop pine resource appears to have created its own market. However, hoop pine is a well recognised and high-quality timber species, large volumes are available from government plantations, and there is a large market close to the plantation and processing sites. North Queensland is at a competitive disadvantage because the final consumer markets are in more heavily populated urban areas two thousand kilometres or more to the south, and in the case of rainforest cabinet timbers, relatively low volumes of each species will be forthcoming. Further, large areas have been planted to conifers and even hardwoods (particularly Australian eucalypts and acacias) around the world, so pricing is likely to remain competitive.

It is in the small-scale hardwood market where supply may not create its own demand, unless the overall supply is sufficiently large, high in quality, and regular in supply (which will

be difficult to organise with many small producers). Otherwise, cabinetmakers will import tropical hardwood timber, or use conifers and composite wood products. Another forestry option attracting private sector investment in tropical forestry is the planting of internationally recognised species (sandalwood, teak and African mahogany) in the dry tropics where land parcels are large, but the financial viability of these investments is yet to be determined.

The more cautious of these views raises questions of how important it is to have a workshop to discuss timber marketing methods and prospects in north Queensland. Is this really an important topic? The following reasons are advanced to answer in the affirmative and justify the need for such a workshop.

Some product is available now. There have been various earlier planting programs in north Queensland, and a resource of farm-grown and DPI plantation caribbean pine (*Pinus caribaea*) and hoop pine or araucaria (*Araucaria cunninghamii*) exists. For the former, sale has been difficult and prices are probably about equal to production cost. For the latter, there is stronger demand, but again a low stumpage price has been accepted, in an effort to stimulate timber processing. There is also a supply of timber from native forests, including regrowth acacia as a pioneer species on previously cleared land.

Market information is demanded by investors. Venture capital providers and non-farmer investors in general are unlikely to invest in timber production without a thorough analysis of market prospects. In fact, launching a prospectus without a thorough market analysis could lead to prosecution. Investors in large and small-scale forestry will want to know whether the venture is likely to be profitable, and what level of risk is associated with it. In some cases, they will aim for a target or satisfying level of profitability. This appears to be the case of venture capital providers and probably also for ethical investors (Sharp, 2002).

Information needs of government for promoting forestry development. Some rural areas in north Queensland including parts of the Atherton Tableland are economically depressed, and there is interest by government (at national, state and local level) in stimulating industry development. A substantial area of land where forestry may be the highest and best use has been identified, and information is needed on the financial viability of new softwood and hardwood plantings. The investigation of market prospects is an important part of any such financial evaluations.

An understanding of markets is needed for planning an orderly re-emergence of the industry and supply chain. If planting accelerates, and there are believers who are confident it will, consideration is needed about overall supply chain, not just the final product market.

Knowing what the competition is. An understanding of alternative sources of timber is critical when deciding whether to invest in timber, or choosing species and quality control measures. An increase in demand can be expected for tropical hardwood species as supplies are depleted in developing countries.

Picking the best-bet species to grow. Obviously, if timber is difficult to sell then having species preferred by the market will be a big advantage. This becomes a particular issue given the large number of high-value cabinet timber species which can be grown on farms in north Queensland, and the problems which can arise in processing and marketing a number of dissimilar timber types, some with little market recognition.

Potential to develop markets for small quantities of specialty timbers. Some timbers fit in niche markets, and viable processing can exist for even small quantities, provided that the timber is of high quality. Examples are timbers for musical instruments, supplies for wood turners, and cabinetwoods for small furniture manufacturers. It is to be noted, however, that

sales for these products are often occasional and *ad hoc*, rather than through continuing supply chain relationships.

Deciding on silvicultural regimes. If future timber salability is determined by timber quality, then this needs to be factored into the program of weed control, pruning, thinning, and so on. Silvicultural treatments such as thinning operations can be costly and the smaller sized trees removed are often difficult to market (Lamb and Keenan, 2001).

Market information is needed to make decisions involving environmental and economic trade-offs. Decisions must be made concerning choice between native and exotic species, particularly exotics, which have international market recognition versus native cabinetwoods which have local, and to a lesser extent, national recognition. To some extent, choice of species will depend on the land type, e.g. native hardwoods (and hoop pine) require favourable sites such as on the southern Atherton Tableland, while exotics can be grown on drier and less fertile sites, however choices have to be made in priorities when taxpayer support is contemplated.

RESEARCH AREAS IN TIMBER MARKETING IN NORTH QUEENSLAND

A variety of themes may be examined with respect to timber marketing in tropical north Queensland. For convenience, these may be divided into: supply chain and market analysis; market facilitation; market surveys; timber marketing experiences from other regions; and future prospects. Each will be briefly introduced, and examined in more detail in later chapters.

Supply Chain and Market Analysis

The supply chain concept provides a useful framework for examining the flows of products and resources including finance in the timber industry. Economic theory of markets and market power is also highly relevant to the industry, where there are often few market players. Government (i.e. DPI Forestry) through setting of stumpage prices has considerable impact on the market. Introduction of new sawmilling technology, including portable sawmills and innovative fixed site mills such as using radial sawing techniques, has potential to assist in reducing milling costs and allowing small-producers to process their own timber. These aspects are discussed in the first section of the report.

Market Facilitation

Scope exists for government and industry to undertake actions to facilitate timber marketing. PFNQ as an industry cluster has a role to play in promoting and assisting timber marketing. Also, as indicated by experience in other regions and other countries, a strong grower organisation can assist growers in marketing their timber, and the NQTC potentially has an important role in this regard. Role clarification between PFNQ and NQTC in the marketing area is required. Of course, it is desirable for foresters to plant species that have sound future market prospects, and in this context some judgments can be made at present of what species are likely to be in demand in the future.

Market Surveys

Specific marketing requirements arise from the utilisation of native species with long rotations and very high timber quality but limited market recognition outside of Australia and in some cases domestically as well. Such lesser-known species from north Queensland include rainforest cabinet timbers and eucalypt hardwoods, including eucalypts from Cape York.

Successful marketing relies on sound information. Often the only way to obtain information about timber markets is to carry out surveys of people in the timber supply chain, whether by probability sampling or by contacting key informants. Market surveys have been undertaken which shed light on attitudes to these species by firms in the timber industry and also by purchasers of timber products. The Australian National University produces timber market reports, and has addressed marketing issues in tropical north Queensland. A comprehensive tropical forestry market analysis is, however, yet to be carried out.

Timber Marketing Experiences from Other Regions

Some of the issues faced in north Queensland also arise in southeast Queensland, northern New South Wales and Tasmania, where some of the same native rainforest and eucalypt species are grown. Studies in southeast Queensland provide further insights into opportunities and constraints in relation to marketing in the north.

Future Prospects

Given limits to the ability to obtain information from stakeholders, some further investigation of markets, application of marketing theory, and in general lateral thinking may help to shed light on future timber marketing prospects. A critical test of marketing capabilities is whether it is possible to export timber or timber products. The prospects for commercialisation of ecosystems services in the future offers promise for increasing profitability of tree farming. A vision is required of where we would like the industry to be placed in the future, and what steps might be taken to move in this direction.

SOME IMPORTANT QUESTIONS TO BE ADDRESSED

A number of questions may be put forward, which a workshop on timber marketing can address. While different people would come up with different lists, the following are some of the questions that were considered important for workshop deliberations:

What supply is currently and potentially available from north Queensland timber markets, by product type? (In other words, a woodflow assessment is needed).

What markets (categorised by type, volume over time, location and price) are currently available for timber products from north Queensland, and what new markets could be developed?

What is the potential for entry into new or niche timber markets, or new timber product development?

How can the outstanding properties of rainforest cabinet timbers be promoted? Will similar properties be achieved in plantation grown timber as opposed to native forest?

Will log markets develop if the resource becomes available?

Should production be aimed at value-adding, niche markets, mainstream domestic timber resources or export markets?

Will production of fibreboard, export of logs, export of woodchip and use of biofuel for electricity generation be possible?

Would it be desirable to concentrate on growing species that have international market recognition?

How important are economies of scale or size in timber milling, and what volumes would be required to make various forms of processing financially viable?

How can returns to growers be increased? For example, how can growers capture more of the 'resource rent'?

How can costs at various stages of the supply chain be reduced?

What is the potential role of certification systems in timber marketing?

What are the costs and markups at the various points in the supply chain?

To what extent do environmental issues affect market prospects?

What timber products or markets cannot be developed due to adverse community opinion or government imposed sanctions?

What are the prospects for viable markets being developed for credits for ecosystem services of forestry?

FURTHER DIRECTIONS OF TIMBER MARKET RESEARCH

Some speculation might be made about future directions of market research for the north Queensland timber industry. The list of questions above provides some issues that are candidates for further research. It may be that research will focus on the institutional arrangements to redevelop the north Queensland timber industry. This research will of necessity pay attention to timber marketing issues. Important amongst these issues is the choice of species to grow. It is a debatable point whether a timber resource will create its own markets, or whether the industry must be developed with close attention to the market prospects relating to tree species and type, and associated silvicultural systems.

While there will no doubt be continued interest in growing small plantations of rainforest cabinetwoods, current market realities are likely to favour larger stands of a small number of the more widely recognised and traded timber species. This suggests the need for research into threshold volumes and economies of scale in timber processing. It might be speculated that other areas of interest will be the potential for marketing ecosystem services, and supply chain issues and locational efficiency of plantations and processing facilities.

While the timber resource in north Queensland is small, there are convincing reasons for investigating timber marketing issues, particularly in relation to any initiatives to revitalise the industry. The papers presented in this monograph summarise research and provide views on a variety of aspects of market opportunities and constraints.

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SUPPLY CHAIN
AND MARKET ANALYSIS

2. PRODUCT MARKETING: A MAJOR ISSUE FOR PRIVATE FORESTRY DEVELOPMENT

P. Byrne

Private forestry is considered to encompass all forms of forestry carried out on private land and, therefore, is characterised by diversity in scale, ownership, species and management objectives. Private forestry suffers in many localities, and particularly in north Queensland, from the dilemma that markets are unlikely to develop without suitable quantities of available material. Private forestry development is unlikely to occur without some certainty of markets. Private forestry continues to grow in importance in Australia as the area available for public native forestry continues to decline in most states and the proportion of the plantation estate in private ownership continues to increase. The need for some certainty in markets for private forest products continues to grow apace. In north Queensland, the potential for profitable private forestry exists but this potential cannot be realised without development of markets for the products. All of the mechanisms examined to assist in private forestry development will depend for their success on the building of positive commercial relationships between the parties in the value chain and, therefore, depend on cooperation between all levels of government, industry and landholders. Private Forestry North Queensland, the Private Forestry Development Committee in North Queensland, is put forward as a mechanism to achieve the building of commercial relationships.

INTRODUCTION

Private forestry is considered to include all forms of forestry carried out on private land, even when a party other than the landholder (including a government agency) owns the trees fully or partly. This definition includes both plantations and native forests that are being managed primarily for timber production. Private forestry, therefore, contains farm forestry and other forms of forestry practised on private land. Across all states in Australia, there is a trend towards private forestry in all forms becoming more important. Public native forests are increasingly being withdrawn from production; public plantations are being sold to the private sector and investment in new plantations is becoming dominated by the private sector.

Private forestry is distinguished from public forestry primarily by the diversity of scale, ownership, species and management objectives. While this diversity is inevitable with such a wide range of forest ownership, it provides private forestry with a range of challenges, not the least of which is product marketing of often small quantities of diverse products. Product marketing needs to be seen as being of primary importance to any private forestry investment. The available markets within a region limit what is commercially feasible in that region. This is a fundamental dilemma for private forestry development in regions such as north Queensland – markets are unlikely to develop without suitable quantities of available material and private forestry development is unlikely to occur without some certainty of markets. Some possible solutions are proposed to overcome this dilemma.

Some means of expanding markets for private forest products are examined with the aim of finding ways to expand private forestry in north Queensland. The principal means of expansion examined are:

- Commercial relationship building;
- Private Forestry Development Committees;

- Government policy framework for Private Forestry;
- Investment framework for Private Forestry;
- Product 'fitness for purpose';
- Tree grower cooperatives; and
- Environmental services markets.

PRIVATE FOREST ESTATE

National Forest Inventory (2003) reported that as at December 2002, 50.5% of the total national forest plantation estate in Australia was on private land, with a further 1,655 hectares reported as unknown but estimated to belong to private companies with plantations on private land. However, in Queensland, the majority (88%) of plantations occur on public land. The proportion of Queensland plantations on public land has decreased markedly from 94% at September 2000 (Wood *et al*. 2001).

Wilson *et al*. (2003) reported about 38 million hectares (23%) of Australia's native forests as privately owned. This compares with about 11.4 million hectares (7%) of multiple-use public native forests where timber production is permitted. The remaining native forests are mainly on leasehold land (46%), nature conservation reserves (13%) and other Crown lands (8%). Private native forests contribute about 25% of the total national supply of sawlogs and other timber products from native forests, and are major sources in Queensland, New South Wales and Tasmania. However, it is likely that many private native forest owners do not have the motivation, knowledge or confidence to develop and apply sustainable forest management procedures.

At September 2000, Wood *et al.* (2001) reported that an area of 2,305 hectares of farm forest plantations and 159 hectares of plantations on private land under joint venture arrangements existed in the north Queensland region. It is unclear if all of the plantings carried out under the Community Rainforest Reforestation Program (CRRP) have been included in this inventory. However, it is clear that the joint venture plantation figures do contain all of the plantations established to September 2000 under the Department of Primary Industries Joint Venture Scheme.

As private forestry continues to increase in importance, the issue of markets for private forest products continues to grow in importance. However, there seems to be little evidence of successful coordinated action to correct the current situation.

TIMBER INDUSTRY IN NORTH QUEENSLAND

Prior to the 1988 listing of the north Queensland (NQ) tropical rainforests as a World Heritage Area, there was a substantial timber industry based on the native forest resource located in NQ. Since listing, the gradual erosion of the timber industry skills base, limited investment in value-adding processes, limited investment in managing the private native forest resource and limited marketing efforts have resulted in the majority of hardwood sawmillers exiting the industry.

An integrated softwood sawmill at Ravenshoe, processing primarily plantation-grown softwood from public plantations, now dominates the north Queensland timber processing industry. A scattered but significant private softwood plantation resource of variable quality remains without a market or processing opportunity. This plantation resource is not of interest to the one major softwood sawmiller at Ravenshoe. Private native forests in the region have very limited product processing and marketing opportunities.

FARM FORESTRY IN NORTH QUEENSLAND

Some landholder support has been shown for farm forestry with over 2500 hectares being established through schemes such as CRRP and the DPI Joint Venture Scheme since 1992. Farm forestry extension services have been intermittent in the region with a wide range of government-funded agencies providing advice under relatively short-term projects.

The desired transition from timber production using native forests to plantations, stated as one of the objectives of CRRP, has not occurred in NQ for a number of reasons. Emtage *et al*. (2000) suggested that, of the five groups of farmers identified in NQ, the group with the strongest interest in private forestry is the group who have least dependence on the land as a source of income, namely retired professionals or hobby farmers. This group is also likely to need guidance, assistance, established networks and access to specialised labour.

As assistance for private forestry is now very limited, it is likely that the area of private forestry in NQ will not increase dramatically for the foreseeable future. Unfortunately, traditional markets will remain limited if the available timber resource does not reach a critical mass. The problem facing all forms of private forestry in NQ, therefore, has a number of dimensions, including:

- A high proportion of small plantings with a range of species and ownership;
- A range of management objectives;
- A wide range of owner interest, knowledge and skills in preparing the crop for a particular market or markets;
- Limited quantities of particular product lines;
- Little processor interest in the available resource;
- Disillusioned owners of marketable private forests which have not found a suitable market;
- Small numbers of landholders showing continued interest in continuing or beginning commercial tree planting in the current environment; and
- Very limited assistance available to potential commercial forest growers.

The problems faced by many growers in NQ are captured by the following quote reported by Borough (2002) from a well-known forester in Albury, NSW:

> "Most of them have planted with encouragement and assistance from state government and now have an unholy battle to get a return on their investment."

There is, however, a range of opportunities for NQ private forestry:

- The predicted future global deficit in hardwood sawlog supply;
- Most Australian plantations have been established for either hardwood pulp or softwood sawlogs, thereby not contributing to overcoming the hardwood supply deficit;
- High quality technical information through existing research and development providers;
- A suite of unique tree species with excellent marketable wood properties;
- Rapid growth rates achieved by species in the tropics;
- Previous experience with tree planting schemes such as the Community Rainforest Reforestation Program (CRRP), Tree Assistance Scheme and Joint Ventures with the State Government;
- Suitable land which may become available in both the wet tropics and dry tropics;

- Complementary infrastructure developed for agriculture such as road and rail networks, dams and irrigation channels;
- Biomass production and processing opportunities with the established sugar industry;
- Proximity of NQ to expanding high volume markets in Asia; and
- An acknowledged need to create sustainable rural employment opportunities in the NQ region.

The potential exists in NQ to develop a marketable timber resource and a modern wood-processing sector based on private forests. However, concerted action is required to ensure the tree growing and processing industry grows to realise this potential.

INDUSTRY DEVELOPMENT REQUIREMENTS

As Borough (2002) reported, the wood processing industry in Australia has shown a strong preference for securing resource from public or private plantations of industrial scale (typically in excess of ten thousand hectares). There are two major features that characterise enterprises of this scale:

- Capacity to supply a number of markets with a range of products through the rotation, thus improving the chances of the tree growing enterprise being profitable; and
- Capacity to enter into long-term but flexible agreements that allow for such factors as log specifications, flexible quantity removal to allow the purchaser to respond to market fluctuations, force *majeure*[1], specified supply arrangements and reliable resource information.

In the north Queensland context, these features may be seen as being irrelevant and unachievable. It is, however, useful to understand the requirements of the markets, which are no longer regional but rather have become global. Growers need to understand that the processors are part of the same industry as they are, and are dependent for their own profitability on the right product being available to them.

Borough (2002) suggested that the small grower could learn much from the operation of the large industrial growers, namely:

- Pool the resource – small quantities need to be aggregated and structured in a way so that contractual arrangements can be made with one party;
- Provide harvest and transport capacity to harvest and transport logs to various markets;
- Secure an array of markets for the full range of products;
- Obtain good information on the resource; and
- Establish trust of growers to reassure the growers that their resource is being marketed effectively and transparently.

It could be argued that the views of Borough (2002) are only relevant to broad-scale *pseudo-industrial* monocultures grown on private land for only wood production, and are not relevant to the small-scale multi-species plantations that dominate the NQ private plantations. While this argument may be true, there are some common elements between the problems for industry development described by Borough and the problems for NQ described above.

[1] A force *majeure* is an event or circumstances beyond reasonable control of any party to an agreement, except an inability to pay money when due.

These common elements include:

- A lack of available markets for the marketable private timber resources;
- A lack of processors willing to buy the resource;
- Limited quantities of particular product lines;
- A wide range of landholder interest, knowledge and skills to prepare the crop for particular markets;
- Very limited assistance available for small growers; and
- Disillusioned owners of marketable private forests that have not found a suitable market.

There are also other factors that may apply in NQ but were not highlighted by Borough. These include:

- The transition from public native forest harvesting to private native forests and plantations, which is accelerating as access to the publicly owned native forest resource declines;
- The need to develop plantation investment vehicles that are suited to private landholder needs and emerging environmental services markets;
- A premium on land availability for plantation development, particularly in high rainfall areas; and
- Strong community and environmental pressure being brought to bear on the commercial plantation industry for public good environmental tree planting and more sensitive placement within existing land uses, and undertaken on a smaller scale.

Blackwell and Stewart (2003) examined the issue of utilising scattered farm trees of high-density eucalypts in Southern Australia and concluded, "To gain the maximum value from these timbers, processors will be required to produce a consistent and accurately dimensioned quality product. Sawing, drying and grading of boards add value to the product. The limited supplies of suitable tree species should ensure a specialist market should be established without the intervention of large companies that will control prices and markets." While the industry and market context in NQ differs from that in Southern Australia, the conclusion above seems to be relevant. Some solutions can be posed which may contribute to the overall solution of this seemingly insoluble problem.

RELATIONSHIP BUILDING

Given the increasing importance of private forestry and the suitability of many areas in NQ for commercial tree growing, some of the elements for a successful private forestry industry currently exist in NQ. Figure 1 presents a schematic diagram of the major elements of a successful private forestry industry specific to north Queensland.

Features highlighted in this diagram that are essential for development of the industry and make it different from the current situation include:

- Markets for existing and new products and services provide the direction for the industry;
- Positive relationships between all of the players in the industry are essential to improve the understanding that all players are important to the future of the industry. (This, of course, is not meant to imply that all players need to be in constant agreement, but that there is a willingness to discuss issues of importance and reach agreement for the future of the industry);

- The central nature of Private Forestry North Queensland in facilitating the positive relationships between all of the players;
- Positive relationships with all levels of Government, particularly Local Government, and clear supportive policies from Government;
- Active involvement in the industry by investors in all of their forms, including landholders and forest growers;
- Active involvement of service providers in the industry;
- Active involvement of representative groups in development of the industry, particularly those representing landholders, forest growers and forest product purchasers; and
- A developing potential role for environmental services as one of the products for private forestry.

The above features are necessary no matter what products or services are to be produced, assuming that there is a requirement for the industry to be productive and profitable. The central nature of a coordinating and facilitating mechanism is seen as necessary and is seen as the role for PFNQ, the local Private Forestry Development Committee.

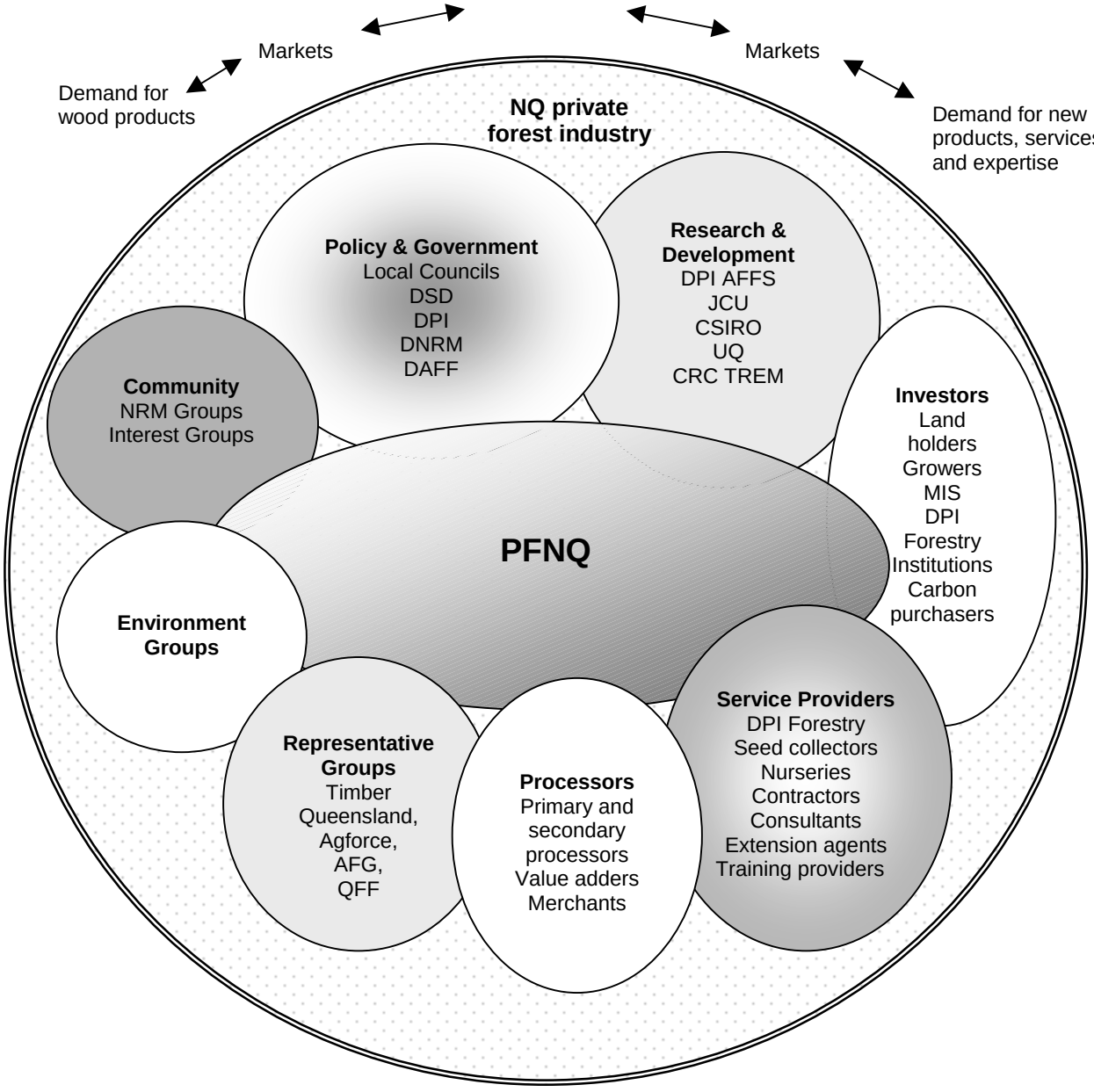

Figure 1: Schematic framework of the north Queensland private forest industry.

PRIVATE FORESTRY DEVELOPMENT COMMITTEES

Eighteen Private Forestry Development Committees (formerly Regional Plantation Committees) exist in the major plantation regions in Australia. Their broad roles are to:

- Enhance the economic development potential of their region by facilitating the expansion of the commercial plantation estate, through the alignment of regional objectives and those government policies and programs that pertain to furthering regional industry development;
- Promote sustainable management of private native forest resources; and
- Liaise with regional, State and national stakeholders to facilitate sustainable industry development.

Private Forestry Development Committees (PFDCs) are funded jointly by National and State governments through the national investment program of the Landcare stream within the Natural Heritage Trust. While they share a common focus on these roles, PFDCs are structured differently to meet regional needs. However, all structures include a management group comprised of representatives of key regional stakeholder groups. Management groups oversee implementation of detailed business plans, prepared by the PFDC Executive Officers, and specifying management, funding and performance assessment criteria. In some States, PFDCs are managed under the auspices of State and Regional Development organisations, while in others they sit under State forestry agencies (PFDC Leadership Group, 2003).

One of the unique strengths of PFDCs is their potentially strong linkages between industry, local and state governments, community, and environmental groups in regional Australia. In addition to industry development, PFDCs have an increasing role in leveraging their strong regional linkages to assist in implementation and monitoring of emerging natural resource management activities. PFDCs are also important to the continuing expansion and viability of the forest products industry.

The key national policy statements informing PFDC activities now include the natural resource management (NRM) programs, the Natural Heritage Trust Extension and the National Action Plan for Salinity and Water Quality. While PFDCs have effective regional networks focused on industry development, considerable challenges lie ahead for engagement by the Committees with regional NRM groups. PFDCs could make an important contribution to regional NRM groups by developing tree planting options that address natural resource condition targets identified in regional NRM plans. These options could be developed collaboratively with relevant stakeholders in the context of regional industry plans. By matching new tree planting projects designed to meet NRM outcomes with existing or potential regional processing enterprises and possible investors, new synergies could be created between landholders, investors and regional NRM groups (PFDC Leadership Group, 2003).

PFDCs can also make an important contribution to facilitating the process of industry restructuring by supporting the development and implementation of regional industry plans, and by focusing upon identification of key investment and marketing opportunities and areas for research and development. Liaising between regional communities, regional development organisations, all tiers of government and industry in relation to all aspects of private forestry development will continue to form a major component of PFDC activities (PFDC Leadership Group, 2003).

GOVERNMENT POLICY FRAMEWORK FOR PRIVATE FORESTRY

At State and National level, the government policies which have most relevance to development of the private forest industry are *Plantations for Australia: The 2020 Vision*, and the developing *Farm Forestry National Action Statement.* Both statements suggest there is a fundamental need for all current and potential sectors of the industry to form productive working relationships in the interests of realising the multiple benefits possible with private forestry. The *Australian Forestry Standard*, particularly the provision for group certification, is also potentially highly useful for the purpose of marketing certified sustainably produced forest products.

At the local government level, planning schemes or their equivalent are the policy instruments that have a major influence over land uses. In NQ some planning schemes are not supportive of private forestry in the form of either plantations or native forest management. Private native forestry is likely to assume greater importance as timber production from the public native forest estate continues to decline. Local governments can play an important role in supporting sustainable management of plantations and private native forests through appropriate encouragement in planning schemes.

The national effort to ameliorate environmental degradation has been predominantly approached from the landcare perspective and based on building up an ethical commitment to sustainable agriculture and environmental responsibility. This is a laudable and an essential component of any revegetation program but, by itself, is inadequate to drive the level of adoption needed to address the serious environmental problems. It is not credible to propose that a task of this size and importance be done on a voluntary, non-commercial basis.

Most farm businesses generate only modest profits and are not able to meet the cost of voluntary non-commercial revegetation on the necessary scale. Nor are sufficient funds likely to be available from the public purse or from some form of public subscription. Ways must therefore be found to incorporate the landcare ethic and the required level of environmental repair into farming systems. Private forestry has the potential to provide a credible solution for governments to promote actively (National Farm Forestry Roundtable[2], 2000).

INVESTMENT FRAMEWORKS FOR PRIVATE FORESTRY

There is a wide range of possibilities for leveraging private investment in tree planting projects with multiple benefits. PFDCs are well placed to provide potential investors with critical regional information, and to assist regional NRM groups and farmer groups to understand investor decision-making processes. However, considerable attitudinal change will be required to achieve such partnership investment, and the challenges of regional information collation should not be underestimated.

Developing business models to enable integrated plantings in high rainfall areas has the potential to assist in addressing both industry requirements for resource expansion where land availability is contracting, and for meeting community expectations regarding the social and environmental impacts of large-scale plantings. Such approaches may also provide a unique opportunity to improve synergies between the industrial and farm forestry sectors in

[2] National Farm Forestry Roundtable was set up by the Australian Government in 1998 under the Wood and Paper Industry Strategy for a period of two years and charged with responsibility to provide an Australia-wide forum on farm forestry.

terms of both investment and marketing. PFDCs have the opportunity to act as information brokers in these processes (PFDC Leadership Group, 2003).

PRODUCT 'FITNESS FOR PURPOSE'

If growers and processors are encouraged to develop close relationships along the value chain, it will become obvious for growers that, if they wish to be rewarded adequately for their product, it must fit the purpose of the primary processor at the time. The current low quantity of available material suitable for high-value markets from NQ private forestry will limit the establishment of large-scale processing plants, which in turn will limit the capacity of growers to plan for a particular market. However, both potential processors and growers will need to be communicating clearly for the markets and the processing plants to develop. This clear communication will need to be encouraged and facilitated by a group such as PFNQ.

The diversity of species, management objectives and ownership provides the industry in NQ with some special challenges in relation to producing relatively uniform products for high volume markets. Low volume specialised markets have some real challenges in providing 'fit for purpose' product. These problems can only be overcome if the grower understands the problems confronting the processing industry and vice versa.

TREE GROWER COOPERATIVES

It would seem that NQ private forest growers would benefit from the establishment of an active tree grower cooperative. While a tree grower cooperative does exist, it struggles because it could not generate sufficient interest and capital to establish a wood processing and value-adding facility that could be expected to attract further interest, membership and investment.

The principal of the use of cooperatives for landholders to be more actively involved in the processing, value adding and marketing of their products is well established in a range of primary industries. The cooperative model is highly adaptable and suitable to the private forestry situation because all control of the business is in the hands of those who are actively involved in the primary business of the cooperative, namely growing trees for processing and profit. Cooperatives act as an extension of its members' business operation (Edols, 2000). Tree grower cooperatives are also an ideal means of maintaining constant contact between the grower and the processor thus providing a mechanism for ensuring that each is aware of the other's requirements.

Due to a lack of capital, the North Queensland Tree Growers Cooperative (NQTC) has struggled to carry on the value-adding business that was considered to be essential as its primary business. Edols (2000) noted that "organising a substantial investment up front has not been a typical facet of traditional cooperative start-ups because it normally takes time to build up a substantial funding base". Edols proposed the use of a New Generation Cooperative that allows for raising of funds from shareholders for an up-front investment for value adding. Cronan (1999) noted that general cooperative legislation throughout Australia varies in relation to the options available for fund raising. Cronan also noted that cooperatives now have flexibility in developing an appropriate debt and equity structure for their cooperative using such mechanisms as member shares, entry fees, periodic charges payable by members, loans by members, external borrowings and, in some states, instruments to allow purchase of equity in the capital of the cooperative (not share capital). Despite these mechanisms, most Australian tree grower cooperatives are struggling to remain viable. At the National Farm Forestry Cooperative Workshop held in Brisbane in November 1999, participants proposed that the government establish a revolving fund to facilitate start-up of tree grower cooperatives. Despite these calls, no action has resulted.

ENVIRONMENTAL SERVICES MARKETS

Where an environmental outcome can be attributed to a particular land-use change and when the outcome can be measured and a value can be assigned, a market may be an efficient means of providing the outcome. In the case of NQ it is not clear whether private forestry as a land-use change will result in the measurable environmental change for which a market may be established. It is also not clear if the capacity exists within the regional community to initiate markets for environmental services (or market-based instruments) that address natural resource management outcomes at the landscape scale.

Beale (2003) explained that environmental services should essentially be seen as a mechanism to reveal the *value* of an environmental good and service in a way that enables this value to be reflected in an exchange between the producers of the value and those who would see advantage in consuming it. The value could be positive or negative, and the *consumers* could be either individual market actors or groups of actors or governments who stand in the market place to buy or sell on behalf of a community. There needs to be a number of prerequisites in place before successful markets are possible. Beale (2003) summarised the requirements as:

- clearly defined and legally enforceable property rights;
- access to information concerning the quality and quantities of goods and services to be traded;
- good, or at least reasonable, knowledge about the supply function of the goods and services to be provided; and
- establishment of efficient and low cost ways of transacting, recording and tracking the trades.

Many environmental resources are not adequately valued through the market system. Markets are generally efficient in allocating resources to *exploitation activities* but may be ineffective with respect to investment in environmental conservation (Chaudri, 2003). Chaudri explained how a mix of policy instruments may possibly shift the boundary between the marketed and the non-marketed sections of the economy.

The potential for private forestry to participate in any future environmental services markets remains to be developed. As an environmental service, private forestry could be advanced through the current series of pilot trials and continued research to accurately establish the environmental effects of planting in particular places in the landscape and within catchments, thus more clearly identifying the environmental good or service being marketed. Active environmental services markets may also require some public policy development. For example, markets in carbon credits will require, among other things, policy development in the area of carbon emission control and market establishment for the emission offsets. Renewable energy certificates are a current example of a market-based instrument that is currently part of public policy in Australia. Beale (2003) concluded “there are lots of uncertainties in applying markets to environmental problems. Markets are not a panacea, and often we are on the frontier of knowledge. We need to learn by doing.”

CONCLUSION

Private forestry remains a future land-use option with much potential for north Queensland landholders. This potential will not be realised unless there are more positive signals from potential markets than is currently the case. Some means of rectifying the current situation are highlighted. However, all of the mechanisms examined will depend for their success on the cooperation of all levels of government, industry and landholders.

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3. THEORETICAL BACKGROUND OF SUPPLY CHAIN MANAGEMENT AND POTENTIAL SUPPLY CHAIN OF NORTH QUEENSLAND TIMBER INDUSTRY

R. H. Keane, J. L. Herbohn and G. Slaughter

This paper examines the suitability of supply chain management (SCM) as a methodology for examining forestry development options in north Queensland – both industrial and farm – with particular emphasis on hoop pine. SCM has been defined from different perspectives by various authors and some of the alternative definitions of SCM are given. SCM is then placed in the context of the north Queensland timber industry focusing on the current structure and participants and the factors that need to be considered to make the supply chain for hoop pine more efficient. This highlights the need for a broader and more extensive supply chain for the north Queensland timber industry. Facilitation of a broader supply chain requires the development of mechanisms to improve cooperation between supply chain participants. This includes the expansion of the hoop pine resource area, value-adding processes, and improved information flows. The goal of research in progress is to develop a framework to facilitate a diverse multilayered supply chain for hoop pine that will promote a north Queensland industry that is economically and environmentally viable.

INTRODUCTION

The global business environment including agribusiness is in a state of transition, being influenced by globalisation, strategic alliances, merger and acquisition, business process and reengineering. These strategic approaches are altering the focus of overall management of businesses and influencing the ultimate goal – reaching the end-users by shifting from mass-marketing to customised marketing and emphasising relationship-based marketing in all fields. The rapid advancement of information technology is also having its affect on businesses and their management. These changes in turn effect the management of supply chains of all businesses. Generally speaking, the widespread success of any business depends on the efficient utilisation of its supply chain, which links all the participants and players of that particular business. The chain usually starts from the gathering of raw materials or goods and finishes when the good is supplied to the ultimate end-users, the customers. The effective and efficient management of supply chains is challenging, and requires clear understanding of the components of *supply chain management (SCM).* SCM is usually concerned with managing the chain involving all the participants of the supply of particular product or service starting at the very core of a business. Competitors are also considered a part of the supply chain network and managed under the chain. As a result SCM is considered to be an integral part of the core competencies of a business, enhancing competitive advantage over its competitors.

The agribusiness sector, as a whole, needs to apply SCM efficiently to be competitive in the changing global picture. Forest industries, such as in north Queensland, involve production pipelines such as are found in other agricultural industries, and thus need to incorporate a well developed supply chain in order to be competitive in local and world markets. This paper presents a preliminary analysis of the significance of SCM in the timber industry, especially in relation to hoop pine, in north Queensland. This analysis aims to find the appropriate definition of SCM and its application to the supply chain of the current timber industry. A

critical analysis of the current supply chain for hoop pine, and all its participants – the large private and public foresters and small farm foresters – will highlight the need for and method of incorporating all the participants into the future chain by offering value-adding activities so as to enhance overall profitability and customer satisfaction of the industry.

The aim of this paper is firstly to assess critically the various definitions of SCM and place key aspects of those definitions in the context of the forestry industry in north Queensland, with particular emphasis on hoop pine. Secondly, the paper identifies the current and most suitable definition of SCM to be applied to the timber industry, both industrial and farm, with a focus on hoop pine. Finally, the paper outlines the existing supply chain structure of the north Queensland timber industry. It also proposes a future supply chain structure for the overall industry by suggesting some steps for adding value.

HISTORY OF SCM

Various studies have indicated that supply management is one of the core functions of an organisation – whether production oriented or service oriented. This supply management concept has evolved over the years from being simply a focus on purchasing to encompassing other related areas including the ultimate supply to the end users. Kopczak and Johnson (2003) observed that there are many views of supply chain management and some are quite elaborate and focus on operations, and others on information management. Burt *et al*. (2003) in their analysis of the growing importance of SCM suggested that a future focus would be on 'Kaizen' or continuous improvement, because this is being recognised as one of the core functions of corporate importance. These authors have also highlighted that supply management is crucial for organisations' strategic planning functions. Several researchers have also focussed on the evolution of supply chain management from simply purchasing or procurement to incorporating other functions including logistics and transportation and information management, among others (e.g. Burt *et al*. 2003; Monczka *et al*. 2002; Ayres, 2001; Fredendall and Hill, 2001; Ross, 1998).

A brief review of the history of the development of SCM reveals that the importance of purchasing function was referred to as far back as 1832 in Charles Babbage's book on the economy of machinery and manufacturing (Monczka *et al*. 2002; Burt *et al*. 2003). Monczka *et al*. (2002) suggested that the greatest development of purchasing occurred after the 1850s when the American railroad went through a growth phase. This lead to the recognition of purchasing as a distinct corporate function that makes a contribution to overall company profitability. The essential elements of the modern purchasing functions of the supply chain developed in the period from 1900 to 1939 were applied in World War I to purchase of war materials, with a particular focus on procuring raw materials.

During World War II (1939 to 1945), the corporate significance of purchasing inputs was increasingly recognised, and courses in business logistics were offered in various North American universities, but the post-war phase was quieter as the number of market-driven firms increased in the United States (Monczka *et al*. 2002). According to Monczka *et al*. (2002), even though value analysis techniques developed, pioneered by General Electric in 1947, the emphasis was on satisfying consumer demands and requirements of a growing industrial market. Burt *et al*. (2003) also observed that post-war years did not see much growth in research into input purchasing, as emphasis was given on marketing, finance, operations and research and development. Purchasing incurred a significant portion of costs of goods sold, but was not managed by skilled personnel. Interest in materials management grew around 1960s to 1970s and the focus was more on solving the problems from a total system viewpoint for an organisation rather than the individual function (Fredendall and Hill, 2001; Monczka *et al*. 2002; Burt *et al*. 2003). During this time the purchasing managers emphasised multiple sourcing through competitive bid pricing, and the major focus of buyers

was on purchase price and the prevention of line shutdowns. Suppliers were rarely viewed as value-adding partners.

By the end of 1970s and the beginning of 1980s, the world business situation changed drastically and was influenced by globalisation, automation, technological change, increased inflation, international competition and strategic alliances. These changes affected the SCM and gave birth to an integrated approach to SCM, where the demand and requirements of the customers and role of suppliers were accorded increased importance. In recent years, purchasing and materials management have been considered vital in adding value to the overall organisation and increasing its profitability (Burt *et al*. 2003), and in meeting the challenge of worldwide competition, rapidly changing technology and customer expectations (Monczka *et al*. 2002). These changes have increased the profile of SCM in the success of an organisation by emphasising the fact that supply managers are active participants in the organisation's strategic planning process. Thus differing SCM definitions have emerged highlighting the importance of supply stages for the overall success of an organisation.

DEFINITIONS OF SCM

When defining SCM, most authors have emphasised the importance of the various chain players as well as considering the customers as a vital part of the chain. Many definitions also focus on the two-way flows of goods and services along with information and funds from purchaser to end-user, so the industries involved achieve their final goal of sustainability and profitability in the global competitive marketplace. This section focuses on the critical aspects of some of the paradigms of SCM as defined by various practitioners and authors.

Changes in the global business situation and increased competition among organisations have influenced the management complexity of all organisations. Monczka *et al*. (2002) pointed out that today's organisations must manage both the upstream firms – suppliers providing direct and indirect inputs – and downstream firms or the distributive network delivering and offering after-market service to customers. Based on this, (Monczka *et al*. 2002, p. 4) offered an extensive definition of supply chain and its management:

> "The supply chain encompasses all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to end users, as well as the associated information flows. Material and information flow both up and down the supply chain. The supply chain includes systems management, operations and assembly, purchasing, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. Supply chains are essentially a series of linked suppliers and customers; every customer is in turn a supplier to the next downstream organisation until the finished product reaches the ultimate end user.
>
> Supply chain management is the integration of these activities through improved supply chain relationships to achieve a sustainable competitive advantage."

SCM has a great impact on wider organisational strategies, mainly those associated with purchasing and sourcing (Monczka *et al*. 2002), incorporating multiple organisations as chain participants. Monczka *et al*. (2002) have divided the participants in three categories – the internal functions, upstream suppliers and downstream customers. Two of the major internal functions of an organisation are order processing and production scheduling. Order processing involves extensive customer interaction – starting from taking the order to after-market service while production scheduling involves actual plans and schedules. The upstream suppliers manage the flow of the right materials, at the right time to the right internal users. Downstream customers include the distribution channels, processes and

functions, which the product passes through in order to reach the ultimate customers. The logistics managers are involved here in the form of managing transportation and distribution.

Monczka *et al*. (2002) observed that there are upward and downward flows of materials, information and funds between the participants of the supply chain. Thus the management of relationships among these players are imperative and offer and opportunity for competitive advantage to the firm. Supply chain as a core competency presents the following advantages to a company:

- Cost reduction or improvement;
- Improved material delivery;
- Shorter cycle time, including product development cycle times;
- Access to product and process technology; and
- Quality improvement.

Ross (2000) identified the complexities in defining SCM, recognising that the concept involves a matrix of applications and can be defined in various ways. He viewed SCM as a comprehensive, dynamic, growth-oriented, competitive management approach that is nurtured by globalisation, change and uncertainty. He also stated that SCM is based on the following three dynamics:

- Operations management techniques, where all the organisations' functions – marketing, manufacturing and finance – are optimally utilised and integrated to form the common business system. These techniques offer competitive advantage by adding value to the day-to-day performance of regular activities. The three sets of activities are inbound logistics, processing activities and support activities;
- Integrated logistics management, which is extended to the interchannel logistics activities. The objective at this level is to interface closely with, not merge, the identical functions performed by logistics counterparts in outside supply channel partners. The main rationale of this dynamic process is that an organisation needs support from its internal as well as external supply chain partners to gain competitive advantage and market leadership; and
- Strategic dynamics, which concentrate on reducing delivery times and costs, and adopting new management techniques and management information system to achieve breakthroughs in products and services that satisfy the ever-changing customer needs. This focus opens up a new dimension for the organisation and gives it a competitive edge through forming alliances with channel system partners and offering relationship-based marketing to suppliers and customers.

Ross (2000, p. 9) summed up the above analysis with the following definition of SCM:

> "Supply chain management is a continuously evolving management philosophy that seeks to unify the collective productive competencies and recourses of the business functions found both within the enterprise and outside the firm's allied business partners located along intersecting supply channels into a highly competitive, customer-enriching supply system focused on developing innovative solutions and synchronising the flow of the marketplace products, services, and information to create unique, individualised sources of customer value."

Some practitioners have underlined the importance of customer as partners all along the chain, including Fredendall and Hill (2001) and Burt *et al*. (2003). Fredendall and Hill (2001)

examined the importance of including customers as participants in the supply chain because of the advantages mentioned below:

- Integration of customers in the chain improves the flow of information so as to understand better the needs of the customers. If the customers are not included, the purchaser (the focal firm offering the goods or services) is uncertain about the customers' needs and ends up complicating the overall plan, with increased costs and lead times.
- It allows the firm to incorporate the product development function along with other organisational functions, so that the communication, internal and external, between product development staff and customers is strengthened. Concentrating on the internal customers makes all employees aware of the chain and encourages their participation to accomplish the end goal of satisfying the customers.

Ross (1998) also highlighted the importance of customers and argued that SCM strategies should be completely customer driven. SCM plays a dual role of a communicator of customer demand from point-of-sale all the way back to the supplier, and physical flow process that ensures the timely and cost-effective flow of goods through the entire pipeline. This is crucial for the efficient application of SCM because customers nowadays are increasingly accustomed to receiving customised products, as the market responds to demand-pull product strategies rather than traditional demand-push strategies.

Various paradigms of SCM have focussed on the management of internal customers as well as external customers. The internal customers can be defined as the receiver persons or departments of another person's or department's output or final product, service or information (APICS Dictionary, cited in Fredendall and Hill, 2001). These internal customers again ensure the delivery of product, services or information to the external end-users. Ross (1998) argued that SCM is a dynamic and open-ended approach to marketplace competitiveness and a continuous process of determining intracompany and intercompany performance, information system techniques, products and services, and organisational and personal competencies to utilise the customer demands. The utilisation of such internal and external participants ensures that the chain achieves productivity, profit and growth. This again is related to the two-way flows of product, service, funds and information, from raw material to end-user.

Burt *et al*. (2003) defined SCM as simply the linkage between the ultimate customers and Mother Earth. They also highlighted the involvement of funds, which come in only when end-users purchase a product or a service. Otherwise transactions within the supply chain are the simple allocation of those funds among the chain's external and internal members. The Internet can be a valuable factor in coordinating and synchronising the activities of the members of a supply chain. Based on this, Burt *et al*. (2003, p. 9) have defined SCM as a chain that includes

> "all internal functions plus external suppliers involved in the identification and fulfilment of needs for materials, equipment, and services in an optimised fashion. The supply system plays a key role in helping the firm satisfy its role in the supply chain."

This relationship of the internal functions and external players of the system has been depicted as in Figure 1.

Burt *et al*. (2003) have also focussed on the combination of total costs and sales in SCM as depicted in the Figure 2. They argued that SCM directly affects the total costs and sales of the firm and also the investment in assets, which in turn increases the overall profitability of a

firm and establishes supply management as a core competency. As a result, shareholders' values are increased. These authors point out that SCM increases sales through particular activities performed by the firm such as being early to the market, improving product quality, reducing the cost of production and innovation of new products and services, thus enhancing customer satisfaction. As a consequence, the firm offers customer fulfillment flexibility by shorter production cycles and lead times. Burt *et al*. (2003) moreover suggested that the total cost of ownership could be reduced by early supply management and supplier involvement through better product designs. Cutting down the acquisition costs, processing costs, administrative quality costs, downtime costs, risk costs, cycle time costs, conversion costs, non-value-added costs and supply chain costs can further reduce the cost associated with ownership and bring about better utilisation of assets and collaborative and alliance relationship between buyers and sellers.

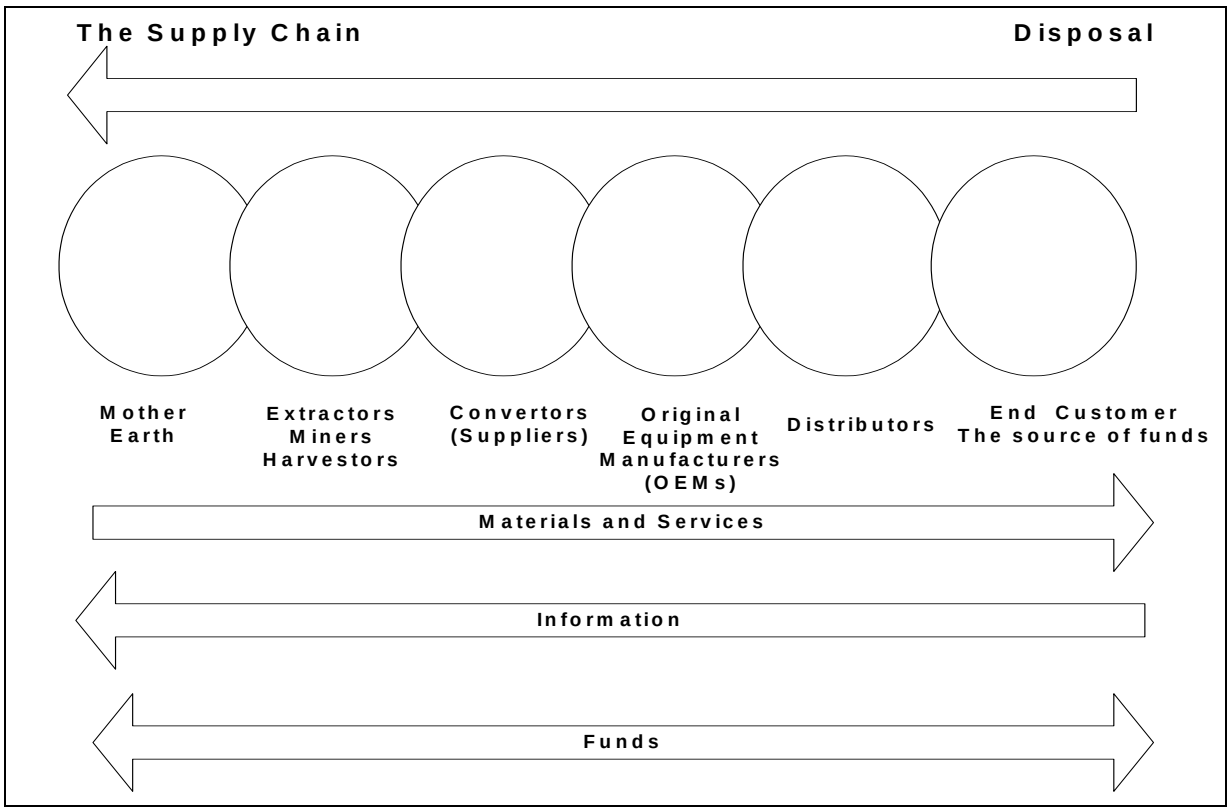

Figure 1: The supply chain (Source: Burt *et al*. 2003, p. 9).

There are other professionals and researchers who support the view that SCM creates value by reducing costs and increasing sales. For instance, Hoover *et al*. (2001) argued that companies with best-practice supply chain management have greater cost-efficiency than their competitors, with increased contribution margin and permanently lower prices.

Burt *et al*. (2003) argued that all participants of a supply chain should further concentrate on a series of value-adding functions:

- **Quality** – should relate to Total Quality Management (TQM) to offer the best possible product and service given the market segment;
- **Cost** – should focus on strategic cost management programs by reducing the total cost throughout the chain;

- **Time** – aim at reducing lead-time so products and services are available to the end users in the minimum possible time;
- **Technology** – should be used appropriately both internally and externally with the members of supply chain to gain competitive advantages; and
- **Continuity of supply** – develop appropriate supplier relationships by monitoring the trends in the chain and marketplace.

Fredendall and Hill (2001) differentiated between SCM and Value Chain (VC), whereas some researchers view them as synonyms. Fredendall and Hill (2001) defined SCM and VC as follows:

> **SCM:** Process from initial raw materials to the consumption of the finished good by ultimate customer, incorporates the external and internal functions of an organisation to enable the use of value chain (APICS, The Educational Society for Resource Management, Dictionary, 1995).
>
> **VC:** Internal functions of an organisation to add value to the overall products or services offered by the company (APICS, The Educational Society for Resource Management, Dictionary, 1995).

Larson and Halldorsson (2002) compiled various definitions of SCM focussing on diverse aspects of its functions. Larson and Halldorsson (2002) recognised the role of the Institute of Supply Management (ISM) in terms of the Glossary of Key Purchasing and Supply Terms (2000), in which SCM is defined as the identification and management of specific supply chains that are critical to a purchasing organisation's operations. They also argued that SCM involves the entire flow of information, materials and services from raw materials suppliers through factories and warehouses to the end-users. Therefore SCM incorporates both upstream and downstream relationships along the chain (Christopher, 1998; Handfield and Nichols, 1999; Lambert and Cooper, 2000 cited in Larson and Halldorsson, 2002).

Figure 2: Impact of supply chain management on sales increase and cost reduction (Source: Burt *et al.* 2003, p. 11).

Four types of conceptual perspectives of SCM have been defined by Larson and Halldorsson (2002), as illustrated in Figure 3. These are:

- **Traditionalist** – view SCM as a strategic aspect of purchasing. They emphasise the development of partnerships with both first and second tier suppliers.

- **Relabeling** – as has been pointed out by various authors, purchasing has evolved to become SCM. They narrow down the focus of SCM only to purchasing.
- **Unionist** – purchasing is a part of SCM and SCM involves a number of business processes, such as purchasing, quality management and customer service.
- **Intersectionist** – various authors have suggested that purchasing and SCM intersect as part of various business processes, giving SCM a broader focus.

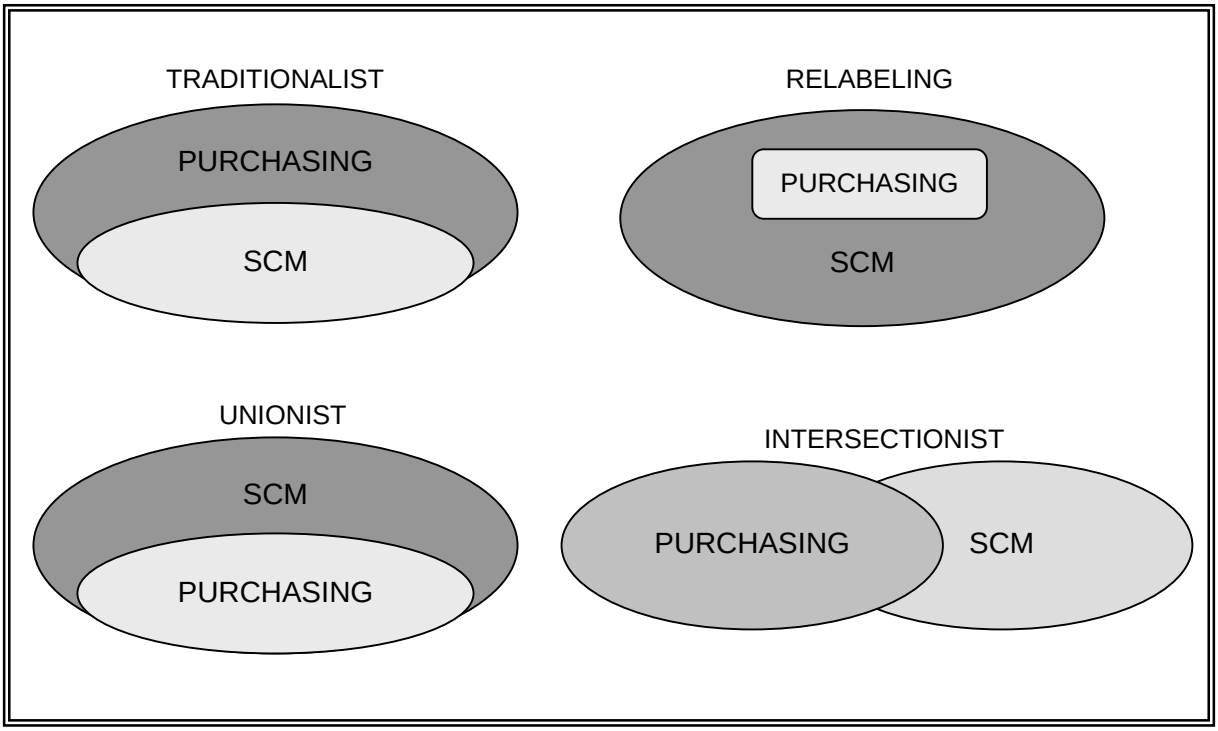

Figure 3: Conceptual perspective of supply chain management (Source: Larson and Halldorsson, 2002).

Ayers (2001) defined SCM with a broader focus on information, financial flows, and the creation and deployment of intellectual capital, and concluded by defining it as the life-cycle processes supporting physical, information, financial and knowledge flows for moving products and services from multiple linked suppliers to end-users to satisfy end-users' requirements. The life-cycle process here includes both the market life cycle and usage life cycle. Ayers (2001) added the usefulness of knowledge management into the definition of SCM and mentioned that value adding in the form of intellectual capital is vital for the profitable marketing of any goods and services. The knowledge inputs lead to increased product innovation in the chain. The flow direction has been highlighted in this definition because SCM not only incorporates flows from suppliers to end-users, but also backward flows including product returns and rebates.

When defining SCM, most practitioners focus on the chain relationships and describe the importance of such relationships among members of the chain. In explaining such relationships, Fredendall and Hill (2001) emphasised the need for collaborative planning among the chain members, which requires the organisation to work with suppliers and customers, so as to ensure that the suppliers maintain production and delivery schedules that satisfy the needs of the customers. Burt *et al*. (2003) further supported this argument and pointed out that there are three types of buyer-supplier relationships – transactional, collaborative and alliance. According to these authors, the transactional relationship is the most basic form, where neither party is concerned about each the other's wellbeing. There is

little collaboration and learning; costs, data and forecasts are not shared; and price – as determined by market forces – is the focus of the relationship. Collaborative relationships exist where management focuses on interdependence and cooperation among supply chain participants and ensures profitability for all parties concerned. Management ensures that the chain's end products are cost competitive, continuous improvement is easier to achieve and overall cost is reduced, quality is improved and time is better managed. There is a strong focus on developing long-term relationships between the supplier and customer in collaborative relationships and alliance relationships. These relationships also have lower total costs, likely increases in research and development expenditure, training, and procurement of newer and more efficient equipment. Supply alliances focus on physical asset and human specialisation and offer lower total costs, reduced time to market, improved quality, improved technology flow from suppliers and improved continuity of supply.

The above analysis of alternative definitions of SCM shows that the concept has two distinctive foci – tactical and strategic. Ross (1998) argued that the strategic dimension of SCM incorporates the vision for a company along with the day-to-day operational activities to exploit the competitive possibilities of the global business environment. To do this the focal company need to seek innovative ways to not only penetrate existing markets but also create new sources of value to open whole new markets and to develop strategic relationships with other chain participants so as to enhance competencies and attract resources necessary to sustain competitive survival. Burt *et al*. (2003) argued that SCM should focus on some strategic activities, including environment monitoring, integration of supply strategy, developing and updating commodity strategies, data management, corporate strategic planning and strategic sourcing, forming supply alliances supply networks, and fulfilling social responsibilities. Kauffman (2002) added further strategic components to his analysis of the SCM definition, such as product, cost, relationship and access. According to Kauffman (2002), an organisation needs to identify and select its product and service, be cost competitive, focus on the strategic relationships among supply chain members and have required access to the product, so as to have the best combination of product, cost and relationship.

SCM has evolved over recent years to take a broader functional and strategic focus. Kopczak and Johnson (2003) argued that the business trends of the 1990s have created a need for this broader SCM while advances in information technology have created the opportunity. The six shifts in business focus based on the advances in information technology, new accounting and financial measures and industry initiatives are:

- from cross-functional to cross-enterprise;
- from physical efficiency to market mediation;
- from supply focus to demand focus;
- from single-company product design to collaborative, concurrent product, process and supply-chain design;
- from cost reduction to breakthrough business models; and
- from mass-market supply to tailored offerings.

In addition to all the characteristics of SCM that have been analysed above, SCM should incorporate the environment in which the chain members operate. The physical environment has gained increased importance over the years, with both individuals and companies becoming increasingly aware of the physical environment and its effect on the business environment. It is important for any industry, and particularly for an agricultural industry, to incorporate the environmental impacts of the activities and functions of its SCM. Burt *et al*. (2003) drew attention to the importance of the physical environment in the efficient

operations of SCM and proffered that the following four 'Rs' can be used to reduce waste and improve sustainability:

- **R**educe the waste generation.
- **R**euse and **R**eallocate materials as much as possible.
- **R**ecycle as much as energy-efficiently possible.

These authors also pointed out that application of the four 'Rs' to manage the SCM would result in economic gain for the whole supply network through cost reduction and more efficient marketing. Enforcing a production process that decreases pollution can reduce the cost. Today's customers are environmentally more conscious and incorporating this awareness into the SCM strategy and delivering an environmentally friendly product will ensure economic gain for the chain participants.

The above analysis of definitions of SCM has highlighted some strengths, weaknesses, opportunities and threats (SWOT) of the overall SCM, which are listed in Table 1.

Table 1: SWOT analysis of supply chain management.

Strengths
• Broad focus encompassing all the supply chain participants and members along with stakeholders both internal and external to the organisation.
• Offers a strategic view of the supply channel (Ross, 1998, p.11).
• Potential to include a customer as a partner in the supply chain Improves the flow of information and integrates the product development functions with other functions focussing on internal and external customers offers several advantages (Ross, 1998; Ayers, 2001; Kopczak and Johnson, 2003).
• Advances in information technology have fostered real time information sharing and knowledge management, coordination and decision making among companies of all sizes and shapes (Kopczak and Johnson, 2003).
• Burt *et al*. (2003) pointed out that are three principal classes of relationships in SCM enhancing the overall communication and performance of the participants and increasing competitive advantages, namely transactional, collaborative and alliances.
• SCM also cooperates with environmental protection factors by offering services of reduction, reuse, reallocation and recycling (Burt *et al*. 2003).
• Companies can achieve high level of productivity, profit and growth (Ross, 1998).
Weaknesses
• Can become complex with the involvement of all the levels of the chain.
• Lack of proper communication among the levels of the supply chain (Ayers, 2001; Kopczak and Johnson, 2003).
• Recent trends in businesses including outsourcing, globalisation, fragmentation and business process reengineering (BPR) have made it vital for SCM to be given more importance than an individual organisation.
Opportunities
• Incorporates the philosophies of just-in-time (JIT), quick response manufacturing (QRM), vendor management (VM) and agile manufacturing (AM) (Ayers, 2001).
• Integration of new communication technology (Ayers, 2001; Kopczak and Johnson, 2003).
• Demand driven then supply driven (Ayers, 2001; Kopczak and Johnson, 2003).

Threats
• A threat arises when a competitor perceives a shortfall in the chain management (Ayers, 2001).
• Can be a defensive weapon that is used by competitors (Ayers, 2001).
• Small firms may lack the resources for the management of SCM.

CURRENT TIMBER SUPPLY CHAIN OPERATING IN NORTH QUEENSLAND

According to the different segmentation suggested by Larson and Halldorsson (2002), as reflected in Figure 3, the current timber supply chain of north Queensland can be conceptually acknowledged as a *unionist* structure at present, where purchasing is viewed as a part of SCM with other related activities including customer service and materials management. This paper aims to develop a more specific focus for the future supply chain of timber industry of north Queensland and link it between the concepts of unionist's and intersectionist's structure as these concepts integrate the overall definitions and functions of supply chain.

Separate supply chains may be identified for softwoods and native hardwoods in north Queensland. When logging took place in native forests, there was a major industry based on hardwoods. Moore (1992, as cited in Herbohn *et al*. 2001) pointed out that the three-year average harvest of rainforest cabinet timbers from Crown and private land directly prior to World Heritage listing was 66,000 cubic metres, with a further harvest of 50,000 cubic metres of lower grade structural timber. The Crown harvesting dropped from 52,000 cubic metres in 1987 (prior to the listing) to almost nil after the listing, whereas the private cut increased to about 30,000 cubic metres by 1992. The cut has since decreased, and only a few small hardwood mills continue to operate.

While many softwood species have been trialled on the Atherton Tableland, hoop pine has been the most successful species, with about 1000 hectares being grown on government plantations, together with a small area of Caribbean pine. On coastal areas, about 13,000 hectares of Caribbean pine has been established.

Figure 4 outlines the current supply chain associated with the timber industry based on the hoop pine resource on the Atherton Tableland, which is owned almost exclusively by the Department of Primary Industries–Forestry (DPI–Forestry). Seedlings are sourced from government nurseries. Currently a bilateral monopoly exists with one seller (DPI–Forestry) and one buyer (Ravenshoe Timbers Pty Ltd). Plantations are harvested and transported to the Ravenshoe mill by contractors engaged by the mill, with royalties paid to DPI–Forestry based on timber volume harvested. As part of the log sale arrangements, Ravenshoe Timbers must accept logs of all grades and sizes. The Mill processes about 30,000 cubic metres of hoop and Caribbean pine per year. The mill has two finger jointing plants, and undertakes some further value adding, including production of mouldings and door cores. The mill is the largest single employer in the Herberton Shire, and has significant influence within the supply chain. The company has a further timber processing operation in Cairns. Hoop pine has a high customer demand because of its high quality and greater range of uses than other softwoods. Ravenshoe Timbers sell products both domestically and through export.

Other factors relating to economics, existing competition, socio-economic conditions, environment and workplace health and safety have a considerable impact on the efficiency of the current supply chain of north Queensland timber industry.

POTENTIAL SUPPLY CHAIN OF NORTH QUEENSLAND

The existing supply chain for hoop pine in north Queensland discussed so far has focused on the unionist viewpoint, as described by Larson and Halldorsson (2002). As highlighted earlier, the aim is to identify a broader and more extensive supply chain for hoop pine, which can be used as a conceptual model to investigate how the hoop pine based timber industry, can be expanded. This is consistent with the definition of Ayers (2001), where other broader functions including provision of information, flows of finance, and the creation and deployment of intellectual capital are to be included. In the future, the supply chain could be enhanced in its role as the life-cycle process supporting physical, information, financial and knowledge flows for moving products and services (timber and value-added products from suppliers – public and private landowners – to end-users or ultimate customers).

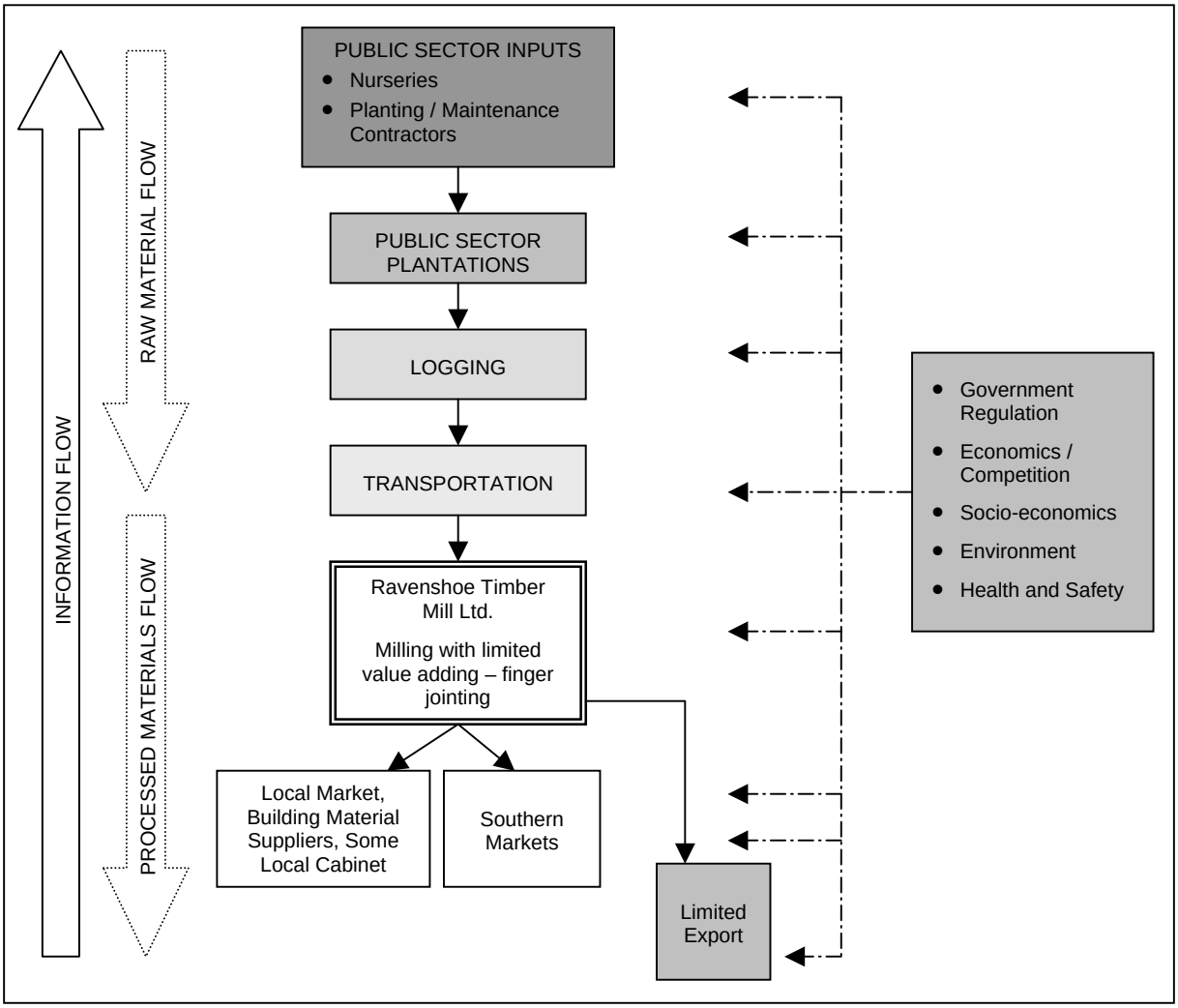

Figure 4: Supply chain associated with growing and milling of hoop pine.

As per Ayers' (2001) definition, it can be presumed that the supply chain should focus on:

- **Functional** – incorporating the integrated participation of all the stakeholders and supply-chain players to establish an effective supply chain network; the customers are of utmost importance and consist of local, national and international markets;
- **Procurement** – private and public sector inputs from nurseries, planting and maintenance contractors, service and information providers so as to utilise the

information and the creation and deployment of forestry-related intellectual capital of the skilled personnel; the factors incorporated here would be logging along with the log buyers;

- **Logistics and transportation** – amalgamation of the current logistics and transportation system to reduce cost, proper utilisation of the system for all the main and value adding products;
- **Information** – ensure and maintain effective information flows and utilisation of information about government regulation, economic aspects, competition, socio-economic and environmental factors, and extended health and safety measures;
- **Business process reengineering** – as an established industry there needs to be a focus on new value-added products and utilisation of the current resources so as to have long-term gain; promote the participation of other fixed-site and portable sawmiller operators to enhance market competition and profitability of all the parties involved;
- **Strategic** – all the goals and objectives should be in line with the strategic focus of forestry management in the region to make the efficient use of all the resources.

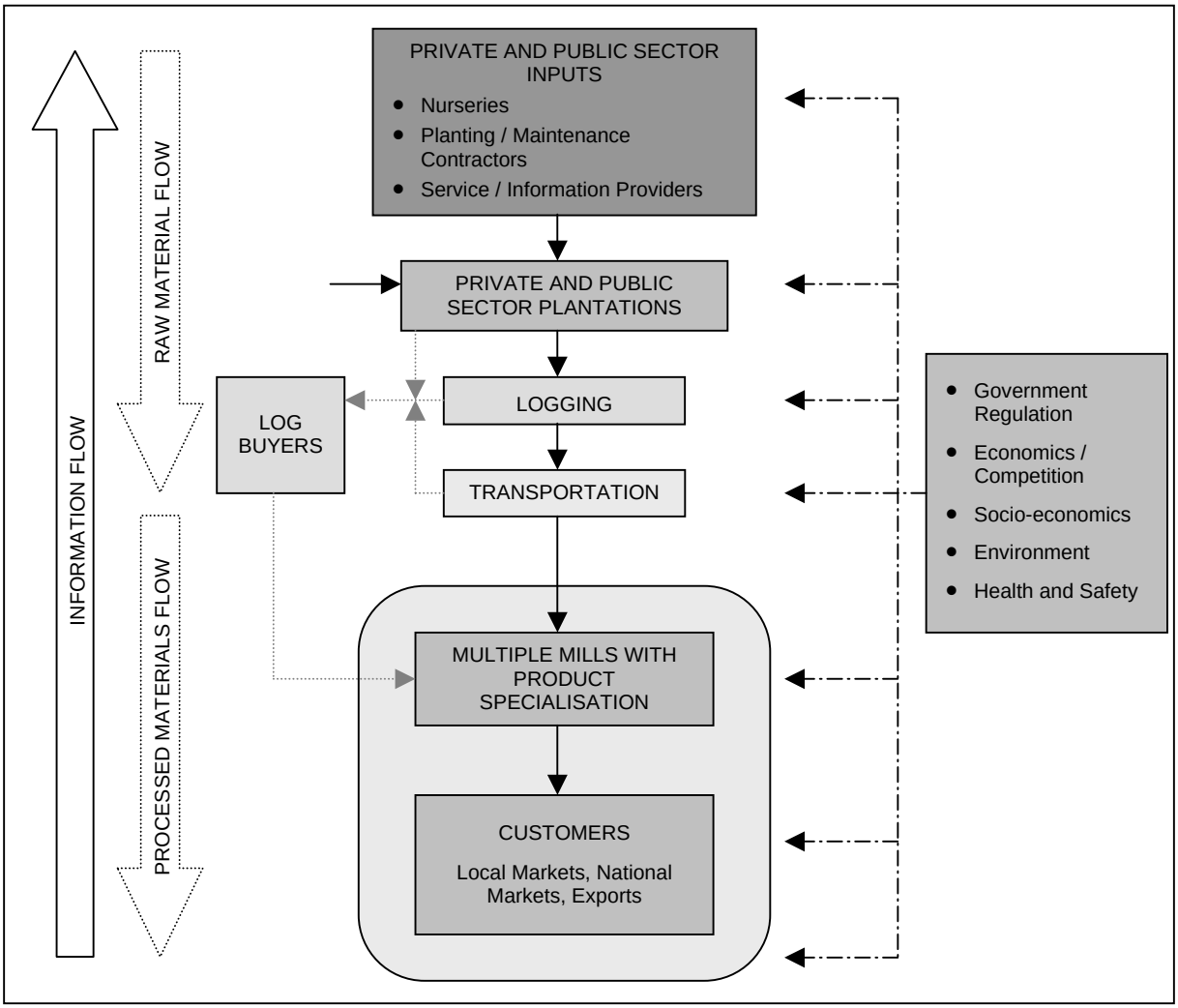

Figure 5: Potential supply chain of north Queensland.

These six factors are included in Figure 5 to highlight the overall dimension of a future enhanced supply chain.

The supply chain consisting of multiple millers would add value to the products. The participation of multiple millers would allow for product differentiation. With a larger log

volume available for milling, logs from plantations could be graded and then sent to different mills, which specialise in processing that particular grade or size of logs. For instance, some mills might process only high quality butt logs for veneer, with others processing lower quality head logs for pallet material. Currently, Ravenshoe Timbers Pty Ltd processes logs of varying quality and sizes. With specialised sawmillers the focus may shift to veneer, plywood and other value-added products, e.g. doors, windows, small furniture, and wooden household products. The entire sawmilling sector could again participate in the export market, as there is a demand for Australian timber in overseas market, especially in Asian markets.

CONCLUSION

The business trends of the 1990s created a need for a broader SCM even in primary industries and advances in information technology created the opportunity. The six shifts in business focus, as identified by Kopczak and Johnson (2003), and based on the advances of information technology, new accounting and financial measures, and industry initiatives can be summarised as follows for the timber industry:

- From cross-functional to cross-enterprise incorporating the different value-added products, steps, multiple sawmillers, small-scale forest farmers and the Crown plantations;
- From physical efficiency to market mediation – the overall supply chain is more market driven;
- From supply focus to demand focus – there should be a concentration on the ultimate users so as to supply products according to their demands and ensure marketability as well as financial and economic viability;
- From single-company product design to collaborative, concurrent product, process and supply-chain design with the co-operation of all the parties concerned from the input suppliers to the end users;
- From overall cost reduction to breakthrough business models – business models enhancing overall feasibility of the forest industry, as well as the economy;
- From mass-market supply to tailored offerings – this will enable the timber industry to focus on niche and specialised market so as to utilise properly the produce and reduce wastage.

These shifts need to be incorporated in the north Queensland timber industry for the efficient utilisation of public and private resources and also to encourage private landowners to engage in planting hoop pine so as to offer some financial incentive for all parties concerned by contributing to value-adding activities.

The participants of the north Queensland timber industry need to be aware of the contribution made by each one of them at each level and incorporate the importance of customers in the management of the supply chain. The overall success of the chain will also depend on the extensive utilisation of the information technology, logistics, and transportation, among other factors. Finally, it can be said that the supply chain should be demand-driven taking the needs of the final customers into consideration and aiming to establish a strong market both locally and internationally.

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4. ECONOMIC THEORY PERSPECTIVES ON TIMBER MARKET BEHAVIOUR IN A SMALL BUT EXPANDING INDUSTRY

S. R. Harrison

Economic theory relating to markets can potentially shed light on the timber market situation in north Queensland and into strategies for regional forestry industry development. Market models provide an economic framework, in terms of supply and demand functions, price elasticities, efficient pricing and resource allocation, and response to shifts in demand and supply (e.g. from subsidies). These models also indicate how market behaviour varies depending on firm size and market concentration amongst sellers and of buyers. This paper applies economic theory to timber marketing in north Queensland. The high degree of market concentration and discontinuities in demand associated with threshold processing timber volumes are notable.

ECONOMIC MODELING OF MARKET STRUCTURE

Economic theory provides important insights into the structure of product markets. Some background in the theory of product markets (e.g. as outlined by Waud *et al*. 1989; McTaggart *et al*. 1992) and its application to forestry are relevant, and are drawn on in the analysis presented below.

Derived Demand, the Timber Supply Chain and Multiple Product Markets

In that timber is an input to other products, a *derived demand* exists for log timber. In fact, various markets exist along the supply chain, from plantation, logging, milling, further value-adding processes, distribution to timber merchants and final consumption. In practice there are a number of parallel – and to some extent independent – sub-markets, e.g. for construction timber, local furniture making, intrastate exports and overseas exports. The existence of multiple markets on the timber supply chain raises the question about the particular components on which to focus attention in terms of planning timber marketing and forestry industry development strategies. In that low stumpage prices to tree growers fail to provide planting incentives, the log market is obviously one point of focus. But because of the nature of the derived demand, it may be that efforts should also be made to promote a greater share of the resource rent for growers (through institutional change) or improve technical efficiency later in the supply chain – for example in timber milling and value-adding – or to promote sales of final products, such that increased demand flows back to stumpage prices.

Time Period of the Analysis

Economic theory examines markets in the short and long-run, the latter being the shortest interval for which all resource inputs are variable. As noted by Pearse (1990), in forestry a distinction may be drawn between the long-run (when new milling plant can establish) and the *very long-run* (the rotation length when new log resource supply can be generated). In north Queensland, the rotation period could be as short as about eight years for pulpwood (for which there is no current market), twenty-five to thirty years for exotic softwoods, and approximately forty to fifty years for native softwood and hardwood species. The very long-

term nature of forestry investments leads to long payback period, a high discount factor for final harvest, and relatively high physical and financial risk.

Assumptions of Homogeneous Producers, Profit Maximisation and Zero Transport Costs

Neoclassical market models for competitive industries in general rely on an assumption of homogeneity or only small differences in product type amongst producers. Potential entrants (or growth prospects) in forestry in Queensland are essentially composed of the government forest service, industrial growers and farmers. These three groups pursue different types of forestry, on different scales and for differing objectives. Government grows exotic conifers for maximum sawlog production and recognised product markets. Industrial foresters have recently established large stands of eucalypt hardwoods, while farmers generally favour hardwoods including rainforest cabinetwood species. Research has indicated that Queensland landholders plant trees for multiple objectives, of which environmental objectives often outweigh economic objectives (Emtage *et al*. 2001), although those not engaged in forestry often attribute their unwillingness to plant to economic reasons (Harrison *et al*. in press). Even amongst landholders, application of hierarchical cluster analysis has identified typologies containing distinct sub-groups in terms of their interest and objectives in forestry (Emtage *et al*. 2001).

The neoclassical economics goal of profit maximization is more relevant for government and industrial forestry, although even in the case of government forestry a multiple use orientation is espoused, i.e. timber production and other benefits (e.g. conservation, watershed protection and recreation) are joint products. When State forest agencies are converted to commercial government business units or corporatised, they typically aim for a particular rate of return on investment, i.e. they exhibit satisficing rather than maximizing behaviour. Similarly, Sharp (2002) found that venture capital providers set a minimum rate of return on investment, varying between firms but with a modal rate of twelve percent. Ethical and green investors in forestry similarly are likely to adopt a satisficing rather than profit maximizing stance. A further type of satisficing decision criterion relevant to forestry investments is the payback period, which can favour short-rotation forestry regardless of the overall payoff (as expressed say by the net present value).

Neoclassical market models assume, among other things, zero transport costs. In the case of traditional timber production, roundlogs transported to a fixed location mill or processing unit form a bulky product with high transport costs, restricting the economic haulage distance and hence market size in terms of timber mill catchment area. In north Queensland, a distance of about 150-200 kilometres is considered a limit for log transport, although in Queensland sometimes logs are hauled over 300 kilometres. Site species matching requirements mean that particular timber species (and associated timber products) are limited to specific locations. For example, high-value rainforest species such as hoop pine and Queensland maple are most suited to relatively fertile soils in high rainfall areas, while eucalpyts and some high-value exotic species are more site tolerant and hence can be grown on more marginal locations with lower land opportunity cost.

The above factors lead to a situation where the economic construct of *perfect competition* has little if any relevance. The producers and their products are not homogeneous, satisficing rather than optimizing objectives are apparent, and locational efficiency issues have an important bearing on transport costs and number of log buyers.

Market Supply, Demand and Efficient Pricing and Resource Allocation

Subject to the above limitations, supply and demand considerations may be applied to the market for log timber. Intuitively, it would be expected that as the price of log timber

increases, the supply increases and the demand falls, and that the long-run schedules would have lower price elasticity than the short-run schedules.

Timber Supply Schedules

It is instructive to consider timber supply in relation to four time scales – the market period, the short-run, the long-run and the very long-run. The market period would apply to timber already harvested and ready for sale. The short-run would allow for more harvesting. The long-run relates to the period in which loggers and millers can increase plant to increase output. The very long-run is that where new plantings can be made and grown through to harvest, i.e. to a full rotation. The nature of the demand curve will differ for each of the time scales. Anticipated returns will depend on expectations of future real timber price rises – which will depend on demand by processors and international timber supply levels – taxation regime, and any assistance measures by government.

In the short-run, *log supply* in north Queensland is likely to arise from the harvesting of government plantations, existing native forest (which does not 'owe' landholders any establishment costs) and to a lesser extent private hardwood plantations reaching early harvestable age where owners are anxious to raise cash. At low timber prices, there is a small level of supply mainly from those landholders who are enthusiastic about forestry and not reliant on plantation returns to maintain a viable business (or have off-farm income). The quantity of logs supplied can be expected to increase with increasing price according to an upward sloping supply curve. However, if the price is very high, or there are expectations of further price rises, forest owners may actually withhold timber to sell later when trees are of a higher quality and will attract a higher price per unit volume ($/m^3), giving rise to a backward sloping section of the short-run supply curve, as in Figure 1.

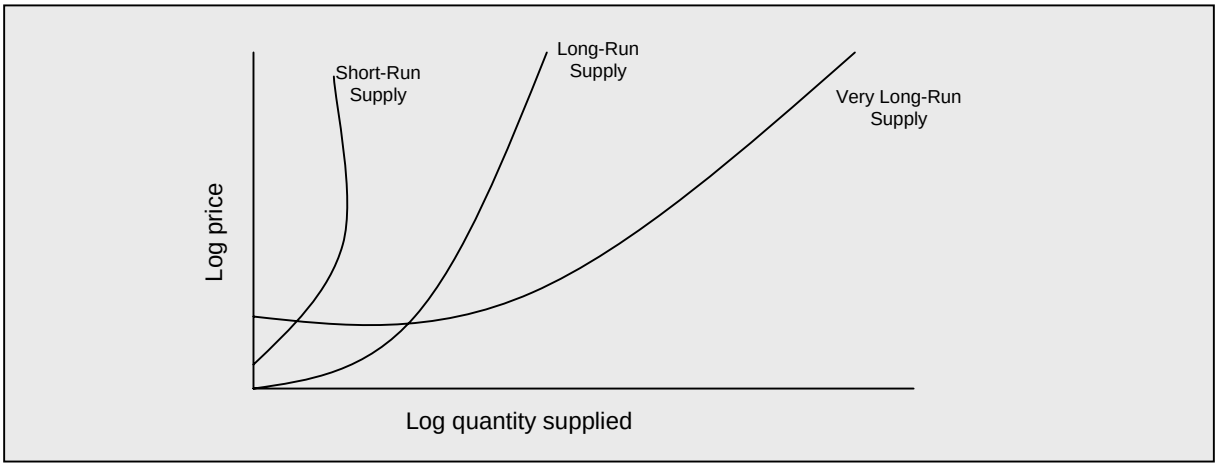

Figure 1: Hypothesised short-, long- and very long-run supply schedules for log timber in north Queensland.

It is to be expected that currently existing stands would be harvested in the long-run, even if the return was little over the harvesting and transport costs, since timber quality deteriorates when trees become over-mature. In the very long-run, new plantations established as a result of prospects of higher log prices would become available for harvest. Hence an upward sloping supply curve in the long-run and very long-run could be expected. This could be a relatively inelastic curve at low prices. At higher prices, there may be increased interest in growing trees – a *bandwagon effect* amongst growers – hence increased supply elasticity. To the extent that plantation supplies became adequate, there could be greater environmental opposition to managing native forests for timber production, and to clearfell logging in plantations, causing some flattening of the long-run and very long-run supply curves.

Timber Demand Schedules

The *demand* for log timber is conditioned by availability of processing plants. Even in the absence of timber mills, a small demand arises from wood turners and very small-scale furniture-makers, hence a downward sloping demand curve can be expected to exist at low timber volumes. If the supply volume is also low, the market may be approximately in equilibrium, as a short-run situation.

As the quantity of resource available increases, it becomes profitable for sawmills to expand plant or new mills establish, and for further value-adding (through vertical integration by millers or entry of specialised firms) to take place. For example, a larger supply of hoop pine in north Queensland would allow further mills to set up, with increased efficiency through specialisation in terms of log type and size. In effect, the quantity available determines the price, or 'the supply creates its own demand'[1].

The long-run demand curve can thus be expected to have a discontinuity at threshold volumes, as at 'qt' in Figure 2. This might in fact be a step function, as processors acquire additional units of plant or further and perhaps larger processors are attracted to set up when increasing timber *resource* supply becomes available.

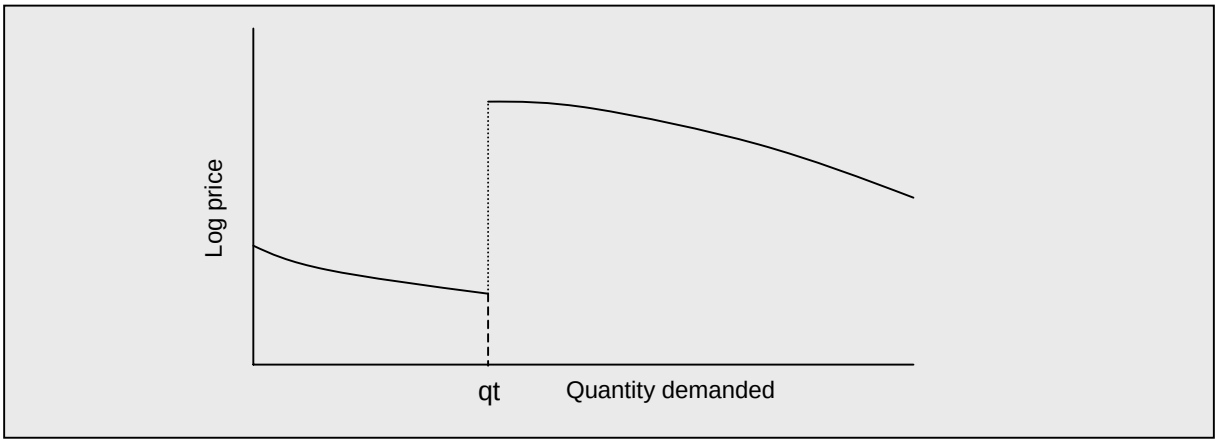

Figure 2: Long-run log demand curve, with discontinuity at threshold volume for processor to establish.

Bringing the supply and demand relationships together, a market diagram as in Figure 3 may arise. The equilibrium may establish at point a, where little processing takes place. Should industry expansion take place, then an equilibrium at b could establish, which is the objective of an industry expansion strategy.

The above analysis presents a picture of demand increasing with quantity supplied (contrary to the normally accepted *law of demand*), though with demand decreasing within processing threshold steps. This situation is probably typical of an *infant industry* situation, where the industry output is an input to further processing, and where the low supply volume results in a lack of processors. It is also probably relevant to an industry redevelopment situation, where there has been major contraction due to loss of a major forest inventory.

[1] This does not necessarily mean that growers will establish plantations in the belief that markets will arise when the timber is ready for harvest. Current lack of resource can create a 'vicious circle' where landholders won't plant trees because of lack of buyers, and milling and further processing won't establish due to lack of resource.

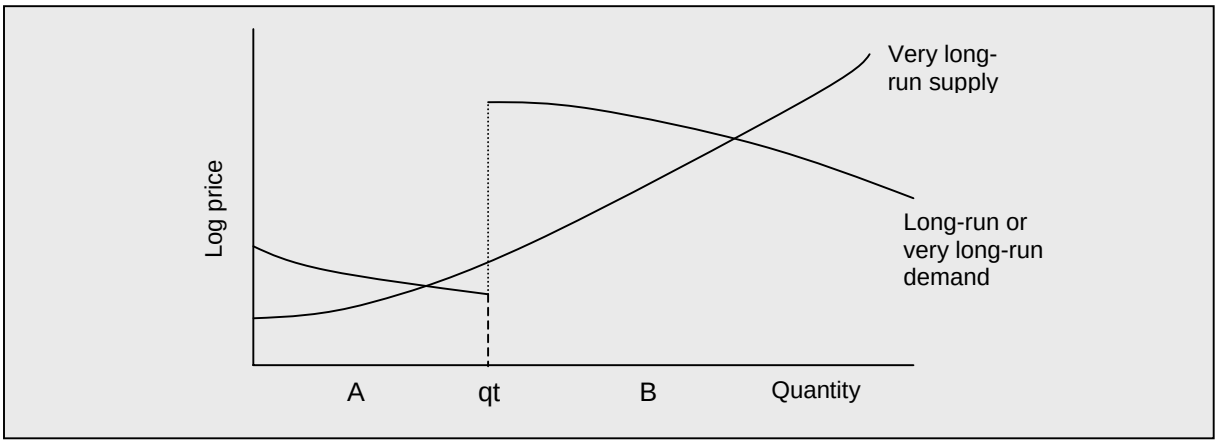

Figure 3: Long-run supply and demand curves for log timber.

POTENTIAL IMPACT OF GROWER SUBSIDIES AND PAYMENTS FOR ECOSYSTEM SERVICES

One application of the market analysis is to examine the effects of subsidies or payments for ecosystem services on the optimal market quantity of logs in the long (and very long) run. If a market equilibrium condition can be identified for log timber, the impact of financial assistance measures can be examined. A subsidy (e.g. tree planting or stand maintenance grant), or a payment for forest services (such as carbon sequestration, watershed protection, salinity mitigation or landscape amenity), would move the supply curve to the right, equivalent to a fall in the producer's marginal cost, as in Figure 4. This could be predicted to lead to an increase in market quantity (of c-b) and a small fall in price. At low or even moderate levels of subsidy, the quantity response is not likely to be sufficient to reach the demand threshold for processors.

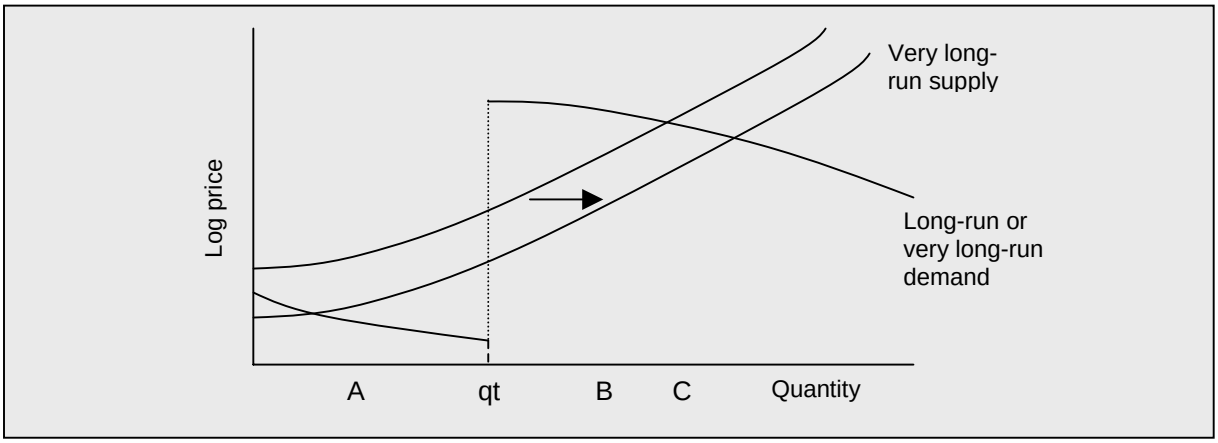

Figure 4: Effect of a grower subsidy on log market equilibrium.

Experience with grower subsidies throughout the world suggests that these have little impact unless a high level of grant is provided, as for example in the United Kingdom (Hill, 2000), Ireland (Ni Dhubhain and Kavanagh, 2003) and Germany (Selter, 2003). Such subsidy levels are not currently politically accepted in an Australian context where effective rates of protection for rural industries are low and have decreased in recent years. It is notable that in New Zealand, log prices for industrial and farm-grown timber increased substantially in the early 1990s, shortly after most grower subsidies were removed, due to freer trade (removal

of the log export embargo) and the 1993 spike in world timber prices (the Spotted Owl event).

Landholder surveys in north Queensland suggest that subsidies for plantation establishment are not highly ranked by landholders in terms of factors, which would encourage tree planting (Harrison *et al*. 2001; Emtage *et al*. 2001). Given the multiple goals of landholders, and likely satisficing behaviour, it is not surprising that other incentive measures could have a greater psychological impact than subsides. Creation of a favourable investment climate such as reducing sovereign risk (in particular providing greater assurance of harvest rights and stable tax treatment) was a highly ranked incentive. Also important were provision of remissions in local government property rates and subsidised seedlings, the financial value of which is quite small to both provider and recipient but has a high symbolic impact on landholders. It is possible that payments for ecosystem services, even if relatively small, could also have a substantial psychological effect and be an effective incentive mechanism.

There appears to be lingering distrust of government forest policy arising from World Heritage listing of the Wet Tropics forests even though this took place in 1988. The remarkably slow Australian Taxation Office decisions on disallowing tax deductions for investment of forest companies have created a negative attitude to forestry investments. Increasingly, farmland is coming under the ownership of business and professional people who commute to city jobs, distance work, or live away from their properties. Landholder typology studies reveal it is these part-time farmers who are most interested in planting trees[2]. Australian federal legislation effective from the 2000/2001 financial year quarantined taxation deductions for plantation establishment and maintenance expenditure to farm accounts, as distinct from any non-farm income, and no doubt had a major disincentive effect on farm forestry.

THE DUAL TIMBER MARKET IN NORTH QUEENSLAND

In north Queensland, distinct markets have arisen for industrial and non-industrial forestry. The above market analysis appears to apply well to both industrial and non-industrial timber markets, and lack of volume is a difficulty in both sectors. The main players, market structure and threshold volume requirements are now examined for each sector.

The Commercial Forestry Sector

The commercial log timber market on the Atherton Tableland is dominated by the industrial-style plantations of DPI Forestry on the supply side and Ravenshoe Timbers Pty Ltd on the processing side. DPI Forestry has about 14,000 hectares of softwood plantation of various ages, in coastal areas and on the Atherton Tableland. The exotic *Pinus Caribaea* (Caribbean pine) and native *Araucaria cunninghamii* (hoop pine) are relatively close substitutes for milling, hence providing a steady if limited volume resource supply. DPI also sold about 212,000 cubic metres of exotic pine timber to Pentarch Forest Products for export in 2003. Ravenshoe Timbers mills both softwood species producing finger-jointed construction timber, house framing, pine mouldings, edge-glued panels and door cores.

The log market closely approximates a *bilateral monopoly*, with single seller and buyer. This timber market situation has been examined by Quayle and Cox (2001), who noted that a *negotiable price range* arises. In a sense log timber is a perishable product, due to the holding cost of plantations, quality decline in over-mature stands, and risk of damage from fire and windstorm. Also, there is considerable social, political and short-term economic

[2] Often these part-time farmers have relatively low quality land more suited to tree growing than cropping (Killen, 2003).

pressure to supply the local processor, because substantial employment is provided in an economically depressed region. The result is that the buyer probably has greater negotiation power than the seller, and that the price falls at a low point in the negotiation range. Additionally, due to the very long-term nature of timber production, it may be that production costs are treated as a sunk cost, and that willingness-to-supply is strongly influenced by resource holding and degradation cost.

The question arises as to what is a sufficient supply quantity to make processing viable. This of course will vary with the type of timber and the type of processing undertaken. A high-volume uniform quality timber input is required for competitive industrial processing, usually based on softwoods. Kent (2001) has argued that the DPI Forestry plantations in the north Queensland area are too small to support a viable processing industry. Commercial forestry in north Queensland with an annual throughput volume of about 25,000 to 30,000 cubic metres probably operates just above the threshold quantity to justify investment in state-of-the-art milling technology. This involves high-cost equipment for laser and computer-guided log sawing, as well as kiln drying and finger-jointing facilities. Greater processing efficiency could be achieved with an increased timber resource supply, supporting additional milling plants and specialisation by log size, final product and species type. About $750,000 in Federal government support has been provided for upgrading milling equipment to maintain viability for timber production and local employment in the face of a limited resource supply, wide range of log sizes and variable input quality resulting from limited pruning.

Marketing of Multiple-Purpose Farm Forestry

The main source of timber in North Queensland was traditionally from crown native forests, which are now protected under World Heritage. There is a history of various farm forestry schemes, but none of large scale or long duration, and only a low level of plantings at the initiative of landholders without government support have taken place. Multiple-purpose small-scale farm forestry in the region could be regarded as a new or infant industry. The species obtained from rainforest logging were primarily tropical hardwoods, many of which had very high quality timber for furniture production. Since cessation of logging Crown forests, much of the infrastructure and skills of the cabinet-making industry has been lost, although there are still many cabinet-makers in the region who source some material from privately-owned native forest.

With government subsidies, many landholders in north Queensland have established native tropical hardwood and eucalypt stands that potentially will yield commercial timber. This includes about five hundred landholders who have planted small areas (averaging less than four hectares, with an aggregate area of about two thousand hectares) during 1993-1996 under the Community Rainforest Reforestation Program (CRRP). Other programs have included the DPI plantation joint venture scheme (PJVS) with landholders (with 160 hectares of four native species planted on sixteen farms during 1996-1999), and environmental plantings facilitated by the Wet Tropics Tree Planting Scheme and Trees for the Atherton and Evelyn Tablelands, TREAT, through funding obtained primarily through the Natural Heritage Trust (NHT). Currently, some stands of African mahogany (*Khaya senegalensis*) are being established, on a larger but not yet commercial scale, using funds obtained through registered and unregistered managed investment schemes and information memorandum or offer documents. There does not appear to be any very large private commercial planting as yet in north Queensland, though some larger stands (thousands of hectares) of eucalypts are being established in central and southern Queensland. Three small fixed-site hardwood sawmills operate in the region, processing about one thousand to two thousand cubic metres in aggregate of native forest hardwood annually, one having high quality kiln drying and chemical treatment facilities (Killin, 2002). A number of licensed and unlicensed portable sawmills are operated in the region (Smorfitt *et al*. 2003).

The small-scale farm forestry sector is much more competitive on the supply side than commercial forestry, and the growers lack coordination and organised marketing; the North Queensland Growers Cooperative (NQTC) having few members and little market impact. There is limited competition on the demand side, in that a few timber mills exist. Most of the downstream demand for tropical hardwoods is met from interstate and overseas imports of low-priced tropical hardwood timbers from unsustainably-managed areas of rainforest in Papua New Guinea, west Africa, Malaysia, Indonesia and the Solomon Islands. There is little evidence of growers who do their own milling being able to make direct sales to timber merchants. This may be possible with greater volumes, or more internationally recognised species, such as African mahogany or teak. Should markets for ecosystem services arise, farm foresters may have an attractive product to offer if they have relatively large plantings, but relative to DPI Forestry lack the scale to minimise transaction costs.

In that the timber volume from small-scale growers in unlikely to ever become as large as that from DPI Forestry plantations, and the regional timber demand is small, the planting of high-value species (particularly cabinetwoods) and some value-adding processing would appear desirable. Even very small volumes of high quality cabinetwoods may permit processing. A personal observation in the Queensland tropics and subtropics is that very small furniture makers travel around their district, purchasing individual logs of high-value timbers such as Red Cedar, Black Bean and White Beech, producing items such as dining room suites and bookcases for local sale. Similar observations have been made by Venn and Whittaker (2003), who commented that for specialised western Queensland timbers for musical instrument production, an annual volume of a few cubic metres may be viable.

At a somewhat higher supply volume, commercial furniture makers will include cabinetwoods in their inputs (Smorfitt *et al*. 2002). Research has indicated that continuity of supply is critical for cabinet makers, who have demonstrated that they are prepared to pay a price premium for imported timber which is available when required and of reliable quality. However, cabinet-makers generally hold low inventories, operate on a just-in-time basis with respect to timber inputs, and place a high premium on readily availability of timber inputs. A volume of ten thousand cubic metres has sometimes been suggested as a threshold volume to support a tropical hardwood timber industry on the Atherton Tableland. This could be achieved with an area as little as about two thousand hectares of well-managed stands. A plantation area and age spread is needed such that a threshold quantity is continuously available. Added difficulty arises because of the large number of species that are used in furniture making, cf. the two relatively similar softwood species (they still have different qualities and markets) used in current commercial forestry in the region.

Portable sawmilling, if performed well to strict standards, may be able to overcome the scale problems in timber milling associated with small-scale farm forestry. However, independent portable sawmillers do not have reliable market outlets, and it has been observed that they can arrive at a situation of holding high inventories and being faced with accepting low prices.

Relationship Between the Two Sectors

Questions arise as to whether the small-scale farm forestry sector can ‘piggy-back on the coat-tails’ of the established commercial forestry sector, in terms of use of facilities, processing capacity, and marketing skills. Perhaps because of the different type of log produced, there is a lack of partnership between government and private growers. A partial exception is the plantation joint venture scheme, which however resulted in establishment of a plantation area of only 160 hectares. This contrasts with the situation in some countries, e.g. in the Black Forest region of southern Germany where government assists private growers in timber marketing. Small-scale growers who plant the species used in industrial forestry have to compete against DPI Forestry to make sales, to a processor who requires

large and regular log quantities, and face difficulty in selling their product. The timber processing infrastructure of the commercial processor is not suited to hardwoods including cabinetwoods, and the processor does not appear to purchase timber from private growers.

CONCLUDING COMMENT

The economic theory of markets sheds some light on the log timber market in North Queensland, although considerable complexity arises from the lack of competitiveness and low throughput volume in the market. Redevelopment of the timber industry following loss of resource through World Heritage listing creates a situation similar to that of the infant industry case, with price likely to increase with increasing supply as processing thresholds are met. The relatively independent nature of the markets for commercial and small-scale farm forestry timber means that the latter cannot take advantage of the scale and infrastructure associated with the former.

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5. PORTABLE SAWMILLS: THE CURRENT AND POTENTIAL FUTURE ROLE IN THE TIMBER SUPPLY CHAIN

D. B. Smorfitt[1], S. R. Harrison and J. L. Herbohn

Markets for rainforest cabinet timbers in north Queensland are currently limited. The vast majority of the logs come from private land due to the reduction of the resource with the World Heritage listing of the rainforest in 1988. For a variety of reasons, no market is available for logs for woodchip. Thus for landholders harvesting trees the main market for these species is the sawn-timber market. In north Queensland the single large-scale processor of logs, Ravenshoe Timbers Pty Ltd, only processes plantation-grown softwoods. The potential buyers of hardwood logs are limited to a few small 'family' fixed-site mills and portable sawmillers. The markets these sawmillers service in turn are often long distances from north Queensland, which leads to high road or rail haulage costs. Additionally, these sawmillers face stiff competition from rainforest timbers of similar characteristics imported from developing countries where legislative requirements and cost of labour are not as onerous as those in Australia. It is important to ascertain what role the cabinet timber industry can play in the north Queensland economy and what role, if any portable sawmilling can play in a future timber industry. Potential exists for greater use of portable sawmills, to handle the relatively small volume of hardwood timber available, and reduce log transport and milling costs.

INTRODUCTION

There has been much interest in the use of portable sawmills in relation to farm forestry in Australia. Various types and models of chainsaws, circular saws and bandsaws are available, which are readily movable between sites, and can be taken to the forest so as to avoid having to transport logs to a fixed-site timber mill. In north Queensland, relatively low stumpage prices in the order of $\$40/m^2$ to $\$50/m^3$ are paid for timber from native forests (Herbohn *et al.* 1997). Potentially, portable sawmills may be a means of increasing returns to landholders by offering a more cost-effective method of milling logs and thus allowing a higher stumpage price to be paid, and allowing landholders to value-add their timber resource on-farm.

FORTECH (1994) noted that portable sawmilling in Australia is a highly informal sector and thus the characteristics are difficult to quantify. The lack of formal sources of statistics on production from this sector, and absence of published work on relative efficiencies and costs of production and quality of output, were also noted. Hunt (2002) encountered a similar lack of information in Papua New Guinea, noting that the overall importance of portable sawmills is difficult to assess, given the lack of data on their production and sales.

The cost of the milling operation is an important element in the overall cost structure of sawmillers. It is useful to differentiate milling costs from other costs such as log acquisition, felling, snigging and haulage, as well as from other value-adding activities such as drying, timber treatment and further processing.

[1] This paper is based on a previous publication by Smorfitt *et al.* (2003).

In spite of the apparent advantages of portable sawmills, there has been some resistance to their use. For example, Laidlaw (1997) noted that Forestry Tasmania does not permit portable sawmilling of any kind in State Forests in Tasmania. This is because such an activity is a potential source of wildfire and because portable sawmilling is difficult to regulate.

In Queensland, under the *Sawmill Licensing Act (Qld) 1936*, sawmills must be licensed with the Primary Industries Corporation. As at 1996-1997, there were 276 fixed-site and 112 portable sawmills licensed in the State, with some licensed portable sawmills operating at fixed locations. The count of portable sawmills excludes most of those for which the blade moves over a stationary log, for which licensing is not mandatory.

Use of portable sawmills by landowners milling their own timber, and entrepreneurs establishing mobile sawmill businesses, has increased in north Queensland in recent years. Anecdotal evidence indicates that mobile sawmillers pay higher stumpage prices to landowners then fixed-site sawmillers, leading to suggestions of profiteering by the latter. However, operators of traditional fixed-site sawmills claim the higher stumpage prices paid by portable sawmillers are only possible because these sawmillers fail to account for costs of workers compensation and industry association costs, and purchase logs on a selective basis.

World Heritage listing resulted in a substantial decrease in the availability of rainforest cabinet timbers. According to Moore (cited in Herbohn, 1996), the annual average volume of rainforest cabinet timber removals from Crown and private land in the three years prior to World Heritage listing was 66,000 cubic metres, with lower grade structural timbers accounting for a further 52,000 cubic metres. Following cessation of harvesting in the World Heritage area, there was initially an increase in the cut on private land. However, overall there was a much reduced timber supply, with lower log quality, fragmented sources and less accessible locations, leading to increased harvesting and processing costs. In this situation, portable sawmills have been suggested as an alternative to traditional fixed-site mills, offering lower equipment and operating costs and environmental benefits. Since portable sawmills can be moved between sites within or near forests, much of the biomass can be left on-site and thus transport costs are minimised. However, it has been observed that as larger quantities are milled, operators often revert to a fixed-site setup, allowing more efficient use of ancillary equipment and a more settled base for labour.

While some research on portable sawmilling has been undertaken in other countries (Verissimo *et al*. 1992 and 1995; Barros and Uhl, 1995) and in other states (Margules Groome Poyry Pty Ltd *et al*. 1995; Stewart and Hanson, 1998), little research has been undertaken in north Queensland, an exception being that of Venn *et al.* (in process). A further aspect is that studies that do mention north Queensland (e.g. FORTECH, 1996), do not cover those hardwood sawmills in the region, which process rainforest cabinet timbers, and exclude portable sawmills.

This paper discusses a number of practical and policy issues associated with sawmilling in north Queensland and the role that portable sawmills may play. While this discussion focuses on north Queensland, most of the comments are generally applicable throughout Australia. This paper further examines the operational framework for portable sawmills and reports on their current uses in north Queensland. Finally, the potential use of portable mills in a developing a plantation-based farm forestry industry is discussed.

THE NATURE AND ROLE OF PORTABLE SAWMILLS

The simplest form of portable sawmill is a chainsaw, frequently attached to a lightweight metal frame that is positioned over the log. Due to the wide kerf, these mills are wasteful of timber. They also require considerable manual handling of logs, have low throughput and

produce rough sawn surfaces, and are generally only suited to low-value low-volume milling such as sleepers or as a means to break down logs for further sawing (Smorfitt *et al*. 2001a).

A wide variety of bandsaw and circular portable sawmills are available. The relative suitability of circular saws and bandsaws for milling high quality boards for cabinet making and the recovery rates achievable is a continuing debate between proponents of each mill type. Folkema (1992) reported that circular sawmills have long been used by Canadian farmers, but sales have dropped since the introduction of mobile bandsaw mills in 1982. Circular saws may use a single, double or multi-blade cutting configuration. A double-blade configuration features vertical and horizontal blades that operate at the same time, cutting two sides of planks with one pass over the log. With a single-blade configuration, orientation may be switched between the vertical and horizontal between passes. A variety of advantages have been identified for each of these two mill types (Smorfitt *et al*. 2001b).

Traditional fixed-site sawmillers argue that portable sawmillers are unable to produce high-quality timber output. Quality of output from portable sawmills is dependent on a number of factors, including species, size of log milled, milling technique and experience and ability of the operator. Smaller and younger logs often have more tension and thus are more difficult to mill without boards twisting. Logs also create problems for portable millers when they are too large to be cut into half or quarters to relieve stress. There are however examples of millers who have been using portable sawmills for ten years and supplying the Brisbane markets with high-quality timber.

Relative economic performance of portable bandsaw and circular sawmills depends critically on timber recovery rate and log throughput. Bandsaw proponents argue that higher recovery rates are achievable for a number of reasons, and that bandsaws are more suitable for milling logs into a variety of dimensions, and are also highly appropriate for cutting a whole log into a number of slabs. Circular saw proponents point to the higher throughput achievable with circular saws and refer to the wave effect of the wandering bandsaw blade resulting in further costs associated with dressing of sawn boards. Bandsaw proponents claim a well-cut board from a bandsaw should need little dressing, and that the wave effect is due to a lack of operator experience and poor maintenance of the guides on the mill. No doubt, there is a role for both mill types.

RESEARCH METHOD

Selection of the Population Sampling Frame and Sample

As well as the approximately four hundred sawmills licensed under the *Sawmill Licensing Act 1936*, anecdotal evidence suggests that there are approximately three hundred unlicensed portable sawmills in Queensland of which approximately one hundred are accredited with the Australian Portable Sawmill Association Pty Ltd (Goodman, 1998). The Queensland Department of Primary Industries (DPI, 1998) reported seven fixed-site sawmills operating in north Queensland. In a sawmill survey in north Queensland a sample of size nineteen fixed-site and portable sawmills was obtained with one fixed-site sawmill refusing to be surveyed. The survey area was from Ingham to Cairns and on the Atherton Tableland.

Development of Questionnaires for the Sawmill Operator Survey

A questionnaire was developed from discussions with operators during visits to two fixed-site sawmills, information provided by portable sawmill manufacturers and their agents and published material. The questionnaire was tested with a sawmiller from southeast Queensland, which revealed that much of the information being sought was of a commercially sensitive nature. A revised version of the questionnaire was tested with a

sawmiller from north Queensland. Two versions of the questionnaire were then developed, one for portable sawmillers and one for fixed-site sawmillers. Both questionnaires were substantively similar but reflected the slight differences in the type of operation and form of information sought from the two groups of sawmillers.

The questionnaire covered four broad areas. First, information was sought on issues affecting the sawmilling industry and the individual firms. Second, information was also sought about sources of log resources, volume of timber milled and acquisition of logs. Third, specific questions were included relating to the operation of sawmills such as type of equipment used, number of employees, sawn timber recovery rates and factors affecting the level of recovery. Finally, more general questions were framed about the role of portable sawmills in the industry and their relationship with fixed-site sawmills. This final group included open-ended questions requiring general comment on issues pertaining to the industry and their impact on the individual firm, covering the following areas:

- main factors affecting sawmiller's current and future milling activities;
- whether the sawmiller had any plans to acquire new milling or associated equipment in the near future and if so what type of equipment;
- main difficulties faced in sourcing logs;
- whether sawmillers regard portable sawmills as complementary or competitive with fixed site-sawmills;
- whether it would be feasible to replace a fixed-site sawmill with a number of portable sawmills and achieve higher recovery rates and higher profitability while maintaining throughput; and
- how sawmillers view the future of the timber industry in north Queensland.

The questionnaire was administered to sawmillers using personal interviews at the site of the sawmilling operation. This approach was chosen to overcome the reluctance of sawmillers to provide information about their operations. In addition, the visits allowed the interviewer to assess the range and condition of milling equipment.

Classification of Sawmillers

Responses of the structured questions were analysed on the basis of three classifications of mill type: 'Licence type', 'Mode of use' and 'Intensity of use'. Sawmills were allocated to the respective categories on the basis of information obtained from the sawmillers, observation of their milling activities and statistics on sawmill licenses obtained from DPI Forestry. If the sawmill was not licensed, then it was allocated to the 'No licence' (NL) category. Mills that fall into this category are smaller portable mills such as the Lewis and Lucas brand circular saws, which fall outside the licensing definition. The remaining mills were categorised according to the license type taken out: fixed- site or portable. Thus it is feasible for a small mobile mill to fall into any one of the three categories. (Mills that fall outside the definition under the Act may still be registered and licensed, should the owner wish.) A licensed mill could be either a fixed-site or mobile mill.

The mode of use classification was made on the basis of observation of the milling activities and through talking to the millers. The three classifications in this category are 'Fixed-site' (FS), 'Portable Sawmill - Mobile' (PSm) and 'Portable Sawmill - Fixed-site' (PSfs). Fixed-site sawmills are those that operate from a permanent site and conduct their activities as if they were a traditional fixed-site sawmill, with covered work areas and associated equipment such as docking saws and bench saws.

The intensity of use category – with sawmillers being classified as either full-time or part-time operators – is designed to differentiate between millers attempting to earn a living from operating the sawmill as opposed to those operating on a hobby (recreational) or semi-commercial basis.

SURVEY FINDINGS

The results of survey data analysis are presented below, and cover aspects including: important issues for the sawmillers; source, species and number of species milled; recovery rates; and timber milling costs.

Timber Resource Security

Respondents were asked to rank five factors identified as issues that may be affecting the sawmilling industry in north Queensland. Responses are summarised in Table 1 using a Likert scale of 1 to 5, where 1 is least important and 5 is most important. Lack of resource security and the competition from imported timbers were clearly regarded by sawmillers as being the most important of these factors with an average overall ranking of 4.2 and 3.9 respectively.

Table 1: Average ranking of factors affecting sawmillers' current and future sawmilling activities (1 = least important, 5 = most important).

Classification	n	Lack of resource security	Old equipment	Low priced imported timbers	Low milling recovery	Restrictions imposed by *Sawmill Licensing Act*
License type						
Licensed as Fixed-site	8	4.0	2.1	4.5	2.6	1.6
Licensed as Mobile	4	3.5	2.5	3.8	1.0	1.3
No licence	6	4.8	1.8	3.2	1.8	2.3
Mode of use						
Traditional Fixed-site	6	4.0	2.3	4.5	2.3	1.8
Portable mill – mobile	3	5.0	1.7	2.7	1.3	2.3
Portable mill - fixed-site	9	4.0	2.1	3.9	2.0	1.6
Intensity of use						
Full time	14	4.0	2.0	3.9	1.9	1.8
Part time	4	4.8	2.5	3.8	2.3	1.8
Overall	**18**	**4.2**	**2.1**	**3.9**	**2.0**	**1.8**

Some patterns are evident among intra-group categories. For instance, fixed-site and licensed portable millers rated low-priced imports higher than resource security as an issue affecting the sawmilling industry in north Queensland. Those millers who are unlicensed, on the other hand, rate in 'resource security' much higher than 'competition from imported timbers'. Similar rankings occured for fixed-site, as opposed to portable and mobile sawmills, in the mode of use classification, and full-time versus part-time in the intensity of use classifications. This higher concern for imported timber may stem from greater awareness of the competition due to selling larger volumes to timber merchants who import timber as well.

The high average ranking of competition from imported timbers is notable. A number of millers reported that timber merchants land a sawn timber similar to Queensland maple in Brisbane for $800/m^3. The millers considered they were unable to produce sawn timber at this price and had production costs far exceeding those in the developing countries due to:

- reduced resource availability in north Queensland resulting from World Heritage listing;
- increasing restrictions being placed on harvesting from private land (such as those introduced by the Douglas Shire Council); and
- higher labour costs and more strict environmental legislation than in developing countries from which the timber is imported.

A further issue associated with competition is that timber merchants are willing to pay a price premium for imported timbers such as Brazilian Oak due to the continuity of supply and reliable availability (Smorfitt *et al.* 1997; Herbohn *et al.* 1997; Petersen *et al*. 1997).

The findings of the north Queensland survey suggest that not all sawmillers in north Queensland hold opinions similar to those expressed by those surveyed as part of the study undertaken by FORTECH (1996). FORTECH (1996, p. 18) stated that "All participants wished to make it very clear that the key issue facing the wood and paper industry at present is that of resource security and that all factors relating to enterprise development are subsidiary to this." In the survey, sawmill operators of licensed full-time fixed-site mills and particularly mills located on the coastal plain ranked resource security lower than those on the Atherton Tableland as an issue affecting sawmilling in north Queensland. This is perhaps due to land clearing on the coastal belt at the time of the survey, making timber available to millers. Some millers held the opinion that if all timber importation were to cease, local supplies would be insufficient to meet market demand for timber. Millers argued there is a need to redress the inequalities – such as stricter Australian environmental and labour legislation with commensurate costs – by placing them on an equal footing rather than reducing competition by restricting imports.

Restrictions imposed by the *Sawmill Licensing Act (Qld) 1936* do not appear to be a concern with an average rating of 1.8. Likewise 'low recovery rate' and 'old equipment' are not rated highly with average ratings of 2.0 and 2.1 respectively.

Source of Timber Acquired for Milling

Cessation of logging of public rainforests as a result of their World Heritage listing has forced millers to obtain timber from alternative sources, particularly native forest on freehold land. The majority of logs are sourced from millers 'own' land and from other 'private' suppliers (Table 2). Eight of the fourteen millers (57%) sourced all their timber from 'private' landholding, and a further six obtained at least thirty percent from this source. Six of the seven millers who obtained logs from their 'own' land obtained fifty percent or more from this source. Only two millers obtained logs from Crown forests. One miller obtained all timber (eucalypt) from this source, and the other only five percent. Three millers obtained logs from 'other' sources, one of who only mills on a contract basis, another for whom contracting accounts for twenty percent of logs milled, and the third (a hobbyist or recreational miller) obtained logs from subdivisions where land is cleared for road development. Some millers have made provision for long-term resource security by purchasing land carrying rainforest.

Table 2: Source of timber acquired for milling.

Classification	Sample size	Number of millers obtaining timber from each source (more than one source possible)				Millers obtaining timber from each source as a % of the total in each subcategory			
		Public	Private	Own	Other	Public	Private	Own	Other
License type									
Licensed as Fixed-site	12	1	7	4	0	8.3	58.3	33.4	0.0
Licensed as Mobile	7	1	3	2	1	14.3	42.9	28.6	14.3
No licence	7	0	4	1	2	0.0	57.2	14.3	28.6
Mode of use									
Traditional Fixed-site	10	1	6	3	0	10.0	60.0	30.0	0.0
Portable mill – mobile	3	0	2	0	1	0.0	66.7	0.0	33.3
Portable mill - fixed-site	13	1	6	4	2	7.7	46.1	30.8	15.4
Intensity of use									
Full time	21	2	12	6	1	9.5	57.1	28.6	4.8
Part time	5	0	2	1	2	0.0	40.0	20.0	40.0
Overall	**26**	**2**	**14**	**7**	**3**	**7.7**	**53.8**	**26.9**	**11.5**

Table 3: Number of species milled by sawmills, by mill categories.

Classification	n	Average number of species milled			Percentage of millers in each group		
		1 species	2 to 5 species	5 or more species	1 species	2 to 5 species	5 or more species
License type							
Licensed as Fixed-site	8	0.0	4.0	35.6	0.0	12.5	87.5
Licensed as Mobile	4	0.0	5.0	21.7	0.0	25.0	75.0
No licence	6	0.0	4.0	14.5	0.0	66.7	33.3
Mode of use							
Traditional Fixed-site	6	0.0	0.0	40.0	0.0	0.0	100.0
Portable mill – mobile	3	0.0	3.5	20.0	0.0	66.7	33.3
Portable mill - fixed-site	9	0.0	4.5	16.6	0.0	44.4	55.6
Intensity of use							
Full time	14	0.0	4.0	28.6	0.0	14.3	84.7
Part time	4	0.0	4.3	0.0	0.0	100	0.0
Overall	**18**	**0.0**	**4.2**	**28.6**	**0.0**	**33.3**	**66.7**

Number and Type of Species Milled

Unlike softwood mills which process standard sized logs of a particular species or a limited number of species with similar properties, north Queensland hardwood mills generally handle a wide variety of species. Furthermore, hardwoods from native forests vary considerably in both size and quality, often containing more defects than plantation trees, such as hollow centres. The impact that this has on the milling operations in terms of additional handling time and reduced throughput is difficult to assess. It is unclear whether the higher prices for cabinet timbers compensate for the higher costs associated with these two factors.

All mills reported processing multiple species, with two thirds milling five or more species (Table 3). A claim made by proponents of both portable and traditional fixed-site sawmills is that the opposing group 'pick the eyes out of the timber' on private land and leave the other group to pick up what is left. Based on the number of species milled, it would appear that fixed-site and portable fixed-site licensed mills operating on a full-time basis mill more species than the part-time unlicensed mobile mills (Table 3). This would tend to suggest that the unlicensed mobile portable sawmills take advantage of being more selective in the logs they mill.

Sawmillers purchase not only the 'primary' species used in high value products – e.g. red cedar (*Toona ciliata*), Queensland maple (*Flindersia brayleyana*) and northern silky oak (*Cardwellia sublimis*) – but also less sought after species which are used for structural timber which can frequently account for a high proportion of the trees harvested. The major criterion upon which sawmillers base their timber purchases is species, with twelve of fourteen respondents indicating they quote to purchase timber on this basis. Quality and diameter are also taken into account by nine and seven sawmillers respectively. Notably, fixed-site sawmillers indicated a willingness to quote on individual species or on a generic price basis depending on the landholders' requirements. Four millers indicated that they would quote for timber on the basis of a generic price for all timber in the area to be logged, i.e. taking all millable logs irrespective of species or quality (Table 4). In contrast, unlicensed portable sawmillers usually purchased timber on the basis of species and quality. This may in part account for 'portable' sawmillers offering higher stumpage prices.

Table 4: Basis of purchase (number of respondents = 14).

License type	Generic price	SPECIES	Diameter	Quality
Licensed as Fixed-site	4	6	3	3
Licensed as Mobile	0	3	3	3
No licence	0	3	1	3

Recovery Rates and Their Impact on Cost Structures

Recovery rate (cubic metres of sawn timber as a percentage of log volume) is one of several factors strongly influencing sawmill profitability. This rate depends on the ability, experience and skill of the miller, the nature of the mill (bandsaws have smaller kerf than circular saws), species of tree cut, dimensions of the sawn timber cut and quality and dimensions of the log input. Recovery rate affects both cost and revenue of the miller. Anecdotal evidence suggests that portable sawmillers are able to achieve higher recovery rates than traditional fixed-site millers. Recovery rates reported in the survey support this view (Table 5). A large number of factors can affect the recovery rate and the relative importance of each may vary between mills. Licensed and unlicensed part-time mobile and fixed-site portable sawmills indicated a recovery rate on average approximately eight percent higher than licensed full-

time fixed-site sawmills. The average rates indicated by sawmills would appear to be in line with data provided by Queensland Timber Board (1996) for fixed-site sawmills.

Table 5: Milling recovery rate expressed as a percentage of roundlog volume.

Classification	n	Mean	Median	Highest	Lowest
Mode of use					
Traditional Fixed-site	6	34.7	34.2	50.0	25.0
Portable mill	15	42.6	42.0	55.0	30.0

The average recovery rate reported for fixed-site mills in Table 5 of 36.4% is close to those previously reported for fixed-site mills in Australia (Bennett, 1990; Qld Timber Board, 1996). However, new fixed-site mills are for a variety of reasons such as the introduction of modern technology including laser guided saws and computer selected log cutting patterns, the switch from circular to band saws, use of finger jointing after defect removal and milling of plantation grown timbers as opposed to native forest timbers, likely to be achieving a high recovery rate.

The average recovery rate for portable sawmills is 42.6%, with a maximum reported recovery rate of 55% (Table 5). These recovery rates contrast with claims of promoters of portable sawmills of 60% to 70%. In a study of recovery rates achievable by portable sawmills, Hasek and Ponce (1973) stated that the loss was negligible and the yield high, approximately 64%, resulting from the high quality and excellent condition of the log. However, a log of lower quality would not necessarily produce a similar recovery rate. In another example of high recovery rates, Mamum and Knoabe (1992) cited a successful portable sawmill operated by a family group in Papua New Guinea consistently achieving a rate of recovery of more than fifty-five percent. Gan *et al*. (1985) quoted recovery rates for portable sawmills ranging from 22% to 47% depending on the cultivars of Heveawood (rubberwood) being milled. Low recovery rates can be expected from tree species where the quality and condition of boles is not high or uniform. Hunt (2001) noted that the uniform logs of plantation timber have a higher recovery rate than native forest trees.

Fixed-site sawmillers claim that recovery rates in the sixty to seventy percent range are generally not feasible under the conditions in which fixed-site mills operate, where highly selective harvesting is not possible and all millable timber is harvested. Circumstances are further complicated in north Queensland by the large number of native timber species available for harvest. There are approximately eight hundred rainforest tree species[2] of which about six hundred reach sawlog size, but only about 150 of these are harvested for timber (Poore, 1988). The lack of standardisation of inputs associated with high species diversity reduces the recovery rates achieved by fixed-site mills. It is also likely that the larger fixed-site mills aim for higher throughput so they spend less time in assessing and arranging each log for optimal cutting patterns, although large mills can afford high technology which could also increases recovery rate.

An interesting point made by one sawmiller who operated a number of portable mills on a fixed-site basis was that whilst there is much talk about negative impact on recovery rates of the wide kerf of blades used in fixed-site sawmills, this impact is limited to the 'breakdown saw', the use of which is restricted to cutting logs in half (one cut) or in quarters (three cuts) for large logs. Subsequent milling is carried out on a bench saw, the kerf of which does not differ greatly from that of a Lucas or Ecosaw portable circular saw.

[2] Hyland and Whiffin (1993) identified 1056 taxa present as trees in Australian tropical rainforests.

Sawmillers were asked to rate a number of factors in terms of their importance in reducing recovery rates (Table 6). The higher overall average rating of 4.1 for small logs and 4.4 for low log quality is not surprising. The low rating of the negative impact of old technology on recovery rates by portable sawmills is contrasted by the higher rating by traditional fixed-site sawmillers. This would support the assertions that the old technology used by traditional fixed-site sawmills is a major contributor to low recovery rates. Some traditional fixed-site sawmillers expressed the view that newly available technology would make little difference to recovery rate due to the dominance of other negative factors such as log size variation, log quality and the species they mill. Furthermore, sawmillers suggested that much of the new technology is designed for softwood sawmills, which receive plantation logs of uniform size, species and quality, and is not suitable for their operations. The high rating for milling 'multiple species' by fixed-site sawmillers corresponds with the large number of species they mill (Table 3). In contrast, the high rating of the effect of small logs and low quality and small boards cut by the portable sawmillers may be a reflection that these sawmillers generally cut higher quality timber and struggle for high recovery rates when they have to cut timber that the fixed-site sawmills usually cut.

Table 6: Average rating of factors negatively affecting recovery rate (1 = extremely unimportant, 5 = extremely important).

Mode of use	n	Multiple species	Small log	Poor quality	Lack of experience	Old technology	Small boards cut	Wide kerf of blade
Traditional Fixed-site	6	4.2	2.7	3.7	4.3	3.7	2.7	3.5
Portable mill	12	3.1	4.8	4.8	3.1	2.2	3.7	3.4

The sawmillers interviewed were unable to provide a definitive figure as to the cost of milling timber, due to the variety of species milled, varying recovery rates depending on species and log quality, lack of detailed cost recording, and commercial sensitivity of the information. However, some estimates were provided, as reported in Table 7.

Table 7: Sawmillers' cost of milling timber ($/m^3 roundlog).

Classification	n	No. who do not know	No. who contract	Lowest ($)	Highest ($)	Average ($)	Median ($)
License type							
Licensed as Fixed-site	8	8	7	112.00	200.00	148.86	140.00
Licensed as Mobile	5	5	4	140.00	250.00	170.00	145.00
No licence	7	7	6	80.00	150.00	128.33	135.00
Mode of use							
Traditional Fixed-site	6	6	6	112.00	200.00	150.33	147.50
Portable mill – mobile	4	4	4	120.00	150.00	135.00	135.00
Portable mill - fixed-site	10	10	7	80.00	250.00	150.00	140.00
Intensity of use							
Full time	16	16	15	112.00	250.00	150.80	140.00

Classification	n	No. who do not know	No. who contract	Lowest ($)	Highest ($)	Average ($)	Median ($)
Part time	4	4	2	80.00	150.00	115.00	115.00
Overall	**20**	**20**	**17**	**80.00**	**250.00**	**146.59**	**140.00**

Anecdotal evidence suggests that portable sawmillers are able to mill timber at lower cost than traditional fixed-site sawmills for a variety of reasons. However, if the overall median contract price is compared with their average for each sub-category, there appears to be little difference except for the 'part-time' operated sawmills in the 'Intensity of usage' category (Table 8). The lower costs estimated by this group may arise because they underestimate some of the fixed or sunk costs associated with their operations.

In an attempt to gain a better understanding of industry views on factors that enable portable sawmillers to operate at lower cost, respondents were asked to rate nine factors on a scale of 1 to 5 as to their importance in reducing overall costs for portable sawmillers. The two most important cost advantages identified by portable over fixed-site sawmillers are lower capital requirement and absence of workers compensation payments (Table 8).

The reduced capital requirement received a high rating by sawmillers in all categories. Fixed-site sawmillers consistently gave Workers Compensation and Health and Safety legislation a higher rating than other respondents. Part-time mobile portable sawmillers also rated this factor highly. This is not necessarily an admission of non-compliance with the requirements of the Workers Compensation and Workplace Health and Safety legislation but rather may be due to many of the portable sawmills being one- or two-man owner-operators, without any employees.

Table 8: Average rating of reasons why portable sawmills can mill timber at a lower cost.

Classification	n	Don't pay towards industry costs	Less capital outlay and thus lower break-even point	Don't meet costs associated with Sawmill licensing	Owner operators are more motivated and thus more productive	Don't comply with Workers Comp. and Workplace Health and Safety Acts	Do not comply with the Environ. Protection Act	Do not comply with the Timber Utilisation and Marketing Act	Nature of the operations make portables more efficient in terms of labour usage	Higher recovery rates achieved
License type										
Licensed as Fixed-site	8	2.6	4.0	2.9	2.9	4.0	3.3	4.0	2.0	2.3
Licensed as Mobile	4	2.3	4.0	2.8	3.5	4.8	4.0	2.3	3.3	2.5
No licence	6	2.7	4.0	3.0	4.0	3.5	3.3	3.5	3.7	4.8
Mode of use										
Traditional Fixed-site	6	3.0	4.0	3.4	2.3	4.7	3.7	4.5	1.8	1.5
Portable mill – mobile	3	3.7	4.7	4.0	5.0	4.0	3.3	4.0	3.3	5.0

Classification	n	Don't pay towards industry costs	Less capital outlay and thus lower break-even point	Don't meet costs associated with Sawmill licensing	Owner operators are more motivated and thus more productive	Don't comply with Workers Comp. and Workplace Health and Safety Acts	Do not comply with the Environ. Protection Act	Do not comply with the Timber Utilisation and Marketing Act	Nature of the operations make portables more efficient in terms of labour usage	Higher recovery rates achieved
Portable mill – fixed-site	9	1.9	3.8	2.2	3.6	3.6	3.3	2.6	3.4	3.7
Intensity of use										
Full time	14	2.8	4.0	3.2	3.2	4.4	3.6	3.6	2.6	2.7
Part time	4	2.0	4.0	1.8	4.0	2.8	2.7	3.0	3.5	4.8
Overall	**18**	**2.6**	**4.0**	**2.9**	**3.4**	**4.0**	**3.4**	**3.4**	**2.8**	**3.2**

Based on the data collected from these sawmillers and other sources, a financial model was developed which was used to assess the cost of milling timber using a small bandsaw. The cost to mill a cubic metre of sawn timber was $406. Appropriate sensitivity analysis for the parameters was also undertaken (reported in Smorfitt, 2000).

Higher recovery rates may also contribute to lower costs for portable mills. Operators of unlicensed part-time mobile sawmills expressed the opinion that the higher recovery rates achieved are significant in reducing their overall costs. Based on figures provided on recovery rates in Table 5, the high recovery by portable sawmills of about eight percent would improve the sawmill's revenue. Fixed-site sawmills did not rate this factor highly, which is surprising because recovery rate improvements should reduce unit costs of all sawmillers. The lower rating may however stem from the belief that portable sawmills do not achieve higher recovery rates than other mills.

Of the sample of eighteen sawmillers, eleven (61%) reported they had no plans to make further investment in equipment (Table 9). The lack of resource security combined with the increasing competition from softwoods, imported timbers and substitute products, such as plastic and steel, does not provide a positive climate for investment on new milling technology. For some millers there was some indication of interest in investing in value-adding equipment such as kilns and moulding machines rather than milling equipment.

Table 9: Sawmillers' intention to purchase new milling equipment or associated equipment.

Classification	Total	Number			Percentage		
		Yes	No	Maybe	Yes	No	Maybe
Licence type							
Licensed as Fixed-site	8	2	4	2	25.0	50.0	25.0
Licensed as Mobile	4	1	3	0	25.0	75.0	0.0
No licence	6	2	4	0	33.3	66.7	0.0
Mode of use							
Traditional Fixed-site	6	1	3	2	16.7	50.0	33.3
Portable mill – mobile	3	1	2	0	33.3	66.7	0.0

Classification	Total	Number			Percentage		
		Yes	No	Maybe	Yes	No	Maybe
Portable mill - fixed-site	9	3	6	0	33.3	66.7	0.0
Intensity of use							
Full-time	14	5	7	2	35.7	50.0	14.3
Part-time	4	0	4	0	0.0	100.0	0.0
Overall	**18**	**5**	**11**	**2**	**27.8**	**61.1**	**11.1**

CONCLUDING COMMENTS

The survey clearly identified a number of aspects affecting the sawmilling industry in north Queensland. Major concerns relate to resource security and competition from lower priced imports. There is, however, also belief that a lack of resource means that domestic demand for rainforest cabinet timbers cannot be met by north Queensland sawmillers. This may suggest a long-term future for these sawmillers if the timber on private land is well managed on a sustainable basis and a low-volume high-value industry is built on this resource.

Most sawmillers obtain the majority of their logs for processing from private landholders. Most fixed-site sawmillers purchase and mill logs of multiple species. Portable sawmillers on the other hand often purchase logs on the basis of a single species or single logs of high quality and this creates the misleading impression that portable sawmillers pay higher log prices.

Sawmillers, as is the case with many small business operators, do not keep appropriate records to allow estimation of milling costs. Any attempt to calculate milling cost is further complicated by the multiple species milled and high variation in recovery rate due to a number of factors. However, sawmillers are willing to quote contract-milling costs for milling logs and some respondents quoted a figure of $700 to $900 to purchase, mill and package a cubic metre of green sawn rainforest timber.

Potential exists for greater use of portable sawmills as complementary to fixed-site mills to reduce transport and other milling costs. This arrangement may also allow for greater utilisation of large branches which full-time portable sawmillers are currently reluctant to mill due to low recovery rates. The increased use of on-site milling may also hold environmental benefits with reduced volume of timber being milled and larger volumes of biomass being retained in the forest. The potential also exists for tourist visits to view portable sawmills in operation, together with other value-adding activities.

It would appear that many portable sawmillers operate financially on a cashflow basis and do not bring all costs into account, possibly due to the lack of information on costs and adoption of a cash flow approach to costing without provision for equipment replacement and all labour costs. Alternatively, mills may be covering costs and thus idle capacity is being utilised and costed at variable cost only. Their ability to mill at these prices may also stem from the fact that many operate on a part-time basis or alternatively have another income source and thus operate on the basis of covering operating costs only. Even if higher recovery rates were to be adopted, the per-cubic-metre milling cost is still in excess of the $140/m^3 median price charged by sawmillers.

The lack of accurate record keeping by both fixed-site and portable sawmillers did not allow for accurate recovery rate calculation. The recovery rates indicated by portable sawmills are

higher than those of fixed-site mills and this would tend to be supported by anecdotal evidence and previous studies. However, it is relevant to also indicate that in the north Queensland situation, portable sawmills purchase logs selectively based on log quality and species. The result is that fixed-site sawmillers are not milling logs of comparable quality and thus a lower recovery rate is to be expected, i.e. the difference is not due to cost-effectiveness.

Portable sawmills may have a role to play in the north Queensland timber industry. This may be limited to those areas where there is a shortage of log resource and in particular to niche markets such as 'bark to bark slabs' of natural feature timber. In some instances, portable mills may even prove a viable alternative to fixed-site mills, though not in situations where large volumes of standardised plantation timbers are to be processed.

The sawmilling industry would not be regarded as a thriving growth industry by any standards, but it has reflected some fortitude and resilience even in the face of stiff competition. Sawmillers currently indicate they are unable to meet domestic demand, but this needs to be seen in the light of a lack of cabinet timber resource and the competition faced from imported rainforest timbers.

It has been suggested that portable sawmills really come to the fore in a declining or emerging timber market. The north Queensland timber industry appears to be in a state of limbo, a combination of both of these. On the one hand, the market is declining in that the major portion of the resource is no longer accessible and the remaining accessible resource on private land is becoming more scattered, less physically accessible due to rougher terrain, and of lower quality. Also, a replacement resource from the CRRP and other private landholder plantings will not become available for a few decades yet.

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6. SOME PRICING ISSUES OF LONG-TERM CONTRACT LOG SALES IN TROPICAL NORTH QUEENSLAND, AUSTRALIA

M. J. Quayle

Two main pricing issues arise when long-term log contracts are considered: sale price at the stump (stumpage), and price adjustment methods for adjusting the sale price through the duration of the contract. Efficiency in determining the log price at the stump is requisite for optimal price adjustment. While price adjustment mechanisms are addressed in this paper, the main emphasis is on the determination of the log price at the stump using Queensland Commercial Plantation forests as a case study. With one large single supplier of logs in Queensland and a few favourably-located buyers it is considered that a bilateral monopoly model is appropriate for analysing price outcomes, rent sharing and volumes supplied in the market. Prices are not determined through the market but are negotiated by the parties supplying and buying the logs.

INTRODUCTION

Log sales in both northern and southern hemisphere countries are usually negotiated through a number of processes which include spot market sales at the stump or delivered to the mill gate, and short-term contracts over one to two years, or long-term contracts between supplier and buyer for terms between fifteen and twenty-five years are common. Contracts normally stipulate the terms and conditions for supply including estimated volume of timber on the harvestable tract of forest, species, price per unit volume, contract duration, and on-sale arrangements. Long-term contracts also include conditions for adjusting price through the duration of the contract to maintain the real price value of timber at the sale date.

The process of selling logs, including the type of contract and the duration, vary across countries. In the Scandinavian countries, the USA and New Zealand, log markets are considered structurally competitive and spot market sales and short-term contracts are the norm[1].

Structurally competitive markets are expected to yield cost minimisation and efficient prices that signal resources should be allocated to the industry to the point where resource returns equal their opportunity cost. Structural competition normally implies that many buyers and sellers in the market produce the competitive forces that ensure that prices reflect efficient costs of production. Any departure from structural efficiency or competitive behaviour will result in a misallocation of resources, a distortion in prices from minimum costs and poor signaling for attracting resources to the industry for investment purposes. Consequently, market structure is considered important for efficiency for market price determination.

Structurally competitive markets are apparent in those countries that sell logs principally on the spot or through short-term contract markets. Finland, Sweden and Norway have a large

[1] The New Zealand log market is highly competitive and structurally efficient. Logs are offered for sale through one of three options: Lump Sum Sale, Stumpage Sale, or Prepared Log Sale. Lump Sum Sales involve sale of the forest tract at a specified price which could be higher or lower than the log price at the mill, stumpage sales pass the responsibility of the price setting to the owner, while prepared log sales pass all responsibilities to the owner for cutting and delivery.

number of smaller sized forest growers who sell their logs at 'roadside prices', at delivered prices or at the stump to cutting contractors. Log markets that are more competitive in nature also operate in the mountain states of western USA where a large number of smaller log suppliers prevent concentration on the supply side of the market, while the New Zealand market has become highly competitive over the past twenty years with private small-scale operators commanding more than twenty percent of the supply side of the market.

Apart from Haile's (2001) work on auctions for log sales from the US forest service and on-selling to other retail markets, little has been written on competitive log sales and price determination. Lohmander (1987), Thompson (1992) and Washburn and Blinkley (1993) were concerned with the impact that log prices have on resource managers' decisions about the time to cut the forest. These models were based on the a priori assumption of information efficiency in competitive markets. However, much of this work has been in relatively competitive market environments and little attention has been paid to log sales in markets that are structurally uncompetitive with a high degree of concentration on either the supply or the demand side of the market or both.

Two issues concerning pricing of logs arise in this context: log price determination in a market that is highly concentrated on both the seller and buyer sides of the market, and the adjustment process of that price over the term of the contract. Non-competitive prices emerge in these market environments and the prices achieved for the log resource do not necessarily reflect the opportunity cost of the resource. Market failure may also arise in plantation forest sales due to externalities arising from carbon sequestration benefits, conservationism and other social benefits. With the emergence of and encouragement of small-scale forest farming, there seems little evidence that other market structures represent the current market profile of log sales in far north Queensland and the southeast region. Specifically, the timber market in Queensland is analysed to explain price outcomes for log sales in highly concentrated markets and the ramifications of adjusting these prices over time. These market characteristics are apparent in tropical north Queensland and affect the sale and pricing of logs from the region.

QUEENSLAND LOG SALES IN PERSPECTIVE

Australian forests cover some 42 million hectares with native forests representing 97% of this area. Commercial softwood and hardwood plantations in Australia account for approximately 1.2 million hectares and are primarily located on the eastern seaboard States of Queensland, New South Wales, Victoria, Tasmania and South Australia (ABARE, 1999).

The area of softwood plantations is much greater than that of hardwood plantations in the eastern states of Australia, with New South Wales the largest having 293,000 hectares and Queensland 173,000 hectares (Bureau of Rural Sciences, 2002). Hardwood plantations cover a much smaller area in these states; only thirteen percent of the plantation estate in New South Wales is hardwood plantings, while in Queensland only about 20,000 hectares of hardwood plantations have been established (Venn, in press).

Public ownership of commercial plantation forests in both New South Wales and Queensland is high. The Queensland Department of Primary Industries – Forestry (DPI-F) still owns and controls 89% of commercial forest plantations in the state while the State Forests of New South Wales controls approximately 70% of commercial plantation forests in use. For all eastern states in Australia public ownership of commercial plantation forests remains at about 66% of the forest estate, despite a strong move in the 1990s towards privatisation and corporatisation of state forest authorities. While Tasmania traditionally has had high levels of private ownership it was not until 1995 that Victorian commercial plantations become predominately privately owned. The Victorian Plantation Corporation sold its holding of plantation forests to the private sector. Nevertheless, the states of Queensland and New

South Wales have retained high levels of public sector control and ownership over the resource.

Queensland plantations are predominantly located in the southeast (SE) and northern districts of the state, covering an estimated 178,000 hectares, with the majority of this area still under government ownership and control. The southeast district is the largest plantation area in the state with 148,000 hectares. Exotic softwood species *Pinus elliottii* and *P. caribaea* predominate but the native *Aracauria cunninghamii* accounts for 28% of the commercially-planted forest area in Queensland. It is estimated by DPI-F that *Aracauria cunninghamii* has the potential to expand to an area of 58,000 hectares over the next twenty years. Commercial plantations of hardwoods have a smaller presence in Queensland. This is probably the result of historically relatively large harvests of hardwood timbers from native forests, which are now declining as logging is being phased out in these forests. However, in New South Wales commercial hardwood plantations cover an estimated 44,500 hectares and the state has a capacity to double this area within twenty years.

The high concentration of plantation ownership in public hands is a result of the enactment of the *Softwood Forestry Agreement Act 1967, 1972, 1976 and 1978* (Walker *et al*. 1998). Active policies were pursued to establish large tracts of plantation forests to replace native forests as a source of timber. Log prices were controlled to encourage investment and employment in value-adding timber processing industries. Processing mills were encouraged to locate close to these plantations for access to the timber resource. As high yields, high employment and industry expansion objectives were sought through controlled pricing of logs, elements of market failure emerged at a structural level in the Queensland log producing industry.

Most log sales in Queensland follow the propositional call method. DPI-F as the major supplier of logs identifies those forest tracts that are approaching maturity and estimates the volume per hectare likely to be harvested, and a reservation price is set for the timber. If a number of tracts are expected to be ready for harvesting over a number of rotational periods, a long or short-term contract may be offered in the sale description of the timber. DPI-F then calls for expressions of interest from potential buyers for closed bid price for the forest tract timber. It is these bids that are called propositional calls. Typically only one and usually no more than two propositional calls are received for any forest tract. The propositional call system is not an open-auction competitive bidding system nor is it a closed tender system where a number of buyers offer tenders for an advertised forest tract of timber. Rather, the propositional call system collapses into a negotiated sale agreement between a single buyer (usually located advantageously to the state forest) and a single monopolist supplier (DPI-F). It is through this system that stumpage prices are determined. Reservation prices, on the other hand, are set by the supplier and based on a number of economic and financial criteria – including production costs, rate of return, employment creation and industry development targets – which suggests that prices other than those that are market-related are being pursued.

Contract prices are adjusted on a quarterly, half-yearly and yearly basis, using an established formula and through negotiations.

Market-based Pricing

When the factor input market for logs and the final output commodities market for processed timber are highly or perfectly competitive, profit maximising firms will demand more log inputs to the point where the productive value of the last cubic metre of logs equates with the additional revenues those additional factors earn in the production and sale of the final output. In other words, the value of the marginal product of logs (VMP) equates with the marginal revenue product (MRP) derived from log inputs, symbolically:

$$\mathbf{VMP = MRP = MPP * MR}$$

where MR = the log price in the commodity market;
MPP = marginal physical product of the log input; and
MR = marginal revenue from sale of processed log.

However, when firms are imperfectly competitive or monopolistic in the commodities market, the MR is less than the price so that less is paid for factor inputs (logs in this case) than their marginal product value. For a monopsonist firm (only one large buyer) in the market for the factor inputs of logs, the demand for the logs equates with the MRP of the logs not the VMP. In this case the supply curve of the factor input has a positive slope: as the monopsonist increases the use of the factor input (logs) he has to pay a higher price for the additional logs which places the monopsonist's *marginal expenditure* curve above its *average expenditure* curve, which is the supply curve of logs. This *marginal expenditure* curve is denoted as the ME curve in Figure 1. The firm will be in equilibrium when it equates the marginal expenditure on the factor (ME) with its MRP, which is its demand for the factor input (here logs).

Bilateral Monopoly

When a monopsonist is the only buyer of the factor input and there is only one supplier of the factor in the market, a bilateral monopoly exists. Under bilateral monopoly market conditions a precise market price for the factor input is not determined: only the upper and lower limits of the stumpage price range is determined by the market leaving the final settled price to be determined from bargaining between the parties (Koutsoyiannis, 1987). The eventual price for the factor depends on the bargaining skills of the parties involved and political and economic considerations may play a role in the process of arriving at an agreed price.

The monopsonist will express a demand for the factor input in accordance with the MRP of the factor (its demand curve) and will choose to employ that level of the factor where the marginal expenditure outlays on additional factor units (logs) equates with the MRP or demand for the factor. The price that the buyer is offering for the quantity of logs at this volume level is determined by the supply curve (average expenditure) for logs for that volume, not from the ME curve. Consequently, the buyer wants a larger quantity of the factor input and wants to pay a lower average price for the quantity. This result is illustrated in Figure 1.

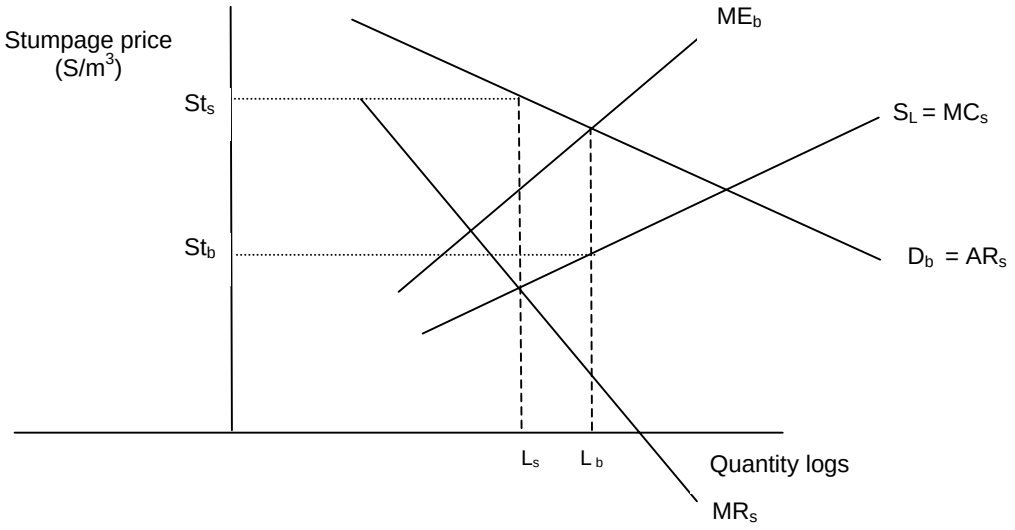

Figure 1: Price indeterminancy in the bilateral monopoly input market: the case of log sales in Queensland.

The supply of logs facing the monopsonist buyer is the upward sloping supply curve S being the *marginal cost* curve of the supplier. As the supplier is aware that its marginal revenues are derived from the demand curve for logs, its marginal revenue curve is expected to be lower than the demand curve for logs. These relationships are illustrated in Figure 1. The supplier therefore sets their price in accordance with the rule that it will supply logs to the point where its marginal revenue from the last sale equates with its marginal cost (supply curve). Price is negotiated from this level determined from the corresponding point off the demand curve.

In Figure 1 the supplier in a bilateral monopoly situation prefers to supply L_s volume of logs at a price of St_s, setting the upper limit to the price negotiations, and the buyer sets the lower limit price level by demanding a larger volume of logs at a lower preferred price of St_b. Bargaining between the two parties results in a price between St_s and St_b. The economic rent from the resource is shared between supplier and the buyer.

The Queensland Case

Bureau of Rural Sciences (2002) estimated that for the year 2001 softwood plantation ownership in Queensland was 89% held by the public sector (DPI-F), making this a monopolist in softwood log supply in the factor input market. By the end of the year 2000 there were twenty-three long-term contracts between fifteen and twenty-five years still operating in Queensland. A number of these contracts had been won by the same processing plants mainly located in the southeast corner of the state; in total seventeen processing and milling plants held supplier contracts for timber logging. These plants are distributed along the Queensland coast and are advantageously positioned near large DPI-F plantations. Normally, only a few plants locate near each plantation to guarantee continuous and adequate log supplies to the buyer to sustain large processing throughput facilities. There are only thirty-two mills in Queensland that cut exclusively plantation softwood, and most are located in the southeast region. Only six of these mills process log throughput levels of 50,000 cubic metres of timber per year. In tropical north Queensland there is only one fixed hardwood processor and two processes that handle both hardwoods and softwoods (DPI-F 1998, pp. 39-41). Some of these buyers are large in size taking all offered logs, others are smaller in size and specific in processing requirements demanding only thinnings, preferring a smaller size log. These regionally located plants are monopsonist buyers and DPI-F is a monopoly input supplier. With remote location and high transport costs, single-buyer single-seller characteristics prevail. The bilateral monopoly model applies to price striking for contracts on logs from softwood plantations.

In the propositional call system, expressions are called for logging rights and stumpage payment for tracts of plantation forests approaching maturity date. DPI-F sets a reserve price and a preferred monopolist price for the logs and attempts to bargain for a high price. The buyer bids a price as low as possible, but one that would meet the seller's minimum acceptable price. Negotiated prices on the contract are set as a compromise between the upper and lower price limits of St_s and St_b as shown in Figure 1.

The hardwood plantation estate in Queensland is small compared to softwoods and comprises only eleven percent of the total plantation estate. Of this the public sector owns only two percent of hardwood plantations with the remainder in private ownership. More competition exists in this market but the market size of Queensland supplied timber is small.

Adjusting Long-Term Contract Prices

Medium and long-term contracts for logs sales normally include price adjustment clauses. Even though the price setting arrangements may result in less than competitive prices, price adjustment procedures are deemed necessary to maintain the real value of the contract

throughout the term of the contract. Traditionally, a simple Wholesale Price Index or the Consumer Price Index (CPI) has been used as a price adjustment tool designed to maintain the real value of the contract.

Buyers of logs who commit to take specified annual volumes of timber from a plantation over a number of years claim they were disadvantaged when a price adjustment system using the CPI method was applied. It was argued that even during periods of inflation log prices remained at a constant real value whereas revenues earned by the processors buying the logs was susceptible to the vagaries of the construction and building cycles in the economy. This created the situation of revenues by the buyers fluctuating over the building cycle but being subject to constant real input prices for logs. This situation is shown in Figure 2 below.

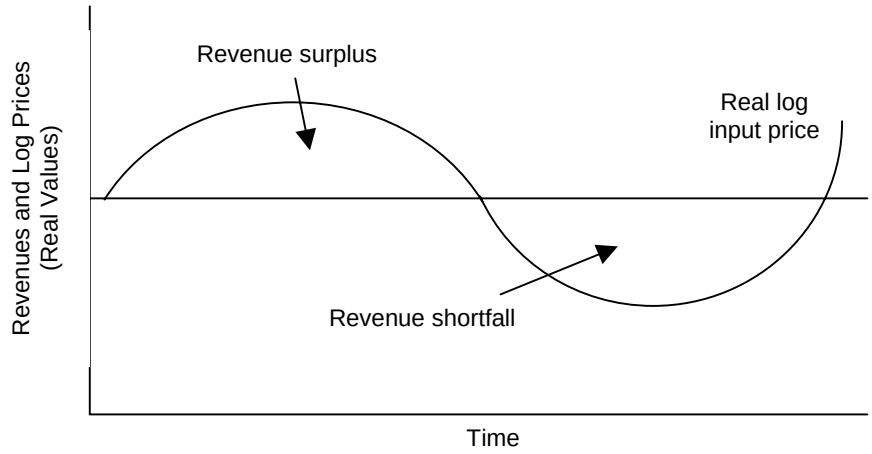

Figure 2: Revenue and input costs for log processors in Queensland.

The argument that lies behind this analysis is that the timber processors (the buyers of the logs) incur a cash flow problem. While their revenue flows vary across the building cycle, their major input cost (log prices) remain constant, creating a cash flow crisis across the cycle. It was argued by the processors that a price adjustment mechanism that reflected the revenue flow of timber products in the final markets would be more appropriate for adjusting log prices to harmonise movements in both input and output prices. A weighted price index of final sales of structural timber and plywood was conceived to replace the CPI as a price adjuster in log contracts.

DPI-F adopted the wood weighted index (WWI) after a trial with some of its buyers in 2000. Quayle and Cox (1999) provided a rationale and a justification for using a downstream market composite index rather than a general price index adjuster such as the CPI. However, due to cost considerations, instead of creating a weighted price index across a number of final outputs, only structural timber was selected as the price adjuster. The WWI became a major component for adjusting existing log prices to determine prices that would apply in the immediate future period of the contract. This relationship is expressed in Equation 1:

$$P_{t+1} = P_t * WWI \quad (1)$$

where P_{t+1} = log prices in the immediately future period;
P_t = current log prices; and
WWI = Wood Weighted Index.

In 1998, State Forests of New South Wales commissioned a pricing and market trends survey of 93 timber wholesalers in New South Wales, Queensland and Victoria. Prices and

percentage price movements for a number of processed timbers were estimated. Price changes for a number of product lines including F5, F8 structural softwood timbers, panelling, decking, and fencing timbers were measured[2]. Average price levels and price movements for each grade of timber are shown for All Regions and Queensland in Table 1.

Table 1: Average processed timber (various products) prices and movements – all regions and Queensland for 1997 and 1998 (Source: State Forests of New South Wales, 1998, pp.16-19).

All Regions				**Queensland**			
Product (radiata pine)	Average price 1998	Average price 1997	Weighted % price change	Product (hoop pine)	Average price 1998	Average price 1997	Weighted % price change
F5 Structural	383	367	5.51	F5 Structural	520	502	3.45
F8 Structural	429	412	5.7	F8 Structural	554	534	3.36
				Panelling	1066	1017	4.09
				Flooring	890	861	4.43
Flooring (Cypress)	584	566	5.1	Flooring (Cypress)	589	551	2.84
Plywood	765	766	0.099				
MDF	450	451	-0.92				

Weighted averages of the price movements were estimated by using proportional volumes of each product type as the weight. Weighted average percentage price changes between 1997 and 1998 were estimated for All Regions and Queensland. The hoop pine price increases in Queensland during this period was 3.34%, and price increases for all softwoods in Queensland and All Regions were 5.22%, and 5.47% respectively. The results from the Timber Market Survey also validated variations in price movements across product types and regions. These results supported the concept that the broad CPI adjuster should be replaced with a weighted price index based on processed timber prices. It was expected that such an index should reflect the demand and supply conditions in the downstream timber markets and therefore would be appropriate as a shadow price adjuster in the upstream factor input log market. However, Queensland opted for a simple price adjustment mechanism based on price movements in structural timber sales only.

The Factor Adjustment Mechanism

The other component of the price adjustment model includes the concept of a Factor Adjustment System (FAS). The FAS was designed to be a composite construct of a number of variables that could be interpreted as a subjective element of the pricing adjustment mechanism. This component is constructed from a number of economic and financial variables which include actual and predicted growth rates in GDP, actual and expected movements in interest rates, actual and expected employment levels, building approvals and the construction of house and unit starts. These variables are interpreted to gauge the expected future direction in the economy and growth in those industries demanding processed timber. This in turn affects the derived demand for logs. It is on this basis that the FAS was included in the price adjustment model as illustrated in Equation 2.

[2] The survey also covered price movements in hardwood processed timbers for the F11, F14, F17, flooring and decking product range.

$$P_{t+1} = P_t * (WWI + FAS) \quad (2)$$

where FAS = Factor Adjustment System

Negotiation of price levels for the next period in the log contract is dependent on the objective WWI measure and the subjective predictive values of the FAS. It is in this manner that future shadow prices for log inputs were to be estimated, based on downstream processed timber price movements and general economic indicators. Given the subjective nature of the FAS, the FAS component of the price adjustment mechanism has been less readily accepted by buyers in the market.

Residual Input Price Adjustment

Two shortcomings of the proposed price adjustment model are evident. First, by relying on price movements in products from downstream processed timbers, productivity gains in downstream activities are being used to value resources in upstream industries. Second, the subjective interpretation of the importance of each of the FAS factors gives a degree of price variation at a personal negotiating level. Further, the established price for logs negotiated in a long-term contract in structurally uncompetitive markets is market indeterminate and a shadow price needs to be estimated.

It has been suggested that an alternative price adjustment mechanism that relies on the traditional residual pricing methodology could be applied. This method values the finished timber products and deducts all the known inputs (except log values) and returns to capital in the processing industries. After transport costs and cutting costs are accounted for the residual value is deemed to be the value of the log input to the timber processor. O'Reagan and Bhati (1991) illustrated that the residual pricing mechanism approach is also fraught with methodological danger because it leads to inefficient prices in the log market. Nevertheless, changes in input prices other than logs could be used as a proxy guide for adjusting log prices on contracts rather than relying on downstream industry price movements to give guidance for price change in the input log market.

CONCLUSIONS

It has been argued that when the price and demand for a factor of production is being considered, this price depends upon the characteristics in both the end-product commodity market (timber sales) and the factor input market (log market). A firm with monopolistic power in the commodities market that faces a competitive log input market will maximise profit by employing that volume of logs where the $MRP_L = MC_L$ (the St rate in Figure 1), where MRP_L is less than VMP_L. Where both the input supplier and the input buyer are monopolist and monopsonist respectively, the buyer maximises profit by setting ME_b with that of MRP_b (demand curve); and the supplier sets price by satisfying the condition that the MR_S equals to the MC_S.

Under these conditions with monopoly power present on both sides of the market, the market does not produce an optimal stumpage price and price is indeterminate. Consequently, market power does matter. Moreover, it is shown that for the case of Queensland, there are a small number of dominant processors that are advantageously located near large plantations owned by a public sector authority that controls the supply side of the market. These conditions generate classic bilateral monopoly price outcomes that determine upper and lower price bounds from which an agreed price is achieved through bargaining and negotiation. The share of the rent from the log resource is determined by the bargaining power of each party as quoted by Pindyck and Rubinfeld (1989, p. 357) 'monopsony power

and monopoly power will tend to counteract each other', monopsony power will push price closer to marginal cost, and monopoly power will price closer to marginal value. Efficient market pricing of logs in Queensland remains unachievable when asymmetrical market power is present on either side of the market. Little improvement can be expected in this market until more competitive pressures are exerted. This can only be achieved by creating more suppliers (plantation owners) and more processors on the buyer side of the market.

Terms and conditions of long-term contracts are determined at the commencement of a log allocation contract. Prices are determined within a bilateral negotiating environment and the method for adjusting prices until the next review period are set in the contract. The WWI and the FAS elements of the pricing mechanism are used to adjust prices through this period. Equal weight is given to each component and both elements relate to downstream activities. Difficulties arise in applying this formula for adjusting contract prices because the WWI is reliant on a singular price movement of structural timbers only and could be misleading for the value of logs for use in other processing activities. Similarly, the FAS is mainly a subjectively interpreted component and personal judgements are made in the pricing decision calculus.

An alternative residual input price movement adjuster has been proposed. Price movements of other factor inputs into the processing industry could act as an indicator of movements in the shadow price of logs sold in the Queensland market. Further research into this option is a logical extension for refining and validating downstream timber product prices as a measuring rod for adjusting price in upstream input markets.

The success of the newly adopted price adjustment method, which includes a WWI component and a FAS factor, for logs supplied from DPI-F in medium to long-term contracts is still to be evaluated. However, DPI-F appears to be satisfied with the implementation of this price adjustment method. Nevertheless, as price review periods draw near both sides in the negotiations will again argue over the importance and role of the FAS component in adjusting log prices. This could lead to price instability and continued inefficiency in price levels for logs in the future.

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MARKET FACILITATION

7. A FORESTRY INDUSTRY CLUSTER VIEW ON TIMBER MARKETING IN NORTH QUEENSLAND

D. Skelton

The listing of north Queensland's State-owned rainforest as a World Heritage Area and the cessation of timber harvesting in 1988 caused a severe contraction in the north Queensland timber industry. The remaining industry is based on softwood from State Government plantations, which supplies only one sawmill of any appreciable size. A few small fixed mills and several portable mills cut hardwoods from Crown and private land outside the World Heritage Area. After only fifteen years, north Queensland's formerly world famous cabinetwoods are now virtually unmentioned in the country's timber trade, and marketing these timbers has become a major issue for the small-scale forest growers. The lack of a steady, high quality supply of north Queensland timbers is probably the cause of depressed prices. The irregularity of supply ensures that prices vary widely. Private Forestry North Queensland Association (PFNQ) is the north Queensland forestry industry cluster and Private Forestry Development Committee. A number of other organisations work alongside PFNQ trying to develop the private forestry industry. A timber cooperative has been formed in the region but it has had little success in establishing a business or securing markets. PFNQ has therefore initiated a marketing facilitation project to provide market intelligence while it finds ways to initiate a private forest and timber stocktake. A stocktake and quality assessment of the region's resource will provide information about the timber already cut and held in storage, and standing timber available to be cut, as well as a projection for the future sustainable yield. This will assist in developing a sale strategy on which to establish sustainable, consistent wood flows to maintain a market in specialist timber uses (e.g. parquetry flooring, furniture and house panelling). Producing timber for the high volume, lower value markets is not favoured as an option for farm forestry. A possible scenario for the development of a small-scale market is suggested; however, it is acknowledged that given the weak state of the local industry and the absence of any industry funding, external resources (particularly Government support) will be necessary to re-establish a viable forestry industry.

THE NORTH QUEENSLAND FORESTRY INDUSTRY: PAST AND PRESENT

The forestry industry in north Queensland is currently in a state of limbo. Prior to the gazettal of the Australian Wet Tropics of Queensland World Heritage Area in 1988, there was a strong forestry industry based on the management and harvesting of State-owned native tropical rainforest. This supported twenty-six sawmills and plymills in a region from Cooktown to Townsville.

The industry had developed over an eighty to ninety year period, on the back of 'timber getting' for red cedar, agricultural and mining development, and non-indigenous settlement. From the mid 1800s red cedar (*Toona ciliata*) had become a valuable and sought-after timber with financially lucrative markets in Australia and overseas. It occurred in tropical to sub-tropical rainforests along the east coast and as colonial exploration and settlement moved north and south from Sydney, stands of red cedar were sought out. The wet tropics, settled in the late nineteenth century, were one of the areas where it was abundant,

particularly on the Atherton Tableland. As red cedar became scarcer and State forest agency became established, other Queensland timbers were investigated, leading to an industry based on the harvesting from natural forests of up to a dozen main species with the full list eventually including about 120 species. Although areas of plantation have been established – on the Atherton Tableland and on the coast near Cardwell and Ingham – the extensive area of natural rainforests managed under a sustained yield, natural regeneration and selective harvesting system probably ensured that plantation expansion was not considered a higher priority. Plantation development would hardly have been considered urgent when there was a resource of over 150,000 hectares of productive accessible natural forest. There was also, until the late 1970s, a general feeling outside the forestry industry worldwide that monoculture forestry plantations were less environmentally friendly than the management of mixed natural forests. Plantations were (and still are to some degree) considered an eyesore and 'ecological deserts' and it has only been in recent years in Australia that plantation forestry has been considered politically preferable to the commercial management of natural forests.

Traditionally, in many countries or regions where there has been a strong natural-forest-based industry, plantation timber has been considered inferior by the milling industry. Certainly the successful utilisation of plantation material requires a different approach and different machinery. In north Queensland, natural forest management was given priority, and this was where most of the local research and expertise was developed. Research into suitable local species and techniques for plantation management was carried out in relation to several of the more valuable cabinetwood species. However, continuing management of the native forests was seen as preferable to the large-scale establishment of plantations of these species. Government plantations in north Queensland have therefore been established with two species that have wide applicability as utility softwood timbers. Consequently, the timber produced is competing with timbers in the softwood mass market and prices are set accordingly and, for the private small grower, the price is considered unacceptable and therefore interest is minimal.

World Heritage listing of crown native forests resulted in the cessation of almost all the natural forest harvesting in north Queensland. In a region that was almost entirely dependant on Crown native forests for a viable timber industry, the listing destroyed the industry and caused immense local anger. The rapidity of the closure also prevented development of an alternative plantation resource base. With most cleared land in the wet tropics at a premium for high intensity agricultural use, the void left behind by the closure of the industry has not been filled by any subsequent forestry investment.

World Heritage listing of north Queensland's tropical rainforests was perceived by some sections of the public and government as necessary to *save* them, in response to decades of land clearing for agricultural and urban use. It was no doubt politically expedient and administratively fairly easy to ban the harvesting of timber from government owned and controlled forests. However, it is ironic that the then Queensland Department of Forestry was actively managing the rainforests to maintain them as rainforests, for a sustained yield of timber in perpetuity, and there was no threat to the forests being cleared for other uses or degraded.

There is a strongly felt view in north Queensland that the timber industry was closed down on a myth. Of the approximately one million hectares of what is now the Wet Tropics World Heritage Area, only fifteen percent was being managed for commercial forestry and the remainder was in effect already preserved by management policies and actions of the Department of Forestry. In essence, natural forest operations in north Queensland (and perhaps those in forests elsewhere in the state where logging is now being phased out) were regarded as sustainable and having low environmental impact compared to other commercial land uses. The industry and communities in these areas have suffered from the Australian

public's reaction to the long-term and widespread clearing and environmental change that other land uses (primarily agricultural development) have caused.

At the time that native-forestry operations ceased in the wet tropics, the area of State-owned plantations in the region had barely reached the size needed for a single viable project. Now, sixteen years after the event, the plantation area is still at only 13,800 hectares, split between 980 hectares of hoop pine (*Araucaria cunninghamii*) on the rich basalt and better metamorphic soils on the Atherton Tableland and nearly 13,000 hectares of Caribbean pine (*Pinus caribaea*) on the poorer soils of both the Atherton Tableland and the coastal lowlands. The largest remaining mill, Ravenshoe Timbers, now specialises in processing softwood from the Queensland Department of Primary Industries Forestry (DPI-F) hoop pine and Caribbean pine plantations on the Atherton Tableland. Annual log intake capacity is about 35,000 cubic metres per year, following recent upgrades in mill equipment. The few remaining smaller mills obtain mainly hardwood from limited logging on privately-owned land and a number of portable sawmills are also operating. The sustainability (in terms of regular sustained yield) of this activity is questionable.

A one-off sale of a parcel of mature Cardwell Caribbean pine has recently been awarded by DPI-F under a tender process to a Melbourne company. At present it is proposed to send the logs overseas and elsewhere in Australia, not to process them locally. Meanwhile, expressions of interest have been called for the long-term rights to harvest these coastal plantations, with a declared preference for local processing.

As a final industry *nail in the coffin*, all of the region's State-owned native forests are expected to be incorporated into the Queensland Parks and Wildlife management system and any new industry in the region will have to be started from a new, planted resource or from sustainably (it would be hoped) managed native forests on private land. As yet, no forestry code of practice for timber production and harvesting on private land has been endorsed by government or industry.

THE NORTH QUEENSLAND FORESTRY INDUSTRY CLUSTER

Private Forestry North Queensland Association (PFNQ) was incorporated as the north Queensland forestry industry cluster in July 2001, although it had operated for a few years previously. It is also the Private Forestry Development Committee (formerly the Regional Plantation Committee) for north Queensland and has received funds from the Federal and State governments to promote private forestry development. Early in its life, PFNQ was an industry cluster of the Cairns Region Economic Development Corporation. However, since incorporation as an association, it is no longer an industry cluster under their auspices. It continues to maintain links and individual membership however. It is one of twenty organisations in Australia (eighteen of them government funded) to promote private forestry development, three being in Queensland, representing geographically, the north (PFNQ: Cape York to Bowen and inland), central Queensland (Proserpine to Gladstone/ Bundaberg and inland) and the south (Maryborough to the New South Wales border).

Elsewhere in the country (particularly outside Queensland), PFDCs have been established not on a geographical basis but where there is already a strong forestry industry. Most are a few years older than the Queensland PFDCs and some have been in operation for over ten years. It may therefore be argued that an industry cluster in north Queensland should have been created as one of the first RPCs, more promptly after the north Queensland native forest industry was forced to close, and that the delay has only compounded the difficulties being experienced now.

In effect, a project established to soften the blow of the closure of the region's timber industry may actually have contributed to preventing a recovery. The Community Rainforest

Reforestation Program (CRRP) ran from 1992 to 1998 and established almost two thousand hectares of mainly mixed-species plantings on the private land of over five hundred landholders. It however failed to re-stimulate the industry, but given the short timeframe and the intense anger in the community affected, any other outcome would have been a miracle! It was also a highly politicized program (and given the circumstances, it could not have been otherwise), and was run by more than one agency – the technical component initially by the Department of Primary Industries and later by the Department of Natural Resources, and the labour market component by Local Government through the North Queensland Afforestation Joint Board.

At a local level, there were some successes and satisfaction by the participants; however, the short timeframe of the project and the withdrawal of support since has meant that long-term investment benefits from the $10-$15 million spent will be minor (exact expenditure appears not to be known owing to the broad spread of funding distribution). It is said that the program did however achieve its political goal of distracting public anger in the short term (primarily though its labour market component in employing youth in planting the trees).

In the late 1980s and early 1990s, governments were in general still strongly in control of the nation's forestry resources. Private industry therefore appears not to have been greatly involved in the *social restructure* in north Queensland following the closure of the industry. Being an industry involved in only the exploitation of the government-managed natural resource, perhaps the industry had little to offer in terms of future investment at the time. Perhaps too, such an upheaval would be handled differently today, and if a forestry industry cluster had been created in the early 1990s, at the time of the first RPCs being established – before north Queensland started losing its industry skills – today's industry situation may have been different. However the fact remains, after sixteen years, sustainable new forestry investment and development has been minimal.

The closure of the north Queensland forest industry preceded the closure or major reduction of native forest harvesting in many other parts of Australia, and it is assumed lessons have been learnt from it. The World Heritage listing predated for example Regional Forest Agreements that now allow for the slow withdrawal of forestry activities in the States' native forests.

Substantial Commonwealth and Queensland funds were devoted to the CRRP (including research funding) over its eight-year lifespan. In terms of areas planted, the main thrust occurred for only five years between 1993 and 1997. A report commissioned by local government on the formation of the CRRP quoted a need for a thirty-year program and over $120 million to create a 'new' forestry resource based on private land (Shea, 1992). Certainly, little that is sustainable in forestry can be achieved in only five years!

The establishment of Private Forestry North Queensland in late 1999 as the north Queensland RPC or PFDC occurred at about the same time as the *winding up* of the CRRP, and now, with the winding up of the National Farm Forestry Program it has entered the *environment* at a point of extreme industry weakness. Currently, with the restructuring of state government forestry services, landholders involved in farm forestry have been left out on a limb, with no support to assist them in the management of their barely ten-year-old trees (on an expected rotation of thrity years plus).

The absence of a strong Regional Plantation Committee and a diminishing CRRP during the mid to late 1990s (that was always fighting for survival, it is reported) – in what was the strong period of the Federal Government's 'Plantations: Vision 2020' Program and national RPC thrust – therefore may not only have curbed major investment in north Queensland forestry but also curtailed a strong farm forestry culture.

Support organisations, other than PFNQ, currently involved in promoting private forestry development in north Queensland are:

- The North Queensland Timber Cooperative (NQTC), centred around the Cairns/ Mossman/ Atherton Tableland.
- Mossman Australian Forest Growers (AFG) group (including the Cairns and Innisfail areas).
- Charters Towers AFG group.
- Island Coast (Tully/ Mission Beach/ Cardwell/ Ingham) Agroforestry Group.
- Other, less formal and fledgling grower groups.
- Far North Queensland Training (a business name and currently only operating arm of North Queensland Afforestation Association, or Northern Skills Alliance as it has now become).
- A number of Local Government Councils.
- The Department of Primary Industries.
- The Department of State Development (responsible for aboriginal communities forestry development).

Not all are members of PFNQ and many individuals remain outside its membership. The fragmented nature of the industry at present, a lack of coherent government interest and irregular government funding support has caused some to remark that there is no benefit to be involved at present. Current issues in relation to these organisations include:

- The Timber Cooperative is six years old, but has been unable to sell any appreciable quantity of timber to date.
- The Timber Cooperative has experienced a declining membership (in part due to increasing membership fees needed to meet costs associated with statutory requirements).
- PFNQ (as an industry cluster) may also be undergoing declining membership owing to perceived lack of progress in industry development.
- There is an overlap of cooperative membership with the local AFG group and there also appears to be an overlap of functions.
- There are possibly too many groups (including PFNQ) in the region, competing for limited funding and membership, but on the other hand many groups report cohesion difficulties, a shortage of time and resources for projects and lack of information and skills.
- There are *breadth of responsibility* issues (perceived geographical boundaries of the respective organisations).
- Corporate sector interests are not self-evident on the landscape due to the long timelines in securing funds, investment, land and project documentation.
- Groups outside the Cairns region believe PFNQ to be too Cairns-centric and have argued that a Cairns-based Timber Cooperative has no relevance for them because of distance and lack of business and service activities.
- Government support and funding for private forestry development and natural resource management in the region has been short-term and erratic. This has resulted in PFNQ operating under-resourced and from a hand-to-mouth existence. The situation has also resulted in a sister organisation, North Queensland Afforestation Association (the successor to the North Queensland Afforestation Joint Board), winding up its natural resource management operations and concentrating only on its training business.

PFNQ's future is still insecure, and its 2003/2004 funds for example were not received until late December.

- Industry participants strongly advocate value-adding processes and are reluctant to sell timber without having added value locally. However, it is unclear at present whether local value-adding would actually increase net income. There is currently no strong downstream processing industry.

THE CURRENT NORTH QUEENSLAND FORESTRY RESOURCE

The plantation resource in north Queensland currently consists of:

- A State government owned plantation resource (13,800 hectares).
- A *harvestable* private forestry resource of relatively low-value Caribbean pine.
- A small number of hoop pine woodlots, mixed hardwood trees from rainforest, windbreaks and acacia regrowth (up to five thousand hectares of acacia forest has been suggested).
- The Community Rainforest Reforestation Program resource, planted between 1992 and 1998, of approximately 1800 hectares on record although over 2000 hectares is reported to have been planted (with an unknown area currently under sound silvicultural management).
- The DPI-F joint venture program with sixteen landholders (160 hectares).
- Farm woodlots established under the Queensland government's farm forestry Tree Care extension program in the 1980s and 1990s.
- Rainforest sawn timber and slabs said to be stored in farm sheds throughout the region (unknown quantity).
- Natural eucalypt and rainforests under aboriginal ownership on Cape York Peninsula (potentially extensive areas).

KNOWN TIMBER MARKETING IN THE REGION

There are many cabinet-makers and small-scale timber users but they source their local cabinetwood timber somewhat *ad hoc* from local millers. Growers claim that the prices offered in the region are unacceptably low and that higher prices are obtainable in southern states (if only they could secure a market). Ravenshoe Timbers, specialising in processing softwood from DPI-F hoop pine and Caribbean pine plantations, produces up to 10,000 cubic metres of sawn wood annually. The Melbourne-based company Pentarch has secured a contract to harvest over 200,000 cubic metres (from over 600 hectares) of the Government Cardwell Caribbean pine resource.

Most timber available from local timber merchants is from the south or overseas. A proportion would come from Ravenshoe mill. Limited local hardwood is available from the few remaining local fixed mills and portable mill operators. Small local hardwood sawmills source their logs locally from private lands, but each business has its own contacts, and purchases are opportunistic.

North Queensland Timber Cooperative has negotiated a sale of the currently standing private Caribbean pine resource with an overseas buyer. However, they have been encountering delays in negotiating port facilities and acquiring government permissions. The Cooperative had hoped to acquire the harvest rights to some of the Cardwell Caribbean pine to *top up* the consignment and make it more commercially worthwhile, in partnership with Ravenshoe Timbers. However, they were unsuccessful in the tendering process. The Cooperative has

also been trying to develop general timber markets in southern states and south Queensland but with no commercial success to date. A degree of frustration has been expressed! Grower groups apparently do not have a sufficiently mature resource to sell at present.

Some trial plantations have been established in recent years north and west of Cooktown by commercial interests. However, it will be fifteen to twenty-five years before production commences.PFNQ over its four-year history has organised workshops to stimulate forestry investment and marketing activity. A number of small companies, all in competition with each other, have attempted to develop a non-registered Managed Investment Scheme following an investment workshop given by PFNQ. PFNQ organised two 'hands-on' marketing workshops in February and April 2003, taking advantage of the availability of marketing consultants brought to the region by the DPI Future Profit Program. Feedback from participants however has not been overly positive, but the consultants did present sound reasoning that participants in the industry could apply.

There has been, and remains, a *groundswell* from some of the industry cluster members that something drastic needs to be done to promote investment and provide sound management advice and information to bolster the existing, fledgling farm forestry industry. However, the industry in general is so weakened that participants appear to have no time to address the broader issues outside the survival of their own businesses, and a spirit of useful co-operation appears to be lacking.

Outside of the State plantations, the volume and production potential of the region's forest resource is unknown. The current private timber market is therefore limited but, it is considered, with some coordination, could be developed on a small scale.

FUTURE PFNQ ACTIVITIES IN RELATION TO TIMBER MARKETING

Although individuals have their own contacts and sales of timber are made, the general consensus amongst timber growers is that there is a lack of buyers willing to offer prices being expected. At the same time there appears to be an absence of any appreciable quantity of timber for sale (excluding the pine resource being negotiated by the Cooperative). There is also a lack of market intelligence. The solution to this appears firstly, to compile market information and secondly to make potential participants in the market more aware of one another.

Although possibly repeating some of the work done by the Cooperative, PFNQ has initiated a marketing facilitation project. The principles of the project are to:

- Identify resource owners and ask what they have available to sell, their resource 'specifications' and the price expected.
- Identify and ask timber users what they want to buy, the specifications and what they are prepared to pay.
- Start small and local, and expand beyond the regional boundaries as part of a natural progression.
- Establish and maintain a degree of market intelligence.
- Establish a 'newsletter' of supply and demand.
- Make and maintain personal contact.
- Distribute the information throughout the local industry and elsewhere where contact has been made (in the newsletter) and provide an open, transparent starting point to stimulate communication.

- Facilitate marketing, but not act as a broker or marketer, and acquire information for general intelligence and for others to act on. Sales will depend entirely on agreement reached between buyer and seller.

The first stage of the fieldwork has been completed and preliminary data have been accumulated. The first edition of the newsletter was produced in December 2003 and contacts established have already resulted in some local timber sales. Maintaining an intelligence-gathering function will permit PFNQ to provide industry advice. The Timber Cooperative, being a business set up to sell its members' timber, should be in a strong position to benefit from the intelligence gathered, as should grower and other organised groups and individuals.

Reaction from the persons contacted to date has been (surprisingly) very positive and supply and demand information has been freely given. However, it appears much of the timber that has already been cut and stored in the form of slabs. It is clear from buyers contacted that the market for slabs is small and it will be necessary to re-saw these slabs into boards in order to sell them at present.

It is also evident that the quantity of north Queensland timber sold, and knowledge in southern markets about the timbers, is now very limited. Most southern processors use imported hardwood timber, Tasmanian blackwood (*Acacia* spp) and various eucalypt species. This has a regular supply and at prices lower than being sought for north Queensland timbers. The lack of a steady, high-quality supply of north Queensland timbers and a commensurate steady demand (that in itself is indeterminate because there is not a steady supply) contributes to the prices remaining below growers' expectations. The irregularity of supply ensures that prices vary widely, depending on supply and demand at a particular time.

Clearly, north Queensland timbers no longer figure strongly in the Australian marketplace and it is not likely that investment in farm forestry will happen until growers see a viable market for their investment. There is a local hoop pine industry on the Atherton Tableland but private growers complain that, owing to the long-term agreement negotiated between the State and the existing mill to guarantee utilization of the State resources, the demand for privately-owned resource is weak and prices are depressed. This is a complaint heard throughout Queensland and elsewhere in Australia. There is therefore not a strong private drive to plant hoop pine or other (depending on region) *mainstream* timbers.

For landholders to become convinced of farm forestry, there is a need to establish a consistent and sustainable supply of high quality timber in the region to establish a small, but steady, firm market. From this it is hoped to expand in the future. *Ad hoc* sales of timber – as being made at present – will never establish an industry toehold. It is therefore necessary to carry out a stocktake and quality assessment of the region's resource: the timber already cut, standing timber available to be cut, and projections for the future. From this a sale strategy can be developed on which to generate sustainable, consistent wood flows to establish a market in specialist timber uses (e.g. parquet flooring, furniture, house panelling). Producing timber for the high-volume lower-value markets is not considered an option for farm forestry.

OTHER PFNQ DIRECTIONS

On a broader front, PFNQ has recently reviewed its business plan and has adopted a revised strategy. Taking into account concerns and issues raised within the region (some outlined above), there is a need to strengthen PFNQ and other functional organisations, to bring both business and individual members in and to address the issues and concerns for all in the region.

Owing to the small scale of a private forestry resource, sound marketing of the existing resource is essential to stimulate the industry and to re-establish a toehold in the markets, but the real issue is to establish a large enough new resource to re-establish a viable industry. Marketing is therefore an integral, – but at the moment not necessarily large – part of a required strategy to develop the industry.

As part of its functions, PFNQ sees itself as undertaking the following activities, to the extent possible:

- Acting as an honest broker for the industry, to work with industry participants, Local, State and Federal governments and development organisations, to bring together information so that the region has something to 'sell' to the investor (including available land for forestry development, timber and other forest produce, and a favourable investment climate).
- Providing a link between all players in the industry, including government, and maintaining a directory of services.
- Providing management and technical services to growers that already have farm woodlots and small plantations so that quality and value can be maximised. The service however will stop short of doing the work in order to promote service providers.
- Promoting the establishment of new farm woodlots and individual or small business owned plantations by assisting landholders understand (and where needed, helping to organise) the logistics in establishing and maintaining woodlots.
- Providing native forest management advice.
- Promoting the publication of regional industry statistics.
- Supporting forestry industry organisations.
- Identifying land suitable for forestry but marginal for other uses and working with landholders, PFNQ members, government agencies, development organisations and potential investors to promote the use of such land for forestry and expansion of a managed forest estate.

Figure 1 outlines the position of marketing within PFNQ's proposed direction.

CONCLUDING COMMENTS

An industry cluster is a group of industry participants working together on those aspects of business development that improve the situation for all players (i.e. the cluster as a whole). Individual businesses still compete and commercial-in-confidence processes are maintained; however, individual businesses are expected to contribute some of their time for the benefit of the cluster. The purpose of a cluster coordinator or facilitator is to keep everyone informed, not necessarily to do the work. Ideas and projects should come from within the cluster membership.

Unfortunately, north Queensland forestry industry participants appear to be tied up in the survival of their own businesses and historically have had little time or resources to contribute to the cluster as a whole. Given the state of the industry, this is not unexpected because there is now a dearth of forestry skill in the private sector in the region. The industry in north Queensland needs to break out of this bind, but it is unlikely the industry has the capacity to do so from within. External resources are needed, and in the absence of an 'industry fund' the government appears to be the only immediate avenue of support, such as through the adequate funding of the Private Forestry Development Committee. With the commercialisation of Queensland government forestry – with a view to it being fully privatised

– its membership of PFNQ would be beneficial, provided it can participate as an 'equal' player.

Some rationalisation of groups within the region will be necessary but the independence of industry participants is not questioned. In an industry with diversity of opinion, it would be impractical to insist on amalgamations or a centralisation of functions. However, a scenario to strengthen the private forest grower, for example, could be for two timber cooperatives to operate from the region's main ports, one in Cairns and one in Townsville. Each cooperative would be strictly a business, each marketing and selling the timber of and to its members. Membership may consist of both growers and end-users, and each should be involved in the marketing and sale of timber but not in silvicultural management. The rationale for this are:

1. With claims by individuals outside the Cairns region that the Timber Cooperative has no relevance for them because of distance and lack of business and service activities, and comments that farm forestry to be successful needs to have strong local community links, local grower groups have a better chance of coordinating the silviculture of farm forestry than a regional cooperative.

2. Cooperatives are businesses, not clubs. To be successful they have to operate along strict business lines (albeit cooperatively). Members buy into a cooperative by 'purchasing' a share but the operating funds are drawn from sales, not from membership fees. Therefore, until an individual's resource is ready for harvest, it is thought unlikely there would be any financial reason for an individual grower to join a cooperative. Likewise, it is seen that there would be no financial reason for a grower to remain in a cooperative if they only have a one-off resource and it has been sold. But for landholders with a continuing forestry enterprise, there is every reason to belong to a local grower group to exchange ideas and comments on woodlot maintenance, growth and silviculture.

The coordinated growing of farm trees should therefore be in the hands of local grower groups. These groups may be members of one or more timber cooperatives. The main planning functions of cooperatives are seen as ensuring – through grower groups – a continuity of supply of high-quality logs. The most serious marketing issue for a cooperative (apart from developing markets) is in coordinating the supply from the local natural forest resource and integrating this into maturing farm plantations and avoiding one-off *ad hoc* sales (unless they were part of a broader strategy).

PFNQ could potentially carry out general industry coordination (as a cluster of participating businesses), and to provide technical services for growing trees (as a government-funded facilitation body, while such funding can be acquired) until the industry has built up a strong skill base (that it has itself, or can pay for). PFNQ would assist in the coordination of appropriate training and research with industry businesses, government agencies, academic and research organisations, grower groups, the cooperatives and training providers.

To maintain what knowledge is left of Queensland rainforest timbers in the marketplace, there is a need to establish a consistent and sustainable supply of high-quality timber out of the region, to retain a small but steady and firm market. From this it is hoped an expanded market will develop in the future from an expanded resource. *Ad hoc* sales of timber – as is presently the case – will never establish a dependable market. Until a sustainable, continued supply of forest produce can be identified, managed or developed, a viable north Queensland forestry industry will remain out of reach. An industry cluster has a role to play in the development of such an industry.

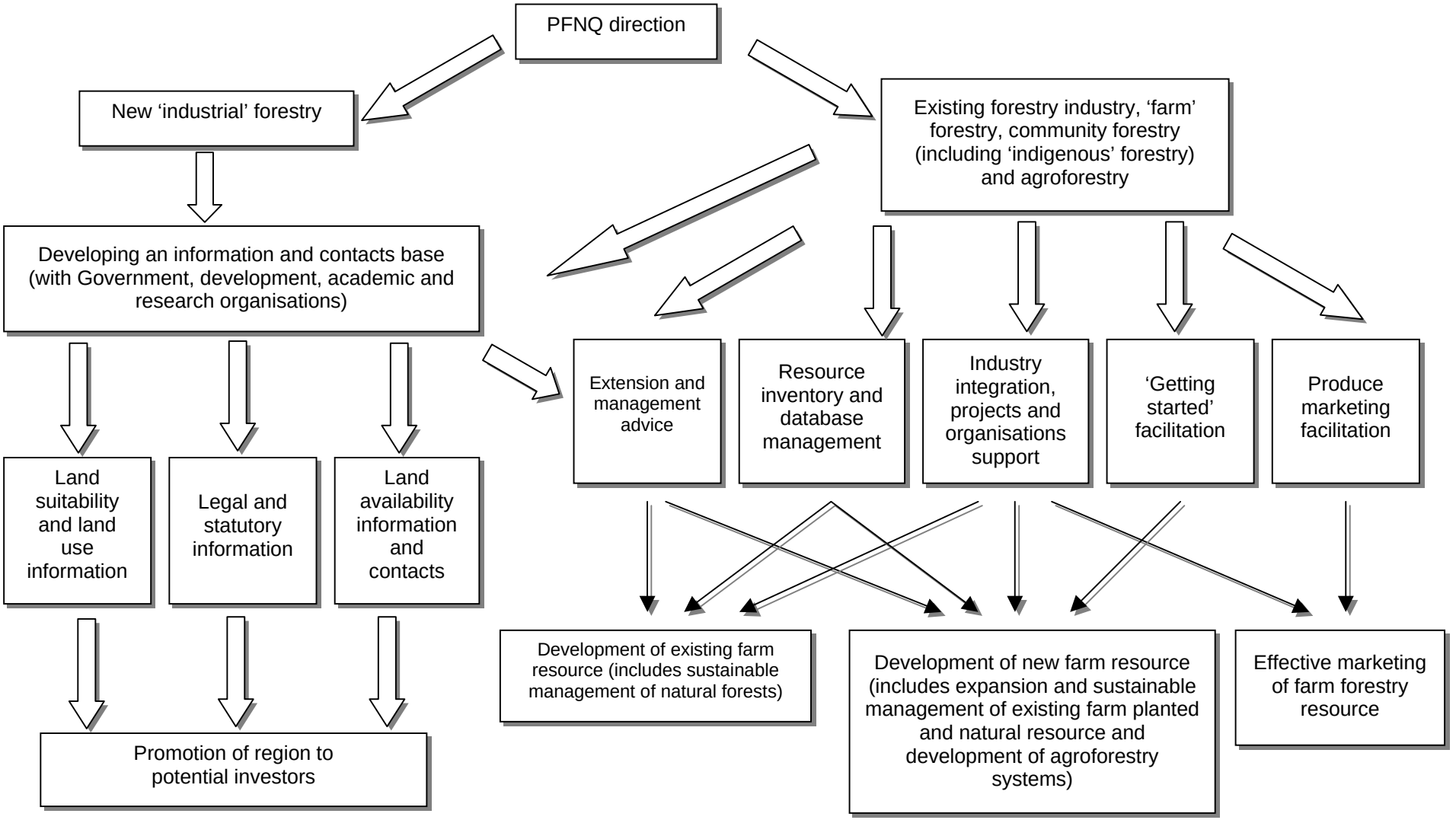

Figure 1: Proposed north Queensland industry cluster direction.

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8. THE ROLE OF GROWER COOPERATIVES IN THE MARKETING OF FARM-GROWN TIMBER IN NORTH QUEENSLAND

J. Suh, D. Killin and S. R. Harrison

This paper examines potential opportunities for tree grower cooperatives in north Queensland. In Australia, there is strong interest in forest grower cooperatives, as evidenced for example by the National Farm Forestry Cooperative Workshop held in Brisbane in 1999. The only cooperative in north Queensland registered under the *Cooperatives Act 1997* – the North Queensland Timber Cooperative (NQTC) – was established in 1998, and has attempted to focus the attention of industry participants on a cooperative approach to timber marketing. New Generation Cooperatives (NGCs) provide a model that could be adapted to the situation in north Queensland. To be a successful cooperative, the NQTC needs to attract a large number of members with a substantial timber resource base and access to value-adding infrastructure, and have substantial start-up capital or be able to enter into transactions for the marketing of large timber lots. Otherwise, it is unlikely that the cooperative will establish a satisfactory funds reserve and have influence on timber marketing and forest policy.

INTRODUCTION

The timber industry was a pioneering industry in tropical north Queensland. Many of the native conifer and rainforest species were found to have excellent timber properties, and supported a timber industry in which there were a large number of small fixed-site sawmills, and a vibrant cabinet furniture industry. Rainforest timber was harvested from native forests and much was sold in southern markets, although considerable cabinet-making took place in Cairns and Townsville. Most softwood timber was obtained from government plantations. The low cost of the timber to local mills was partly achieved through low royalty payments to State government and allowed the transport cost to southern markets to be met.

Over time, in spite of adoption of progressively more conservative logging regimes, there was strong pressure from environmental groups for cessation of rainforest logging. As a result, in 1998 an area of about 900,000 hectares of mainly Crown rainforest was gazetted as the Wet Tropics of Queensland World Heritage Area (WTWHA). Logging ceased on this area, but for a time, with high sugar prices, the supply of rainforest timbers continued from conversion of private forestland to agriculture.

In the last few years, there has been an economic downturn in the tobacco, dairying and sugar industries in north Queensland, and increasingly heavy reliance on tourism to support the economy. The potential role of forestry for income generation, employment and environmental benefits is recognised, and efforts have been made to encourage farm forestry. However, the rate of recent planting has been disappointingly slow, this being in part due to low stumpage prices. Attention is now being given to measures to accelerate plantation establishment and re-establishment of timber markets. One such measure is increased cooperation between growers.

This paper examines potential opportunities for tree grower cooperatives in north Queensland. The next section depicts the characteristics of the north Queensland timber industry and summarises findings from regional market studies. The concept of the new

generation cooperative is then introduced with some insights in forest owners' organisations in Germany, Finland and Australia. The paper then examines the potential entrepreneurial initiatives and cooperative opportunities for tree growers in north Queensland. Finally, government roles in supporting timber markets are discussed.

SOME CHARACTERISTICS OF THE NORTH QUEENSLAND TIMBER INDUSTRY SITUATION

Supply and Demand Considerations of a Re-emerging Industry

The demand for log timber is a derived demand, in the sense that demand for final products will feed back through the supply chain to demand for trees at the stump. This translation of final consumer demand of course assumes an intact supply chain. The low level of timber production in north Queensland creates a situation, at least for hardwood species, where a lack of demand arises because there is not sufficient resource to make processing a profitable venture. While there is timber demand for specialist purposes, such as a few small-scale furniture manufacturers and souvenir producers, there is not a threshold quantity to support additional larger processors, apart from the softwood processing of Ravenshoe Timbers Pty Ltd. This means that the normal downward sloping demand curve as quantity increases simply is not relevant. The nature of the hardwood demand curve is more like that of Figure 1.

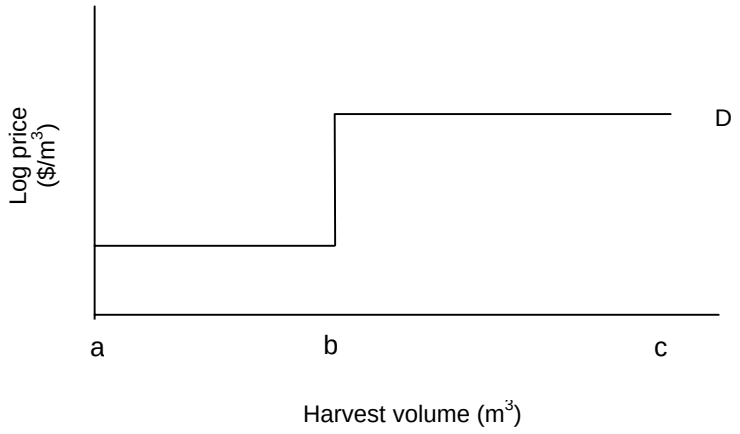

Figure 1: Perverse demand curve for hardwood timber under shortage of supply.

In Figure 1, the timber quantity up to point b is that required for small users. At point b, the threshold quantity is reached for processors to be attracted to setting up in the district. Within the intervals a-b and b-c, demand is likely to be price insensitive, although it may not be perfectly so as indicated here. This kind of demand curve also has implications for supply. In the short run, the supply curve is likely to be upward sloping, with higher prices attracting more harvesting. In the long run, a lack of demand is likely to lead to a lack of future supply[1].

This circle can only be broken by government assistance or risk-taking entrepreneurs, or the interaction between both. Some landholders will no doubt invest in the belief that high quality hardwoods will be a scarce and prized commodity in the future, although history indicates that these landholders will only plant small areas (often two to five hectares). A resource base in softwoods of sufficient size to allow one technologically advanced commercial mill to operate (Ravenshoe Timbers) is currently provided by government plantations. A viable

[1] Demand and supply perspectives are discussed in more detail in Chapter 4 of this monograph.

future timber industry is most likely to require supplies from some large growers, government or private, many small-scale growers, and production of both exotics and native species.

Locational Disadvantage

North Queensland suffers from a market disadvantage in terms of plantation location and transport costs to major timber markets (Cox and Quayle, 2001). Venn (2000) noted the need for high-value products to justify transport costs from north Queensland to markets of major population centres, in relation to Cape York timbers, it is necessary is to produce value-added products such as ply, veneer, laminated board, finger-jointed mouldings, specific rare timber logs or furniture products. In other words, small-scale forest producers have to consider the importance of processing of timber into more valuable products to outweigh locational disadvantage. This is difficult and costly for growers unless cooperative arrangements with regard to capital, equipment, information and marketing are established.

The economically recoverable value of a forest varies in terms of net stumpage return after allowance for harvest and transport costs. Timber having a net value of zero is said to be at the *extensive margin* of recovery, as indicated in Figure 2. Low stumpage value may be due to low timber quality, higher extraction costs, high transport costs to markets, a government plantation subsidy arrangement, or low log prices set by the state government as price leader in the timber market. The combination of these factors will mean that some stands will have a negative net value, as appears to be the case with some farm plots of Caribbean pine (*Pinus caribeae*) on the Atherton Tableland. The economically recoverable timber inventory may increase with new and more cost-effective harvesting and processing technology.

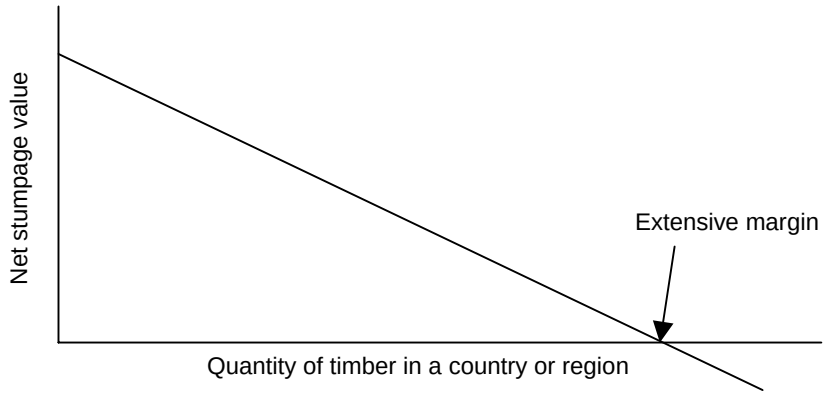

Figure 2: Economically recoverable forest inventory (Source: Pearse, 1990 p. 59).

Estimates of the amount of land available and appropriate for timber production made by Keenan *et al*. (1998) and later updated by Annandale *et al*. (2003) adopt a distance of two hundred kilometres from Cairns as the potential planting area, based on transport cost to Cairns. Notably, major costs arise in transport from forest to sawmill or processor, and from processor to consumer market, and Cairns is not necessarily an important hub for either of these. If processing facilities are constructed near plantations and value-adding is carried out, then greater transport distances can be justified. In that the number of timber mills in north Queensland has dropped sharply since creation of the Wet Tropics World Heritage Area, new capital investment will be required to create these processing facilities.

Timber produced by small-scale operators also faces considerable disadvantage in terms of access to export markets (Cox, 2001). Lack of experience of Australian producers in export markets is also an impediment to international competitiveness. Thus, the small-scale

forestry sector could benefit from emulating the marketing approaches pursued by industrial timber processors (Cox and Quayle, 2001).

The Current North Queensland Timber Resource and Findings of Market Research

Approximately 2000 hectares of native rainforest species and eucalypts were planted in fourteen local government areas under the Community Rainforest Reforestation Program (CRRP) during 1993-1998. These plantings are still immature, and some of the slower growing species will take about fifty years from planting to harvest age. Stand management has been of variable quality, but mostly below the standard required to produce high-grade clearwood, and it is likely that only 500 to 1000 hectares of timber will be of sufficient quality for marketing purposes. Similarly, earlier government-subsidised small plantings of Caribbean pine were in general not well managed for timber production, and so are not in demand by local timber mills.

Market research has been carried out within the Rainforest Cooperative Research Centre, through surveys of cabinet-makers and their employees and of the public in relation to their demand for timber products. This has provided information about the attitudes of cabinet-makers towards the use of rainforest and eucalypt timbers. For example, cabinet-makers would use local timber if it were available on a regular basis, and are observed to pay a substantial premium for imported timber because of reliability of supply (Herbohn *et al*. 2001). Surveys of the public as timber consumers reveal a high regard for rainforest timber products (Smorfitt *et al*. 2001). However there is little demand from cabinet-makers for these timbers because of the difficulty in obtaining ready supplies when required. Cabinet-makers operate on a just-in-time inventory system and keep little timber inventory. Ready timber availability – i.e. easy to locate and suitable for immediate use – is a critical factor in the choice of inputs, and cabinet-makers are prepared to pay a premium for this convenience of supply.

These studies suggest that if sufficient volume and regular supply of rainforest timbers were available, there would be substantial demand by cabinet-makers in north and southern Queensland, although this is the ‘high end’ of the market, and prices would be constrained by bulk production of composite wood products and by other solid wood products including hoop pine, Tasmanian oak and imported timbers. It is clear that cabinet-makers do not always seek to purchase timber from individual mills, but require convenient wood packs from timber merchants, although the supply chain with respect to native species will need to be re-established in the future when plantation material is ready for harvest, as it is likely that log size and wood characteristics will differ from those of the original native forest material.

Cabinet-makers indicated they require timber that is ready to use (dry or seasoned, cut and stored and sorted to standard sizes), and readily available (e.g. from a central supply point). These requirements give strong support for the need for small-scale growers, processors and further value-adders to act cooperatively, or at least through a central supplier or marketing agent. It would appear that small volumes of available timber are not so much a problem as the fragmentation of supply, and the inability to add value to the primary resource due to lack of capital to fund facilities. It would be quite possible for a high-value industry to develop with small yet regular supplies, e.g. ten thousand cubic metres, or even five thousand cubic metres per annum, of roundwood for the entire region of north Queensland converted into value-added certified timber products and sold into discerning markets in the European Union, the United Kingdom and north America.

Another market research finding is that the species which have been most planted on farms in the CRRP are not a close match with those which cabinet-makers have traditionally used from native forest resources and which they expect to be in greatest demand in the future.

However, it may be unrealistic to expect adequate quantities of some favoured species such as red cedar to become available, and it is likely that the next generation of cabinet-makers will increasingly rely on timber supplies from a smaller range of species.

Increasing the Volume of Timber Sales

Restoration of a timber industry in north Queensland will depend on some high volume sales, such as:

- lumber for housing and industrial construction in Queensland;
- bulk produced furniture items such as desks and bookshelves produced from hoop pine, or possibly furniture produced from African mahogany;
- veneer and plywood, using rainforest timbers, eucalypts or softwoods;
- wood fittings such as railings and mouldings;
- high-volume exports of poles; and
- woodchips and biofuel for small-scale wood-fired electricity generation, or co-generation if the market for renewable energy certificates (RECs) develops further through the possible raising of the Australian Mandated Renewable Energy Target (MRET) from two percent to ten percent by 2010.

Some of these items could be joint products from the same plantations, e.g. the branches and tops of trees providing millable logs could be used for biofuel or woodchip. The percentage of high value timber is increasing due to availability of improved technology, such as finger jointing which allows long boards to be produced from short log sections and logs with defects.

THE NEW GENERATION GROWER COOPERATIVE AND THE NORTH QUEENSLAND TIMBER COOPERATIVE

Traditional Cooperatives and New Generation Cooperatives

A cooperative is defined as a business operated primarily to provide benefits to members through marketing transactions and through a distribution of earnings from these transactions. In return, members have a responsibility to provide equity capital and govern the business (Coltrain *et al*. 2003). Cooperatives are distinct from other types of business structures in that those who use the cooperative are the same people who own, finance and control the organisation. Cooperatives act as an extension of their members' business operations.

In the traditional cooperative structure, members have the ability to control their cooperative through the 'one member, one vote' principle. An outside group cannot join the cooperative and exercise control through voting without active participation in the primary business of the cooperatives. Through traditionally structured cooperatives, various benefits to members can be organised. Cooperatives can realise economies of scale otherwise unattainable by individuals, e.g. aggregating small quantities of product into marketable parcels. Cooperatives can also facilitate improved quality control and access markets, limit opportunistic behaviour by buyers or processors, and give members greater influence over the prices they receive.

Traditional cooperatives face limitations for organising a value-adding investment. In the traditional cooperative structure, the building up of cooperative funds and equity typically occurs from membership subscriptions (shares) and receiving a commission on activities

(retained earnings) over several years (Edols, 2000). In such cases, neither member shares nor retained earnings satisfactorily facilitate significant upfront and member investment in value-adding. Traditional cooperatives tend to attract service capital rather than investment capital. Service capital benefits members mostly by extending the value of their own business; investment capital provides a more direct financial gain.

The new generation cooperative (NGC) model was developed in Minnesota and Dakota in the USA in the early 1990s. There are over 50 examples of successful NGCs in agriculture, forestry and fishing industries in the USA (Edols, 2000). The focus of NGCs is on investment capital. NGCs are designed to enable producers to profit from production and marketing of value-added products made from their raw commodities. Like traditional cooperatives, a NGC is a distinct type of organisation that is collectively owned and democratically controlled by its members. It satisfies their common economic needs and ambitions. The distinction of the NGC from the traditional producer cooperative lies in that the NGC members band together to strengthen their economic position by vertically integrating everything from purchasing their production inputs to marketing processed goods into retail markets, rather than only provide marketing services for their raw commodity production. Table 1 summarises the characteristics that differ between NGCs and traditional cooperatives.

Table 1: Differences between traditional cooperatives and new generation cooperatives (Source: Edols, 2000).

Business function	Traditional cooperatives	New generation cooperatives
Funding	Significant funds unlikely to come from initial subscriptions or share purchase. Funds from members likely to be built up only over time from a retained earnings policy. The alternative of attracting outside capital is possible but can lead ultimately to a threat of loss of control by membership.	Significant funds can come from initial subscriptions or share purchase. Shares are product delivery notes or rights to deliver to the processing facility and the incentives exist to invest because of the prospect of dividends and capital gain from the shares.
Shares	Shares have a nominal value. They are typically service capital. Shares are not transferable or redeemable. Capital gain is generally not possible unless the co-op converts to a company.	Shares have a market-driven value, are typically investment capital, and are not transferable. The market value of shares depends on underlying performance of the business. Substantial capital gain is possible.
Benefits	Benefits to members typically take the form of earnings as well as rebates and lower costs.	Dividend return is a rate of return on investment.
Delivery rights	Commitment to support the cooperative is often tenuous. There is typically no real contract to deliver.	There is a two-way contract to deliver commodity by virtue of the purchase of shares. The cooperative has a contractual obligation to accept the member's product.

Some Observations of Forest Owners' Organisations in Germany and Finland

Farm Forestry in Baden-Wűrttemberg, Germany

The renowned forests of the Black Forest area in Baden-Württemberg in southwestern Germany provide a striking example of a vibrant forest industry in a region with some characteristics similar to those of north Queensland. The regional economy is heavily tourism dependent, with large numbers of international visitors. The landscape is dominated by forests, but interspersed with areas of cattle grazing, particularly in the valleys. It is subject to severe windstorms (typhoons) similar to the cyclones, which periodically damage plantations in north Queensland, particularly on the wet tropical coast.

The timbered area in the Black Forest was reduced to about one tenth of the previous area as a result of WWII, when trees were felled to meet war timber needs and then to meet reparation payments after the war. Most of the felling was of government-owned rather than private forests. The forests were subsequently re-established, and are now being progressively converted away from exotics such as spruce to the more natural beech and oak forests.

In the Black Forest area, agriculture, forestry and tourism contribute about one third to total farm income (Brandl, 2002). In this highly-visited region, it should be noted that the forests play an important part in the management of farms and forestry is critical not only for provision of timber, but also for tourism. For example, Erlenbacher pasture cooperative has generated income by promoting tourism (Selter, 2003). The eleven members of the cooperative graze cattle in the western part of the Black Forest southern nature park, which is the region for hiking in summer and for skiing in winter. Managing their fifty hectares of forestland, the cooperative members offer farmstay accommodation and serve as a source of information and provide visitor guidance (Selter, 2003). The maintenance of an attractive landscape is important for the tourism industry and is also a function of well-situated farm enterprises (Brandl and Nain, 2000). In other words, forestry in this region helps to retain and sustain rural communities and towns rather than having people move to the cities.

Organisation of Private Forest Owners in Finland

Finland is the most densely forested country in the European Union, with 74% of the land area forested, and produces one third of EU wood pulp and one sixth of sawn wood production (Lillandt, 2001). Private ownership or family forestry is an established tradition in Finland, with more than 900,000 family forest owners, controlling 62% of the total forest area.

Voluntary silvicultural management and the cooperation between private forest owners has a long history and tradition in Finland. The first forest management associations (FMAs) were founded in 1907. The associations provide independent voluntary forums of self-organisation and self-support of forest owners. There are more than 250 FMAs across the nation. FMAs are formed into regional unions, with coordination by the Forestry Council of the Central Union of Agricultural Producers and Forest Owners, which has power to influence forest policy nationally and internationally (Lillandt, 2001).

FMAs are governed and financed totally by forest owners and have democratically chosen administration. The legislation enables FMAs to receive a forest management fee from forest owners. Every forest owners pays a forest management fee and thus is automatically a member of the FMA in their area.

The main aims of FMAs are: to provide professional assistance in matters of forest management and timber sales; to promote profitability of forestry practised by forest owners

and the realisation of the other goals they have set for their forests; and to advance the economically, ecologically and socially sustainable forest use (Veijalainen and Pajuoja, 2000; Lillandt, 2001).

Recently, the organisations involved with private forestry in Finland have been subject to structural and other change processes. Many of the tools formerly available for activities of FMAs, such as stumpage price bargaining, have lost their relative importance during the 1990s. The new situation requires FMAs to adopt a more market-oriented approach in their operations. Nevertheless, FMAs are still the most important body to promote profitability of farm forestry in Finland. With increasing urbanisation and globalisation the role of FMAs might even increase. Australian timber cooperatives may gain insights from Finland, especially in terms of how they structure, conduct and finance their business (Lang, 2003).

Timber Grower Cooperatives in Australia and the North Queensland Timber Cooperative

In Australia, there is strong interest in forest grower cooperatives, as evidenced for example by the National Farm Forestry Cooperative Workshop held in Brisbane in 1999, which was supported by Australian Forest Growers, National Heritage Trust and Queensland Department of Primary Industries (Banks, 2002).

As of 2002, there were eighteen registered farm forestry cooperatives in Australia, some examples being the Farmwood Tasmania Cooperative, North Queensland Timber Cooperative, Western Timber Cooperative in Western Australia and Gippsland Wood Producer's Cooperative in Victora. The Farmwood Tasmania Cooperative has been a leader amongst farm forestry cooperatives in Australia, and is hoping to establish the Farmwood brand nationally for the marketing of all farm-produced timber. This cooperative is already gaining economies of scale as a wholesale clearing house for product. The success of the Farmwood Tasmania Cooperative has mainly resulted from the export of radiata pine purchased from government plantations.

The North Queensland Timber Cooperative (NQTC), the only cooperative in north Queensland registered under the *Cooperatives Act 1997*, was established in 1998. Classified as a traditional cooperative, the NQTC has attempted to focus the attention of industry participants on a cooperative approach to timber marketing. The NQTC completed an inventory of private pine resource in 2001 and intends to export this resource to Korea and other north Asian countries.

Queensland's major forest grower is the Department of Primary Industries Forestry (DPI Forestry), which is a commercial business group and responsible for approximately 80% of the State's domestic timber production. DPI Forestry has about 1000 hectares of plantations of the native conifer hoop pine (*Araucaria cunninghamii*) on the Atherton Tableland as well as exotic pine (*Pinus caribaea*) on the wet tropical coast near Ingham, Cardwell and Kennedy. Although this appears to be a substantial regional resource, it is still considered less than the volume of about 13,000 hectares required for major investment into modern, internationally competitive softwood processing facilities. This is a major concern for industry development, because much of this resource is now at harvest age and some of it is overmature. Small areas of other exotic species, including African mahogany (*Khaya senegalensis*) and teak (*Tectona grandis*) have been trialed in recent years by the private sector.

It is notable that the NQTC, like the Farmwood Tasmania Cooperative, has tried to purchase pine from government plantations, so as to assemble a sufficiently large quantity to attract export orders. However, DPI Forestry did not award the NQTC the tender. The NQTC did purchase Queensland maple (*Flindersia brayleyana*) from the DPI Forestry Gadgarra

plantation. Unfortunately, the stand was overmature and overstocked with volunteer species. Even though a low stumpage price of less than $20/m^3$ was paid, this does not appear to have been a profitable investment.

NGCs are a viable option to be considered for use in the north Queensland forestry industry. Formed to enable members to process raw commodities, members should not only receive market prices for their raw products, but also gain the opportunity to profit from the processing and marketing of the value-added products produced by their NGCs.

To be a successful cooperative, the NQTC needs to attract a large number of members with a substantial timber resource base and access to value-adding infrastructure. It also needs to attract greater capital, or enter into transactions for the marketing of large timber lots. Otherwise, it is unlikely that the cooperative will establish a satisfactory funds reserve and have influence on timber marketing and forest policy, in the way that grower associations have done elsewhere.

POTENTIAL ENTREPRENEURIAL INITIATIVES AND OPPORTUNITIES FOR THE NORTH QUEENSLAND COOPERATIVE

A number of circumstances have risen which create opportunities for the NQTC. Possible actions that the NQTC could take to develop timber markets in north Queensland include utilisation of venture capital, investment in processing facilities, timber buying, value-adding to harvested timber, forest product certification, carbon credit pooling, and online sales and marketing services.

Utilisation of Venture Capital to Establish Plantations

A number of unlisted managed investment schemes and information memoranda are currently being promoted by private companies to expand the eucalypt plantation estate around Miriam Vale to produce woodchips for export. Such private sector ventures could be established further north, particularly in the dry tropics where land is less expensive, to grow eucalypts or even higher value species such as African mahogany if irrigation is used for plantation establishment. Nevertheless, more research and development work is required, particularly in the areas of genetics or tree breeding, before new species apart from eucalypts are grown on a commercial scale, and the risk for investors in such projects is high. Eventually, such large-scale planting may generate a timber resource that could provide a stimulus to development of processing facilities. The growing of furniture species will most likely help to generate a high-value timber resource, which will encourage processing of furniture timbers from small-scale growers.

Investment in Processing Facilities

This would require that sufficient resource is available to warrant the outlay. Techniques such as finger jointing which allow smaller logs and shorter lengths of timber to be used, and curing and new wood panelling products which add value to timber, have the potential to increase profitability of small-scale forestry and hence encourage greater adoption. The required capital for such processing facilities would necessitate private sector investment usually done by a large corporate forestry company. Other less capital intensive options for small-scale forests include portable sawmilling, followed by kiln drying.

Timber Buying

Millers or agents could undertake timber purchasing, through collecting up lots from small producers, as standing timber or timber felled and perhaps cut to flitch stage by the grower.

This type of activity occurs in Mindanao in the Philippines, where agents of timber merchants will travel up to about four hundred kilometres to purchase timber, and are generally willing to accept small quantities from individual producers. One of the primary purposes of a timber cooperative is to eliminate the high profit taking of these timber merchants or agents or 'middlemen'.

Value-adding to Harvested Timber

There are ample opportunities for tree growers to produce value-added products by networking entrepreneurs and visiting one another's operations to observe and learn. For example, a local group may choose to own a truck and portable value-adding equipment and the activity enhancing marketing may involve collecting like consignments, arranging sales and delivering the products. There is little doubt that the timber industry value chain in north Queensland would benefit from horizontal or vertical integration, or both. Strategic alliances are another way of industries and networks collaborating so as to compete more effectively in global markets (Greenwood, 2002; Howard, 2002; Nott, 2002; Sharp, 2002).

In that cabinet-makers require more readily available stocks of tropical hardwoods, the opportunity exists for the NQTC or other investors to establish a regional processing and storage facility to fill this niche in the market. Possible niche markets for north Queensland timbers are listed below.

High-value Furniture Items

Queensland rainforest cabinet timbers – which can be classed as *diamond* timbers – have for many years been used to produce outstanding furniture items. Some furniture items produced with eucalypt timbers such as Chinchilla white gum (*Eucalyptus viminalis*), while rather heavy furniture, have a highly attractive appearance. Highly attractive and durable furniture items can be produced from acacia timbers, including *Acacia mangium* and natural forests or regrowth of *Acacia aulacocarpa*. Opportunities exist for production of these high-value furniture products in north Queensland, and transport of these timbers to southern markets, provided growers cooperate to pool the resource over time so as to provide the market with a steady supply.

Flooring Materials

There is considerable demand for floorboards and parquetry of high durability timbers, both in Australia and in overseas markets, including Asia and north America.

Power and Telephone Poles

There appears to be a promising market both domestically and in Asia for wooden poles, for pole replacement and line extensions. Relative to concrete, wooden poles have a similar life, and are considerably less expensive. Satellite communication and mobile phones may reduce the demand for telephone poles. On the other hand, increasing electrification in developing areas suggests strong demand for power poles. Required dimensions and strength ratings vary greatly between countries, but in general eucalypts produce suitable poles.

Timber Supplies to Wood Turners and Other Hobbyists

There is a constant if relatively small market in timbers of attractive features including cabinetwoods to hobby craftsmen such as wood turners, who sometimes pay high prices for small quantities at wood auctions.

Woodworks Products for Collectors and Souvenirs for Tourists

Various outlets exist for timber products for collectors and tourists, and these can take advantage of the flow of domestic and international tourists through Cairns. In some cases, manufacture takes place on site such as at the Tolga Woodworks on the Atherton Tableland.

Forest Product Certification

Because farm forestry is such a small and new form of primary industry in north Queensland, it is likely that niche markets will need to be found for species other than hoop pine, exotic pine or eucalypt sawlogs, which all have well established timber markets. Certification for forest products may provide an option for the emerging industry. The NQTC has already attempted to promote its *green* credentials by building an energy-efficient EcoHouse at Edge Hill in Cairns, made from timber sourced from members' plantations and sustainably managed native forests. If the NQTC applies the same standards to its growing and processing activities, then discerning timber product distributors in Europe, Japan, North America and the United Kingdom may be willing to enter into long-term import agreements. Certification system options include the international Forest Stewardship Council (FSC) and Pan European Forest Certification Council (PEFC), and domestically there is also the recently approved Australian Forestry Standard (AFS). Cooperatives can apply for group certification under all of these schemes, saving individual growers time and money, and opening up new marketing opportunities that would not otherwise exist, although the transactions costs may be high.

Carbon Credit Pooling

If a carbon market were to be established, either under international ratification of the Kyoto Protocol or locally through some sort of domestic carbon market, then small-scale forest growers might benefit from participating in cooperative marketing arrangements to sell carbon credits to potential purchasers such as government, industry and fuel companies. Emerging carbon market requirements such as measurement and verification of carbon stocks could mean that small areas may not be practical to include in regional carbon sinks, which will need to achieve a benchmark economy of scale in order to be attractive to investors. Cooperatives can play a vital coordination role in the regional carbon market by pooling the carbon sequestered from both the increase in sinks from forestry plantations and the reductions in agricultural emissions as a result of improved practices.

Online Sales and Marketing Services

Increasingly, timber products are being purchased over the Internet, particularly in the developed world. Cooperatives can assist small-scale growers and processors to market their product online to primarily city-based purchasers with high disposable incomes. Although it is easy to establish a web presence, the necessity to maintain database and inventory records on a continuing basis and provide desktop support to purchasers means that pooling resources to fund this online sales and marketing service will greatly assist farm foresters.

CONCLUDING COMMENTS: THE ROLE OF GOVERNMENT IN SUPPORTING TIMBER MARKETS

In the future, timber production in north Queensland is likely to be comprised of a small number of relatively large-scale producers, plus many landholders with small areas of native conifers, rainforest and eucalypt plantings, and exotic species. Timber production, ecosystem services, landscape amenity and tourism are likely to be closely interlinked. In this situation,

there is scope for government assistance in the marketing of timber from private producers.

Several ways are apparent through which government could support timber marketing in north Queensland, either directly or through supporting processors and grower organisations. At present, the state forest agency in Queensland tends to be a competitor with growers, particularly for softwood species, and sometimes makes log allocations at prices with which private growers could not compete. The State government could provide financial assistance for processors, and in fact has done so recently in relation to Ravenshoe Timbers. After World Heritage listing, the Federal government provided some financial assistance to timber mills in north Queensland, but this was of short-term duration, as a form of compensation for the closure of sawmills, and some of the funds were spent outside the region.

There are many lessons to be learnt from government-supported planting schemes, the most notable of which was the CRRP. An important lesson is the need for government support to be targeted strategically at regional capacity building, rather than direct investment into plantings. From another point of view, it must be stressed that although government can provide necessary supports targeted on tree growers, commercially committed and competent managers must be growing the trees for the right long-term reason, i.e. reasonable economic returns.

In the long-term perspective, as suggested by Cox and Quayle (2001), cooperative marketing between processors and growers is a key factor to facilitate export growth of Australian timbers. The cooperative approach to trade might include pooling of research into timber types, market evaluations, export transport arrangements and even central wood processing facilities. However, despite the contemporary market wisdom that says that team efforts at market entry are likely to be more successful than individual attempts, the small-scale growers and processors of north Queensland still tend to operate as individuals and seem to want to distance themselves from cooperative working arrangements so as to maximise short-term profit. By marketing their timber outside a cooperative to their existing network of buyers, small-scale processors do not have to pay commission, a shortsighted strategy that supports neither the processors in the long-term nor the cooperative itself. This implies a role for government to facilitate the interaction of timber boards and industry leaders, and regional alliances of small-scale forestry with industrial processors. Australian government support for the domestic industry has not been as generous as that of some of our near competitors, e.g. investment tax allowances, tax holidays while businesses are established, export market development support and training are provided to Malaysian firms.

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MARKET SURVEYS

9. MARKET REPORT FOR AUSTRALIA'S SMALL-SCALE CABINET TIMBER GROWERS[1]

U. N. Bhati

This paper reviews the profitability of cabinet timber plantations in farm forestry settings. The study also presents price trends and outlook for cabinet timbers. It is concluded that real prices of at least some cabinet timber species can be expected to rise in the future, although growing these species is a relatively high-risk investment.

'CABINET TIMBERS' AS A CONTENTIOUS SUBJECT

Relatively little research has been carried out on the so-called higher-value cabinet timbers in Australia. Hence, in the absence of objective information, conflicting views thrive on cabinet timbers, rendering cabinet timbers a contentious subject. What is or what is not a cabinet timber can be a subject of an argument. Hence, it is useful at the outset to clarify the concept of cabinet timber.

According to Matthews (2002), cabinet timber is a product of a sawlog or veneer log of a quality suitable for fabricating objects such as cabinets and other furniture. Regardless of the species, the end use of a tree can range from firewood to kitchen cabinet. Thus, conceptually, cabinet timbers are not confined to the higher-value species. Figure 1 shows that, by volume, radiata pine is the dominant species used by furniture or cabinet manufacturers in Australia, with other species playing a minor role (Sexton, 2002). Thus, not only in concept but also in practice, radiata pine and other species are or can be cabinet timber species.

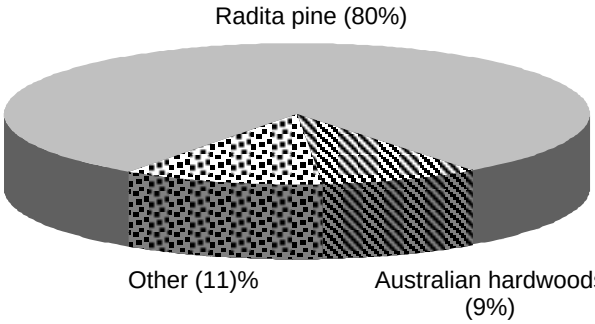

Figure 1: Timber species used by furniture or cabinet manufacturers, by volume in Australia.

The focus of this paper is on higher-value cabinet species, to which the term 'cabinet timber' has traditionally been applied. Such species are also referred to as 'appearance grade', 'decorative', 'diamond', 'elite', 'luxury', or 'speciality' timbers. Four examples of these

[1] This paper appeared as a lead article in ANU Forestry Market Report No. 24. That report and another ANU Forestry Market Report, mentioned later in this study, are available from website http://sres.anu.edu.au/associated/marketreport/index.html.

species—out of the many—are Tasmanian blackwood (*Acacia melanoxylon*), Australian red cedar (*Toona ciliata*), teak (*Tectona grandis*), and African mahogany (*Khaya senegalensis*).

RELATIVE PROFITABILITY

From an economic perspective, farm forest growers are likely to invest in cabinet timber plantations if the changeover to the plantation yields a risk-adjusted total net return that is at least equal to the return from the next best alternative use of farm resources in enterprises such as grains, wool, beef cattle, dairying, apples, bananas or sugarcane. The risk-adjusted relative profitability of cabinet timber plantations is therefore a key issue. Consequently, several studies were reviewed for this study. The review revealed existence of a few studies that have analysed profitability under probable risks. Studies on the risk-adjusted profitability of cabinet timber plantations relative to the alternative farm enterprises could not be found.

The apparent absence of studies on relative profitability of cabinet timber species may be due to lack of reliable information on their silviculture, site requirements, yields, costs, product prices, and other important variables. However, a few independent researchers and advisers have contributed their informed opinions on the subject of profitability. Some of these are:

- "Current stumpages on their own do not provide sufficient incentive for substantial investment in blackwood plantation." (Warner, 2001).
- "With reduced prices [of timber] and a comparatively long rotation [forty to seventy or more years], plantations of many [tropical] rainforest species may not be as attractive as once thought." (Bristow *et al.* 2001).
- "…any farm forester evaluating whether it is a commercially viable proposition to improve the silvicultural management of their native forest blackwood, or to establish plantations of this species, would quickly discover that based on current stumpages, returns may be greater from alternative land uses." (an unpublished study by Private Forests Tasmania 2002).
- In New Zealand blackwood is an exotic species and is subject to fewer pests and diseases than in Australia. A review of economic analyses on blackwood plantations in New Zealand concluded: 'Economic analyses are difficult because of uncertain data; economic evaluations have returned positive values, ranging from internal rate of return of five to eleven percent; in New Zealand, blackwood returns appear less than radiata pine's; silvicultural costs are difficult to determine; recoverable yields are relatively unknown; [and] log sales have insufficient history to give consistent pricing." (Nicholas and Brown, 2002).
- Smorfitt *et al.* (2002) have commented that farm forestry based on Queensland native cabinet timber species was a potentially profitable enterprise. However, they have cautioned that the yield and price and thus profit uncertainties were high in such an enterprise.

In the light of these opinions from independent experts, and the fact that the cabinet timber plantation industry is still in its infancy (Britton, 2001), it would be advisable for farm forest growers to be particularly careful before investing in cabinet timber plantations. Parsons (2000) also provided excellent advice, which is worth quoting. Residual price analysis suggests that we cannot assume that a seemingly attractive value [price] for appearance grade timber will translate automatically into a healthy profit margin for the grower. Careful attention by growers to a number of factors will be essential, including:

- species selection – selecting species with high market acceptance, and therefore greater likelihood of high product value;

- silviculture – tending, pruning and spacing to maximise production of higher value logs; and
- marketing – probably including developing arrangements to bring together products from a number of growers to ensure professional marketing (perhaps including some form of certification), quality control and continuity of supply.

Findings from research conducted in Queensland, Tasmania and elsewhere have the potential to lift relative profitability of cabinet timbers. Industry would benefit by tapping into the latest research-based knowledge and by ensuring research and extension activities have a sustained support.

PRICE TRENDS FOR CABINET TIMBERS

Australia's domestic market for cabinet timbers - a relatively small market in the world context - is open to import competition from all over the world. Consequently, import prices tend to set the benchmark for prices for similar products in Australia (Herbohn *et al.* 2001). It is therefore informative to look at price trends in the world market.

Figures 2, 3 and 4 present free-on-board (FOB) fortnightly prices of selected tropical logs, sawnwood and furniture in the world market. The prices are in 1990 US dollars in real terms, that is, adjusted for price inflation in the world economy. Selection of species, product grades, and the exporting countries for the figures was partly based on the criterion that they competed directly or indirectly with Australian cabinet timbers and products. The source of the data is the International Tropical Timber Organisation.

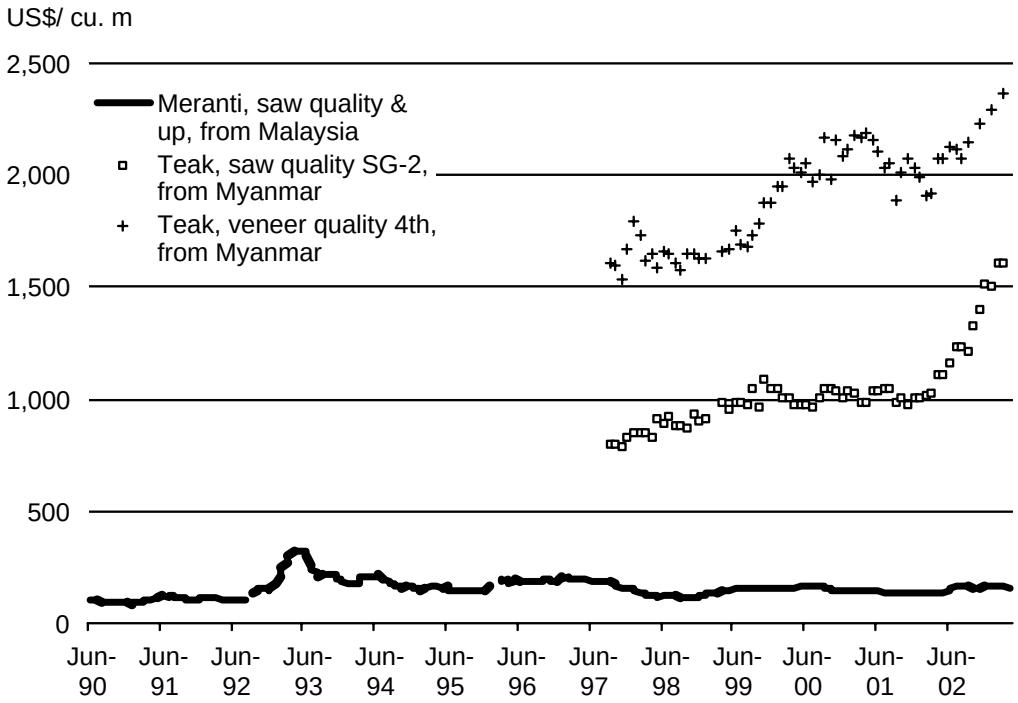

Figure 2: International FOB prices of tropical logs, in constant 1990 US Dollars.

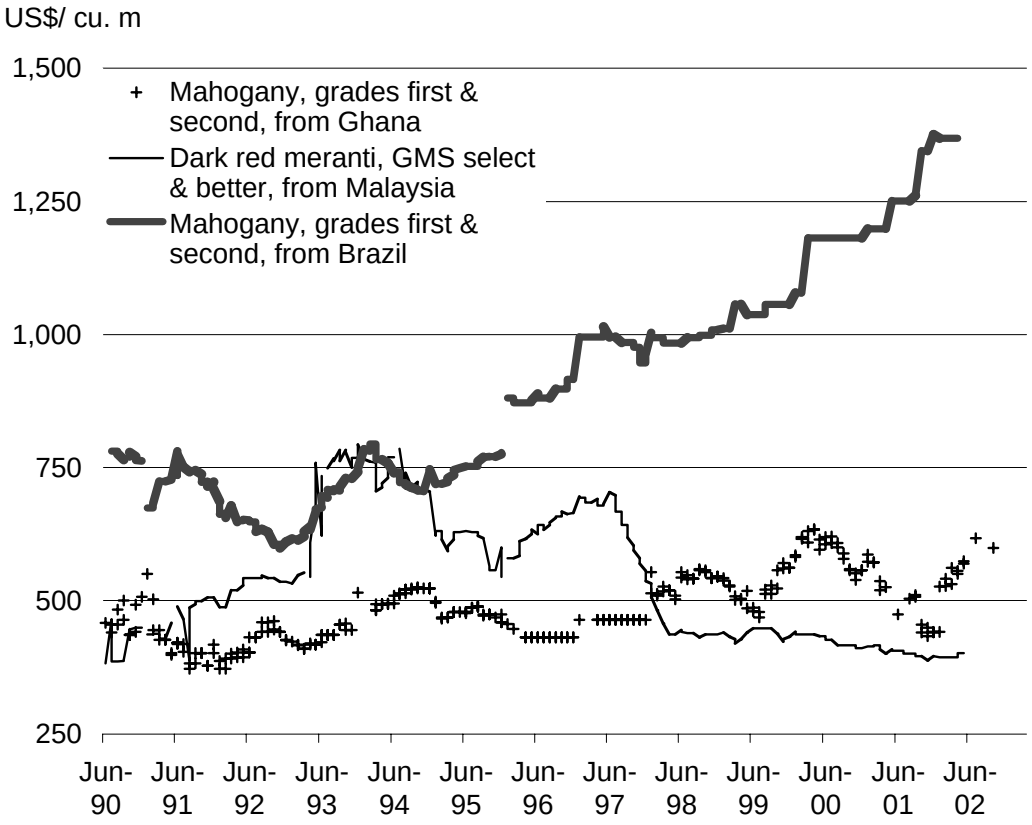

Figure 3: International FOB prices of tropical sawnwood, in constant 1990 US Dollars.

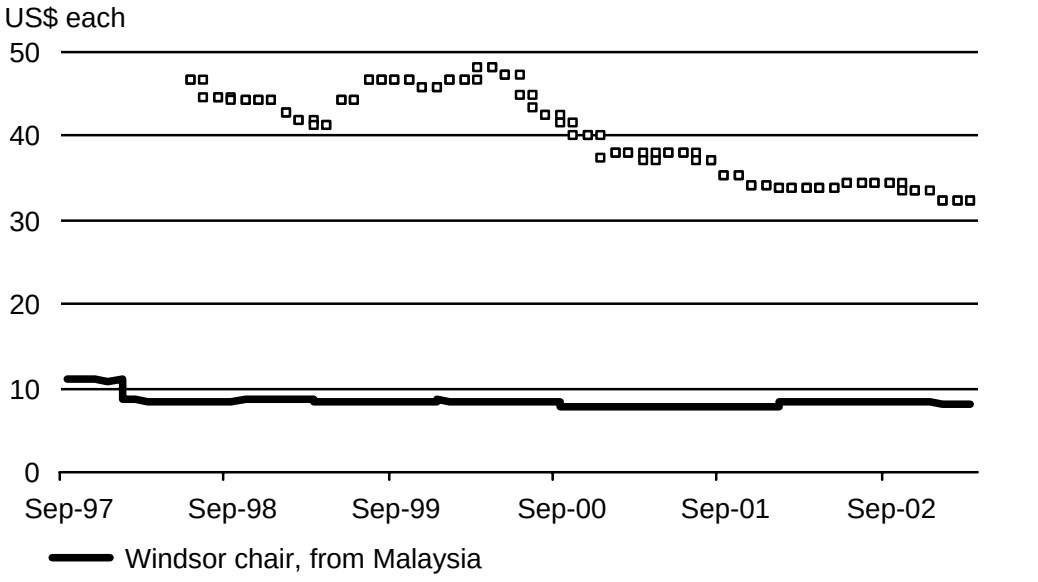

Figure 4: International FOB prices of chair and table, in constant 1990 US Dollars.

The figures show rising trends in the prices for some products, declining trends for others, and almost unchanging trends for the remainder. Evidently, not all trends have gone in the same direction; overall, it is a mixed picture.

Australia has very sparse time series price data, and those data too present a mixed picture on price trends. The above-mentioned Private Forests Tasmania study showed that royalty (stumpage) was $60 per cubic metre in 2001 for the highest grade, Category 4, blackwood sawlogs from Tasmania's public native forests. It also presented a graph, showing rising trend in royalties for blackwood sawlogs and pointed out that, during 1982–2001, the royalties increased at an average rate of eight percent a year. Over the same period, general price inflation in Tasmania, as measured by the consumer price index for Hobart (State's capital city) averaged 4.3% a year. Thus, blackwood sawlog royalties not only had a rising trend, but overall the rise was real.

Time series price data on other cabinet timbers in Australia are unavailable. However, it is worth quoting Bristow *et al.* (2001) on the situation in Queensland: "With the closure of rainforest logging [in north Queensland public native forests] it was predicted that the reduction in the availability of high quality cabinet timbers would lead to higher prices. However, over the last decade cabinet timber prices have declined." Recent supplementary information, however, suggests that the prices might have remained unchanged. In either case, it is certain the prices have fallen over time in real terms.

It is clear that the trends in real prices of blackwood in Tasmania (rising) and of rainforest cabinet species in north Queensland (declining) have not gone in the same direction. Evidently the trends in both the world market and Australia (Tasmania and Queensland) present a mixed picture.

PRICE OUTLOOK

The lead article in the September 2002 issue of ANU Forestry Market Report investigated the price outlook at some length. Since then no significantly new information has come in the public domain, except an update from World Bank. The latest World Bank (2002) projections show that during 2002–2015, real prices of *timber* (tropical logs and sawnwood) in the world market are projected to rise at an average annual rate of two percent. And, the projections for Malaysian maranti logs show their real prices rising at an average annual rate of three percent and sawnwood at 1.8%.

The September 2002 ANU Forestry Market Report also outlined a study by Morell (2001), which represented the views of a group of FAO staff on changes in world forestry over the period to 2050. The study concluded that during the period, solid wood will be at a premium, especially rare, high-quality hardwood grown in tropical natural forests, and prices of these timbers will be very high.

MAIN SUMMARY POINTS

- The World Bank projections and the views of FAO staff imply a positive outlook for Australian cabinet timber prices.
- However, the mixed picture of historical price trends in the domestic and world markets clearly suggests that not every cabinet timber species, log grade or processed product might experience the same positive price outlook.

Any positive change in product price will help profitability. However, opinions of independent experts have cast a shadow of doubt on the relative profitability of cabinet timber plantations.

Hence, before investing in these potentially profitable but highly risky plantations, it is advisable for farm forest growers to give very careful attention to key factors such as species selection, silviculture and marketing.

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10. DEVELOPING MARKETS FOR LESSER-KNOWN SPECIES FROM TROPICAL AUSTRALIA[1]

J. L. Herbohn, D. B. Smorfitt and S. R. Harrison

This paper examines issues involved in the marketing of tropical rainforest cabinet species and eucalypt timbers in north Queensland, reporting findings from surveys of cabinet-makers. Timber availability, suitability, customer request and colour and grain are the most important factors in the decision of cabinet-makers to select a particular species. Timber price only becomes important when it cannot be passed on to the purchaser. Australian rainforest cabinet timbers are highly regarded by both cabinet-makers and the general public; however, their use is restricted by actual and perceived availability.

BACKGROUND

Tropical rainforest cabinet woods and eucalypt species are examples of what are generally known as 'lesser known species', with relatively low market recognition internationally and even domestically. Many hardwood species grown in tropical countries, while having excellent timber properties, suffer from this lack of recognition, which raises particular difficulties for marketing. Part of the problem arises in that there are typically a large number of individual species, with differing timber properties, and relatively small volumes of each, which has limited the establishment of high-throughput supply chains. Literature on utilisation of lesser-known species has been reviewed by Venn and Whittaker (2003), who examined the market prospects and potential profitability of specialty hardwoods from Western Queensland.

Prior to World Heritage listing of the Wet Tropics of Queensland, rainforest species were used in the production of high-quality furniture. Some planting of these species has taken place on farm land, particularly that supported by the Community Rainforest Reforestation Program (CRRP), demonstrating that these species can be grown in plantations. Surveys reveal a high level of interest by landholders in growing rainforest species and eucalypts. However, stumpage prices for these species have been relatively low (although there are some notable cases of high timber prices in auctions of small timber quantities), and an understanding of market realities is critical for investing in plantations of these species.

A number of surveys have been conducted of cabinet-makers to determine their usage of and attitudes to timber of rainforest and eucalypt tree species and composite wood products. These have been designed to increase understanding of the likely future role of rainforest species in particular, and to provide information for forest policy, such as which species to promote to prospective growers. The next section of this paper, explains the survey method adopted. Profiles are then presented of the cabinet-making firms, followed by an examination of the factors affecting their choice of timber inputs. Factors affecting consumer choice of products made from rainforest cabinet timbers (RFCTs) are then examined briefly, followed by an outline of the species that cabinet-makers wish to see planted to satisfy their future timber needs. Finally, the results of the various studies are discussed in context of the implications for the marketing of rainforest cabinet timbers from north Queensland.

[1] This article is largely based on Herbohn *et al.* (2001).

RESEARCH METHOD

Three separate but interrelated studies (and associated sets of surveys) have been conducted that provide information about the marketing of rainforest cabinet timbers in Queensland. The first study involved a survey of managers of cabinet-making firms, conducted in Cairns, Townsville and Brisbane. The questionnaire comprised three sections: general information on mangers and the characteristics of their firms; questions relating specifically to the use of rainforest cabinet timbers and a range of other timber inputs in cabinet-making operations; and multiple-part questions asking managers their opinions on why people buy, or do not buy, products made from RFCTs. During interviews, managers also had the opportunity to list further factors that had not been included in each series of statements. Further details of the sample selection process and the research methods applied can be found in Herbohn *et al*. (1997), Smorfitt *et al*. (1997), Peterson *et al*. (1997) and Herbohn *et al*. (2001).

The second survey was of the employees (as distinct from managers) of the same cabinet-making firms, and solicited views on what species should be planted to satisfy future timber requirements of the firms. Questions were included on awareness, usage, and suitability for three purposes, viz. furniture, kitchen benchtops and kitchen cabinet doors. The third survey investigated attitudes of the general public to products made from rainforest cabinet timbers and the reasons why they have purchased or not purchased products made from rainforest cabinet timbers. This survey is not discussed here, but is reported in Chapter 11 of this monograph.

PROFILES OF QUEENSLAND CABINET-MAKING FIRMS

As indicated in Table 1, furniture construction comprises a large proportion of the product mix of firms with low turnover (less than $100,000 per annum) in each city. In contrast, construction of kitchens comprises a much higher proportion of the product mix of medium ($100,000 to $300,000 per annum) and large firms (more than $300,000 per annum). Materials and labour each comprise about 40% of the cost of products manufactured by cabinet-making firms, with unspecified overheads comprising the remainder (Herbohn *et al*. 1997).

In relative terms, small cabinet-making firms are by far the largest users of rainforest cabinet timbers (Table 1). These firms also use relatively greater proportions of other high-value timbers such as other Australian hardwoods and imported tropical timbers (Herbohn *et al*. 1997; Petersen *et al*. 1997; Smorfitt *et al*. 1997). The average proportion that rainforest cabinet timbers comprise of total wood products used by firms decreases dramatically with firm size, particularly in Townsville and Cairns (e.g. 32%, 18% and 6% for small, medium and large Townsville firms respectively). Conversely, medium and large firms in each region use a substantially higher proportion of composite wood products.

The use of Australian rainforest cabinet timbers by north Queensland (Cairns and Townsville) firms is much greater than by Brisbane firms (Table 2). This is not surprising given that almost all supplies of these timbers are secured from north Queensland. For many uses, Australian rainforest cabinet timbers, other Australian hardwoods and imported tropical timbers are close substitutes. If these timbers are combined into a single category of ‘cabinet timbers’ then patterns of timber in Brisbane and north Queensland firms are much more closely aligned. There are a number of eucalypts that are commonly used in manufacture of kitchens. For this reason, the common eucalypt species (e.g. those sold under the trade name of Tasmanian oak) used by cabinet-makers have been categorised as ‘cabinet timbers’ although this is traditionally not the case.

Table 1: Product mixes for cabinet-making firms in Cairns, Townsville and Brisbane (Compiled from Herbohn *et al.* 1997; Smorfitt *et al.* 1997; and Peterson *et al*. 1997. Note: Rounding errors cause some percentages across rows not to add to 100%).

City	Firm Size	Share of Product Type (%)		
		Furniture	Kitchens	Other
Cairns	Small	14	42	39
	Medium	11	71	18
	Large	16	59	25
Townsville	Small	46	40	14
	Medium	11	71	19
	Large	6	64	29
Brisbane	Small	24	51	25
	Medium	20	61	19
	Large	7	61	32

Table 2: Use of rainforest cabinet timbers and composite wood products as inputs into products (Note: Cabinet timbers are defined as the aggregate of 'rainforest timbers', 'imported tropical timbers' and 'other Australian hardwoods').

Wood input	City	Fraction of total wood inputs used (%)		
		Small firms	Medium firms	Large firms
Rainforest timbers	Cairns	26	9	2
	Townsville	32	18	6
	Brisbane	7	4	3
Composite wood products	Cairns	50	64	84
	Townsville	33	49	64
	Brisbane	59	61	70
'Cabinet timbers'	Cairns	46	28	12
	Townsville	61	38	13
	Brisbane	27	25	14

In Townsville and Cairns, most small firms surveyed use at least some RFCTs, with some using high proportions. Conversely, few medium and large firms use large amounts of RFCTs, with the averages for both of these categories being skewed by the relatively high use of these timbers by a small number of firms (see Herbohn *et al*. 1997 and Smorfitt *et al*. 1997 for further details). While RFCTs generally comprise a small proportion of the wood products used by medium and large firms, the absolute volumes may be large in particular cases. For example, for one Townsville firm with a turnover greater than $500,000, RFCTs comprised forty percent of the total wood products used. In this case, the absolute quantities of RFCTs used would probably exceed the combined quantities of RFCTs used by all seven small firms in the sample.

Patterns of wood product use are almost certainly related to type of work undertaken by firms of different size. Rainforest cabinet timbers have traditionally been used for the construction of high quality furniture. This type of work makes up a high proportion of the turnover of small cabinet-making firms and explains their high usage of these timbers, along with imported tropical timbers with similar qualities.

Composite wood products such as chipboard and medium density fibreboard are the main materials used in the construction of modern kitchens. Solid wood inputs such as Tasmanian Oak (included in 'other Australian hardwoods'), and to a lesser extent rainforest timbers, are also commonly used in the exposed sections of high quality kitchens. Composite wood products are used with these timbers, in areas hidden from view. The relatively high usage patterns of Australian hardwoods by medium and small-sized firms strongly suggests that these firms specialise in the construction of higher quality kitchens. The small amounts of Australian hardwoods used by large firms, suggests that these firms mainly construct kitchens at the lower to middle of the quality and price range.

Just over a third of all cabinet-making firms kept no inventories of timber, with a further one third keeping less than two cubic metres on hand (Herbohn *et al*. 1997; Peterson *et al*. 1997; Smorfitt *et al*. 1997). There were however a number of notable exceptions, with nine firms in the sample holding between ten and sixty-five cubic metres. Low inventory levels such as these strongly suggest that most firms only order materials when a job order has been placed. In Townsville where the level of use rainforest timber is highest, rainforest cabinet timbers comprised 78% of total timber inventories (Herbohn *et al*. 1997). Furthermore, thirteen of the fifteen firms using RFCTs held inventories, and RFCTs comprised 90% or more of the inventories of eight of these firms. Conversely, only one of the nine firms not using RFCTs held any wood products as inventory, of only one third of a cubic metre. This disproportionately high percentage of RFCTs in timber inventories compared to the levels of use suggests that firms have difficulty in obtaining these timbers on a regular basis, c.f. composite wood products are readily available from a number of suppliers on request. Similar patterns, although much less pronounced, were found in Cairns firms (Smorfitt *et al*. 1997) though less so for Brisbane firms (Peterson *et al*. 1997). The reason for this is almost certainly lower utilisation rates of rainforest timbers rather than greater availability reducing the need to hold stocks.

FACTORS AFFECTING THE CHOICE OF TIMBER INPUTS BY CABINET-MAKERS

Table 3 illustrates the degree of influence of cost, quality, suitability and customer requests on managers' choices of wood products. Low cost is a factor in the decision of managers of cabinet-making firms to use composite wood products. The influence to low cost in the decision to use these products is significantly greater than for other categories of wood inputs. For these other categories, which are all solid wood products, there are no significant differences in the rating of low cost as a factor influencing choice. This suggests that once the decision is made to use solid wood inputs, cost is not a discriminating factor in choice of inputs. Solid wood products are considered expensive compared to composite wood products. If a customer requests the use of an expensive input, then the cabinet-making firm simply passes the cost of materials on to the customer. Costs of solid wood inputs such as RFCTs only become important to managers if the firm cannot pass the cost on to customers. While cost may not be an important factor in cabinet-makers decision *to use* RFCTs compared to other solid wood inputs, it is a major factor in managers deciding *not to use* rainforest timbers, i.e. when costs cannot be passed on.

The high quality of rainforest cabinet timbers appears to be a factor in the decision of managers to use these timbers, with mean rating of quality as a factor in their decision to use

them being significantly higher than for all other categories of timber (at the five percent level). The ratings for degree of influence of suitability of rainforest cabinet timbers on managers' decisions to use them were also significantly greater than for all other timbers except for Australian hardwoods and composite wood products. Few significant differences were found between various timber types with respect to customer request, with managers tending to attach a higher weight on this factor compared with the other three although these differences are not statistically significant.

Customer requests for products to be made from rainforest timbers are received relatively infrequently in all three cities (Herbohn *et al*. 1997; Peterson *et al*. 1997; Smorfitt *et al*. 1997). Significantly fewer customer requests for RFCTs are made to managers of Brisbane compared with managers in Cairns and Townsville. This indicates that customer request is an important factor in managers deciding on timber inputs.

Table 3: Influence of cost, quality, suitability and customer requests on managers' choice of wood products for use in the manufacture of kitchens and furniture (n = 24) (Note: Ratings are on a scale of 1 = very little influence, to 5 = very strong influence).

Wood product type	Low cost (lc)	Quality (q) (colour, grain)	Suitability (s)	Request by customer (r)	Significant differences (across rows)
Australian rainforest timbers (r)	2.5	4.1	4.0	4.2	lc < q,s,r
Australian hardwoods (ah)	2.9	3.7	3.8	4.2	lc < q,s,r
Australian softwoods (as)	3.1	3.4	3.5	3.9	c < r
Imported tropical timbers (it)	2.7	3.8	3.8	4.0	lc < q,s,r
Imported softwoods (is)	2.8	3.4	3.4	3.7	ns
Other timbers (ot)	2.9	3.6	3.7	3.8	ns
Composite products (c)	3.7	3.1	4.0	3.9	q < s
Summary of significant differences (down columns):	**c > (r, ah, as, it, is, ot)**	**r > (ah, as, it, is, ot, c)**	**r > (as, it, is, ot); it>is**	**r > (is, ot)**	

The frequency of requests from customers for products *not to be made* from rainforest cabinet timbers is also quite low, with 68% of managers reporting that they never receive such requests and a further 23% reporting that they seldom receive such requests. These results suggest that lack of customer demand is not due to environmental concerns. Some caution must be exercised when interpreting results because the survey addressed managers *not* customers. For example, customers who do not want products made from RFCTs for environmental reasons may simply request other products without making their views known to managers. Alternatively, customers with environmental concerns about the use of RFCTs may purchase non-timber products and hence have no contact with managers of cabinet-making firms.

Of the 130 managers surveyed, 65% had attempted to purchase Australian rainforest timbers in the past twelve months. There was no statistically significant difference at the five percent level between the three regions in proportion of cabinet-makers who had attempted to purchase rainforest cabinet timbers in the past year. Managers were asked to indicate the degree of difficulty that they had experienced in obtaining RFCTs in the appropriate quantities. A high proportion reported that they experienced difficulties either 'all the time' or 'often'. The problems were most pronounced in Townsville (63%) compared to Cairns and

Brisbane (38% and 34% respectively). The relatively high inventories of RFCTs held by Townsville firms are also indicative of difficulties in obtaining these timbers on a regular basis.

Opinions in regard to the relative cost of rainforest timbers were similar in the three cities (Herbohn *et al*. 1997; Peterson *et al*. 1997; Smorfitt *et al*. 1997). The majority of managers (53%) considered RFCTs to be *expensive* or *very expensive* relative to other materials, while only ten percent considered them to be *inexpensive* or *very inexpensive*. Perception of high cost may be a reason for the low utilisation rates of Australian rainforest timbers, particularly by larger firms. Since large firms are predominantly manufacturing low cost *mass produced* kitchens, made from less expensive materials such as composite wood products, it is unlikely that high input costs could be passed on to customers. Perceptions of the high cost of RFCTs combined with an inability to pass these on to customers mean cabinet-making firms are unlikely to use these as inputs unless customers specifically request them.

FACTORS AFFECTING THE PURCHASE OF PRODUCTS MADE FROM RFCTs

Customers of cabinet-makers can be divided in one of three categories: those who buy, those who are interested but don't buy; and those who are not interested in buying. Responses by managers in regards to a series of questions relating to these three categories were similar in the three cities (Herbohn *et al*. 1997; Smorfitt *et al*. 1997; Peterson *et al*. 1997). In general, managers believed that customers purchase products made from rainforest cabinet timbers mainly because they prefer them to other products. Higher product quality and *good value for money* were also considered important factors. Almost all managers believed that inability to afford products made from RFCTs was the main reason why customers were either *not interested* in buying these products or *interested in buying but not doing so*. Managers also believed that *poor value for money* and *preference for other timber products* were factors contributing to the lack of demand for products made from RFCTs. Nearly half of the managers also considered that a customers' belief that rainforest cabinet timbers are no longer available is an important factor in why those customers interested in buying products made from RFCTs were not doing so. Hence, promotion of RFCTs to the general public may increase demand for such products.

The high level of agreement of managers with the statement that "customers do not buy products made from RFCTs because they cannot afford them" indicates that a high final product price is probably a major constraint on demand. Part of the high cost of products made from RFCTs is undoubtedly associated with the high cost of RFCTs as inputs to the manufacturing process compared with other products such as composite wood products. In addition, the cost of labour associated with manufacturing products from RFCTs is likely to be substantially higher than for products made using other inputs. Because there is no secondary industry producing commonly used components such as doors and bench tops, all of these components must be manufactured on a one-off basis in-house. Mass-produced components commonly have a labour component of about twenty percent of total cost while one-off specialty items can have a labour component of up to sixty percent (McLennan, 1995).

In recent years much concern has been expressed by environmental groups about the effects of logging on tropical forests. Accordingly, public concerns about the effects of rainforest logging may influence the demand for products to be made out of RFCTs. About thirty percent of managers indicated that environmental concerns were a reason why people do not buy products made from RFCTs.

CONSUMER ATTITUDES TOWARDS PRODUCTS MADE FROM RFCTs

Surveys of consumers such as that undertaken by Smorfitt *et al*. (2001) provide important information for the marketing of RFCTs and products made from them. In that study, consumers were found to regard products made from RFCTs as being highly superior to those made from composite wood products. A majority also considered products made from RFCTs superior to products made from eucalypts, though about one third thought that the two were comparable in quality. A high proportion of people in the age between 25 and 54 had recently purchased products made from rainforest cabinet timbers. Consumer attitudes are discussed in more detail in Chapters 9, 11 and 12 of this monograph.

CABINET-MAKERS ATTITUDES TOWARDS RFCTs AND PLANTING RECOMMENDATIONS

Cabinet-makers in Cairns, and to a lesser extent Brisbane, are familiar with a large number of rainforest cabinet species and rate many of these highly for use in kitchens and for furniture. Furthermore, there is a willingness to use these species even if they have not been used previously (Smorfitt *et al*. 2002). Table 4 presents opinions of Cairns and Brisbane cabinet-makers concerning what species should be planted to satisfy their future timber needs.

Table 4: Comparison of Cairns and Brisbane cabinet-makers' top fifteen species recommendations against CRRP plantings. (Source: Smorfitt *et al*. (2002). Notes: * Timber was rated highly or very highly recommended. ** Species either not in the planting list or less than one thousand planted. *** Multiple eucalyptus species. Comparative rankings in parenthesis if not in the top fifteen recommendations.)

Species	Cairns ranking	Brisbane ranking	Fraction of Cairns respondents (%)*	Fraction of Brisbane respondents (%)*	Fraction of total CRRP plantings (%)
Qld maple	1	4	83.9	60.0	7.7
Northern silky oak	2	5	82.1	51.4	0.5
Red cedar	3	2	78.6	70.0	0.2
Qld walnut	4	6	75.0	51.4	**
Tasmanian oak	5	1	67.9	77.1	***
Northern silver ash	6	7	60.7	47.1	1.8
Maple silkwood	7	(17)	57.1	20.0	1.4
Qld silver ash	8	8	51.8	45.7	1.4
Kauri pine	9	14	51.8	28.6	6.0
Black wattle	10	13	53.6	27.1	2.1
Black bean	11	12	48.2	28.6	2.6
Red silkwood	12	19	51.8	17.1	**
Satin silky oak	13	11	44.6	30.0	**
Red siris	14	(20)	55.4	17.1	2.1

Species	Cairns ranking	Brisbane ranking	Fraction of Cairns respondents (%)*	Fraction of Brisbane respondents (%)*	Fraction of total CRRP plantings (%)
Hoop pine	15	3	35.7	67.1	10.3
Rose mahogany	(20)	9	28.6	48.6	**
Red mahogany	(21)	10	25.0	38.6	12.7
White beech	(23)	15	26.8	25.7	0.3

There is general agreement between both Cairns and Brisbane cabinet-makers about which rainforest and eucalyptus species they prefer. Although ranks of particular species differ slightly, five species are listed in the six most popular for both areas. The one exception is hoop pine, a native pine grown in large-scale plantations in southeast Queensland and to a much lesser extent on the Atherton Tableland in north Queensland. Hoop pine was ranked third by Brisbane cabinet-makers and only nineteenth by those in Cairns. This difference is possibly due to market penetration achieved for this species through a combination of ready availability, price competitiveness and promotion in the Brisbane market.

The results indicate that a number of rainforest and eucalyptus species, in particular Queensland maple, red cedar, northern silky oak, black walnut, Tasmanian oak and hoop pine, have sound market prospects. A comparison of the species recommended by cabinet-makers and those which have been planted under the CRRP in north Queensland reveals a notable disparity. As indicated in Table 4, of the five most highly ranked species by Cairns cabinet-makers (all of which are native rainforest species), only Queensland Maple was planted to any extent (7.7% of CRRP planting up to 1997).

IMPLICATIONS FOR MARKETING OF NORTH QUEENSLAND RAINFOREST CABINET TIMBERS

Gresham (1995) suggested that the following factors (in order of priority) influence the purchase of timber by firms manufacturing wood products: colour, grain, volume availability, end-use range, price and physical properties. In the current study, *colour* and *grain* were aggregated into the single category of *timber quality*. The materials of choice for Queensland cabinet-makers are composite wood products and the factors that influence this choice are cost and suitability. Clearly, cabinet-makers are responding to market conditions where the high demand for indoor furniture and kitchens appears to be for a low-cost product made from a serviceable material. This evidence conflicts with Gresham's suggested order of priority for the factors influencing choice of timber product. Cabinet-makers, driven by customer demand, *are* willing to sacrifice quality for cost and serviceability.

Only if composite wood products are excluded is there any measure of support for Gresham's suggested order of priority. For all other timbers, including RFCTs, price is not a dominant factor influencing choice. Although *quality* appears to have a strong influence, in relation to both indoor furniture and kitchens, as suggested by Gresham, *customer request* is equally or more important. This pattern has implications for the use of *all* timber products in furniture manufacturing. Firstly, a majority of managers (53%) acknowledge that Australian rainforest timbers are *expensive* or *very expensive* (Herbohn *et al*. 1997; Peterson *et al*. 1997; Smorfitt *et al*. 1997) and few (ten percent) consider them to be 'inexpensive' or 'very inexpensive'. Secondly, a possible reason why the *price* of an expensive product is irrelevant, from the manufacturer's viewpoint, is that high quality timbers, such as RFCTs, are primarily used only when requested by the customer. In these circumstances, it is relatively easy for the manufacturer to pass the high timber cost on to the customer. Thirdly,

customer requests to managers for products to be made from RFCTs are received relatively infrequently; 59% of managers in Brisbane and 36% in north Queensland reported that their customers seldom or never request products to be made from RFCTs.

Gresham has suggested that ready availability is an important factor in the choice of wood inputs. No direct evidence has been collected on whether availability of RFCTs has a major influence on the usage rates. However, in the Townsville and Cairns areas where the use of these timbers is greatest, managers reported higher levels of difficulty in obtaining rainforest cabinet timbers (Herbohn *et al*. 1997; Peterson *et al.* 1997; Smorfitt *et al.* 1997). Furthermore, anecdotal evidence suggests that availability probably ranks with timber quality (colour and grain) and customer requests in terms of importance. For example, imported Brazilian Oak, which is almost indistinguishable from locally sourced northern silky oak (*Cardwellia sublimis*) was recently selling for $2,200/m^3$. At the same time, *C. sublimis* was selling for $1,800/m^3$. Such a price differential for an almost identical product is surprising, especially given the high regard and long tradition of use associated with northern silky oak. One cabinet-maker, when queried on this, stated that firms using timbers such as these are willing to pay a premium for ready availability. Once again, this is because cost of timber inputs are passed onto customers; the customer pays the premium for ready availability (i.e. convenience for the cabinet-maker).

In Brisbane, problems of availability seemed less important with the majority of firms indicating they seldom or never had problems acquiring RFCTs (Peterson *et al*. 1997). This is probably a function of much lower usage (associated with lower customer demand). Of greater concern in the Brisbane market is that many firms (thirty percent) indicated that they had not attempted to acquire RFCTs over the previous year because *they do not use the material*. Hence, it would appear then that even if ease of access to rainforest cabinet timbers was increased, this would not necessarily result in increased use.

In terms of price and quality, imported tropical timbers and Australian hardwoods can be regarded as substitutes for RFCTs. There is anecdotal evidence to suggest that both of these categories of timber inputs are readily available to cabinet-makers on demand and that this is a major reason for their use in preference to RFCTs. Therefore, increasing the ease by which RFCTs can be acquired would make them more competitive with their direct substitutes. However, the current use of Australian hardwoods and tropical timbers by most firms is not great, particularly for large firms, so there is only limited scope for substitution in absolute quantities. Also, RFCTs are not perfect substitutes, particularly for Australian hardwoods. The latter are a more convenient timber input for cabinet-makers because of the availability of pre-manufactured products (e.g. bench-tops, cupboard doors) not currently available in RFCTs.

If efforts are to be made to increase the utilisation of RFCTs and Australian hardwoods, factors other than price and availability must be considered. One mechanism to increase customer demand for products to be made from RFCTs is better marketing. Since RFCTs are held in high regard by cabinet-makers in terms of quality and suitability for use in kitchens and furniture, there is potential to market RFCTs to the public as being a superior product (i.e. diamond timbers). This potential will not be realised unless the industry adopts better marketing strategies.

Sinclair (1992) identified a number of factors affecting the demand for furniture. These factors include personal disposable income, interest rates (and thus the cost of financing purchases), population geographic movement (with resulting replacement of furniture), demographics of the household and household formation. A study by Epperson and Wacker (1988) identified the 25 to 54 year age group as having the highest expenditure on furniture, associated with household formation.

Promotional campaigns can be used to increase market share by increasing the public's awareness of a product. One approach would be to reduce prices, but this does not appear to be feasible under current circumstances where higher stumpage prices for RFCTs are desired. An alternative is to market tropical timbers as *diamond timbers* as suggested by Johnson and Sarre (1995) from the International Tropical Timber Organisation Secretariat. Diamond timbers are those suitable for decorative use, e.g. top-of-the-range furniture and feature panelling, and timbers for restoration of antiques and old buildings, musical instruments and hand-made arts and crafts items. This principle could in turn be extended to products made from these timbers. Johnson and Sarre have suggested that there is great potential for high prices to be obtained for these timbers because of their aesthetically pleasing characteristics and inherent physical stability. Many Australian rainforest species exhibit the characteristics of *diamond timbers* and some, such as red cedar, already command high prices.

Before rainforest cabinet timbers can be promoted and sold as *diamond timbers*, an understanding of the final markets must be achieved (Johnson and Sarre, 1995), particularly in respect to the factors affecting the choice of timber inputs. The research reported in this chapter is an important first stage in providing such an understanding.

A central marketing organisation for rainforest cabinet timbers could aggregate the current fragmented supplies of these timbers, and substantially increase the ease with which cabinet-makers could gain access to them. The studies reported by Herbohn *et al*. (1997), Peterson *et al*. (1997) and Smorfitt *et al*. (1997) suggest that making these timbers readily available to cabinet-makers is probably a necessary precursor to a marketing campaign designed to raise the profile of these timbers with the general public. It may be an easy task to persuade consumers that RFCTs are a high quality material, superior in many respects to other materials. It may also be possible to improve the availability of supply of RFCTs although this will not be as easy. The difficulty will be to persuade consumers that it is worth paying a premium for this quality. The task will be made even more difficult because these substitute materials have already gained market acceptance.

SUMMARY

Australian rainforest cabinet timbers are highly regarded by both cabinet-makers and the general public. Small cabinet-making firms are the largest users of RFCTs; usage by medium and large firms is quite low, their product of choice being composite wood products. Factors that appear important in the choice of inputs by cabinet-makers are quality, availability, customer requests, suitability and cost. Cost is only important when it cannot be passed on to customers. Where cost is a factor, the product of choice is composite wood products. Cabinet-makers are willing to pay a premium for availability and will avoid products that are not readily available unless customers specifically request their use. Many cabinet-makers have difficulty obtaining regular supplies of RFCTs and in many cases have been turning to other products. In the southern markets, the data were even more concerning – large numbers of cabinet-makers, despite having a very high regard for RFCTs, are simply not trying to obtain them. The data reported in this chapter gives support for moves by local growers to form cooperatives to market timber. Cooperatives could help overcome some of the availability problems and thus lead to greater demand. However, to increase demand by cabinet-makers, customer numbers must first be increased. Cabinet-makers will probably pay higher prices for RFCTs as long as they can pass this on to customers. Another finding of this chapter is that RFCT species being planted in north Queensland are not a close match with those expected to be in greatest demand in the future.

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11. THE RELEVANCE OF END-USER PERCEPTIONS AND PURCHASE HABITS FOR THE CURRENT AND FUTURE MARKETING OF AUSTRALIAN RAINFOREST CABINET TIMBER PRODUCTS[1,2]

D. B. Smorfitt, J. L. Herbohn and S. R. Harrison

Australia has some of the highest quality cabinet timber species in the world, sourced primarily from tropical rainforests in north Queensland, and there has been a long tradition of using these to produce furniture. Cessation of logging of Crown rainforest land has greatly reduced log supply, but there is now considerable interest in growing rainforest timbers on private land. This study provides the first quantitative description of the public's perceptions and purchases of Australian rainforest cabinet timber products in north Queensland. It provides information that contributes to understanding the factors affecting the demand for products made from rainforest cabinet timbers. The majority of the north Queensland community consider Australian rainforest cabinet timbers to be vastly superior to composite wood products. Reasons for reluctance to purchase products made from RCTs include their high cost and the 'stage of life' of respondents, but also desire to protect rainforests. The main purchasing group are clustered in the 25-54 year age category. These findings have implications for current and future marketing of RCT products as well as government initiatives to promote afforestation with rainforest species.

INTRODUCTION

The rainforests of north Queensland contain some of the finest cabinet timber species in the world. The supply of these timbers was dramatically reduced following the declaration in 1988 of the Wet Tropics of Queensland World Heritage Area (WTWHA), covering an area of nearly one million hectares of rainforest. The expectation of higher stumpage prices due to the reduced supply has not eventuated. In fact stumpage prices received by landholders have languished at about \$30/m^3 to \$50/m^3. This appears to be due to a variety of factors, including continued supplies due to clearing of rainforest on private land, sawmillers being required to purchase all species in a woodlot rather than selective purchasing of preferred species and, most importantly, the importation of rainforest timbers from neighbouring countries at low prices.

To some extent, market failure exists in north Queensland. If planting of Australian rainforest cabinet timbers (RCTs) is to become financially viable and attractive to landholders, higher-value markets for end-user products must be developed that enable higher stumpage prices to be paid to growers. However, such markets are difficult to develop without resource security and continuity of supply for processors of RCTs. This presents a considerable marketing challenge to the industry. A sound understanding of the markets in which sawmillers, timber merchants and cabinet-makers operate (predominantly cabinet-making), and the attitudes and needs of end-user consumers whose purchasing preferences will

[1] The authors are members of the Rainforest CRC, the financial assistance of which has made this research possible.

[2] This paper draws on a previously published paper (Smorfitt *et al.* 2001).

dictate the use of timber inputs by cabinet-makers, is an important step in addressing this challenge.

The significance of the end-user consumer market requirements has been identified in surveys of cabinet-makers (Herbohn *et al.* 1997; Smorfitt *et al*. 1998; Peterson *et al*. 1998) where cabinet-makers were asked to rate various factors influencing managers' choices of timber for indoor furniture, kitchen bench-tops and cupboards. Factors considered included *cost*, *quality*, *suitability* and *customer request*. Managers of cabinet-making firms consistently rated the last of these factors highly relative to other factors.

Sinclair (1992) identified a number of factors affecting the demand for furniture. These factors include personal disposable income, interest rates (and thus the cost of financing purchases), population geographic movement (with resulting replacement of furniture), demographics of the household and household formation. A study by Epperson and Wacker (1989) identified the 25 to 54 year age group as having the highest expenditure on furniture, associated with household formation.

Various promotional and advertising campaigns can be used to increase the market share of products manufactured from RCTs by increasing the public's awareness of these products. One approach would be to reduce prices, but this does not appear to be feasible under current circumstances where stumpage prices for RCTs to growers are low. Another approach is to establish a recognised brand name, as has been achieved with a number of southern eucalypt species collectively marketed as Tasmanian Oak, which are used extensively in kitchen cupboard manufacturing. Likewise, the Western Australian timber industry has achieved great success with the marketing of jarrah, particularly for outdoor furniture. The success of these timbers has to a large extent been based on their relatively high availability as well as sound promotion and marketing.

In the case of tropical rainforest timbers, a potential strategy is to market them as *diamond timbers*[1], as suggested by Johnson and Sarre (1995) from the International Tropical Timber Organisation Secretariat. Johnson and Sarre suggested there is potential for high prices to be obtained for these timbers because of their aesthetically pleasing characteristics and inherent physical stability. Many Australian rainforest species exhibit the characteristics of 'diamond' timbers and some, such as red cedar, already command high prices. Johnson and Sarre also stated that to be successful, 'diamond management' requires expert market research, particularly in respect to the factors affecting the choice of timber inputs and, once the markets are understood, promotional activities are required to capture, maintain and increase market share.

Before rainforest cabinet timbers can be promoted and sold as *diamond timbers*, an understanding of the final markets must be achieved (Johnson and Sarre, 1995), particularly in respect to the factors affecting the choice of timber inputs. The results of the survey reported in this paper are an important step in providing such an understanding, by providing information about the public's purchasing patterns and their perceptions of RCTs, and why customers buy or do not buy products made from these species.

Surveys of community purchasing patterns for products made from RCTs, perceptions of these timbers relative to eucalypts and composite timbers, and reasons for purchasing or not purchasing these products were conducted in Cairns and Townsville. The next section provides a brief overview of the research method and questionnaire design for this study,

[3] Diamond timbers are those suitable for decorative use, e.g. top-of-the-range furniture and feature panelling, and timbers for restoration of antiques and old buildings, musical instruments and hand-made arts and crafts items.

after which survey findings are discussed. Finally, some inferences for marketing and industry development are explored.

METHODOLOGY

The research method involved identifying the population for sampling, developing a questionnaire to collect information about the preferences of consumers and administering this through personal and phone interviews. Questions were developed which covered:

- demographics of participants such as age, gender and education level;
- when last purchases of items made from Australian rainforest cabinet timbers took place;
- extent of the respondents' awareness of RCTs as indicated by respondents rating of RCTs against composite wood and eucalypt products'; and
- reasons why respondents bought or did not buy products, and why they would want to buy products made from RCTs.

The rating of RCTs compared to the two alternatives was on a scale from *vastly inferior* to *vastly superior* with the option of 'Don't know' also allowed. Purchase histories were investigated for the last year and various earlier periods. Questions sought level of agreement with a number of statements encompassing product affordability, value, quality, consumer preferences and environmental concerns.

The survey focussed on Cairns and Townsville, the major population centres in north Queensland region. Areas that are frequented by a wide cross-section of the public were sought for the surveys. The first survey was conducted at a weekend WoodExpo in Cairns. For the Townsville interview survey, two shopping centres were willing to allow the survey to be conducted on an intercept basis, viz. the Willows and KMart shopping centres. A further survey comprised sampling and phone interviews of households listed in the Townsville Telstra White Pages. The sample was selected from the 077 area code (Townsville, Mount Isa, Cloncurry and Hughenden districts). Random numbers were used to select page numbers, columns and rows of the white pages.

The main surveys were carried out during 1997. Adult respondents (over 18 years) were sought in all five surveys. A sample size of at least about fifty was sought for each of the five sample groups, as a compromise between sampling error and survey expenditure. The data from respondents have been summarised into frequency tables and cross-tabulations from which inferences have been drawn about consumer experiences and attitudes. Descriptive statistics were derived using a MicroSoft Excel spreadsheet. SigmaStat and SigmaPlot were used for statistical analysis and graphical presentations. Due to the relatively small samples, data from the three Townsville groups were pooled in the analysis. Full details on survey questionnaire development, sampling frame and limitations are provided in Smorfitt (2000) and Smorfitt *et al.* (2001).

SURVEY FINDINGS

Several important trends in consumer purchasing of relevance to the current, ongoing and future marketing of RCTs have been highlighted by the survey.

Purchase Behaviour Versus Age

Table 1 summarises proportions of the overall sample (in-person and telephone sample groups combined) who have purchased products made from RCTs, are interested in purchasing these products or are not interested in purchasing these products. A chi-squared

test reveals a significant relationship between the variables age and buying behaviour (p = 0.029). This table reinforces the view that people in the 25 to 54 year age groups have the highest tendency to purchase RCT products, and interest in purchasing these products is lowest amongst older people. No significant differences were found between gender or education groups in terms of their purchasing behaviour.

Table 1: Buying behaviour versus age.

Age	Buying behaviour (% or respondents)		
	Bought	Interested	Not interested
Less than 25 years	44.0	36.0	20.0
25 to 34 years	51.0	34.7	14.3
35 to 54 years	56.9	25.9	17.2
55 years and over	35.0	25.0	40.0

Respondents' Last Purchase of RCT Products

Table 2 indicates the history of purchases of furniture items produced from rainforest cabinet timbers, for the five sample groups and in aggregate. Overall, one third had purchased items in the last year and over half in the last five years. The purchase rate was highest for the Cairns WoodExpo group, followed by the telephone survey group.

Table 2: Time at which last purchase made of product produced from RCTs.
Note: The number of respondents varies between tables, because some questions were not answered by some respondents.

Sample group	When last item purchased (% of sample)					Number of respondents
	Last year	1-5 years	6-10 years	More than 10 years	Never	
K-Mart	18	37	10	10	25	60
Willows	18	16	13	4	49	45
Telephone survey	26	22	10	12	30	50
Townsville combined	21	25	11	9	35	155
Cairns WoodExpo	45	18	3	6	28	94
All groups	33	21	7	8	31	249

Figure 1 provides information of recent purchases for the Townsville combined sample according to respondent age. The proportion who made purchases in the last five years is highest for the 35-44 year age group (54%) and the 25-34 year age group (52%), but only 22% for respondents aged 55 years or over. Among older respondents, there is a high rate (48%) who purchased items more than five years ago, but also a high rate (30%) who have never purchased RCT products. A large proportion (56%) of young respondents (less than 25 years) have never purchased RCT products.

Perceptions of the Quality of Products Made from RCTs and Other Timber Types

Respondents from all survey groups appeared to have clear views on preferences for products made from RCTs as compared with composite wood products. As indicated in Table 3, more than 85% of all respondents felt that RCTs are 'slightly superior' or 'vastly superior'. The lower proportion of Willows respondents (78%) who rated RCTs as vastly superior may be accounted for by the greater proportion of respondents (44%) who fell into the less than 25 years age group, reduced availability of these products in recent years, and perhaps the slightly lower education levels in this survey group. No significant differences were found between the sexes in their rating of the relative timber value of RCTs and composite wood products.

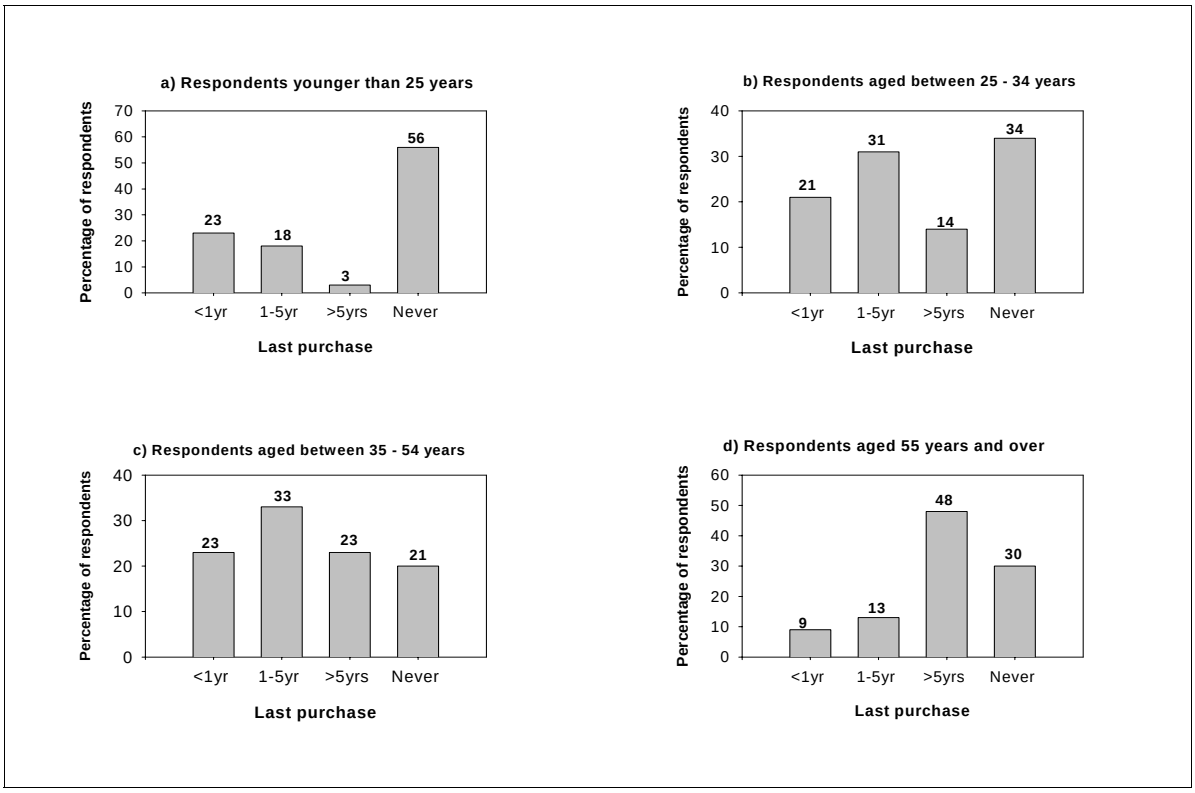

Figure 1: Recency of purchases of products made from RCT expressed as a percentage of the total respondents in each age group, Townsville combined sample.

In contrast, respondents appeared to have difficulty in rating RCTs against eucalypt species (Table 4). An average of forty percent of the combined Townsville groups felt they were unable to make a judgement. The lower level for the Cairns group (24%) is to be expected considering the nature of the WoodExpo and thus the likely interests and knowledge of patrons.

Females were found to rank cabinet timbers more highly in relation to eucalypts than males (chi-squared statistic significant at the 0.01% level). The ranking of RCTs versus eucalypts also differed significantly with age of respondent (one-way ANOVA test significant at the 0.01% level), with young people ranking the difference more strongly than other age groups.

Table 3: Rating of RCTs against Composite wood products (percentage).

Sample group	Vastly inferior	Slightly inferior	Comparable	Slightly Superior	Vastly Superior	Don't know	Sample size
K-mart	0	0	0	5	91	5	64
Willows	0	2	4	7	78	9	45
Telephone survey	0	0	2	6	88	4	50
Townsville combined	0	1	2	6	85	6	159
Cairns WoodExpo	0	0	1	1	97	1	95
All combined	0	0	2	3	91	3	254

In contrast, respondents appeared to have difficulty in rating RCTs against eucalypt species (Table 4). An average of forty percent of the combined Townsville groups felt they were unable to make a judgement. The lower level for the Cairns group (24%) is to be expected considering the nature of the WoodExpo and thus the likely interests and knowledge of patrons.

Females were found to rank cabinet timbers more highly in relation to eucalypts than males (chi-squared statistic significant at the 0.01% level). The ranking of RCTs versus eucalypts also differed significantly with age of respondent (one-way ANOVA test significant at the 0.01% level), with young people ranking the difference more strongly than other age groups.

Table 4: Rating of RCTs against Eucalyptus species (percentage).

Population group	Vastly inferior	Slightly inferior	Comparable	Slightly Superior	Vastly Superior	Don't know	Sample size
K-Mart	0	3	27	22	16	33	64
Willows	0	9	16	20	16	40	45
Telephone survey	0	0	22	14	16	48	50
Townsville combined	0	4	21	19	16	40	159
Cairns WoodExpo	0	0	26	19	31	24	95
All combined	0	2	24	19	23	32	254

Reasons Why Respondents Purchase or Don’t Purchase RCT Products

Respondents who had purchased RCT products within the past five years were asked to indicate their level of agreement with seven statements concerning reasons for purchase (Table 5). More than fifty percent of respondents agreed with each of the following reasons: realistically priced, good value for money, better quality, preference for RCTs to other materials, liking for Australian timbers and the desire to pass the product down as an heirloom. There did however appear to be a number of respondents who felt that buying products made from RCT may lead to the destruction of rainforests.

Respondents who were interested in buying RCT products, but had not done so in the last five years, were asked to indicate their level of agreement with a number of statements concerning reasons for not making a purchase (Table 6). Value for money, low quality, preference for other products and destruction of rainforest did not appear to be of major

concern. Approximately forty percent regarded these products as 'too expensive', while fifty percent were undecided about whether these timbers are still available.

Table 5: Level of agreement of respondents from the Townsville combined sample, who have purchased RCTs during the past five years with statements concerning reasons for purchase of products made from RCTs. Notes: n = 68, except for heirloom, where n = 67. Rounding errors are responsible for some rows not adding to 100.

Statement	Level of agreement (% of respondents)				
	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Realistically priced	1	28	16	50	4
High value for money	0	9	12	57	22
Better quality	1	4	4	50	40
Preferred to other materials	1	7	3	65	24
Australian timbers	0	1	4	59	35
Destruction of rainforest	4	38	24	28	6
Heirloom	1	21	10	45	22

A similar set of statements were presented to respondents who had not purchased RCT items and said they were not interested in doing so (Table 7). Cost, value for money, low quality, preference for other products and destruction of rainforest did not appear to be of major concern. Again, fifty percent were undecided about whether these timbers are still available. Sixty percent felt it was due to their stage of life; this may include both the young who don't have the need for (or the funds to purchase) these products, and older respondents who are more likely to have fully furnished homes.

Table 6: Level of agreement of respondents from the Townsville combined sample, who indicated an interest in purchasing RCTs, but have not done so during the past five years, with reasons for not purchasing RCT products. Notes: n = 49. Rounding errors are responsible for some rows not adding to 100.

Statement	Level of agreement (% of respondents)				
	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Too expensive	4	24	35	29	8
Low value for money	14	55	18	10	2
Substitutes better quality	16	63	16	4	0
Prefer other materials	8	59	22	8	2
Destruction of rainforest	0	35	20	24	20
Timbers not available	6	22	51	20	0

Table 7: Level of agreement of respondents from the Townsville combined sample, who indicated no interest in purchasing RCTs and have not purchase RCT products during the past five years, with reasons for not purchasing RCT products. Notes: [1] n = 43; [2] n = 42; and [3] n = 41. Rounding errors are responsible for some rows not adding to 100.

Statement	Level of agreement (% of respondents)				
	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Too expensive[1]	2	30	37	28	2
Low value for money[2]	12	45	33	10	0
Substitutes better quality[3]	17	44	32	7	0
Prefer other materials[2]	5	40	26	29	0
Destruction of rainforest[1]	2	21	2	33	42
Timbers not available[2]	7	45	36	10	2
Stage of life[1]	0	26	12	30	33

RELEVANCE FOR MARKETING AND PROMOTION OF RCTS

The findings of this study are likely to be of interest for people associated with the current and longer-term growing, manufacturing and marketing of RCTs. It must be noted that the results of these surveys must be interpreted with caution in terms of the reliability of the sample surveyed. The survey of members of the public attending the WoodExpo could lead to bias because enthusiasts of native timbers would be over-represented and the expo was designed to increase community awareness of native timbers. Intercept at shopping malls may have led to some bias in respondents relative to the characteristics of the overall population. For example, purchasing behaviour in north Queensland could be different outside of Cairns and Townsville. In some cases, the number of respondents in cells in cross tabulations was relatively low, and only limited statistical analysis has been possible. In spite of these limitations, the survey results are considered to be reasonably representative of attitudes of the north Queensland population, and some relatively clear patterns have emerged. Nevertheless, it would be hazardous to translate these results to the whole of Queensland, since interest in purchasing products made from RCTs may be much stronger in the north, with a long tradition of manufacture and use of these timbers.

This study provides the first quantitative description of the north Queensland public's awareness of RCTs and reasons for purchase or non-purchase of products made from them. Consistent with Epperson and Wacker (1989), most purchases of RCTs are made by the 25 to 54 age groups. Respondents have preference for RCTs against eucalypt and clearly prefer RCTs to composite wood products. This was particularly notable in the younger age groups and women generally.

The findings are broadly consistent with those of earlier studies on demand for high value or 'diamond' timbers. High cost does appear to be of some concern, especially among respondents interested in buying RCT products, but who have not done so recently. These people represent a real potential demand for manufacturers of these products. Greater promotion of RCTs and products made from these timbers needs to be undertaken, especially to overcome the lack of knowledge of respondents regarding the availability of these timbers. If the public feel the timbers are no longer available due to World Heritage listing or any other reason, they will not ask for products to be made from the timbers.

The public also need to be made aware of the source of these timbers, especially those grown in plantations, to allay fears of rainforest destruction. This is important for the private landholders planting RCTs on their land for future harvest. There is a growing public awareness of the environment and various measures such as certification are being put in place to ensure that only timber harvested on a sustainable basis or meeting specific environmental requirements are used.

Any attempts at marketing RCT products to the public would appear best be directed towards the 25-54 year age group. Younger people are possibly not in a financial position to purchase products of this nature, and the older groups can be expected to have fully furnished homes and may even be downsizing.

Rainforest timber resources currently available in Australia cannot justify mass production enterprises as is the case with composite wood products and particular solid timber species such as radiata pine. This may change in the distant future as supplies of RCTs come onto the market from current plantings. Due to reduced availability and high cost of RCTs timbers as inputs, and thus the corresponding high price charged for products, RCT products may need to be marketed as 'diamond timber' products. Higher prices could facilitate increased returns to landholders, which would in turn encourage further planting of these timbers.

The north Queensland community's preferences for products made from RCTs and other solid timbers is of relevance to various groups currently planting or considering planting rainforest and eucalypt species. Providing a threshold quantity of these timbers is produced to provide resource security for millers and cabinet-makers, and orderly marketing is achieved (e.g. through timber grower cooperatives), there is potential for RCT plantations to become an economically viable land use. This would generate regional employment, export products and environmental benefits.

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12. POTENTIAL MARKETS FOR LOGS AND SAWN TIMBER FROM DARWIN STRINGYBARK FORESTS OF CAPE YORK PENINSULA

T. J. Venn

On Cape York Peninsula there are about 1.7 million hectares of eucalypt forests with commercially attractive timber species on land tenures other than National Park. Potential north Queensland markets for Darwin stringybark (*Eucalyptus tetrodonta*), Cooktown ironwood (*Erythrophleum chlorostachys*) and Melville Island bloodwood (*Corymbia nesophila*) are described, and prices and quantities demanded estimated from informal discussions with timber processors and consumers who are familiar with the species are reported. Interviewees are optimistic about market prospects for the former two species, but are pessimistic about Melville Island bloodwood. The structural hardwood market is the largest market for hardwood timbers in north Queensland. Other products from the region with relatively high demand include strip flooring and electricity poles. Darwin stringybark is considered to be highly suitable for the electricity pole, structural timber and strip flooring markets, where prices of about \$500/m^3 of chemically treated log, \$1,400/m^3 of chemically treated structural timbers and \$2,750/m^3 of kiln dried floorboards, respectively, could be achieved. Cooktown ironwood is regarded as a high-quality appearance grade timber, with interviewees indicating a willingness to pay at least \$2,000/m^3 of dried timber and potentially up to about \$5,000/m^3. Opportunities exist to sell small volumes of Cooktown ironwood into extremely high-value domestic musical instrument markets. Interviewees asserted that Darwin stringybark and Cooktown ironwood have sound prospects in overseas markets.

INTRODUCTION

The Queensland Department of Primary Industries - Forestry (DPI-Forestry) considers the stands of timber in the Darwin stringybark (*Eucalyptus tetrodonta*) forests on Cape York Peninsula (CYP) to be the largest remaining forest resource in Queensland with potential to make a major contribution to future timber supplies (Wannan, 1995). However, with the exception of operations by the Australian and United States Air Forces during World War II (Annandale *et al.* 2002), large-scale sawmilling has never been attracted to the region. This is due to several factors. First, the low resident population of CYP of approximately 18,000 (north from and including Cooktown), means local markets are small. Second, lack of transport infrastructure, coupled with long distances to major domestic markets, leads to high freight costs when selling outside the region. Third, prior to World Heritage listing in 1988, the state-owned rainforests of north Queensland around Townsville, Cairns and Cooktown supplied large volumes of high quality timber to north Queensland markets (Keenan, 1998). Therefore, there was little financial incentive for the timber industry to pursue the remote and generally lower quality timber resources on CYP. Fourth, until about twenty years ago, the dominant commercial timber species on CYP, Darwin stringybark, had been considered an inferior hardwood (Davis, 2001). Fifth, only about 55,000 hectares of the commercially productive forests on CYP are in State Forests and Timber Reserves managed by DPI-Forestry (Wannan, 1995)[1], with the remainder on land tenures such as mining leases and

[1] A substantial part of the 55,000 hectares of commercially productive forests on CYP estate has recently been transferred to National Park (Killin, 2003).

indigenous land, where DPI-Forestry has less resource security and relatively little experience in working with the land title holders. DPI-Forestry has thus had little incentive to undertake research that may attract timber processors to the region, including determination of wood properties of potential commercial species, and estimating the extent of the timber resource. Finally, the Cape York Peninsula Land Use Strategy (CYRAG, 1997) recommendation that forestry activity on CYP be constrained to its present level (subject to a sustainability assessment) has probably also discouraged public and private forestry investment in the region.

Current harvest of timber on CYP is estimated to be in the vicinity of 2,000 cubic metres of log per year (CYRAG, 1997), mostly for local low-value applications such as fencing, mining timbers, green roughsawn construction timbers and railway sleepers (Wannan, 1995). Nevertheless, the future for forestry industries in the natural forests of CYP may be brighter than history would suggest. The *Cape York Partnerships Plan* has committed the Queensland Government to developing a strategy to drive a regional economy on CYP, which builds on the strengths of the region – its people, culture, history and extensive range of natural resources, including forest resources (Department of the Premier and Cabinet, 2000). The deep-water port at Weipa provides opportunities to transport timber by sea to major domestic and international markets. The large shortfall in hardwood production in north Queensland brought about by the cessation of logging in the rainforests of the Wet Tropics, is currently met by timber imports from processors in southern Queensland, northern New South Wales and overseas (Keenan, 1998). Freight costs for these imports are likely to be comparable with freight costs on timber from CYP. Darwin stringybark is now a well-regarded general purpose hardwood timber in north Queensland. In Australia and overseas, timber product manufacturers are developing an increasing interest in 'outback' and lesser-known specialty timbers, such as the Goldfields timbers of Western Australia (Siemon and Kealley, 1999) and the hardwoods of western Queensland (Venn and Whittaker, 2003). Several species found on CYP, particularly *Erythrophleum chlorostachys* (Cooktown ironwood), are gaining popularity in specialty, high-value uses such as musical instrument manufacture.

Balkanu Cape York Development Corporation have identified the eucalypt forests of Aurukun Shire, on the western coast of CYP, as a potential engine with which to drive the Wik elders' vision of economic independence (Venn and Harrison, 2001). At the invitation of Balkanu, a postgraduate research project funded by the Rural Industries Research and Development Corporation and the Australian Centre for International Agricultural Research commenced in 2000 to assess opportunities for a culturally and ecologically sustainable sawmilling industry based in Aurukun. An important element of this study is the identification of potential markets for timbers harvested from eucalypt forests in the Shire.

This paper presents the findings from timber market research in north Queensland that had been undertaken to assist the forestry decision-making of Wik people. The paper begins by outlining the product market types and timber species examined in the survey. Next, the aims and methods of the market survey are described. Results of the survey are then reported and followed by concluding comments.

MARKETS AND SPECIES TARGETED BY THE SURVEY

Following discussions with Wik people in Aurukun, officers of Aurukun Shire Council, Balkanu and DPI-Forestry, it was decided that the market survey should focus on the potential of species from the eucalypt forests of CYP for poles, structural and appearance grade sawnwood (including potentially high-value niche markets), and waste products from sawmilling operations (e.g. sawdust and woodchips). Although railway and tramway sleeper markets in north Queensland have been supplied with CYP eucalypt forest timbers in the past, DPI-Forestry recommended against investigating this market, because of the relatively low prices paid for sleepers and high levels of uncertainty about future demand in north

Queensland, and the increasing use of concrete in place of timber. It was also suggested that landscape and fencing markets not be considered, because low-cost treated plantation pine has gained market acceptance for these applications in many parts of Australia. Indigenous people on CYP could produce traditional arts, crafts and weapons from the forest timbers of CYP. However, these potential markets have been excluded from this survey because traditionally manufactured indigenous arts and crafts are not produced from sawn timber, and tourist markets in most parts of Australia, including north Queensland, appear to be saturated with these products[2].

There is a great diversity of rainforest, open forest and woodland on CYP; however, few shrub and tree species are suitable and available in sufficient quantities for sawmilling. The Darwin stringybark forests on CYP are considered to have high potential for commercial sawmilling. Covering about 1.9 million hectares of CYP, of which 1.7 million hectares are on land tenure other than National Park (Wannan, 1995), these forests are dominated by Darwin stringybark, but Melville Island bloodwood (*Corymbia nesophila*), Hyland's bloodwood (*C. hylandii*), Clarkson's bloodwood (*C. clarksoniana*) and Cooktown ironwood are also relatively common. The distribution of these forests on CYP is illustrated in Figure 1. A large proportion of this resource is on indigenous lands, including about 330,000 hectares in Aurukun Shire. Darwin stringybark, Melville Island bloodwood and Cooktown ironwood are considered to be the key commercial timber species in the region, because of their desirable wood properties, relative abundance, and general market acceptance in north Queensland. Therefore, they constitute the focus of this market survey.

Darwin stringybark, Melville Island bloodwood and Cooktown ironwood have high basic densities (800 kg/m^3 to 1,000 kg/m^3), high air-dry densities (1,000 kg/m^3 to 1,200 kg/m^3) and high Janka hardnesses (10 kN to 13 kN) (Bootle, 1983; Smith *et al*. 1991; Annandale *et al*. 2002). These species also have high natural durability, being termite and decay resistant for at least twenty-five years and potentially for more than fifty years when used untreated and in contact with the ground (Smith *et al*. 1991; Annandale *et al*. 2002). Furthermore, these timbers are considered to have aesthetically appealing colours, from red-browns to reds. Hopewell (2001, p. 9) stated that Darwin stringybark is an "excellent structural timber" and "has excellent potential for tool handles" for which spotted gum (*Corymbia citriodora* subspp. *citriodora*) is currently the preferred species. Cooktown ironwood has long been renowned as a beautiful, decorative timber with potential for high-value products, such as musical instruments (Swain, 1928). However, it is also one of the world's densest commercial timbers, making it difficult to work. Smith *et al*. (1991) reported that Darwin stringybark and Cooktown ironwood are suitable for a wide range of internal and external building applications, indicating the high versatility of these species. Little has been published about the utilisation potential of Melville Island bloodwood; however, it may be suitable for a range of uses similar to Darwin stringybark (Annandale *et al*. 2002).

MARKET SURVEY AIM AND METHODOLOGY

The original intention of the market survey was to estimate potential domestic and international demand for the target CYP timber species; however, it rapidly became apparent that none of the species are well-known within the Australian timber industry south of Cairns or overseas. This observation has been confirmed by an independent market review of CYP timbers undertaken by the Queensland Forestry Research Institute (Hopewell, 2001). Timber

[2] The saturation of markets with Aboriginal arts, crafts and weapons appears to be due to large-scale production by non-indigenous Australians employing non-traditional methods. For example, didgeridoos are manufactured by boring a hole through a small solid log, and decorated by painting with dots and kangaroos. Boomerangs are laser cut from sawn timber boards, not carved from the natural 'elbows' of branches and roots, as performed traditionally.

processors cannot be expected to provide market information about species they know little about.

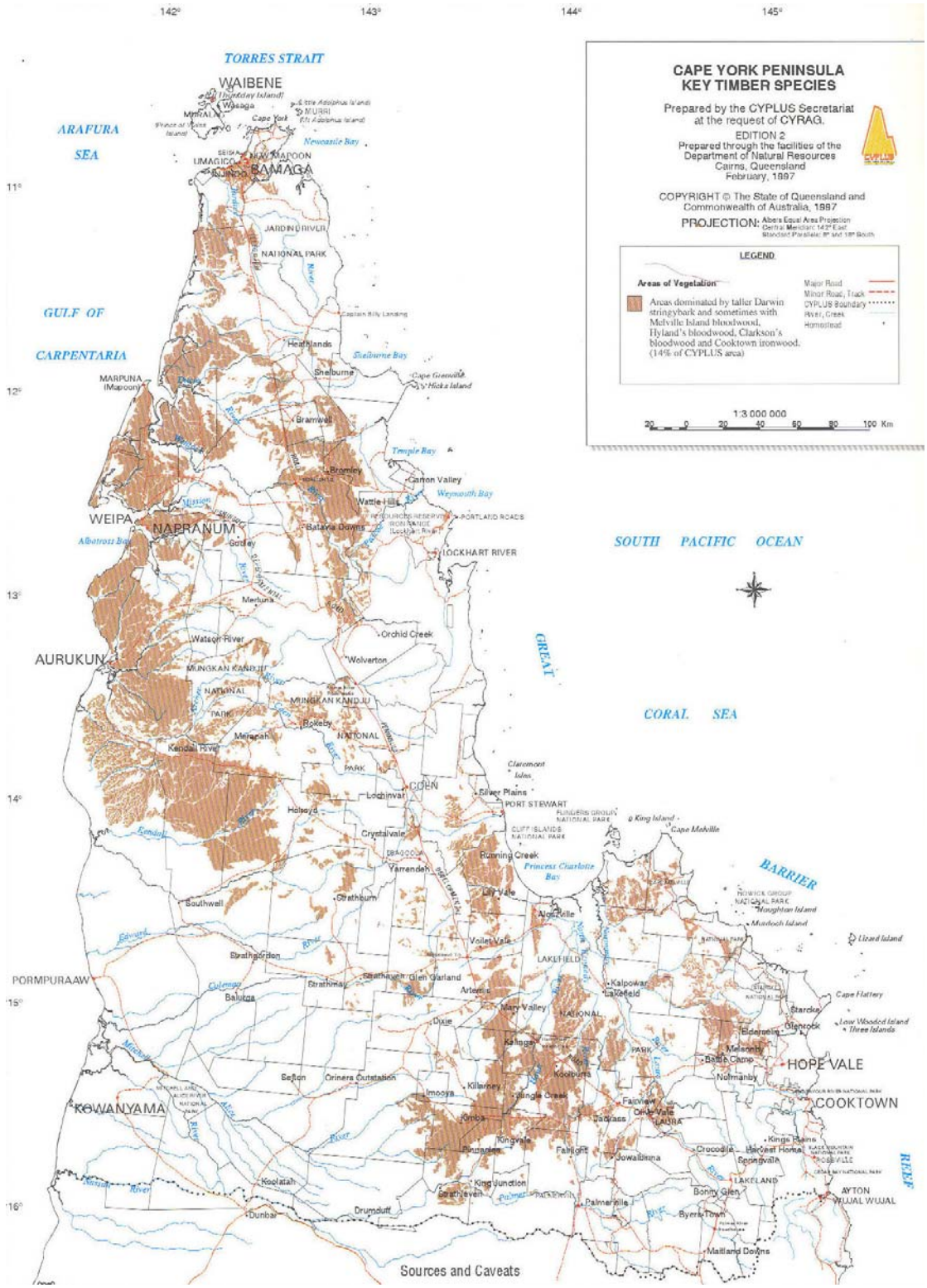

Figure 1: The distribution of Darwin stringybark forests on Cape York Peninsula considered to have commercial timber production potential (Source: CYRAG, 1997).

In a study on the potential domestic and overseas markets for western Queensland hardwoods - species with which domestic and overseas markets are similarly unfamiliar - a

postal survey was believed to be the only affordable means of collecting market information (Venn and Whittaker, 2003). The survey included information about the woodland resources and wood properties, together with colour photographs of the timbers. While useful information about potential domestic market opportunities was collected, few helpful comments were received from overseas respondents. The development, posting and subsequent analysis of returned questionnaires consumed considerable resources, including the employment of one person full-time for several months. It became evident that a wide-ranging examination of potential domestic and overseas markets for CYP species would require a similar level of commitment of personnel and financial resources. This would greatly exceed what could be reasonably undertaken within the postgraduate research project.

The aim of the market survey for timbers from the Darwin stringybark forests of CYP was limited to examine only potential north Queensland markets (Townsville and areas further north). Information about other potential domestic and international markets was to be collected opportunistically. Specifically, objectives of the current survey were to collect information about market perceptions of the suitability of CYP timber species in various markets and determine market demand (price and quantity) in north Queensland markets.

It was indicated by officers at DPI-Forestry, Atherton, that the timber industry in north Queensland has a poor reputation for responding to postal correspondence, and that unstructured discussions may be the most appropriate means of obtaining market information. Therefore, it was decided to hold unstructured telephone and in-person discussions with people involved in the north Queensland timber industry. In-person discussions would be requested from a sub-set of interviewees found to be particularly informative during telephone discussions.

DPI-Forestry provided contact details for selected sawmills and several large consumers of timber products in the Cairns region whom they considered could provide useful market information. Telstra Yellow Pages and internet searches, and referrals from contacted sawmillers, highlighted other businesses, local councils and government agencies in north and south Queensland, and the Northern Territory, who could provide market information. In this way, a list of forty-six potential sources of market information for CYP timbers was generated. Each was contacted by telephone during the period May to June 2000. In most cases, interviewees had sound knowledge of the species being considered. For interviewees who did not, details about wood properties, such as colour, density, strength and suitable uses, were read over the phone. This information was obtained from Bootle (1983) and Smith *et al.* (1991), which are respected information sources for timber properties within the Australian timber industry.

Many telephone discussions yielded useful information and some resulted in invitations to visit processing facilities and hold in-person communications with senior staff. However, most sawmillers and suppliers of structural and landscape timbers in Cairns and on the Atherton Tableland were reluctant to provide information. Indeed, it was necessary to end several telephone discussions with these interviewees prematurely, because conversations became angry and hostile. This appeared to be a result of lingering distrust towards government and other institutions, stemming from the World Heritage listing of the Queensland wet tropics in 1988. Table 1 lists the businesses, local governments and government agencies willing and able to provide useful market information. Ten from this list were visited in November 2000, which facilitated collection of more detailed information from in-person discussions.

RESULTS OF THE MARKET SURVEY

Statistical analyses have not been performed on the results because of the unstructured method of information collection and small sample. Due to the limited trade in CYP timbers, it is not possible to verify the assertions of interviewees with published estimates.

Table 1: List of businesses, local governments and government agencies who provided useful market information for CYP species.

SAWMILLS, FURTHER PROCESSORS OF TIMBER PRODUCTS, AND MERCHANTS
Tolga Woodworks (Tolga)
Grey's Sawmill (Charters Towers and Proserpine)
Red Ebony Pty Ltd (Mary River East Station, Northern Territory)
G & D Landscaping (Cairns)
Cairns Fencing (Cairns)
Tenni and Arbouin (Atherton)
Chris Vandyke Designs Pty Ltd (Cairns)
Far North Timber and Truss (Cairns)
Comalco Ltd (Weipa)
Far North Ergon Energy (Cairns)
Spirit Drums (Cairns)
South Queensland Farm Forestry Development Committee (Yeppoon)
MITRE 10 (WEIPA)
MANAGERS OF A PROPOSED FLOORBOARD PLANT FOR WEIPA
Gayler Consultancy Group (Hervey Bay)
HOWARD MILL (MARYBOROUGH)
PLANTATION FOREST GROWERS
Sylvatech Ltd (Darwin)
LOCAL GOVERNMENTS
Aurukun Shire Council
Napranum Aboriginal Council
Weipa Township Office
Cairns City Council
Townsville City Council
GOVERNMENT AGENCIES AND GOVERNMENT-FUNDED AGENCIES
The Queensland Forestry Research Institute (Atherton)
Queensland Department of Primary Industries - Forestry (Atherton)
Northern Territory Department of Primary Industries and Fisheries (Darwin)
Greening Australia, Northern Territory (Darwin)

Perceptions about the Marketability of Timbers from the Darwin Stringybark Forests of CYP

Within the north Queensland timber industry, Darwin stringybark and Cooktown ironwood appear to be well-known and highly regarded as strong, durable timbers. Several interviewees described these timbers as *real hardwoods*, as opposed to what they referred to as the *second-rate* hardwoods (predominantly spotted gum) imported into the region from southern Queensland and northern New South Wales. Darwin stringybark has apparently become a preferred structural and electricity pole timber in north Queensland over the last ten to fifteen years, although supply is limited. Many interviewees commented that Cooktown ironwood is an excellent structural hardwood, but that the timber is of such high appearance quality that it should not be employed in structural use. One interviewee commented that, as a decorative red hardwood, Cooktown ironwood is superior to jarrah (*Eucalyptus marginata*), a popular decorative native hardwood in Australia. Other interviewees asserted that Cooktown ironwood is ideal for billiard cue, furniture and musical instrument manufacture. Subject to the timely availability and price competitiveness of timbers from the eucalypt forests of CYP, most interviewees suggested that they would buy Darwin stringybark and Cooktown ironwood in preference to southern Queensland hardwoods.

Melville Island bloodwood is less well-known by the north Queensland timber industry than Darwin stringybark and Cooktown ironwood. Nevertheless, the timber has been used in the Northern Territory for housing, including pole homes, and around Weipa for poles, piles, sleepers, and occasionally, home-made furniture. The few interviewees that have milled this species asserted that it is generally of lower quality than the other two timbers considered in this survey, and has limited market potential. This is largely due to the prevalence of loose gum veins, which result in low usable sawnwood recovery (e.g. see Annandale *et al*. 2002).

Several interviewees commented that consumers are becoming interested in the history of timber, hinting that indigenous communities on CYP may have a unique marketing advantage. It was suggested that marketing CYP timber as a product that is culturally and ecologically sustainably harvested from forests managed by traditional indigenous owners, would open niche markets in Australia and overseas where higher timber prices might be obtained.

Potential Markets for Darwin Stringybark and Cooktown Ironwood

Few interviewees were willing to comment on market opportunities for Melville Island bloodwood; hence no potential market information can be reported for that species. Table 2 reports the potential demand by market type for Darwin stringybark and Cooktown ironwood in north Queensland, covering a range from unprocessed sawlogs to dressed sawn timber. Market prices include freight to Cairns, unless stated otherwise.

Table 2: Potential demand for Darwin stringybark and Cooktown ironwood in north Queensland. Notes: [a] Price excludes freight to market; [b] Woodchip prices are export prices FOB to Japan. Price is \$150/bone dry metric tonne. The basic density of Darwin stringybark is approximately 800 kg/m^3; [c] Based on \$25/linear metre (lm), as paid by builders in Cairns (35 cm log centre diameter); [d] Based on \$350/pole, as paid by Ergon Energy for a 11 m long, 20 cm small-end diameter, 12kN treated pole delivered to Cairns; [e] Based on \$200/lm, as paid by Spirit Drums for a log with 60 cm centre diameter; [f] Strip flooring prices are based on a dressed floorboard size of 86 mm x 19 mm (nominal 100 mm x 25 mm) and prices of 4.50/lm for Darwin stringybark, and \$4.50/lm to \$8.50/lm for Cooktown ironwood. In nominal dimensions, the prices are \$1,800/m^3 for Darwin stringybark and \$2,600/m^3 (\$1,800/m^3 - \$3,400/m^3) for Cooktown ironwood.

Potential market	Market price (\$/m^3)		Approximate quantity of hardwood demanded in north Queensland (cubic metres/year)
	Darwin stringybark	Cooktown ironwood	
Sawlog stumpage (standing timber in forest)	40-80[a]	40-80[a]	Unspecified
Woodchips	120[b]	N/A	N/A
Building or landscape pole (treated)	260[c]	260[c]	Unspecified
Electricity pole (treated)	500[d]	N/A	3,500 poles
Log for musical instrument manufacture	N/A	700[a,e]	30
Green-off-saw boards	600 (500-800)	600 (500-800)	1,000
Rough sawn (air-dried) boards	800	800 (700-900)	
Structural treated (air-dried)	1,400	N/A	35,000
Structural with sap removed (air-dried)	1,600 (1,500-1,800)	N/A	
Cross-arms for electricity poles	1,400	1,400	240
Appearance (air-dried)	2,000	2,000 (1,800-5,000)	600 +
Strip flooring (kiln dried)	2,750[f]	4,000[f] (2,750-5,200)	2,500
Musical instrument timber (air dried and dressed)	N/A	12,000-18,000	Unspecified

Stumpage and Woodchip Markets

The lowest value markets for timbers from the Darwin stringybark forests of CYP are those for logs at the stump and woodchips. Interviewees were unclear about potential stumpage values for Darwin stringybark and Cooktown ironwood, and therefore the tabulated stumpages are based on DPI-Forestry records, which indicate that the average stumpage paid for hardwood sawlogs harvested from natural forests on State-owned land in Queensland in 2001-2002 was in the order of \$40/m^3. Stumpage paid for natural forest

hardwood logs sourced from private land in Queensland can reportedly be as much as double that paid for logs from State-owned land (GRO, 1998).

Some interviewees believed that the eucalypt forests of CYP contain a potentially large woodchip resource. There are currently no domestic markets for pulplogs or chipwood in north Queensland; however, it was asserted that the port of Weipa and close proximity to Asia would probably make CYP mixed eucalypt woodchip competitive against similar grade material being supplied from Tasmania. Woodchips are a globally traded commodity and the tabulated price is based on average free on board (FOB) hardwood woodchip prices in Australia in 2002. It was argued by some interviewees that development of an export woodchip market would provide an outlet for waste products from sawmilling operations and low-grade logs, which could facilitate silvicultural practices that will improve the timber productivity of the forests (e.g. removal of stunted and over-mature trees).

In Australia, woodchipping natural forests is unpopular with environmentalists and if it were to occur on CYP, which is regarded as a wilderness area of national importance (CYRAG 1997), it would attract much criticism. There may also be difficulties associated with obtaining an export license from the Commonwealth government, which would be crucial to the financial viability of the operation. Recent research has indicated that the dominant hardwood species in the eucalypt forests of CYP are not suited to pulping for paper (Clark, 2003). The basic densities of these species are higher than what paper manufacturers generally desire, and studies have indicated that pulp yields from natural stands of Darwin stringybark are low. The high basic densities also make the target CYP species unsuitable for composite wood products such as laminated veneer lumber and medium density fibreboard (McNaught, 2002).

Building and Landscape Poles

Building and landscape poles are moderate-value roundwood markets. The building and landscape poles considered in this survey are for larger structural projects where centre diameters of logs are typically at least about thirty-five centimetres. Interviewees were uncertain about potential quantities demanded; however, one indicated that the market is small in comparison with the market for electricity poles.

Electricity Poles and Cross-arms

The demand for poles in north Queensland is largely determined by the activities of Ergon Energy. Prior to World Heritage listing of the Wet Tropics, hardwood electricity poles were purchased directly from the local timber industry; however, vacuum-pressure impregnated spotted gum and ironbark poles are now purchased from southern Queensland. Between 1997 and 1999, an average of 1,330 poles per annum were purchased by Ergon Energy for Cairns and the surrounding region (excluding Townsville) (Bowman, 2000). Future demand in north Queensland is anticipated to be higher due to urban expansion and replacement of old poles. For example, Bowman (2000) estimated that the operations of Ergon Energy in the Cairns region will require about 2,500 poles per annum in the near future.

Darwin stringybark and Cooktown ironwood are preferred pole species of Ergon Energy; however, the latter species rarely grows into a tree with a long straight bole suitable for electricity poles. The price Ergon Energy is willing to pay for poles varies according to pole length and strength grading. In 2000, prices ranged from $150 per 5 kN, 9.5 m treated pole, to $2,300 per 20 kN, 20 metre treated pole delivered to Cairns. Road and sea freight restrictions limit the maximum pole length that could be supplied from CYP to 14 m (Fox 2000). A 11 metre long 12kN treated pole is worth approximately $350 delivered to Cairns. Electricity companies in China and Vietnam are importing treated hardwood poles. Some

interviewees commented that exporting poles to Asia is a potentially lucrative market for Darwin stringybark.

The demand for cross-arms also arises largely from Ergon Energy. Each electricity pole has between one and ten cross-arms to carry wires. Cross-arms are untreated hardwood with gang nail plates at both ends and a white strip of paint across the top to reduce splitting. They are commonly required in the dimensions of 100 mm x 100 mm x 2,400 mm or 3,600 mm. Ergon Energy currently pays $35/piece and $50/piece respectively for cross-arms of these dimensions. Ergon Energy estimated that they require about 8,000 pieces annually in north Queensland, but no figures on past consumption are available. Cooktown ironwood and Darwin stringybark are recognised as suitable timbers for cross-arms.

Green-off-saw and Air-dried boards

Several sawmillers, further processors and builders indicated their willingness to purchase green-off-saw and roughsawn seasoned (i.e. dried to between 12% and 14% moisture content) Darwin stringybark and Cooktown ironwood boards. The prices interviewees stated they are willing to pay are standard for roughsawn hardwood timber in Queensland. It was indicated that the quantity demanded is likely to be low, because the range of uses for such low-value sawn timber products is limited without further processing, and most builders lack the equipment for further processing. Sawmills with further processing facilities may buy small volumes to supplement their existing business. There may be more lucrative markets elsewhere in Australia. One sawmiller asserted that he sells roughsawn, air-dried Cooktown ironwood to a merchant in Sydney with an annual value of about $5 million (five hundred cubic metres at approx $1000/$m^3$).

Structural Timbers

It was indicated that structural timbers constitute the largest hardwood market in north Queensland, mostly for roof framing and mouldings. Potential treated timber prices suggested by interviewees are indicative of current structural hardwood prices in north Queensland. The sapwood free price was provided by a builder who indicated a willingness to pay a premium for untreated, sapwood free structural timber. Protesting that aesthetically pleasing Cooktown ironwood should not be used in structural applications, no interviewee suggested a structural timber price for this species; however, it could be expected that it would sell in structural markets at a price similar to Darwin stringybark. Estimates of planned housing construction on CYP provided by Aurukun Shire Council, Napranum Aboriginal Council and the Weipa Township Office, indicate that approximately 100 cubic metres to 125 cubic metres of structural hardwoods are required annually on the western coast of CYP. Interviewees were unable to provide information about the total size of the north Queensland structural hardwood timber market. The tabulated estimate is based on 1993 per capita sawlog consumption data for the region north from and including Townsville (Keenan, 1998).

Appearance and Strip Flooring Timbers

Appearance grade timber has aesthetically pleasing colour and figure, little or no defect (e.g. loose knots and splits), and depending on the application, little or no distortion (spring, twist, bow or cup). Potential markets for such timbers include woodturners and manufacturers of furniture, kitchen cabinets, bench-tops, VJ boards (overlapping joint internal wall panelling) and other internal or external building features (e.g. staircases and parquetry flooring). Appearance grade hardwoods are also demanded by manufacturers of strip flooring and musical instrument. Due to the extremely high prices that some musical instrument manufacturers pay for timber, this potential market is described separately.

Darwin stringybark and Cooktown ironwood are considered to have suitable properties for appearance grade markets, although the latter species appears to have greater prospects than the former. The tabulated market price of $2,000/m^3 for appearance grade timber was suggested by timber merchants and end-users of timber (e.g. cabinet makers and builders), and is similar to the price of many popular native cabinet species in Queensland, with the exception of red cedar, which typically sells for about $4,000/m^3 (Sewell, 2001). One respondent believed that furniture-grade Cooktown ironwood could wholesale for between $3,000/m^3 and $5,000/m^3 in southern Australian States. The strip flooring price suggested for Darwin stringybark is relatively standard for hardwood flooring in Queensland. Interviewees were confident that Cooktown ironwood could attract a substantial premium in strip flooring markets.

Appearance grade Darwin stringybark and Cooktown ironwood are believed to have sound market prospects in Taiwan, China and Japan. Small volumes of Cooktown ironwood are reportedly being exported to a furniture manufacturer in Singapore. One interviewee asserted that samples of Darwin stringybark strip flooring have received highly favourable reviews in the USA.

Musical Instrument Timbers

Cooktown ironwood is becoming renowned as an attractive timber that is highly suited to musical instrument manufacture. Spirit Drums, manufacturers of handcrafted, solid-shell drum kits, presently constitute the entire market for musical instrument logs in north Queensland. After trialling several hardwood species, they now only produce Cooktown ironwood drums because of the species' acoustic and structural properties. Their drum kits have achieved worldwide recognition for excellence (e.g. Ostrander, 2000). Spirit Drums are willing to pay high prices for logs, but they require large logs with a centre diameter of about sixty centimetres.

Cooktown ironwood has proven to be ideal for guitar and violin finger boards, fret boards and chin rests, and for flutes. While it is suggested that high prices can be obtained by selling into musical instrument timber markets, the majority of domestic manufacturers are small, demanding kilograms, not cubic metres, of timber annually (Venn and Whittaker, 2003). It has been estimated that the annual demand for sawn and dressed high-density musical instrument timbers in Australia, such as Cooktown ironwood, may be not exceed twenty cubic metres (Venn and Whittaker, 2003).

Several interviewees asserted that there are excellent opportunities to export Cooktown ironwood to overseas musical instrument manufacturers. Two interviewees indicated that they have been contacted directly by European violin manufacturers seeking suppliers of Cooktown ironwood. While the quantity demanded by overseas musical instrument manufacturers is likely to greatly exceed the domestic musical instrument market, international luthier[3] suppliers have reportedly offered to pay only between about $2,000/m^3 and $2,500/m^3 FOB for Cooktown ironwood, which is far below what comparatively small-scale domestic musical instrument manufacturers are willing to pay.

CONCLUDING COMMENTS

The north Queensland timber industry is, generally, enthusiastic about the utilisation of Darwin stringybark and Cooktown ironwood; however, Melville Island bloodwood is much

[3] Luthery is the trade or craft of making and repairing stringed instruments, such as mandolins, violins, violas, cellos, guitars and double bass. A luthier is the title of the tradesperson or craftsperson who undertakes this work.

less well regarded. Prices interviewees are willing to pay for the former two species are similar to current hardwood prices in north Queensland, although some indicated that a premium could be achieved by Cooktown ironwood in appearance and flooring markets. Electricity poles are a relatively high-value roundwood market for Darwin stringybark; however, transport costs for poles from CYP may be high due to their bulk. There appear to be sound prospects for Darwin stringybark and Cooktown ironwood in markets for sawn and treated structural and appearance timbers in north Queensland. Lucrative opportunities may exist for a small number of suppliers of Cooktown ironwood to musical instrument and other niche domestic and overseas markets. Some interviewees were optimistic about the potential sale of woodchips from the Darwin stringybark forests of CYP; however, recent research indicates there are unlikely to be markets for such high-density material.

Wik elders in Aurukun Shire are keen to establish a forestry industry to generate employment and income for their people. It was frequently asserted that indigenous people on CYP have an excellent opportunity to sell CYP timbers with a story of sustainable traditional management. This market survey has eliminated some of the uncertainty surrounding the viability of such an undertaking; however, to make an informed decision, traditional owners require further information. The property rights of Wik people to timber resources on their lands, particularly with regard to commercial utilisation, are not precisely defined and have not yet been tested in a court of law. The comprehensiveness, exclusivity, physical extent, duration, divisibility and transferability of their rights will have an enormous bearing on the profitability and type of timber industry appropriate for Aurukun. Research to quantify and qualify the timber resource, and to expand knowledge about the ecology of important timber species and the resilience of Darwin stringybark forests to logging activities, is required to determine economically and ecologically sustainable harvest levels and methods. Traditional owners might also find financial analyses of supplying domestic and overseas markets with CYP timbers beneficial in their decision-making processes. The author's on-going research is addressing these information requirements.

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FUTURE PROSPECTS

13. DOMESTIC AND EXPORT MARKETING PROSPECTS FOR SMALL-SCALE GROWERS IN NORTH QUEENSLAND

M. Cox

This paper examines prospects for small-scale farm foresters in terms of marketing factors that are influenced by the industrial plantations of timber in Australia and responses available to small-scale forestry. Factors that promote the prospects of lesser used and lesser known species are used to evaluate market prospects for north Queensland timber. Market prospects are identified and the importance of end-user requirements in achieving these is demonstrated by examples of successful market approaches to sales of Australian-sourced timber.

INTRODUCTION

Small-scale farm foresters do not contribute the majority of supply to the Australian national forest estate but their contributions are significant in the overall supply of timber in Australia. The last National Forest Inventory (Bureau of Rural Sciences, 2002) indicated an estate in the region of 1.5 million hectares and out of that total estimates indicate up to sixteen percent involved small-scale producers with industrial joint ventures and leasehold arrangements with government or private industry (Cox, 2002). An extended insight of this inventory assessment was that only five percent of the national forest plantation involved farm foresters contributing to the national plantation supply of wood from their own land without industrial associations.

The national forestry industry is dominated by industrial wood plantations which are either state managed or privately owned and to that extent the market prospects, both domestically and internationally for farm forestry are influenced by industrial species choices, pricing behaviour and market selection. Plantations of Pinus radiata and Eucalyptus globulus in Western Australia, Victoria, New South Wales and Tasmania illustrate how alliances between industrial foresters and farmers can and do work successfully. As a result of this, the market behaviour of farm foresters could be described as predetermined where industrial influence dictates the best choice is through a joint venture or cooperative alliance with a dominant supplier or processor in their region, unless the individual farmer is not happy with the stated financial or other management arrangements.

For small-scale growers in Queensland there is an infant framework of Regional Plantation Committees and timber cooperatives that may provide the central structure necessary to displace the industrial and government model of association evident elsewhere for farm forestry adoption. These groups have little resourcing and their ability to influence the direction of the industry is currently limited due to their lack of funds. The timber industry in north Queensland has a potential that could set the region apart from the industrial plantations of the southern states and southeast Queensland, the most obvious being the range of timber species available and climate that might be used to support distinct production and marketing prospects. However, the industry in north Queensland is still dominated by DPI Forestry, who own four thousand hectares of plantations compared with about two thousand hectares privately-owned, most of which is less than eight years old.

QUEENSLAND WOOD SUPPLY, PRICING AND MARKET LESSONS

Australian state governments have traditionally supplied wood through managed forests on Crown land and allowed processors access to their resources. In using contracts that lasted between five and forty years they effectively set the base prices in the market for logs of accepted species though royalties, residual payments and recently in Queensland the application of a dedicated pricing index called the WWI (Wood Weighted Index) for softwoods that is now also being extended to hardwoods. These contract base price arrangements for established species can influence the market values for other niche timber species in common end-use markets if they are in competition within those same end-use markets.

As an example of how markets can be affected by supply changes, the market for mouldings (and structural timber) in Queensland were for many years partly supplied by the *P. radiata* of southern states with the balance from Queensland derived *A. cunninghamii*. They competed in the Queensland state market for housing industry mouldings and there was an inherent advantage to the locally supplied species due to location and royalty arrangements with the state government supplied logs. This situation was challenged when New Zealand derived *P. radiata* began entering the market in much greater volumes from the end of the 1990s with high quality lower-priced product and in later years low-priced finger-jointed mouldings. The pressure by the local industry to change the pricing regime led to a revision of the supply arrangements by the state to allow the processors to meet the market price of these new competitors (DPI Forestry, 2002) but the local industry was put on notice that it had to look for new markets for long-term survival.

Queensland processors reacted to this by acknowledging that *A. cunninghamii* was wrongly positioned in the market and efforts were subsequently made to reposition this species by entering Chinese and Japanese markets and aligning it with the related *Agathis* species and pricing in those destination markets. The twin benefits that have emerged are a higher export price level and new overseas markets.

Any farm forestry growers in Queensland that grow *A. cunninghamii* would benefit from this realignment of the industry and state government to an export market strategy, but small-scale suppliers of this species make a negligible contribution in overall market volumes. There are lessons for timber marketing though. First, market prospects for small-scale suppliers are typically aligned to industrial processors success in developing new markets. Second, market prospects of lesser known species (LKS) and lesser used species (LUS) often hinge upon a buyer's acceptance of name and perceived characteristics of wood. An example of managed perceptions is the case of *E. regnans*, *E. obliqua* and *E. delegatensis*. These are Australian hardwoods, the characteristics of which have been used to provide a relatively uniform product for chosen markets. These species are collectively known as Tasmanian Oak or Victorian Ash in export and domestic markets and attempt to align their product brands to trade on customer familiarity with ash and oak species in overseas markets including the USA and Japan. They have been successful in doing so through the central market desk of Australwood in Victoria.

MARKET PROSPECTS DEPEND ON MORE THAN ENSURING SUPPLY

In Queensland the variety of species of timber grown industrially concentrates on native and exotic softwoods while in recent times a greater state government commitment to hardwoods has occurred. The state government (DPI–Forestry) has already established five thousand hectares of hardwoods in southeast Queensland and plans to plant an additional five thousand hectares in the southeast by 2009 in a coastal swathe extending to Gladstone,

bringing the total hardwood estate to ten thousand hectares. They are actively seeking farm growers with economic lot sizes (at least twenty to thirty hectares, and preferably more), primarily for leasing contracts but also limited joint ventures to be part of the state's hardwood plantation vision. The definition of small-scale forestry might be affected in southeast Queensland if this scheme achieves widespread success. In Western Australia there are similar requirements by the Department of Conservation and Land Management (CALM) for access to the state government scheme for *E. globulus* plantations. This clear support by DPI Forestry will benefit partner growers in two ways. Firstly, more secure revenue arrangements are available to growers who can take advantage of the profit a prendre legal arrangements by the state government and the annual rental returns that are possible given these new legal arrangements. Secondly, the harvesting and marketing arrangements, and therefore prospects for the sales of timber, will be the responsibility of DPI Forestry. The inference in this government-supported plantation approach is that the prospects of suppliers will be tied to the market success of the scheme.

Farm foresters that plant species aligned with industrial interests or state governments in joint venture or leasehold arrangements have greater market certainty but perhaps lower profit potential. There are no independent *marketing* opportunities in this scenario. Farm foresters are *price takers* in this type of industry structure and their *prospects* are limited to the returns on their contractual agreements with their partners.

It is reasonable to think that future success of Queensland hardwoods will require a central market desk approach similar to that provided by Australwood of Victoria if market prospects for its timber are to be realised. The Victorian Australwood group began in 1993 when a dozen sawmill companies formed a network, and they now market Australian hardwoods in overseas markets including Japan, China and the USA. Using an approach that for competitive advantage relies on the promise of more stable output from the combined supply of its members, their market prospects are enhanced by a sustainable timber message and technical support for customers in the markets they enter. This kind of solution is a marketing approach to the industry and it requires an acceptance of the need to manage the process from growing trees through to harvest and processing them into products, which are then delivered to the end-user.

A marketing approach implies that products are tailored for the end consumer and if necessary the processes, production and delivery are adjusted to the end market needs to enhance success. As Toivonen and Laurila (1997) stated, "The marketing personnel need to be able to deliver the end-users' requirements regarding the wood material for those making the decisions about what kind of wood raw material is used." This is demonstrated in marketing material for Australwood, where their product characteristics and grades are identified for consumers to support their buyers' need for information, and a uniform approach is adopted to their timber offerings in any prospective market. In entering the Japanese market, some of the key Australwood ingredients for success, according to its director (Gooding, 2000), were clear government support, effective market entry research, close relationships with potential customers and dealing directly with users rather than trading houses. Australwood has built on this approach to enhance its export prospects. It concentrates on a few end-uses for its products such as flooring and cabinet work, and its timber grades include features such as blemishes caused by pests by having a range of grades from feature to rustic grades.

FARM FORESTRY AND LUS

Farm foresters who are not aligned with state or private interests will not necessarily plant industrial species. The reasons for this are diverse. The variety of supply of available timbers from farm forestry in Queensland is potentially much greater than in other states, due to the range of climate zones and productive tropical rainforest areas found in the state. The

number of species of rainforest and hardwood timbers available for use in cabinet -making in Queensland gives an indication of the variety that used to be available in the market when native rainforests were logged – now these are protected and the supply has almost completely dried up. A recent listing of timber species supply in the Queensland market suggests that more than fifty native species are available (Smorfitt *et al.* 2002). Many of these species are not produced in marketable quantity and reflect recent changes in logging restrictions on private lands in north Queensland rainforest areas. On the one hand, if supply could be increased, this might be seen as an advantage to the end-user by providing a large range of choices for cabinet-makers that farm foresters could take advantage of. But there are several problems that are demonstrated by this range of possible timber material, which can affect market prospects. LUS have inherent problems such as maintaining uniform quality and supply certainty, understanding structural characteristics and workability of the timber, pricing and even transport requirements.

A survey carried out for the ITTO (Eastin *et al.* 2000) involving Ghanaian sawmill and value-adding wood processing industries and US importers and wholesalers of tropical hardwood lumber and veneer gives an indication of the factors that enhance prospects for LUS species. Table 1 indicates the factors identified and their relative market importance as identified by the respondents. The most important factor for success was reliable supply and this is understandable in markets where distributors and retailers treat timber as a commodity. In a farm forestry sector where a large variety of species has been the norm, reliability of supply of individual species is unlikely to be achieved and adds to the difficulties of achieving market success.

A more analytical assessment of the factors implies the need for *organisation* to achieve reliable supply, the provision of appropriate technical and promotional material and the achievement of certification for products. In addition, there is a need for *collaboration* in meeting the need for sample volumes and pricing for a market entry strategy. These factors are as important in a domestic market as they are in an export market to achieve the success all growers have in mind when they plant.

Table 1: Importance rating of different factors in promoting the introduction and acceptance of LUS. Summary rating of Ghanian and US responses (n = 120 firms).

Factor	Importance Rating
Availability of a reliable supply of product	6.34
Availability of technical/promotional material	5.68
Availability of small trial volumes	5.38
Low trial price	4.86
Acceptance of the LUS by an influential firm	4.82
Risk-free trial period	4.48
Certification of the LUS	4.39

A major question that arises for the farm-forestry sector is whether the current organisational framework can provide the organisation and collaboration required for achieving some of these factors, and whether there is enough supply for *niche* timber markets – there may simply not be enough trees already in the ground. Achieving this is difficult in a commercial environment where goals are clearly identified and participants have a model of supply chain collaboration in other industries to identify with in striving to create new market prospects and profit from their joint collaborative behaviour. In the Australwood case mentioned earlier the

species are limited in number and linked by a uniform and marketed brand name and the commitment comes from commercial timber mills over the last decade.

MARKET PROSPECTS, SPECIES AND DIFFERENTIATION

If north Queensland, farm foresters commit themselves to differentiation of species planted rather than using successful established species grown by industrial forestry their prospects for profit in end-use markets will be affected. In a sense the different climate, land use and just the issue of their location creates the opportunity to distinguish their planting choices, but they have to bear the cost of greater difficulty in establishing a market for their product.

An example of a current prospect for farm forestry in north Queensland is the attempt to establish commercial plantations of mahogany. African Mahogany (*Khaya senegalensis* and *Khaya nyasica*) commands a premium price in end-use markets in the northern hemisphere, is a recognised furniture species and in the dry tropics of north Queensland has the potential to grow at a commercially attractive rate in managed plantations, although this is yet to be demonstrated on a large scale. This species can serve to illustrate how the prospects for north Queensland timbers can be enhanced, if large plantations arise of this species then farm foresters may be able to benefit by choosing to grow this species even though their land areas may not reach the desired size of commercial investors.

Adopting a unique species as a plantation choice can also create difficulties. Mahogany commands a premium price in the current market but its future prices are still subject to the value the market will place on it. It has predicted rotation periods of twenty years from the added climatic benefits of expected fast growth in north Queensland. It is also an attractive species because it can be grown on large properties. It still faces the difficulties of establishing a market presence for a new source of supply and establishing appropriate and supported standards for an end-use market. These higher establishment costs may be outweighed by the *absolute scarcity* to end-use demand of a timber like mahogany, particularly once native forest sources of this species are logged out or locked up in reserves.

In contrast to mahogany, exotic pine (e.g. *P. radiata*) is ubiquitous and can only ever experience short-term *relative scarcity* in markets due to the large range of producers that exist in world markets, there is a ready supply of it from many sources because it is an established and successful industrial plantation species. Its price is relatively stable and reflects the nature of its market supply. As a generic commodity timber, its characteristics have been enhanced by selected planting and management methods and its end-uses have been expanded. *P. radiata* now has many enhanced characteristics due to constant improvement in management, processing and marketing. It is capable of high structural strength with appropriate drying techniques and as earlier mentioned has been successful in crowding out hoop pine (*A. cunninghamii*) in the mouldings market in Queensland. Its prospects are clearly aligned with industrial suppliers, but this can be attractive to farm foresters who want certainty in silvicultural management techniques and end-use markets.

Unique species or industrially different timbers that are chosen by farm foresters face the problem of achieving a balance between meeting the constraints of their micro-environment, their own land-use needs and the special requirements of different species. Farmer choices often neglect the important factor that will enhance their market prospects for financial return in the future, an assessment of the needs of potential end-users in the market. Figure 1 demonstrates the necessary conceptual integration of these factors in the decision of the farm forester to plant a particular species.

African mahogany has an existing market. Its end-uses are well established, including parquetry flooring, short lengths for feature timber, woodturning blanks, the high-end furniture

market and veneer demand which can be supplied from different stages of the tree growth and match end-user requirements. Its market prospects are enhanced by its known features in destination markets. Farm foresters who plant this species are therefore enhancing their prospects for successful marketing of their timber.

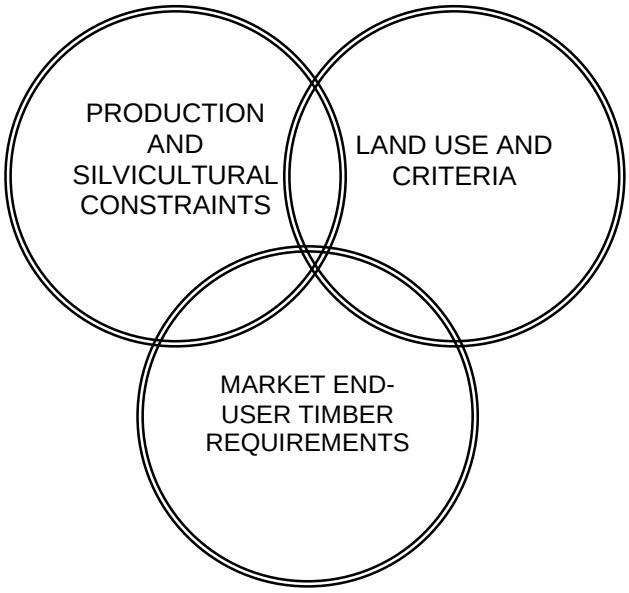

Figure 1: Market prospects need to be part of the planting decision.

JAPANESE MARKET PROSPECTS FOR THE TIMBERS OF NORTH QUEENSLAND

Japan is Australia's major export partner and a major world market for timber; along with China it is the best prospect for any timber exporter in the region. Japan has a large market for timber housing and timber fitouts beyond its population size. The Japanese population have a preference for timber buildings. In 1999, Japan had 1.2 million housing starts compared to the USA which had 1.67 million yet Japan has less than half the United States population. These figures indicate the relative importance of timber housing in their market and prospects for trade. In addition to new housing starts there is a large market for rebuilding and refurbishment. The Japan Lumber Journal reported in September 2003 that in Japan there are about twenty million units of over-thirty-year-old houses, for which rebuilding is necessary. Among them, wooden houses comprise about ten million units.

Japanese timber housing demand is strong for religious, cultural and aesthetic reasons. Their use of timber as a feature is also common. The Japanese consumer favours premium products and rainforest timbers properly presented can be successful in this sophisticated market. One reason is that the size of the market provides the natural occurrence of demand segments for the full range of timbers, but the market demands attention to detail that the individual farm forester and even a representative organisation would find difficult to service.

The traditional nature of timber demand in housing can work against market prospects for rainforest timbers. This occurs because most north Queensland rainforest timbers have strong grain features and colour. This is highly desirable in feature timbers and high-value furniture, flooring and veneers. The problem is that features including weight and appearance in rainforest hardwoods can become a problem for a market that wants light, strong, pale and straight grained timbers. As an example, the typical timber species used in post and beam Japanese houses illustrates the current demand in the market. Typical timbers used include

Japanese cedar (*Cryptomeria japonica*), Sitka spruce (*Picea sitchensis*), white spruce (*Picea glauca*), hemlock (*Tsuga heterophylla*) and radiata pine (*P. radiata*). Meeting Japanese Agricultural Standards and Japanese Industrial Standards for small supplies and non-uniform species is another problem in this market. Current prices of $US380/m^3 for 2x4 timber shows that it is a lucrative market but one that deals in high volumes and would be difficult to service. There may be greater prospects for entry into a narrow market, such as shoji and fusuma (sliding doors) or amado (rain doors) in Japanese housing.

Rainforest timbers have greater prospects in high-end furniture markets, flooring and veneers. Quarter-sawn timbers that can be sliced have great appeal in the Japanese market and small volumes of high-grade timber that can be sliced for veneers as thin as one millimetre can command high prices in these markets. Farm foresters may need to *rename* domestic species to create customer identification and acceptance in destination markets and educate the consumer. This type of marketing commitment can take many years and often the easiest solution to enhance prospects is to target specific companies rather than general sales in destination markets. Involving potential end-user companies at an early stage rather than when the timber is harvested would enhance the prospects for sales by allowing companies to factor in potential supplies. For the farm forestry sector a common purpose is necessary to realise these prospects, with more cooperation than has been seen in the market up to now.

CONCLUSION

This paper has outlined a view of issues that affect the market prospects of farm foresters. The conclusion reached is that an alignment with industrial suppliers or government interests provides farm foresters with the most certainty but the least say in prospects for their timber. Market prospects can be realised when selected species, specific outputs or targeted markets are pursued in a regional or umbrella organisation that helps to establish the credentials for a long-term marketing approach to be achieved that benefits the owners of the resources.

Farm forestry in north Queensland has limited chance of alignment with industry plantations or state governments, due to the absence of a DPI Forestry joint venture program. Its supply of timber is derived from a relatively low volume base and is erratic, and its sales are based on ad hoc and opportunistic marketing. In addition, its available species from private native forests are more diverse, which creates problems when prospects for its timber output are considered. These problems are compounded by distances to large markets, and lack of timber milling and value-adding options due to lack of resource scale, limited species recognition and no coordinated timber marketing experience.

There are particular strategies that might be pursued to enhance these prospects in domestic and export markets. A fundamental change in behaviour may be needed to meet these requirements. Farm foresters have planted trees with multiple criteria in mind in the past with little thought to end-use and often a vague notion of returns. This approach has meant uncertain returns and a lack of prospects for sellers aside from opportunistic sales. In order to improve prospects for small-scale forestry species, some suggestions have been made to adopt niche marketing behaviour patterns, target specific segments within markets domestically and overseas, attach timber species to defined end-uses and align output to specific end-users as part of a long-term relationship

The best prospects for these approaches occur in Australia's largest market, which is Japan. Although it has not been discussed in this paper, segments of the US market have similar prospects although transport distances are greater. The difficulties in a sustained marketing campaign that coordinates many diverse growers to realise these prospects may be insurmountable but other organisations have shown that it is possible.

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14. COMMODITISATION OF ECOSYSTEMS SERVICES AND OTHER NON-WOOD VALUES OF SMALL PLANTATIONS

S. R. Harrison, D. Killin and J. L. Herbohn

Forest plantations generate a number of favourable environmental and social benefits for the community, quite apart from the revenue from timber and other private benefits to growers. There has been much interest in whether the positive externalities of natural and plantation forestry – including carbon sequestration, salinity mitigation, biodiversity protection, and watershed and water quality protection – can be converted into market products for which forest owners receive payment. Various mechanisms for marketing ecosystem services have been trialled or suggested. Market-based instruments have advantages over subsidy and grant payments, but are not necessarily more socially efficient. Opportunities exist for marketing ecosystem services (particularly carbon credits). There are signs that these markets will develop in the future, providing the institutional framework is supportive.

INTRODUCTION

While some landholders are happy to plant trees for environmental objectives, others expect a positive financial return from their investment. Similarly, a target rate of return is sought by industrial foresters, e.g. anecdotal evidence suggests a rate of return of seven percent is regarded as a satisfactory return for industrial forestry in Queensland. Sharp (2002) found that venture capital providers seek a return on forestry typically of the order of twelve percent. Financial analysis of forestry projects in north Queensland suggests that profitability is marginal if a discount rate of the order of seven percent is adopted (Harrison *et al*. 2001) but non-market benefits can be substantial (Eono and Harrison, 2002).

The creation of markets mechanisms for rewarding growers for non-wood forest benefits (NWFBs) provides a potential alternative to direct taxpayer support[1]. According to Killin and Brazenor (2003), "It is increasingly apparent that any type of commercial plantation expansion in north Queensland will need to combine traditional timber-only returns with greenhouse and biodiversity bonuses, and returns from the emerging carbon credits market, to achieve a sufficiently high financial rate of return for forestry (seven percent)".

Considerable attention has been given worldwide to the potential to create markets for the ecosystem services and non-marketed products provided by native forests and plantations. This could take the form of annual payments to growers for specific ecosystem service components, or it could involve the creation of some form of marketable certificate for the service. Landell-Mills and Porras (2002, cited in Pagiola *et al*. 2002) identified about three hundred examples throughout the world of experiments with market-based approaches to providing incentives for conserving forests and their public good benefits. Pagiola *et al*. (2002) presented case studies of some of the more advanced experiments, with a focus on three particular ecological services, viz. watershed protection, biodiversity conservation and carbon sequestration.

[1] A *market mechanism* may be thought of as a system for rewarding the providers of ecological services, whereas a *market-based instrument* may be viewed more narrowly as the creation of a trading system for a particular item, e.g. a carbon or salinity credit.

The next section of this paper examines the rationale for creating market mechanisms to allow tree growers to capture a return from the public good benefits of their investments. Market based instruments are then placed within the context of the range of policy instruments available to achieve environmental objectives. The types of forest services for which markets normally do not exist but for which a commodity could be created are then discussed. Experiments and experiences with trading systems are reviewed. Opportunities for payments for ecosystems services of forestry (including small-scale plantations in north Queensland) are then examined. Concluding comments follow.

THE RATIONALE FOR PAYMENTS FOR FOREST EXTERNALITIES

Forest enterprises generate a number of benefits to the community above and beyond those to the tree growers, categorised in general terms as *ecosystem services*. Because the investor (farmer or company) cannot capture the value of these outputs, which are not traded in markets, the private return from forestry is less than the social return, and hence afforestation and reforestation take place at less than socially optimal levels. That is, a form of market failure takes place. This market failure may be particularly apparent for the long-rotation high-value native hardwoods, cf. shorter-rotation exotic conifers. If landholders are to incur private costs to provide benefits for the community, then social justice would suggest there should be some form of compensation from the beneficiaries. It is therefore logical to examine how growers can be remunerated for these positive social externalities.

If landholders can sell some form of ecosystem service credit for the social benefits they generate, then these services become a forest joint product rather than forestry externality (the externality is *internalised*), and this may make the enterprise profitable from a private viewpoint (Binning *et al*. 2002). Hence there is interest in a number of countries in commodification of positive externalities of forests and creation of a revenue stream for tree growers.

Market mechanisms provide an incentive for tree planting and forest protection. Since long payback period is an important impediment to farm forestry, some system of annuity payments allowing a return to be generated soon after planting and before commercial timber is produced may make forestry a considerably more attractive investment. As well as making plantations more *financially viable*, annual payments for ecosystem services can ease cash flow problems, i.e. make forestry investments *financially feasible* for cash-strapped landholders. Revenue from ecosystem services could also reduce financial uncertainty of plantation investments. Further, there may be an important psychological impact of the ecosystem credit scheme, in terms of signaling to landholders that government and traders in ecosystem credits support farm forestry, and that establishing plantations is an ethically correct action. As well, creation of ecosystem service credits could provide a feeling amongst non-industrial foresters of greater harvest security, as a result of a demonstrated financial commitment of government and industry to their enterprise.

The creation of markets for ecosystem services will involve establishment, operating and monitoring costs (i.e. *transactions costs*). In this context, Brand (2002) argued that Australian Federal and State governments are unable to provide sufficient support for developing markets for ecosystem services, and that a more promising option is to mobilize private capital. He observed that forestry investments, which can provide a cash flow from environmental services as well as long-run returns from timber, can be attractive to the private sector. It is probable, however, that government will have to play a major role in facilitation of any ecosystem service marketing systems.

Brand 2002 (p. 237) noted, “The Kyoto Protocol rules, particularly the provisions of Article 3.3, are an important stimulus to this new financial mechanism [investing in carbon

sequestration]. Article 3.3 requires national governments in industrialised Annex 1 countries to account for afforestation, reforestation, and deforestation events occurring since 1990. The Bonn agreement in 2001 confirmed that projects eligible for credits against agreed national CO_2 emission targets would include those where a land use change from non-forest to forest had occurred." He further noted that the accounting methodology adopted is the stock change approach, where forests that are growing are treated as a carbon sink and harvesting is treated as re-emission to the atmosphere.

Companies in some of the industries associated with environmental pollution are likely to show interest in purchase of credits for environmental services, e.g. fuel and energy companies such as Shell and BP Amoco with respect to carbon sequestration (van Bueren, 2001). This may arise because the companies have emission caps placed on them by national governments, or may wish to gain experience in trading before any formal requirement is imposed upon them, or choose to invest in environmental credits to demonstrate good environmental citizenship. Should the Kyoto Protocol be ratified internationally, then mandatory constraints can be expected on net carbon emissions, and since vegetation sinks are recognised in this regard, industry will be required to reduce their emissions or purchase emission credits[2].

MARKET-BASED INSTRUMENTS VERSUS OTHER POLICY OPTIONS FOR ENVIRONMENTAL PROTECTION

In practice, a variety of *environmental policy measures* or instruments have been applied by government at its various levels to overcome environmental problems, or bring about a 'socially efficient level of emissions'. Figure 1 provides a summary of the more common of these methods. Some of these methods use the authority of the government to command that polluters limit their emissions (command-and-control or CAC methods). Some facilitate operation of a market for abatement (market-based instruments, MBI), while some rely on development of improved technology to mitigate emissions or to repair damages. As well, governments can undertake direct action for environmental protection, at taxpayer expense. These policies may be compared on the basis of a number of criteria, including: efficiency and cost-effectiveness; fairness (equity); environmental justice; incentives for long-run improvement; information requirement, implementation cost and enforceability; and moral considerations.

In general, environmental economists advocate market-based instruments (MBIs) as alternatives to standards and CAC measures, which are unpopular with industry and lead to avoidance and high enforcement costs. The creation of marketable certificates creates private sector incentives for environmental protection, and allows those who can generate the benefits at lowest cost to do so, and those who would not be cost-effective in generating the service to purchase certificates from others (Field and Field, 2002). Hence the service tends to be produced at lowest overall (economic) cost in a free and well-defined market.

Forestry is typically assisted by the MBI of abatement subsidies, and by direct government expenditure on plantations and conservation plantings. Traditionally, non-industrial forestry has been encouraged through various forms of subsidies and grants for tree planting. However, this imposes an obvious cost on the taxpayer and, further, subsidies appear not

[2] Sinks are included in national allocation plans but at the time of writing it was still to be decided whether forestry sinks will be fully incorporated into the flexible mechanisms of the Kyoto - Joint Implementation, the Clean Development Mechanism, and emissions trading; for example, forestry sinks are currently excluded from the EU Emissions Trading Scheme. This may be resolved at the ninth session of the Conference of the Parties (CoP 9) of the United Nations Framework Convention on Climate Change.

particularly effective for promoting tree growing unless they are set at a high level, and they are currently out of favour with Australian governments. Commoditisation of ecosystem services and trading of some form of transferable permit such as a carbon credit is an alternative to taxpayer-funded subsidies.

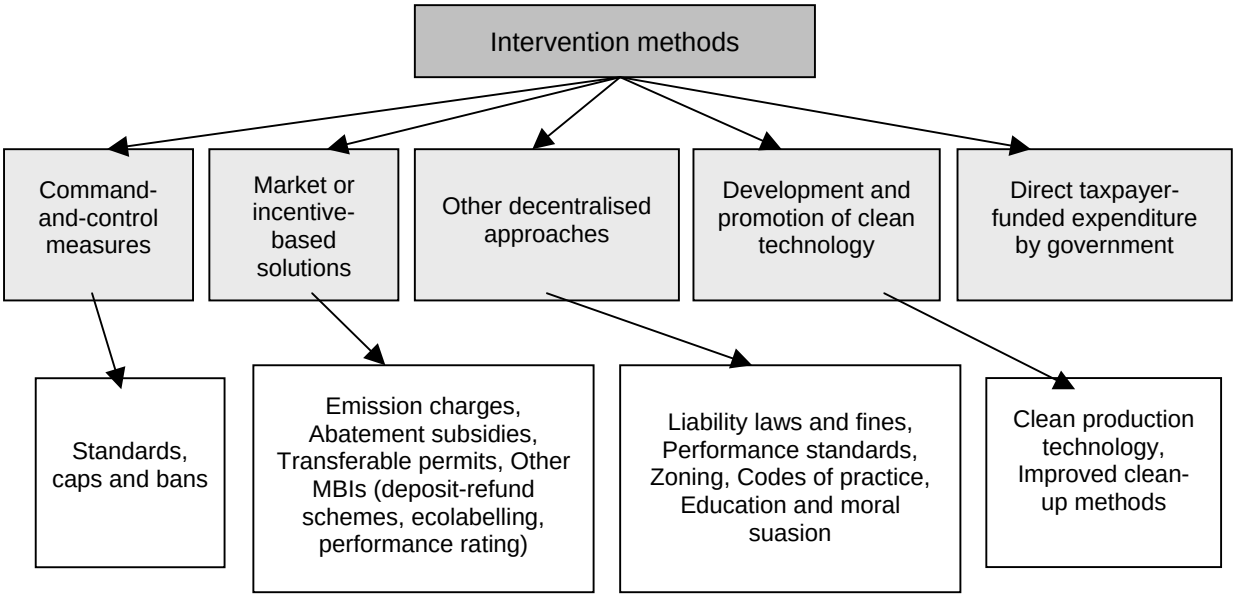

Figure 1: Policy instruments for environmental protection or to promote remedial action.

The idea of introducing market mechanisms for payment for forestry ecosystem services is appealing in that the market rewards the service provider, and taxpayer subsidies are not needed. A difficulty in operating transferable permits for ecosystem services is the middleman cost of managing the market and the securing a profit for services. Added to this is the high transaction cost of estimating and validating the economic benefits of the services provided, and monitoring the service provision over time, and maintaining a trading system. Depending on the scale of forestry operation, and the complexity of the validation and monitoring system, the transaction costs could outweigh the value of the ecosystem service benefits provided, particularly for small-scale operators. A highly scientific validation and monitoring system would provide confidence in the environmental product for traders; a simple assessment and monitoring mechanism though somewhat imprecise may make the trading system more viable financially and more easily adopted by landholders. The simplest approach is to base payments on the area planted, and perhaps other factors such as land type, species planted, and the assurance of continuation of the land under forestry[3].

Because costs of tradable permit mechanisms can be high, they are not necessarily the most socially-efficient means of rewarding tree growers for the environmental services generated. A similar effect can be achieved with subsidies or grants. The high woodland grant payments in the UK and assistance measures in Germany for non-industrial foresters are, at least in part, payments for ecosystem services. In the UK, landscape amenity is considered an important service of forestry, as reflected for example by the fact that higher grants are paid for stands of broadleaf species than for conifers (Hill, 2000). Government support for farm forestry in the Black Forest region of Germany in part reflects social benefits of retaining an

[3] Sometimes harvesting is permitted only on condition of prompt replanting.

attractive rural landscape (supporting tourism) and stable rural population (reducing the drift to the cities)[4].

It may be argued that tradable permits are superior to subsidies or grants because the former are earned in markets while the latter are born by taxpayers. However, the distributional impacts require closer scrutiny. If a fuel company were to purchase carbon credits, the cost would be borne by motorists and shareholders. If an electricity generator were to purchase carbon credits, the cost would be borne by electricity consumers. In other words, the members of society meeting the cost of the ecosystem service are not radically different to taxpayers in general.

An argument against subsidies and grants is that they create a 'dole-out mentality' and that landholders do not value plantations for which they have incurred little personal expense. In contrast, transferable credits allow landholders to earn revenue from their own endeavours. That is, the psychological impact of a market for ecosystem services could be important. As well, there might be greater certainty of the long-term continuation of the market, cf. the notoriously short life of most government forestry support programs in Australia. Further, transferable credits may be more efficient in terms of linking payments to the value of environmental benefits, cf. the often political targeting of forestry subsidy programs.

EXPERIMENTAL TRADING SYSTEMS FOR FOREST ECOLOGICAL SERVICES

The commodification of ecosystem services requires establishment of some form of product and market mechanism. According to Pagiola *et al*. (2002, p. ix-x), "The sale of ecosystem services is a complex undertaking with a tremendous variety of market structures, payment schemes, and numbers and types of participants … Issues of property rights, pricing, and interaction between services, not to mention services that have yet to be described, remain problematic. The innovations in this area are still limited in scale, scope, and impact, and trading in environmental services remains a nascent activity." Nevertheless, a number of promising examples can be found of trading in ecosystem services from forests, some of which are now briefly reviewed.

Trading Carbon Sequestered by Plantations

It is to be expected that emission trading schemes will develop in the future (for carbon and other greenhouse gases), and these may include forestry carbon sinks. Estimating the carbon sequestration value from plantations is a complex accounting issue. Questions arise as to whether to use carbon stock or flow estimates for accounting, and whether to include carbon in all parts of the tree (including canopy and roots) as well as soil carbon. It is desirable that net carbon sequestration be estimated, taking account of the previous land use and of the carbon costs of establishing and managing plantations, timber harvesting, transport and processing, and carbon leakage arising from milling and product decay (especially for short-life items such as newspapers). The analyses may also extend to the reduction in greenhouse gases from not producing the products which timber displaces.

Pioneering work on development of a system for trading sequestered carbon from plantations was undertaken in New South Wales. In 1999, State Forests of New South Wales (SFNSW) and the Sydney Futures Exchange signed a Memorandum of Understanding to jointly develop a market for trading of sequestered carbon, which was compatible with Article

[4] Of course, the forestry support arrangements in the UK and Germany may not be appropriate in Australia. Both countries have much higher populations and high industrialisation, and it may be that urban people interface more with rural areas than in Australia.

3.3 of the Kyoto Protocol (Lamb, 2000a). Under the *Carbon Rights Legislation Amendment Act 1998 (NSW)*, carbon sequestration is recognised as a right (a *profit á prende*), and there is separate ownership and trading entitlements to land, trees and carbon rights. A Carbon Accounting Standard was proposed to provide a standardized, transparent and defendable carbon product.[5] It was envisaged that pools would be formed of growers who achieved accreditation in their carbon management system (including SFNSW). The proposal included full and partial accreditation depending on accreditation competence, with the latter having lower accreditation costs and allowing trade of 70% or 50% of the net tradeable mass of carbon[6].

The Sydney Futures Exchange trading in carbon credits was proposed to commence in 2000, but failed to proceed. In this context, SFNSW was ahead of its time. According to Brand (2002, p. 242), "At this point there is no officially sanctioned registry of carbon stocks anywhere in the world". However, Brand (2002) noted that the NSW government in 2002 introduced a penalty of $A10-20/tonne for excess CO_2 emissions, and indicated that carbon sequestration credits could be used as offsets to this commitment, as well as releasing a detailed position paper on carbon credit accounting, registry and trading systems.

A drawback of the carbon credit trading proposal, identified by Lamb (2000a,b), is that the compliance requirements would be too expensive for individual small growers, a minimum forest area to support the transactions costs being of the order of 1000 hectares. This might be overcome to some extent by a pooling process, with the carbon pool managed by a large firm, private consultant, industry association or grower cooperative, and sharing of the carbon credits amongst the pool. One example might be the joint venture plantings, such as those undertaken by government or by timber companies and landholders.

Another Australian initiative for trading sequestered carbon is the Hancock Natural Resource Group's New Forest Program. This is designed to "establish investment products that will assemble a portfolio of different forests with varying profiles of carbon sequestration, land and water rehabilitation benefits, timber production, and other returns" (Brand, 2002, p. 237).

The above proposals place high priority on accountability. However, they are perhaps too complex for many situations, including application to smallholder forestry in developing countries. In contrast, Pagiola *et al*. (2002) envisaged a somewhat simpler carbon trading system, which would be workable in developing countries.

Marketing of Watershed Protection Values

Pagiola (2002) reviewed a formal, countrywide system of environmental service payments for water services of forests in Costa Rica. These services include reduction in sediment loads, regulating the timing of water flows, increasing flows (particularly in dry seasons), and improving water quality. It is noted that the services typically are enjoyed by people some distance from the forest that generate them, and land users in or near the forest typically do not receive any compensation for providing the services. In this initiative, payments were made to watershed land users by electricity companies at a rate of US$42/ha/year for reforestation and forest management activities. In the event, only 24,000 hectares out of a target area of 200,000 hectares was specifically financed from water services between 1997 and 2002.

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[5] The National Carbon Accounting System was established in 1999, and first reported in 2002. Australia's land-use change emissions have now been estimated for the period 1988-2001 (AGO 2003).

[6] This has now been superseded by the rules governing the Kyoto Protocol, which will require compliance with the Marrakesh Accords and provisions arising from CoP 9.

Marketing of Salinity Mitigation Credits from Forestry

Reforestation is recognised to have high potential for amelioration of dryland salinity. Salinity credit trading has taken place in the Murray-Darling Basin in Australia, but this appears to have been between governments, and not as compensation to landholders for reforestation in the catchment. No case studies of trading in salinity credits are provided in the collection of papers by Pagiola *et al*. (2002).

Bioprospecting

Laird and Kate (2002) examined prospects for pharmaceutical biodiversity prospecting, pointing out cynically that this was a poorly understood area except for the recognition that "many drugs have natural origins, and many sell very well" (p. 151). They concluded that biodiversity prospecting has the potential to provide considerable funding and non-monetary support for forest conservation. However, it is probable that this finding would not carry over to plantation forests.

Payments for Allowing Public Recreation in Woodlots

A further mechanism for generating a cash flow for farm foresters is for government to provide payments for the provision of recreation services. For example, in the United Kingdom, farmers with existing natural stands of forest located near major urban areas are entitled to a Woodland Improvement Grant for works which will encourage informal public recreation in existing woodlands, such as construction of car parks, seating in picnic areas, construction of walking paths and signage, thinning to make views more pleasant, and making the wood safer for the public (Forestry Commission, 1995). Smith (1994) commented on the role of managed landscapes of the UK and the financial compensation to landholders to provide recreation facilities such as camping sites, on their land. Similar arrangements have been provided in The Netherlands where woodland owners who allow public access are compensated for expenditure on items such as footpath maintenance and litter collection (Hummel, 1991). It is questionable whether Australian governments would be prepared to make payments for recreation services of private forests, given the large areas gazetted as National Parks and the lack of culture of public access to private land.

Use of Thinnings and Harvest Residue as Biofuel

Fuelwood is an important product from forests in developing countries, and plantation timber is burnt for energy generation in some European countries, though biofuel use is limited in Australia. In a sense, this is a type of environmental service of forestry, in that fuelwood provides a sustainable primary energy source to displace some fossil fuel use. A promising application is in small-scale electricity generation. Biofuel energy generation is widely adopted in Europe; for example much of the plantation-grown timber in Denmark, along with cereal stubble, is used for urban heating networks. Biofuel electricity generation requires a relatively large and continuous wood supply, and considerable capital outlay is involved in setting up the generation plant and linking to transmission lines. Also, in Australia environmental groups oppose this energy source fearing the fuelwood will be extracted from native forests. More impetus could be given to use of biofuel if there is a substantial increase in the Australian government's mandatory renewable energy target (MRET).

Some Observations from Experimental Applications

A number of observations may be drawn from the examples of trading systems reviewed above.

- Trading in forest ecosystem services is still in its infancy.
- Major administrative issues have to be overcome. As noted by Brand (2002, p. 244), a key impediment to commercialisation of environmental services is the lack of definition, accreditation and registration of these goods and services.
- Clear evidence of demand is necessary to set up markets, which should be recognised as demand driven rather than supply driven.
- Transaction costs can be high, including setup, assessment, validation and monitoring costs.
- The revenue generated from trading may be sufficient to make a difference in terms of plantation viability. Two Australian examples of potential values and prices of ecosystem services may be cited. Brand (2002) reported that financial modeling by Hancock Natural Resources Group (HNRG) indicates an increase in after-tax rate of return on forestry investments from 10.6% to 12% from inclusion of carbon credits, based on a price of US$5 per tonne of CO_2 equivalent. Wilson Land Management Services and Ivey ATP Agricultural Consulting and Management Services (2002, cited by Venn in press) estimated that the net present value (NPV) of off-site salinity costs avoided by establishing 6,310 hectares of plantations within the catchment was $427/ha at a discount rate of eight percent.
- Managing forests for joint products can lead to differences in silviculture. It may be necessary to extend the harvest age, and take other measures to achieve joint products at some sacrifice to wood production.
- Future prospects are promising, particularly for trading in carbon credits. Brand (2002, p. 244) noted that "There is widespread optimism that carbon sequestration may be the first of these international environmental commodities…. Once these markets are functioning and the price signals and forward price curves are established, we will see institutional capital take a lead role in providing services such as carbon sequestration, watershed management, and biodiversity enhancement."

POTENTIAL FOR MARKETING NON-WOOD FOREST/PLANTATION VALUES IN NORTH QUEENSLAND

There are a number of products and services of plantation forestry in north Queensland which potentially could be made into commodities, such that growers could receive a return from them. These include:

- carbon sequestration;
- watershed protection (protection of water quality, soil erosion control, sediment control, flood mitigation, maintenance of dry-season flows, protection of marine habitat) ;
- salinity mitigation (watertable management) ;
- biodiversity conservation or enhancement;
- bioprospecting;
- forest recreation (landscape amenity, access roads, walking tracks, seating) ;
- wildlife habitat; and
- biofuel production (especially from thin-to-waste timber and harvest residues).

The values of these services and products will vary with the type of forest, type of potential purchaser, community attitudes and government policy. Plantations produce carbon, and add to watershed protection and salinity mitigation, while native forests have greater biodiversity conservation and bioprospecting values.

The impetus for trading in carbon credits arises from international factors – e.g. concern over global warming – and consequent international accords such as the Kyoto Protocol and its flexible mechanisms. In the case of other environmental services, the externalities are mainly confined to the local region, hence there is less international pressure for control mechanisms and less impetus to develop trading systems. However, there is perhaps stronger justification for domestic beneficiaries to compensate landholders for providing the services.

Tradable Credits from Carbon Sequestration

In Queensland, the large firms that generate greenhouse gases are likely to be the ones interested in purchasing greenhouse gas credits, and having cash flows sufficiently high to be able to do so. These include electricity generators (since most generation is by coal-fired plants) and fuel companies (since motor vehicle emissions contribute to CO_2 and other undesirable emissions). A system of renewable energy certificates (RECs) is now operating in Australia. In the case of local positive off-site impacts, such as watershed protection, the benefits are felt at a local government level (e.g. local government manage domestic water supplies), but often local government would have difficulty funding payments for ecosystem services.

It is probable that in the case of farmers in north Queensland, with only a small area of forest, the cost associated with a system of tradeable carbon credits would outweigh the benefits. Harrison *et al*. (2003) noted that in a sample of 72 participants in the Community Rainforest Reforestation Program, 34% had planted less than 3 hectares, and 24% between three and ten hectares, the median area being 3.5 hectares and the maximum 45 hectares. New large industrial growers, such as the companies planting eucalypts in southeast and central Queensland, may have plantations of sufficient scale to enable trading in carbon credits[7]. It may be that grower associations (such as the North Queensland Timber Cooperative) or brokers could aggregate the contributions of small-scale growers in some form of group accreditation so as to make trading feasible.

The most notable effort towards placing real dollars on ecosystem services of forestry in north Queensland has been the Greenhouse Gap Abatement Program (GGAP) initiative, arranged by the Douglas Shire Council and Mossman Central sugar mill. The Australian Greenhouse Office agreed to funding of $1.7million to facilitate the planting of about 3000 hectares of forests, along with other energy projects. It was considered likely that one of the large fuel companies would be prepared to purchase the carbon credits from this program. The GGAP project offered the prospect of payments for carbon sequestration, although the federal government funding was mainly designed for operational activities (or 'making it happen') and it is probable that the carbon credits would have gone proportionally to the Federal governments and the private sector investment companies, who may have then passed on some of the payments to individual tree growers. More fundamentally, it is difficult to envisage how such an area of plantations could be established, compatible with the preference in the region for native species, when the highly generous Community Rainforest Reforestation Program achieved a planted area of only about 2000 hectares over six years. Depressed sugar prices and the relatively small catchment area have resulted in financial difficulties for the Mossman Central sugar mill, and the GGAP initiative (which includes an ethanol plant at the mill) may not proceed.

[7] Most of the DPI-Forestry plantations are not Kyoto compliant because they were established before the baseline year of 1990; only post-1990 plantations established on previously cleared land are acceptable.

Watershed Protection and Related Benefits

Given the high levels and intensity of precipitation, watershed protection is of high priority in north Queensland. Establishing plantations on degraded farm land would contribute to erosion control. Prevention of transport of sediment and agrochemicals to the Great Barrier Reef would be a further benefit. Development of a system of marketing watershed protection credits would be difficult; presumably, local governments would need to promote this policy. It may be that governments would opt for a system of standards or best management practice (BMP) rather than tradable permits.

Water Quality Protection

Drinking water quality does not appear to be an issue in north Queensland, with the relatively low population and water storages located within the protected rainforest area. Of greater concern is water quantity, exemplified by recent shortages of town water on the southern Atherton Tableland, although forestry has limited ability to increase water yield.

Salinity Mitigation

Dryland and irrigation land salinity does not appear to be a pressing problem, in part due to the very high rainfall and the soil types in much of north Queensland, although it may become an issue around the Burdekin Dam.

Biodiversity Protection and Bioprospecting

Research is being devoted to bioprospecting in north Queensland, but from natural forests, not plantations.

Wildlife Habitat

Surveys of landholders indicate that plantations do provide habitat for macrofauna (mainly lizards and birds), although the habitat contribution is small in relation to the World Heritage rainforests, and it is unlikely that any support for tradeable permits would be provided for this reason.

Forest Recreation

It is unlikely in the present political climate that payments would be made for landscape amenity benefits of farm forestry. High landscape amenity is provided in the region by the large area of protected rainforests, including nearly one million hectares in the Wet Tropics of Queensland World Heritage Area.

Biofuel Production

Currently in north Queensland, logging residue is burnt on site or left on site. An opportunity exists for electricity generation utilising biofuel from thin-to-waste and harvest residues, for which technology is currently available. However, the likely low market value would not have a strong incentive effect, though this situation could change with an increase in the MRET target. Opportunity exists for linking bioenergy generation with the current cogeneration of sugar mills.

Negative Externalities of Plantation Forestry in North Queensland

It is notable that farm forestry in north Queensland also generates some negative externalities, such as provision of habitat for feral animal pests and native pest species, which cause crop damage. These problems are dealt with by standards (e.g. a requirement to control feral pigs) and cull quotas (e.g. for cockatoos). Both species could be turned into resources for hunting and domestic or export sale, although this does not seem compatible with current government environmental culture[8].

CONCLUDING COMMENTS

Traditionally, farm forestry has been supported by subsidies and grants. Transferable credits are an alternative market-based instrument, which converts the ecosystem services of forests into a market commodity. The marketing of forest ecosystem services and other products and services has potential to improve the financial viability of small-scale timber plantations, and hence encourage accelerated planting and generate substantial public good benefits. To date, such commoditisation has been largely experimental throughout the world, though viable models have been devised. In north Queensland, opportunities exist for marketing forest ecosystem services (particularly carbon credits) and for creating markets for plantation waste. It can be expected that these markets will develop in the future, providing the institutional framework is supportive. Should market mechanisms become available for what are currently externalities, farm forestry will have less of an image of a non-viable enterprise, and more investment funds are likely to become available, although lack of economies of size may be a limiting factor.

The political climate for greenhouse gas emission reduction through plantation forestry is strong in Australia, which has argued for vegetation carbon sinks during international negotiations. On the other hand, limited support can be expected for marketing of other ecosystem services of farm forestry. In Europe, access to the countryside tends to be regarded as a birthright of the urban population. In contrast, some countries including Australia have a stronger exclusion attitude to farm land, supported by trespass laws, and concerns over bushfire risk. Whereas pioneering work on trading of credits for carbon sequestration has been carried out in Australia, progress is likely to be slow on developing tradable permits for other plantation ecosystem services.

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TIMBER MARKETING EXPERIENCES FROM THE SUB-TROPICS

15. ESTIMATING FUTURE TIMBER NEEDS: A CASE STUDY FOR THE SUNSHINE COAST AND HINTERLAND

A. Sewell

Surveys of local industry on the Sunshine Coast and hinterland have shown that local artisans and larger manufactures have a keen interest in the uses of locally grown timber species. Items currently made from these timbers include dining room tables and chairs, side units, bed ends, chest of drawers, outdoor furniture, carving and turnery. This paper outlines the results of the surveys carried out during 2000 and 2002. Details have been obtained on species preferences, furniture timber requirements, optimum sawn board dimensions, minimum and maximum lengths needed, sawn volume requirements for furniture, current financial seasoned san timber values, the industries concerns for their long-term supply of timber, and costs and the availability of cheap timber imports.

INTRODUCTION

It has long been apparent to stakeholders in the farm forestry sector in the Sunshine Coast hinterland that detailed information is needed about local timber users (Francis, 1929; Smith *et al*. 1991), in order to identify their concerns, species preferences, volumes required in their businesses and sawn timber requirements. An opportunity to obtain this information has been provided by the Maleny *Chainsaw to Fine Furniture Expo*. This event, founded by the Barung Landcare Association in Maleny and first held in 1996 has provided an excellent outlet for the local artisans to promote their skills in manufacturing goods from timber and in the promotion and use of the local timbers. It has also provided an important educational tool for the community as to the establishment, management and harvesting of plantation timbers and the ecological and sustainable management of privately-owned native forests.

This paper reviews the results of two surveys conducted during the Barung Landcare Chainsaw to Fine Furniture Expo in Maleny in May 2000 and 2002. Local exhibitors provided substantial information about select grade prices, log lengths and milling sizes required and their concerns for this cabinetwood industry. These two surveys were limited to manufactures mainly on the hinterland of the Sunshine Coast but who are playing an important part in the local economy and the establishment of a farm forestry culture for the region. A list of 10 questions was developed relating to the information thought necessary from the local industry to gain an insight into the operations and needs of the industry. The questions were initially prepared and assessed by a number of local furniture makers. The questionnaire, a copy of which is provided in Appendix A, was posted to seventy local artisans, with individual responses treated as confidential. A total of thirty responses was obtained with the response rate being 43%, which has provided sufficient data to gain an insight into the operations, and needs of the industry. Most of the artisans either attended the Expo or mailed their responses to the Barung Landcare Association from where they were collated.

RESULTS OF THE SURVEY

The preferred species are indicated in Table 1. There was a strong preference for native species, with red cedar a clear leader, although the exotic species camphor laurel ranked fourth in terms of frequency of listing.

Table 1: Timber preferences by furniture manufacturers.

Species	Trade Name	Number of Times Species Chosen
Toona ciliata	Red cedar	21
Araucaria cunninghamii	Hoop pine	15
Grevillea robusta	Silky oak	15
Gmelina leichhardtii	White beech	11
Acacia melanoxylon	Blackwood	10
Eucalyptus grandis	Rose gum	8
Flindersia schottiana	Silver ash	8
Flindersia australis	Crows ash	6
Allocasuarina torulosa	Rose sheoak	5
Castanospermum australe	Black bean	5
Dysoxylum fraserianum	Rose mahogany	5
Elaeocarpus grandis	Silver quandong	5
Eucalyptus tereticornis	Forest red gum	5
Flindersia brayleyana	Qld. maple	5
Lophostemon confertus	Brush box	4
Corymbia citriodora	Spotted Gum	3
Eucalyptus cloeziana	Gympie messmate	3
Eucalyptus microcorys	Tallowwood	3
Eucalyptus pilularis	Blacbutt	3
Eucalyptus siderophyloia	Grey ironbark	3
Melia azaradach	White cedar	3
Agathis robusta	Kauri pine	2
Araucaria bidwillii	Bunya pine	2
Eucalyptus resinifera	Red stringybark	2
Eucalyptus saligna	Sydney blue gum	2
Acacia harpophylla	Brigalow	1
Alphitonia excelsa	Red ash	1
Ceratopetalum apetalum	Coachwood	1
Corymbia intermedia	Red bloodwood	1
Dysoxylum mullerii	Red bean	1
Eucalyptus propinqua	Grey gum	1
Melicope elleryana	Pink euodia	1
Sloanea woollsii	Yellow carabeen	1
Syncarpia glomulfera	Turpentine	1
Interstate imports and exotics		
Camphor laurel		13

Species	Trade Name	Number of Times Species Chosen
New Guinea rosewood		7
Tasmanian oak		5
Jarra		4
Brazillian mahogany		3
Kwila		3
European beech		2
Huon pine		2
Mango		2
Tasmanian myrtle		2
Radiata pine		1

Manufactures preferred boards that are rough sawn, preferably air-dried and sometimes kiln dried. Other timber pieces identified for use include slabs, decayed timber of various sizes, natural forms and turning blanks of various widths and thicknesses. Optimal board dimensions are indicated in Table 2.

Table 2: Board sizes regarded as optimal by furniture makers.

Percentage of Sawn Boards (%)	Board Thickness (mm)	Width (mm)
48	25	50 - 500
32	38 - 50	100 - 500
20	squares	50,75,100,150, 200

Preferred optimum lengths identified from the survey were as are listed in Table 3. It was noted that long lengths (e.g. five to six metres) were not requested, and it was not considered essential for boards be totally defect free.

Table 3: Preferred optimum lengths.

Lengths Required (m)	Percentage of Supply (%)
0.5 – 1.0	26
1.0 – 2.0	32
2.0 – 3.0	32
3.0 – 4.0	8

In respect to specific items of furniture by species, it was that all of clients request specific species to be used when samples of the manufactures work is on display or where a photographic record has been kept of the articles made previously. Many manufactures (64%) preferred to produce *one off* products by species instead of *production runs* using the same species.

The results of the question ‘What do the clients request’ revealed that twenty percent of clients request made-to-order items, 66% are open to ideas of the manufacture, eight

percent make requests based on previous work and four percent of manufactures design and sell their own products.

Units manufactured by wood workers include the following top ten in order of priority: dining tables, chairs, coffee tables, shelving/sideboard units, turned items, bed suits, chest of drawers, carving/sculptures, corner units/TV units and outdoor furniture. Other items included cupboards, desks, small boxes, games/puzzles and pens, bar stools, coffins, indoor settings, windows and doors.

Volumes of sawn timber needed for individual articles are reported in Table 4. These estimates refer to net timber requirements only, and do not allow for wastage in furniture production. A further twenty to fifty percent in timber volume is needed to allow for machining and wastage.

Table 4: Timber volumes required for some furniture manufacturers.

Item	Volume /cubic metre (nett)
Dining table	0.15 – 0.2
Chairs	0.002
Coffee tables	0.02 – 0.08
Shelving/side unit (1800 x 700 x 400)	0.08 – 0.15
Chest of drawers	0.1 – 0.15
TV cabinets	0.1 – 0.18
Doors	0.5 – 0.7

Manufactures have been divided into three main groups: niche marketeers (50%) where the volume of timber turnover per year varies from 1 to 10 cubic metres; medium manufactures (20%) with volume from 11 to 20 cubic metres; and industrial (30%) with volume of 21 to 100 cubic metres.

Some current prices paid for sawn boards of native timber species are reported in Table 5.

Table 5: Current prices of sawn boards, native tree species.

Species	Price ($/m^3)
Native species	
Blackwood	1500 - 2500
Silver ash	2000 - 3000
Queensland beech	2300 - 3000
Queensland maple	2100 - 3000
Silky oak	1800 - 2150
Red cedar	4200 - 5000
Exotic species	
Brazilian mahogany	4200 - 5000

Species	Price ($/m^3)
Fijian mahogany (Meranti)	1650 - 3000
European beech	5600

Furniture manufacturers reported a number of concerns with regard to the supply of cabinet timbers for their production activities into the foreseeable future, as listed below.

- Unavailability and increasing costs of sawn boards.
- Competition from low-cost imported timbers.
- Lack of information and support for the future of small scale farm forestry in this region. This includes the withdrawal of support programs (notably Treecare[1]) and general farm forestry information previously provided by government agencies
- Importation of low-priced furniture.
- Lack of information on native forest management. Government agencies have withdrawn educational support except to supply advice on conservation values.
- Lack of availability of wide boards and slabs
- Having to compromise by using less preferred species due to limited species availability.
- Lack of information on the use for recycled timber.

Doubtful of future supplies in quality and available quantity from plantations (mature timber required). The long-term success of plantations currently being established will greatly depend on the quality of sawn board recovery and quality of sawn boards from harvesting and milling in twenty to thirty years time.

DISCUSSION

The survey into the local timber industry has provided information about a number of defined issues from species preferences, optimum sawn board sizes, maximum lengths of boards needed, what are the main furniture pieces produced, cost of supply and the volumes required for individual items. It has also provided information on the size (i.e. volume of timber throughput) of local manufactures, the current prices being paid for the sawn board and the manufactures current concerns for the industry.

The results of the survey have shown that local artisans and the larger manufactures have developed a keen interest into the uses of locally grown timber species (Sewell, 1998). Some use of imported timbers from interstate and overseas also occurs in the region (Bootle, 1983). There appears to be a diverse range of goods being produced in the Sunshine Coast hinterland from local timbers, including dining room tables and chairs, side units, bed ends, chest of drawers, outdoor furniture and turnery.

There is a strong correlation between what the local farm foresters are currently planting and the major preferred species for woodworking. Further research will be needed before some species, which have proven to be unsuccessful at this stage in plantations (including red cedar), can be grown with confidence for furniture production.

[1] A government scheme, which operated successfully for ten years (1990-2000) providing advice to landholders on the role of trees within their landscapes, for biodiversity, rehabilitation, farm forestry plantations and native forest management.

The use of a major weed species for furniture production (camphor laurel) and the difficulty of eradicating this species from the landscape may necessitate a review of its potential as a commercial resource and the subsequent management systems on offer.

ACKNOWLEDGMENTS

The data presented in this paper could not have been compiled without the assistance and support of the Barung Landcare Association of Maleny, local furniture makers and artisans, sawmillers and contractors. Their support and candid replies to the questionnaire is much appreciated.

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APPENDIX A

QUESTIONNAIRE USED IN THE SURVEY OF FURNITURE MANUFACTURERS AT THE CHAINSAW TO FINE FURNITURE EXPO

Question 1

What species of timber do you prefer to work with and what are your top ten selections? If possible please list cabinet timbers as well as some hardwood species if used.

Question 2

Could you please list your main production areas (e.g. dining room table and chairs, side units, wardrobes, outdoor furniture or other)?

Question 3

Do you have an idea of the volume of timber required for a year's full production in your workshop?

_____ cubic metres

Question 4

Could you please list the specific needs of the timber needed in your work (e.g. 'timber rough sawn', 'timber dressed', 'air-dried' or 'kiln dried', or 'recycled')?

Question 5

Is it possible to list the total timber requirements (volume in centimetres) to produce individual furniture products? A rough guide will do unless you have specific lists available eg. Amount of timber needed to produce a dining room suite of one table and six to eight chairs, a sidewall unit and a wardrobe etc.

Question 6

What sizes of timber do you prefer to work in, e.g. 70% - 25 mm boards 150-200 mm wide, 20% - 40 mm wide boards and 10% - 50,75,100 mm squares. Could you please provide an estimate of your needs?

Question 7

What are your optimum lengths of timber you work with? Is there a minimum and maximum length needed?

Question 8

If producing furniture, do you prefer to have a specific timber species in large quantities to be able to produce a production run of furniture or do you select specific species and quantities for one off products?

Question 9

How specific are your clients in detailing what they want or are they open to a range of ideas suggested by you, your designs and your previous work?

Question 10

What are your concerns if you have any in regard to the supply of cabinet timbers for your business needs into the foreseeable future? Could you please list them?

16. LOG PRICING FOR LOCAL TIMBER SPECIES IN SOUTHEAST QUEENSLAND: WHAT ARE THE ISSUES AND CAN THEY BE RESOLVED?

A. Sewell

This paper raises issues that need to be addressed to encourage the small-scale forest industry based on native rainforest cabinet timbers to develop and prosper in the future. Prices being paid *at the stump* to growers of hardwood and rainforest cabinet timber species are below what may be necessary to enable a sustainable viable industry in the long term. Data have been compiled for seasoned, select grade, cabinet timbers and are compared with known prices paid for sawn, seasoned select grade hardwood. A key finding is that current prices being paid at stump may well be half to one quarter the true value when compared to the sawn seasoned prices being paid for rainforest cabinet timbers.

INTRODUCTION

Historically log prices in Queensland have been set by government agencies in consultation with the sawmilling industry. These prices took into account the value-adding costs incurred in the cut, snig and haul process, and their relationship to the processing and marketing costs. Also, stumpages reflected an understanding that log valuations took into account the location of country towns sawmills and product produced was based on green-off-saw timber.

Tree growers, being at the lowest end of the wholesale chain have little or no control over the prices being paid at the stump for their product except the opportunity to withdraw it from sale or value-add on the property by on-site milling, drying and machining. Often the lack of knowledge by the private owner of processes and marketing has caused disappointment with financial returns. Demand has also been influenced by timber imports from Asia, New Zealand and the American west coast.

There has been an industrial shift in recent years concerning the supply of logs with the phased removal of state forest reserves in Southeast Queensland from the timber supply chain under the Queensland version of Regional Forest Agreement. This has resulted in a surge in the proportion of privately owned supply from native forest (forty percent to over seventy percent) over the past five years. The responsibility of harvesting logs from private land has generally been left in the hands of the local contractors and the sawmilling industry.

There has been in the past ten years a growing interest by landholders to establish small-scale farm forestry plantations on their properties with the hope that in the long term these will be harvested and generate a financial return. Concerns have been expressed in recent years as to what is being paid at stump for cabinet timbers (Sewell, 1998) and the question arises as what opportunities exist to have these *at stump* prices increased.

Two surveys were carried out during the *Barung Landcare Chainsaw to Fine Furniture Expo* in Maleny in May 2000 and 2002, each involving distribution of questionnaires to local exhibitors. These surveys have revealed some interesting figures, which may influence select grade prices, log lengths and milling sizes required for this local industry. Ten

questions were asked requesting information on species being used, prices paid for seasoned boards, optimum sizes required and volumes used. Seventy questionnaires were sent out, with a forty-three percent response rate.

PRICES FOR RAINFOREST CABINET TIMBERS

Current prices being paid for seasoned timber are listed in Table 1, with estimates of what the dollar values could be at the stump if the imbalance between hardwoods and cabinet timbers were to be rectified over a period of time.

Table 1: Realistic prices for rainforest cabinet timbers *at stump*, 2002.
Note: [a] Lower prices being paid for sawn board from thinning.

Species	Trade name	Price at stump ($/m^3)	Average ($)	Green-off-saw ($)	Select grade ($)	Standard ($)	Cover ($)
Acacia melanoxylon	Blackwood	120-187	153	840	1500 - 2500		
Agathis robusta	Kauri pine	136-215	175	870	2400 - 2600		
Allocasuarina torulosa	Rose sheoak	75-80	77	625	1650 - 1700		
Araucaria bidwillii	Bunya pine	75-85	80	750	800 - 2500		
Araucaria cunninghamii	Hoop pine	75-85	80	750	1500 - 1800		
Argyrodendron trifoliatum	Brown tulip oak	130-200	165	860	2250 - 2500		
Castanospernum australe	Black bean	157-245	201	914	2550 - 3000		
Dysoxylum fraserianum	Rose mahogany	157-245	201	914	2750 - 3000		
Dysoxylum mollissmum	Miva mahogany	136-215	175	870	2400 – 3000		
Eleaocarpus grandis	Silver quandong	136-215	175	870	1200 – 3000[a]		
Flindersia australe	Crows ash	147-230	188	894	2400 - 2800		
Flindersia brayleyana	Qld. Maple	110-170	140	820	2100 - 3000		
Flindersia schottiana	Silver ash	147-230	188	894	2000 - 3000		
Gmelina leichardtii	White beech	136-215	175	870	2300 - 3000		
Grevillea robusta	Silky oak	125-195	160	850	2000 - 2500		
Melia azedarach	White cedar	110-170	140	820	1800 - 2250		

Species	Trade name	Price at stump ($/m^3)	Average ($)	Green-off-saw ($)	Select grade ($)	Standard ($)	Cover ($)
Toona ciliata	Red cedar	350-450	400	2,400	4200 – 5000		
Eucalyptus grandis	Rose gum	55-60		720	900 – 1800	800	400
Eucalyptus tereticornis	Forest red gum	90-95		1,125	1500 – 3000	1,500	750
Lophostemon confertus	Brush box	100-105		1,250	2000 – 3000	1,666	833

The prices listed in Table 1 are designed to provide an indication of what dollar values could be paid for cabinet timber prices at stump, green-off-saw and seasoned select grade. Standard grade and cover grade have not been included in this report but the price for standard grade could be around forty to fifty percent of select grade price and cover grade about ten to fifteen percent of select grade price. These figures are derived from the current select grade financial values provided by the exhibitors of the Chainsaw to Fine Furniture Expo in 2000 and 2002. There are many factors influencing the stump price today and what will be the price in the future.

Allowances for cut, snig, haul, milling, drying, machining and marketing costs, as well as the margins operating between each stage, need clarification if cut stump prices are to be determined. As can be seen from the prices listed in Table 1, there is a marked variation between species, of between \$75 – \$450/m^3 at the stump.

In discussions with local millers it would appear that there may not be a need for standard grade or cover grade in many of the rainforest cabinet timbers because defects can be removed. The sawn board may well be classified as select grade for furniture use because optimal lengths from the surveys suggest that long sawn boards are not required for furniture unless specifically requested prior to milling. Also, there is a market for natural edge products with and without defect included.

At stump values listed in Table 1 for cabinet timbers have been derived using the select grade seasoned sawn figures supplied from the Expo of 2000 and 2002 survey. Prices have been calculated as average prices at stump as well as a green-off-saw value, which may assist future sellers and buyers of sawn cabinet timbers.

A number of issues arise about stumpage prices in southeast Queensland, which warrant further discussion. These include:

- What is the current price being paid by contractors and millers and is this information readily available?
- What should be the reasonable values for cabinet timbers as stump prices, green-off-saw and seasoned boards? Can they be calculated?
- Is there a wholesale price for these species?
- What will the longer-term values be for cabinet timbers once the plantations currently being established come on line and start to supply larger quantities of log to the markets?
- Will the current figures being quoted for sawn product be deflated because of volume availability in the future?

- What prices need be paid ($/m^3) at the stump to provide a viable, sustainable industry?
- What will the quality of sawn product be from plantations relative to the current supply from mature logs from native forest?
- Will plantation-grown species supplied as sawn timber have the same dollar values as those supplied from native forest?
- Will the species being grown in plantations have similar qualities (e.g. colour, figure, strength and density) as that currently being achieved from native forest?
- What is the recovery rate from milling rainforest cabinet timbers, and is it higher than for hardwood and does the recovered material have a wider end use?
- What prevents industry paying higher prices for unique rainforest cabinet timbers?
- Is there a cultural and industrial change on the way where logs will be processed on-site to the manufacturer's requirements, air dried and then sold to the furniture manufacturer for further processing? What issues arise from this change?
- What are the cost differences between on-site porta-milling (using portable bandsaws, horizontal and vertical sawing machines and chainsaw slabbing mills) and conventional fixed-site sawmilling? Questions that need to be answered are - is the sawn timber from porta-milling of the same quality as that from conventional milling, is the recovery rate higher from either milling technique, and are there dollar savings to be made from porta-milling?

DISCUSSION

Growers and industry need to recognise and develop realistic pricing for logs harvested with increased returns for the grower to provide long-term sustainability. Community interest in farm forestry in southeast Queensland is increasing with time, with establishment of plantations of the more valued cabinet timbers species and requests from the local furniture industry for more timber, and there is an urgent need to clarify the major issue of supply and demand. One of the most discussed issues raised by farm forestry growers in the region is: "Is the growing of cabinet timber a commercially viable proposition and what are the expected financial returns for their efforts?" In recent years many forestry extension workers have endeavoured to discuss these issues to assist the grower and industry alike but due to lack of knowledge and understanding of this complex matter, it has invariably been put into the too-hard basket. In the cattle and dairy industries, the rate of return from the farm gate to the local butcher shop or supermarket has been identified as being on average three times the farm gate price for their products. Currently timber prices appear to increase from the stump to the retailer and manufacturer by a factor of 6.5 – 7.5 times.

The discussions raised on these issues of financial timber values from the stump to the seasoned sawn board could offend some parties in the industry because of the privileged information, which is being held privately. If the industry is to be encouraged especially in the establishment of cabinet timber plantations, an endeavour must be made to lay aside any personnel bias and endeavour to provide a broad overview of future realistic prices which will be of benefit to all growers, contractors, millers and manufactures alike.

Given their high-end values, cabinet timbers should be able to provide the growers with a viable economic return for their investment. The Department of Forestry used to classify all cabinet timbers in southeast Queensland as miscellaneous scrub woods, with the exception for red cedar, which attracted a price premium due of its reputation for high quality. Current prices being paid at the stump for cabinet timbers tend to reflect current hardwood prices at the stump, without recognising their greater sawn value after processing. This imbalance needs to be rectified if there is to be a viable long-term sustainable cabinet timber growing industry.

ACKNOWLEDGMENTS

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17. SILVER QUANDONG (*ELEAOCARPUS GRANDIS*) GROWN AS A MONOCULTURE FOR THE SUB-TROPICAL AND TROPICAL REGIONS OF AUSTRALIA: ITS PLANTATION AND MARKET POTENTIAL

A. Sewell

The community's interest in small-scale farm forestry on the basaltic soils of the Sunshine Coast hinterland appears to be a growing trend for the region. Small-scale plantations have been established over the past ten to twelve years. Most if not all these plantations have been made up of a mixture of ten to twelve rainforest cabinet timber species planted at a range of spacings ranging from 625-1600 stems per hectare with a rotational harvesting range of between twenty to eighty years or more. Limited trial results locally and in north Queensland has shown that Silver Quandong quickly becomes the dominant species within the stand and may have potential as a monoculture option for some growers. The long-term view for southeast Queensland cabinet timbers supplied as dried seasoned sawn board is one of high market potential.

INTRODUCTION

Cabinet timbers have been researched over many years by state government agencies working in forestry, especially in Queensland and northern New South Wales (Lott, 1998). The aim has been to identify the most suitable species with the greatest potential to produce a quality sawn board with high financial return. A range of mixed species and monocultures have been trialled, the result being most of the plantations established for industrial large-scale format used hoop pine (*Araucaria cunninghamii*).

The surge in interest in small-scale farm forestry in the early 1990s (Mitchell *et al*. 2001) has resulted in a broad range of rainforest cabinet timber species being planted. Over the past four to five years some species within the mixed plantings have shown excellent growth rates. The top performer has been in most cases silver quandong (*Elaeocarpus grandis*). Silvicultural management techniques of these newer stands has improved markedly in recent years with the better understanding of growth rates, species-site requirements, provenance selection, spacing, species mixes, pruning requirements, thinning options, early harvesting and small-scale milling.

Farm forestry plantation growers have been endeavouring over many years to identify what rainforest cabinet timbers species may be able to be harvested at an earlier age than was previously expected. The majority of cabinet timbers currently being grown (Sewell, 1998) will require a thirty-five to eighty years timeframe to provide harvestable logs for sawn material especially in the higher furniture values required by local industries.

Silver quandong appears to have the credentials to be an important species for plantation development in the subtropical regions of Australia. It has similar possibilities for overseas establishment. It has great potential because it is a fast growing species, free of known fungal infections and has little recorded insect damage.

Hoop pine *(Araucaria cunninghamii)* is one of the most successful native cabinet timber to be grown as a plantation monoculture. There are various other species with the potential to be grown as a monoculture in southeast Queensland, including *Cedrela odorata*, *Eleaocarpus eumundi, Flindersia brayleyana* and *Melia azedarach.*

This paper outlines the current option for growing silver quandong and reviews the opportunities for establishing the species in a monoculture format. The financial returns are reviewed in the broad context of today's dollar values. It is hoped that this initial assessment will encourage discussion and feedback amongst growers, millers, market suppliers and furniture manufactures as to 'where from here' in considering the suitability of silver quandong with its potential of becoming a commercially viable species.

CHARACTERISTICS OF SILVER QUANDONG

Logs of *Elaeocarpus grandis (*syn*. E. angustifolius)* are marketed under the standard trade name of 'silver quandong'. The common names of this species include 'blue fig' and 'blue quandong'. The generic name of this species derives from Greek *elaia*, olive tree; *karpos*, fruit (in reference to the fact that the fruit is olive-like in appearance, is edible in some species of the genus, and can be pickled); Latin *grandis*, large*; folium*, leaf.

The natural range for this species is coastal rainforest and scrub areas from Nambucca Heads in New South Wales to Cooktown in north Queensland on moist rich soils. It is generally found naturally growing on frost-free sites on red basalt soils of volcanic origin as well as alluvial flats in medium to high rainfall areas (1250-2000 millimetres+) with an elevation ranging from coastal plains to 500 metres a.s.l. It has high moisture requirements. In terms of physical description, the tree attains a height of 25-35 metres, a diameter at breast height (dbh at 1.3 metres above ground) of 75-150 centimetres, trunk slightly wrinkled, large buttressing, bark colour grey, under bark colour yellow. The leaves are alternate, elliptical, 75-125 millimetres long, with length 3-4 times the width, having margins finely toothed, and narrow at both ends. Old leaves turn a bright red. The flowers are greenish white and appear about June, with the fruit maturing in the following May to September (Francis, 1929).

Its timber quality allows it to be a species with a multiplicity of end uses as fine furniture, panelling, boat building, turnery and veneers. The potential of the species at this stage has not been fully recognised or researched. The market trend for this species appears sound and its future assured.

Silver quandong has in the recent history of cabinet timber plantation establishment (past ten to fifiteen years), shown to be able to achieve excellent growth rates compared to other species being used. It appears to outgrow most any other species on all sites where the species has been established. From casual observation and measured recordings of dbh and height growth of this species throughout southeast Queensland and northern New South Wales, this species appears to have sound prospects for being grown as a monoculture plantation timber crop, although there has been little research into its potential. In 2003, a site was selected for a small monoculture plantation (four hectares) of silver quandong to be established on the Blackall Range near Maleny. A number of sites have also been selected in coastal southeast and north Queensland to assess its potential.

SILVICULTURE, AND TIMBER PROPERTIES AND USES

The issues which need to be clarified prior to selection of any tree species include: site preference, genetic selection, site preparation, spacing, pruning, fertiliser application,

unmerchantable thinnings, commercial thinnings and final crop stocking, potential markets and net returns. These issues are discussed below.

Planting sites are preferably in the natural range reported above, with plantings established outside this range having the potential to fail or grow poorly due to climatic or soil unsuitability. Some established plantation sites where this species has been tried are well outside its natural climatic and soil range and will ultimately fail. The species is drought and frost sensitive.

There is a range of options for site prepation, e.g. no cultivation, single tyne ripping on the contour, rotary hoeing and mounding. Selection of the best option will depend on the site, financial commitment required and time available.

Current seed source for plantation establishment is from natural collections in the field. Current planting densities are in the range 625 to1600 sph. The optimal planting density appears to be 625-1000 sph. Wider spaced silver quandong in mixed plantations appears at an early stage (four years) to develop large whorls of thick branches and shorter height growth. Pruning can be difficult with large branches and the pruning process may take up to three years to complete, as scaring can be very severe.

The silvicultural management of an average maintenance program will need three to four applications of herbicide for weed control in the initial twelve months. Weed free conditions need to be in place for a minimum period of 24-36 months. Normally each planting site is prepared with the use of an herbicide to control any weed competition prior to planting with follow-up application to a one-metre radius around each tree.

Initial pruning is required to six metres in height, designed to maintain two-thirds foliage retention, with subsequent natural shedding of lower branches through shading as the trees mature. With crown closure and competition, the potential log length could be up to about ten metres, under appropriate thinning and higher pruning options.

To maintain optimum growth of the best trees, poor formed stems and others need to be removed to reduce the stocking by on average one third within six to seven years and a further on third at age ten to twelve years to leave a final stocking of 150-200s/hectare.

TIMBER PROPERTIES AND USES OF SILVER QUANDONG

Questionnaires provided in 2000 and 2002 at the Chainsaw to Fine Furniture Expo exhibitors held in Maleny in the Sunshine Coast hinterland provided valuable information about timber properties and uses. The timber qualities of the species is proving to be highly suitable for most furniture requirements with good machinery working characteristic, and the species is well suited for plywood, boat building; steam-bending, furniture, veneer and turnery (Smith *et al*. 1991).

Early harvesting of young trees in established plantations in the southeast region as part of a thinning regime, has allowed scientific evaluation for timber properties by the Queensland Forestry Research Institute. Sawn boards from timber samples for trees of age six and eight years have revealed timber qualities very close to those of mature wood from one hundred year old trees. This suggests that the species has potential to be grown as a plantation monoculture where a shorter rotation (harvesting age) is required than for other cabinet timber species currently being grown.

There is little variation in sapwood and heartwood colour; timber density is greatest towards the bark. Timber testing revealed a density of 750-kg/m^3 green, and about 495 kg/m^3 dry. Shrinkage (drying) is about 1.5% radial and 4.5% tangential. The durability is in class 4;

timber may last one to eight years in the ground depending on conditions. The sapwood is Lyctid susceptible either green or dry and where the timber is to be used as furniture a preventative treatment (e.g. with Boron) is necessary and preservation and seasoning easy.

Wood-working characteristics may be summarised as: machines well, fixing good, gluing good and finishing well. Major uses in Australia include plywood, boat building, steam-bending applications, furniture, veneer and turnery. Definitions for select, standard and salvage grades are listed in Appendix A.

DATA COLLECTION

Tree performance has been observed at a number of sites selected in coastal southeast and north Queensland. It would appear from the data collected in small-scale plantations in southeast Queensland that on favourable sites, normally basalt-based soils or moist alluvial flats, that the average dbh has an mean increment of three to four centimetres per annum for the early years followed by a slow-down to two centimetres per annum. Average dbh at age six years for the sites investigated revealed a mean dbh of 23.0 centimetres. On suitable sites, the dbh at age ten years is between 25.0 and 30.0 centimetres. Log lengths would vary depending on silvicultural management but an average of 7.2 metres could be expected.

At age fifteen years, dbh could be in the vicinity of 35-45 centimetres, with a potential log length of 9.6-12.0 metres. The '25 Rule' (i.e. dbh x 25 = spacing needs for optimum growth potential) is a useful concept in forestry management but more direct regimes are usually employed, i.e. with wider spacings. This general rule may not be optimal for silver quandong grown in plantations.

PLANTATION MODEL OPTIONS FOR SILVER QUANDONG

Two plantation model options have been considered for this paper:

Model A – Silver Quandong Planted as Part of a Mixed Species Trial

Cabinet timber plantations in the southeast Queensland have been established on basalt soils and alluvial river flats where the species grows naturally. The sites selected for this report have been initially planted with a mixture of fast, moderate and slow growing cabinet timber species (eight to ten species) with a stocking of around 1600 s/ha (stems/hectare). Apart from silver quandong, the species list normally included Queensland maple *(Flindersia brayleyana),* white cedar *(Melia azedarach),* silky oak *(Grevillea robusta),* rose mahogany *(Dysoxylum fraseranium),* white beech *(Gmelina leichardtii),* black bean *(Castanospernum australe),* blackwood *(Acacia melenoxylon)* and tulip satin wood *(Rhodospherea rhodanthema).*

In one particular trial on basalt soils, a mixed stand was planted (following the Jack Mitchell method) at a spacing of 1600 sph with silver quandong at a stocking rate of 533 sph within the stand. This trial has now been thinned with the overstory[1] of silver quandong to 400 s/ha at age six years. The understorey was also thinned down to 400 sph with the removal of trees of poor form and vigour.

It is proposed to commercially thin this stand again at age ten years to bring its overstory down to 200 spa with thinned material of silver quandong again being sawn and sold to identify market opportunities in the local furniture industry. A supply of 200 spa from this next thinning operation at a stand age ten years is expected to have a dbh in the vicinity of 25-30

[1] Dominant trees within the stand.

centimetres+. If the mean dbh were 27.5 centimetres with a log length of 7.2 metres, volumes per stem would be in the vicinity of 0.4 cubic metres or 80 cubic metres/hectare. This stand has been pruned to a minimum height of six metres with subsequent higher branch shedding due to shading and competition. A harvest of the silver quandong in the next five to ten years (age fifteen to twenty years) should provide release for the understorey[2] species incorporated into this plantation.

Prices paid at the stump for select grade mature butt logs (six metre lengths) from native forest appear to be in the vicinity of $90-140/m^3 dependent on log size and quality. Salvage thinning logs from plantations need to be purchased at a lower price because of smaller size and potential lower recovery than can be expected for mature logs. Currently, value could be in the vicinity of $20-25/m^3 for first thinnings.

Allowing for a recovery rate of fifty percent from bandsaw milling and where logs are milled on-site with little snigging costs, sawn volume should be around forty cubic metres per hectare. Current prices being paid by the local furniture manufactures rang from $750/m^3 for thinning material up to $2500/m^3 for high quality select grade, seasoned sawn board. The ratio of sawn board recovered as select, standard and salvage grade from these thinned harvested logs is potentially a 40% / 30% / 3% split. The model used in this thinning process may be but one of many options available to the grower when deciding on a planting and thinning regime for maintaining optimal growth for the plantation.

Harvesting of this stand has proven difficult, in that in the action of removing part of the overstory of silver quandong has led to damage to the retained slower growing cabinet timbers which may only be four to ten metres in height. Extreme care will be needed in felling the silver quandong at the next thinning because the species is developing larger spreading crowns. How to successfully thin without damage will be a major issue in the future confronting most if not all mixed-species plantation stands that have been established in recent years. One option for ease of thinning early is to place silver quandong in mixed plantations in individual rows, e.g. as every fifth row.

Obervations are available from north Queensland on the coastal plains, where silver quandong has been planted as a monoculture at 1388 sph, with no thinning or pruning, and is now aged seven years. The top five hundred stems in per hectare reveal an average of 22.8 centimetres dbh, similar to the performance in southern Queensland. The north Queensland plantation is now showing severe signs of stagnation with deaths occurring due to intense competition and lack of the thinning critical for optimal growth within plantations.

Model B - Plantation Production Model with Silver Quandong Grown as a Monoculture

The growing of silver quandong as a plantation monoculture may well have merit for some landholders if it can be shown that the species can be harvested at an early age of fifteen to twenty years, c.f. other cabinet timber species currently being recommended for the region may well have a harvestable age from thirty to eighty+ years.

Requirements for Establishment and Management Under Model B?

It is recommended that planting be at an initial stocking rate in the vicinity of 625-833 spa (4 x 4m, or 4 x 3m spacing), initially commercially thinned at age six to seven years to a stocking rate of 400spa, with a final commercial thin to 200 spa at age ten to twelve years

[2] Understorey is defined as any species planted which is much slower growing and is therefore not competitive with the overstory species.

with a retained stand of 200 spa. Final stocking may vary depending on site limitations and longevity of the plantation, and it may well need to be reduced to 120-150 spa for optimal growth if longer-term retention is required.

Logs from the first thinning of trials in the Maleny distric have produced an average of 0.136m^3/stem (av. dbh range of 20-25 centimetres with log length of 4.8 metres) allowing for a discard rate of fifteen percent of initial stocking due to poor planting stock, deaths from other causes, recovery should be in the vicinity of 130spa. Therefore, volume production from this site at the first thinning would be in the vicinity of eighteen cubic metres. Considering a sawn recovery rate of fifty percent, 9m^3/ha should be available as sawn board.

Current dollar value for thinning material is estimated to be around \$750-1200/m^3 so total returns from thinnings would be in the vicinity of \$9000 per hectare. This assumption is based on a recovery of 40 / 40 / 20 split (40% select grade, 40% standard grade and 20% salvage grade). A further commercial thinning of the stand to reduce density to 200 spa at age ten years should provide the equivalent of average dbh of 27.5 centimetres with log length of 7.2 metres (0.4m^3/stem or 80m^3/ha). Sawn recovery at 50% with a 60 / 30 / 10 split recovery with price/cubic metre at \$1500 for select, \$750 for standard and \$10 for salvage grade would equate to a total return of \$45,400 per hectare.

The potential final harvest at the age of fifteen to twenty years is an approximate yield of 200 spa, dbh of 37.5 centimetres and log length of 12 metres. A volume of 1.3m^3/stem equates with a total log volume of 260m^3/ha. With a milling recovery of 50% from a 80 / 10 / 10 split of sawn board from 130 cubic metres, it has the potential to return \$222,300 per hectare based on a payment of \$2000/m^3 for select grade seasoned sawn board, \$1500/m^3 for standard grade; and \$100 for covered grades. Return of \$230,800. Total earnings in sawn boards from this evaluation equates to \$285,200 per hectare based on current costing figures of supply to the furniture manufactures of the region.

These figures are as quoted as gross returns for seasoned select dried sawn boards, standard and salvage grades and do not take into account any other establishment, silvicultural, cut, snig, haul, milling, drying, machining and marketing costs involved.

Cut Stumpage Values

From the commencement of the harvesting process there are specific steps required in order to produce seasoned, select grade timber. Sawn timber recovered needs to be quantified at the milling stage to identify the ratio between select standard and cover grade recovery. Estimated at-stump values for silver quandong currently range from \$50-\$80/m^3. Concerns have been expressed in the community that this financial return is low considering the market into which the timber is being placed, i.e. fine furniture and panelling. A review of the *at stump* prices being paid to growers is currently underway which suggests that the price range should be in the vicinity of \$136-215/m^3 at the stump, depending on the log quality.

The following issues that must be considered when assessing these figures:

- What are the potential financial values for the cabinet timbers as stump, green-off-saw and seasoned boards?
- Are the figures quoted *in the ballpark* for returns to growers, processors and marketers?
- Is there a wholesale price for these species?
- What will the longer-term values for cabinet timbers be once the plantations currently being established come on line and start to supply larger quantities of logs to the markets?

- What will be the quality of sawn product from plantation-grown logs and will it have similar characteristics of density, colour and figure to that from natural stands?
- What will be the realistic prices for thinnings and products made from them?

MARKETING AND TIMBER USES

Silver quandong as a commercial timber species used for many years in the southeast Queensland may have the potential for establishment as a plantation monoculture within the plantation estate in this region, and also in northern New South Wales and tropical regions on moist fertile frost free sites. It appears to have merit for early harvesting when a short-term harvest is required.

Results from two recent sawmilling studies in southeast Queensland are presented in Table 1. Logs obtained from six and eight year old plantation thinnings provided highly useful data that may assist in the development of plantations of this species and may provide a monoculture option for some growers.

Table 1: Silver quandong wood properties (Source: Thinning results and sawing trials in Maleny in 1998 and Samford in 2001). Code: Janka (Hardness), MOE (Strength), MOR (Stiffness).

Location and tree age	Density (air dried [kg/m^3])	Mechanical Properties Janka	MOE	MOR
Maleny (age 6 years)	456	2.4	7.25	66.1
Samford (age 8 years)	535	3.4	8	78
Mature wood (age 50 years+)	495-500	2.8	11	72

Current processing techniques include the use of harvesters, bandsaws, porta-milling and conventional circular saw methods of breaking down logs into sawn products. Over time current methods will change as new technologies are developed for the harvesting and processing of logs taken from plantations. Market and end-use options vary greatly depending on size of logs available, distances to milling, market outlets and the expected financial returns.

DISCUSSION

Few sawing studies have been undertaken to evaluate logs salvaged from thinning operations. Investigations of milling of log thinnings into select, standard and salvage grades of sawn boards need to be refined to allow for optialm recovery and thus provide a higher financial return to growers.

The current practice of most nurseries is to use seed as their starting point to supply market requirements. It would be preferable to review seedling production options, and to use cuttings or tissue culture because this may improve their seedling supply chain. Cuttings can have a 79-80% strike rate thus allowing for a shorter supply timeframe year round and avoiding the problems of spasmodic germination that occurs with this species.

Information provided through the Chainsaw to Fine Furniture Expo has shown that length of sawn timber sizes is not generally required in the furniture industries in southeast Queensland. This augurs well for local processing of smaller logs.

Unfortunately, little research work has been carried out with this species. Volume production (mean annual increment in cubic metres per hectare), predictions of financial returns and

percentage of sawn board recovery from plantation grown trees pose questions that will need to be answered in future years as more plantations are established and eventually harvested. Irrigation may be an economic option in drier areas.

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APPENDIX A

DEFINITIONS FOR GRADING OF RAINFOREST CABINET TIMBERS AS SEASONED SAWN BOARDS

Select grade: Select grade applies to sawn boards, planks and squares graded on face appearance for ultimate use in highest quality furniture and joinery and for finishing work. The material shall be well sawn, sound, free from all decay, knots, gum veins, discolouration, end-splits and Lyctus susceptible sapwood, but the following shall be permitted.

(a) Spring – not exceeding 12mm per 3.5m length of piece.
(b) Bow – not exceeding 12mm per 3.5m length of piece.
(c) Sloping grain – not exceeding 25mm in 300mm.
(d) Non-Lyctus susceptible sapwood – provided there is no marked colour difference between the sapwood and heartwood.

Standard grade: Standard grade applies to sawn boards, planks and squares graded on face appearance for ultimate use in highest quality furniture and joinery and for finishing work. The material shall be well sawn, sound, free from all decay, knots, gum veins, discolouration, end-splits and Lyctus susceptible sapwood, but the following shall be permitted.

(a) Pin – knots and pin holes associated with discolouration (Queensland birds-eye) – not exceeding 10mm diameter; aggregate occurrence not exceeding one per 100mm^2 of face; and not more than one occurrence in any one 100mm^2.
(b) Clean pin-holes – not exceeding 2mm in diameter; average number not exceeding three per any 300mm^2 of face; and not more than six per 2lm of piece.
(c) Sound tight knots – not exceeding 12mm in diameter, and spaced not less than 1m apart .
(d) Tight gum veins - not exceeding 4mm wide and 300mm in length.
(e) Spring– not exceeding 12mm per 3.5m length of piece.
(f) Bow – not exceeding 12mm per 3.5m length of piece.
(g) Sloping grain – not exceeding 25mm in 300mm.
(h) Natural discoloration, including white streak inherent in the timber – not permitted in the following species: rose butternut, magnolia, mararie, satin sycamore, sassafras, canary beech and yellow walnut.
(i) Non-Lyctus susceptible sapwood – permitted except in species where there is a marked colour difference between sapwood and heartwood e.g. Queenslanld walnut, red cedar, northern silky oak, and black bean, in which species sapwood shall only be permitted on the face not graded.
(j) End-splits: (1) in boards up to 200mm wide – not permitted.
(2) in boards over 200mm wide – total length not exceeding 300mm.

Salvage grade: Salvage grade applies to recovery from sawn boards, which in the hands of the assessor may be deemed suitable in short lengths for furniture and joinery but have a high discard rate.

18. SPECIES SELECTION FOR CABINET TIMBER PLANTATIONS FOR THE SUB-TROPICAL REGIONS OF EASTERN AUSTRALIA

A. Sewell

In recent years there has been a marked increase in interest by local farm forestry growers in establishing and successfully managing rainforest cabinet timber plantations, using a range of potential species. Silvicultural techniques are changing as farm foresters experiment with alternative species, species mixes, spacings, thinning options and establishment techniques. Little research work has been carried out into the thinning practices required in plantation configurations currently being used in the sub-tropical eastern Australia. Species are identified which appear to be the most suitable for manufacturers requirements of stability, colour, wood-working properties and long-term availability. The case study is typical of many of the recent small-scale plantations established in the sub-tropical region of eastern Australia.

HISTORICAL INFORMATION

During the 1950s and 1960s the Department of Forestry research centres established a number of experimental single-species and mixed-species stands including trials of under-planting species in existing stands of exotic pine, hoop pine, wet sclerophyll and rainforest vegetation. Results have been mixed as maintenance and commitment waned after establishment and early measurement phase of many of the species trial sites.

A change in research policy and direction since the mid 1970s has provided little or no research into the suitability of these cabinet timbers for long-term plantation use. The research emphasis has focused on establishment and management of exotic pine and hoop pine in plantations.

From the mid-1990s, the early stages of the hardwood program were being instigated with trials being established to identify species-site suitability, culminating in the establishment of a Joint Venture Hardwoods Program (Brooker and Kleinig, 1994). In the early 1990s, Jack Mitchell of Samford near Brisbane pioneered the development of farm forestry in the region using a combination of fast, medium and slow-growing commercial rainforest cabinet timber mixtures. Mitchell encouraged the planting in southeast Queensland on a range of sites using a bare earth silvicultural treatment with no site cultivation prior to planting.

The reality of providing a financial crop in fifteen to twenty years versus sixty to eighty or more is highly dependant on species selection, site, rainfall and soil, and needs careful consideration and planning (Sewell, 1998). The options currently available for farm forestry are to encourage growers to make rational and difficult decisions, to make their plantation a financially viable operation. Table 1 lists the major species currently identified for plantation use with trade names and the estimated harvesting age.

Some growers may over time allow their plantation revert to a habitat area without any silvicultural management. These sites may well, in the mid to long-term, provide a timber resource with selective harvesting of trees as they mature.

Table 1: Commercial cabinet timbers and hardwoods approximate age to harvest.

Botanical name	Trade name[1]	Harvest age (years)
Cabinet timbers		
OPTION 1:		
Acacia melanoxylon	Blackwood	15-25
Araucaria cunninghamii	Hoop pine	25-60
Castanospermum australe	Black bean	50-80
Dysoxylum fraserianum	Rose mahogany	50-80
Eleaocarpus grandis	Silver quandong[2]	15-40
Flindersia brayleyana	Qld. Maple[2]	35-50
Flindersia schottiana	Silver ash[2]	40-60
Gmelina leichardtii	White beech	50-80
Grevillea robusta	Silky oak[2]	25-60
Melia azedarach	White cedar	15-40
Rhodosphaera rhodanthema	Tulip satinwood	30-60
OPTION 2:		
Araucaria bidwillii	Bunya pine	25-60
Argyrodendron trifoliolatum	White booyong	60-80
Cryptocarya glaucescens	Silver sycamore	60-80
Dysoxylum muelleri	Red bean	60-80
Flindersia australe	Crows ash	60-80
Podocarpus elatus	Brown pine	40-60
Commercial hardwoods		
OPTION 1:		
Corymbia citriodora (varigata)	Spotted gum	25-60
Eucalyptus cloeziana	Gympie messmate	25-60
Eucalyptus microcorys	Tallowwood	25-60
Eucalyptus pilularis	Blackbutt	25-60
Eucalyptus resinifera	Red mahogany	25-60

[1] The Trade name is officially recognised in the publication by Smith *et al*. (1991) titled *Building Timbers: Properties and Recommendations for their Use in Queensland*. This provides a comprehensive list of Queensland timber species with commercial potential. Common names are generally used to describe the species growing locally in a region.

[2] Best bet species for smaller plantation mixes.

Botanical name	Trade name[1]	Harvest age (years)
Eucalyptus saligna	Sydney blue gum	25-60
OPTION 2:		
Eucalyptus acmenoides	White Mahogany	25-60
Eucalyptus grandis	Rose gum	25-60
Eucalyptus propinqua	Grey gum	25-60
Eucalyptus siderophloia	Grey ironbark	30-80
Eucalyptus tereticornis	Forest red gum	30-80
Lophostemon confertus	Brush box	35-80
Syncarpia gloomulifera	Turpentine	35-80

There are a number of models or options which can be used to establish cabinetwood plantations and the best option depends on who is spoken to, and their own preferences as expert opinion can vary as to what model is most suitable.

A case study of farm forestry is now outlined, to illustrate some of the decisions, which must made by growers.

CASE STUDY OF FORESTRY ON THE JACOBS' FARM

Phil and Patricia Jacobs established their farm forestry plantation on red basalt soils, consisting of two 0.25 hectare cabinet timber plots in July 1993 and October 1994 on their 2.2 hectare property on the Maleny plateau. The plantations comprise a mix of fast, medium and slow growing native rainforest cabinet timber species planted under the guidance of the 'Jack Mitchell method'. The site was prepared by total weed eradication, eight to ten mixed species being planted on 2.5 metre spacing between trees and rows (1600 stems per hectare). Complete weed eradication was continued for a minimum period of five years with up to eight applications of herbicide applied each year. Species established included blackwood (*Acacia melanoxylon*), Black bean (*Castanospermum australe*), red bean (*Dysoxylum muelleri*), silver quandong (*Eleaocarpus grandis*), Queensland maple (*Flindersia brayleyana*), silver ash (*Flindersia schottiana*), silky oak (*Grevillea robusta*), white beech (*Gmelina leichardtii*) and white cedar (*Melia azedarach*).

Thinning Options for this Stand

The rationale for the thinning process on this rainforest site was to remove the poorer formed stems and to reduce the stocking from 1600 sph down to 800 sph at age six years, which comprised four hundred overstory stems and four hundred understorey stems which are much slower growing. A further thinning is proposed at age ten years to thin the overstory down to 200 sph and retain the understorey at its current density.

Selecting species for retention on the basis of diameter growth production (standing volume) resulted in the retention of the dominant faster growing species of silver quandong as the overstory. An understorey of moderately fast growing Queensland maple (*Flindersia brayleyana*) was retained with the suppressed or slower growing species of blackwood (*Acacia melanoxylon*), black bean (*Castanospermum australe*), red bean (*Dysoxylum muelleri*), silver ash (*Flindersia schottiana*), silky oak (*Grevillea robusta*), white beech (*Gmelina leichardtii*) and white cedar (*Melia azedarach*).

If consideration is given to harvest the larger stems of silver quandong at about fifteen to twenty years it will allow the retained understorey species to develop and take over the site. Recent measures are included in Table 2.

Table 2: Diameter measurements for the Jacobs' species trial established in April 1993. Note: Measurement records for dbh 1998-2003. Species – silver quandong (*Eleaocarpus grandis*).

Plot 1 thinned to 400sph overstory at age six years					
Date	5/98	5/99	5/01	5/02	6/03
Dbh	23.5	24.5	25.5	26.0	28.2
Plot 2 not thinned, currently at 1600 s/ha					
Date	5/98	5/99	5/01	5/02	6/03
Dbh	20.1	22.9	23.8	24.7	26.2
Plot 1 Qld maple (*Flindersia brayleyana*)					
Date	5/98	5/99	55/01	5/02	6/03
Dbh	9.7	10.7	11.4	13.9	15.2
Plot 2 Qld maple (*Flindersia brayleyana*)					
Date	5/98	5/99	5/01	5/02	6/03
Dbh	9.7	10.4	11.3	12.4	14.3
Plot 2 White cedar (*Melia azeradach*)					
Date	5/98	5/99	5/01	5/02	6/03
Dbh	14.5	14.5	14.8	14.8	15.2

The thinning process activated at age six years has provided some harvestable sawlogs, averaging 23 centimetres dbh with a log length of 2.4 metres, which were converted via a portable bandsaw to potential furniture grade boards. Logs were sawn through and through, bark-to-bark to provide a mix of quarter and back-sawn boards. Timber slabs were stacked and air-dried to a moisture content of approximately fifteen percent, which took about eight months for 25 millimetre thick boards. Subsequent measurements for this site has shown a limited growth response at this stage (age ten years) from the silver quandong with a minor response from the retained understorey species. Evaluations of these early trials have revealed that:

- Cabinet timbers are site-specific, requiring establishment on basalt-based soils or alluvial creek flats for optimal growth rates.
- Higher stocking rates of up to 1600 sph do assist in earlier crown closure and therefore reduce the number of herbicide applications for weed control.
- Cabinet species currently being recommended require a minimum of 1600 mm rainfall or have to be irrigated to maintain optimum growth rates.
- Combinations of fast, medium and slow species may in the longer term provide difficulties for harvesting without damaging the retained stems because harvesting of selected species can range over a time period of 15-80 years.
- Silky oak prefers full sun with little or no competition to achieve maximum growth.
- Silver quandong appears to have the potential to be grown as a monoculture and on this site has outgrown all other species.
- Silver quandong is showing a small response to the initial thinning but the difference between thinned and unthinned stands will increase with time, because silver quandong

cannot withstand competition as the trees get larger. It has been observed in plantations established in north Queensland that severe stagnation occurs for most of the plantation stand if thinning is not part of the silvicultural program within 10 years of establishment.

- Species thinned are coppicing and these included silver quandong, white cedar and blackwood. Some form of basal herbicide spray at the time of felling will be required to control this regrowth.

Comment and Future Options

Because of the initial planting which consisted of trees with harvest age of 20-80 or more years, severe collateral damage to occur from the trees being removed at the various thinning stages, may have the potential to severely restrict the growth rate of species being retained in the lower strata of the stand.

The rationale for planting a large number of species together (Bootle 1983) is that it does provide in the planting regime aspects such as a greater choice when selecting final crop trees and greater biodiversity values.

Stocking rates of between 600-1600 sph will vary depending on the strategies being proposed under the long-term management of the plantation; high stocking provides earlier crown closure and therefore less weed maintenance is required.

The current trend of limiting the number of species grown together is an acknowledgement that the greater the number of species included in a plantation, the more issues are raised in silvicultural management and for many growers a smaller number of species planted is more suitable for their needs.

Future Species Mixtures

A new considered approach is therefore being canvassed which restricts plantings to only four to five species with a cost saving in establishment and by planting only 625-833 sph. The four species being selected for their rapid growth and higher financial returns include silver quandong (*Eleaocarpus grandis*), Queensland maple (*Flindersia brayleyana*), silver ash (*Flindersia schottiana*) and silky oak (*Grevillea robusta*). In some cases alternate species could include shite cedar (*Melia azedarach*) and blackwood (*Acacia melanoxylon*).

Thinning Options

The current preference is to thin commercial stands of exotic pines and hoop pine from below with preference given to identify selected final crop trees and to reduce the stocking rate by removing slow growing trees and hence to promote maximum growth rates for the trees retained.

As there appears to be no set formula currently available for thinning of cabinet timber plantations, a thinning option has been developed to thin these higher stocked stands (1600 sph) by the following process. Half of the stand is thinned from below to retain the faster growing species at age six to eight years, with a potential second thinning occurring at 10-15 years to retain a final crop of between 150-200 sph.

For the more recently established stands of limited species mixtures and stand density of 625-833 sph, a modified version of the above thinning technique may be suitable, i.e. the stand is thinned at age six to eight years to 400 sph with initial sawlog harvesting possibly occurring with the removal of some of the silver quandong if large enough for milling and the remainder thinned to waste. Subsequent timing of thinning operations to 150-200 sph will be

dictated by growth and market opportunities for the thinnings, with selection for retention being made on the basis of growth, form and spacing. Some compromises will have to be made to suit these factors.

Timing of the harvesting program for the final tree crop will greatly depend on a number of factors prevailing at the time. These include log size, market requirements for selected size of sawn board, milling techniques, rate of sawn recovery and market values, i.e. price for sawn board either green-off-saw or seasoned dried board and volumes available.

The age of the trees at harvest will greatly depend on size and market options. The current view amongst growers is that for the four major species mentioned, silver quandong could be harvested at an early age of fifteen to twenty years as part of the thinning process, silky oak at age twenty-five to thrity years for it to develop sufficient volume and timber colour, Queensland maple at thirty-five to forty years and silver ash at about forty years or more.

Silvicultural issues of quality seedling stock in the form of seed sourced, cuttings and tissue culture require further discussion and research. Identifiable pests and diseases affecting these species also need further study.

SUMMARY

In the past ten to twelve years there has been a marked interest by local farm forestry growers in establishing and successfully managing cabinet timber plantations, using a range of species. The consequence of these plantings has been the use of between ten and twenty-five commercial species in mixtures with stand density varying between 625 and 1600 sph at establishment. The majority of these plantations have been established on red basalt soils and alluvial creek flats with a rainfall of between 1600-2000 mm of more per year.

Silvicultural techniques are changing as farm forestry property owners experiment with alternative species, species mixes, spacings and establishment techniques. New growers establishing themselves in the region appear to be more open in their approach to farm forestry and are more commercially focused in wanting to produce a viable financial return.

This considered approach is showing itself by growers now establishing only four species/ha of silver quandong (*Eleaocarpus grandis*), Queensland maple (*Flindersia brayleyana*), silver ash (*Flindersia schottiana*) and silky oak (*Grevillea robusta*), with a nominal spacing of 625-833 sph with a monetary saving in establishment and management costs. The Queensland Forestry Research Institute is also researching these alternative methods of species selection, spacing and stocking rates.

It must be noted little research work has been carried out into the thinning practices required in all plantation configurations currently being used in the Queensland sub-tropics. To maintain optimal growth rates, some rationale based on *best bet options* and current information of how individual species grow needs to be carefully considered.

Cabinet species have the potential to produce a high quality sawn timber product as required by the market in the foreseeable future, but careful consideration is needed into all facets of the operation.

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