Eco-Certification as an Incentive to Conserve Biodiversity in Rubber Smallholder Agroforestry Systems: A Preliminary Study

Anne Gouyon

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Developing Mechanisms for
Rewarding the Upland Poor in Asia for Environmental Services They Provide

Acknowlegements:
A peer review of this report was conducted by Jeffrey Hayward, Asia-Pacific Manager of the Rainforest Alliance Smartwood Programme.

Published in 2003

The Program for Developing Mechanisms for Rewarding the Upland Poor in Asia for Environmental Services They Provide (RUPES) is supported by the International Fund for Agricultural Development (IFAD).

Published by:
World Agroforestry Centre (ICRAF)
Southeast Asia Regional Office
PO Box 161, Bogor 16001, Indonesia
Tel: +62 251 625415, 625417; fax: +62 251 625416, email: icraf-indonesia@cgiar.org
ICRAF SEA webstite: http://www.worldagroforestrycentre.org/sea

Layout by: Kusuma Wijaya
Cover design by: Dwiati Novita Rini

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Rubber agroforests managed by smallholders, a low intensity cultivation system with a forest like structure, cover more than 1 million ha in Indonesia and contribute significantly to the conservation of forest species. In the face of the rapid deforestation that is taking place in Indonesia, their importance for conservation is of fundamental importance. Rubber agroforests offer many economic advantages to smallholders, such as low development costs and minimal risks. However, they offer a smaller return on land and labour than alternative land uses, such as the monoculture of high-yielding hevea clones, oil palm, and, in areas close to urban markets, intensive food crop production. In the absence of specific incentives, there are no reasons why smallholders should forego the benefits of more profitable land uses for the sake of biodiversity conservation. This means that the conservation community must be ready to reward the services rendered by smallholders willing to conserve their agroforests instead of converting them to higher-productivity land uses. One way of internalising the cost of the conservation services is through eco-labelling of the products coming from the agroforests. Selling eco-labelled products at a higher than average price would increase the economic returns from the agroforests. This report examines prospects for selling eco-certified products from agroforests and the potential benefits and constraints of eco-certification.

Prospects for selling eco-certified rubber from agroforests

At present there is no market for eco-certified natural rubber. Seventy percent of the world rubber production and almost 90% of the Indonesian production is absorbed by tire manufacturers. This market segment mostly requires medium quality natural rubber, the bulk of Indonesian smallholder production. It is probably the least permeable to eco-certification in the short term.

Marketing campaigns by tire manufacturers focus on the performance and safety of the tires, concentrating on the high technology used to produce them. Some of the leading brands are increasingly incorporating environmental concerns in their communication and management strategies. These concerns are at present focussed on reduced energy consumption of cars through better tire technology, limiting the negative environmental impact of the manufacturing process, reducing waste by increasing tire lifespan, and increasing the re-use, recycling and recovery of tires. No mention is made of the plantations origin of natural rubber and its possible social and ecological impacts. The fact that smallholder agroforestry plantations have the reputation of producing a heterogeneous product with a high impurity content has a negative impact on their technical properties, making them less attractive to the leading tire manufacturers, who are the most concerned with environmental aspects.

In addition, strong competition amongst tire manufacturers and the competition of synthetic rubber (although not entirely substitutable to natural rubber) puts pressure on natural rubber prices, leading to a situation which is not favorable to the payment of premium prices for eco-friendly natural rubber in the tire industry.

Unlike tires, latex goods produced from high quality liquid latex are mostly consumer products and may be more conducive to eco-certification in the short term. A number of manufacturers of latex mattresses, for example, are already marketing natural latex as a product of tree plantations in the tropics, which gives a green and eco-friendly image to their products. However, the post-harvest methods used by agroforestry smallholders at present do not enable the exportation of liquid latex. Shifting to the production of high quality, liquid latex in agroforests would imply significant changes in the harvest, collection and early processing of latex, the feasibility of which need to be examined carefully.

Developing an image for eco-friendly agroforest products will face the additional difficulty of differentiating between natural rubber from any type of low-biodiversity plantations and high-biodiversity agroforests. Some segments of the natural rubber industry, such as mattress manufacturers, are already marketing natural rubber goods as “green”. The green image of natural rubber - as opposed to synthetic latex - stems from its natural origin and renewable nature, plus to a certain extent, from the abusive equating of the environmental services (watershed protection, biodiversity conservation and carbon sequestration) provided by rubber plantations and natural forests.

Prospect for eco-certified timber from agroforests

Contrary to the case of natural rubber, eco-sensitive markets for timber do exist. Large international furniture and other wood products companies actively seek eco-certified timber (mostly under the Forest Stewardship Council label). The market for eco-certified timber may be more immediately accessible to products from rubber agroforests as rubber agroforests produce timber from both rubber and non-rubber trees.

There is a well-identified demand for rubber wood, which is largely used in industrial furniture manufacturing. In order to have a commercial value, rubber wood needs to be treated 72 hours after felling in order to avoid the growth of fungi which stains the wood. Harvesting and chemical treatment of rubber wood produced in agroforests will be more expensive to organise than in plantation areas because they are scattered, may have limited accessibility, and have a lower volume of rubber timber per area to be harvested (the number of trees per ha when an agroforest is renewed is approximately four times lower than in a plantation). An additional constraint to reaching a viable commercial value that is faced by agroforest rubber timber is that of quality related to the conical shape of the rubber tree coming from unselected origin and stains related to tapping practices. Analysis is needed to see if the benefit of a premium price due to eco-certification can offset those handicaps.

The demand for hardwood timber products for export to eco-sensitive markets is at present much higher than the supply. Competition for smallholder rubber agroforesters would mostly be with the natural forest management companies, and not with plantations. This would put smallholders in a better position since they would not suffer from problems of remoteness. The major issue would be the one of volume since the stock of timber from these species would be much lower, on a per hectare basis, than in natural forests. Apart from hardwood species for higher-end usages such as furniture, there is also the possibility of exploiting eco-certified softwood species from rubber agroforests. PT Xylo Indah Pratama, a company manufacturing pencil slats out of *pulai* wood *(Alstonia scholaris)* sourced in rubber agroforests from South Sumatra, already does this., a. Levels of demand and local processing capacity need to be explored to assess the possible future expansion of such markets.

Potential, constraints and benefits from various certification types

Forest management certification schemes are designed to provide consumers with guarantees that a product – timber or non-timber – comes from a well-managed forest, usually based on a combination of economic, environmental and social criteria of good forest stewardship. The most widely recognized scheme in this category is that endorsed by the Forest Stewardship Council (FSC). Since its creation in 1993, 30 million ha of forests have been certified worldwide by FSC accredited certification bodies. The FSC is strongly supported by some of the major international environmental NGOs, who are putting pressure on wood buyers to give preference to products coming from certified sources. The FSC Principles and Criteria are concerned with economic viability and diversity of the forest products, social justice (respect of the rights of local people, especially indigenous communities, and forest workers) as well as ecological soundness. In the first analysis, they seem largely compatible with the general management practices observed in rubber agroforests. Through a group certification approach and with the backstopping of ICRAF, the feasibility of FSC certification for a few villages seems well at hand.

An important technical issue to be carefully addressed, however, is setting-up an adequate chain-of-custody, ensuring that no products from illegitimate sources are entering the certified pool. The financial cost of a certification operation (compliance cost, certification *per se* by outside bodies and marketing costs) is also of concern. External aid would need to be secured to launch a pilot project. Only when large enough areas are involved could these costs, which would then be much lower per unit area, be borne by the agroforesters themselves.

The major issue with FSC certification is that it would not discriminate between latex or hevea timber from agroforests, and latex or hevea timber from monoculture plantations. Hence it cannot be expected to contribute to filling the profitability gap between both cropping systems. Discrimination could possibly be achieved via an association with another, more specific certification scheme, provided that market linkages with buyers can be made under the joint certification.

The organic certified food market (organic certification) is developing rapidly especially in some European countries. Organic consumption is starting to include other products such as clothing and bedding, and could therefore potentially apply to a range of rubber goods. Such a certification scheme would better discriminate rubber agroforests from more intensively managed plantations. It would probably not be widely applicable to timber. No demand for organic rubber *senso stricto* has been established at present, although a lot of consumer products such as mattresses are marketed under claims of being free of chemicals and produced in a nautral way. Such claims would be better backed-up by organic certification.

Another alternative would be to target a system certifying that a given raw material comes from high-biodiversity agroforests (an agroforest certification label). The Rainforest Alliance certification program called Conservation Agriculture, or the Forest Garden Products (FGP) label originating from Sri Lanka appear as potentially interesting. Since promoting biodiversity conservation through adequate agricultural practices is one the major objectives of such certification schemes, they would better fit the Indonesian rubber agroforest case. However the above-mentioned labels have limited market recognition and, as in the case of organic certification, potential market incentives need to be investigated carefully.

It is concluded that using certification schemes to provide incentives for the conservation of biodiversity of smallholder agroforestry in Indonesia has good long term perspectives. It holds a significant potential of incentives, especially if timber and non-timber products can be combined and marketed to adequate buyers. However, identifying the right markets, developing linkages and forming the right institutional arrangements to handle certification will take time and will require resources.

ABBREVIATIONS

ADB	Asian Development Bank
CAP	Conservation Agriculture Program
CFC	Cloro-fleuro carbon
CIRAD	International Center for Cooperation on Agricultural Research and Development
EMS	Environmental Management System
ENGO	Environmental Non Government Organisation
FELDA	Federal Land Development Authority
FMU	Forest Management Unit
FGP CS	Forest Garden Products Certification Service
FSC	Forest Stewardship Council
GAPKINDO	*Gabungan Perusahaan Karet Indonesia.* Indonesian Rubber Industry Association
GFTN	Global Forest and Trade Network
GMO	Genetically Modified Organism
ICRAF	International Center for Research on Agroforestry
IRRDB	International Rubber Research and Development Board
IFOAM	International Federation of Organic Agriculture Movements
ISO	International Standards Organisation
LEI	Lembaga Ekolabelling Indonesia
MREPC	Malaysian Rubber Export Promotion Council
MTCC	Malaysian Timber Certification Council
NES	Nucleus Estates and Smallholders
NGO	Non Government Organisation
NTFP	Non-Timber Forest Products
NR	Natural Rubber
NSRC	NeoSynthesis Research Centre
ORRAF	Office of the Rubber Replanting Aid Fund
PEFC	Pan European Forest Certification
PIR	*Perkebunan Inti Rakyat* (Nucleus Estates and Smallholder)
RAS	Rubber agroforestry systems
RISDA	Rubber Independent Smallholder Development Authority
RMA	Rubber Manufacturers Association
SFI	Sustainable Forestry Initiative
SCS	Scientific Certification Systems
SGS	Société Générale de Surveillance
SIR	Standard Indonesian Rubber
SLIMF	Small and Low Intensity Managed Forests
SNCP	Syndicat National du Caoutchouc et des Pneumatiques
SR	Synthetic Rubber
SRDP	Smallholder Rubber Development Program
TCSDP	Tree Crop Smallholder Development Program
TFT	Tropical Forest Trust
TNC	The Natural Conservancy
TSR	Technically Standardized Rubber
WWF	World Wildlife Fund

BACKGROUND AND OBJECTIVES

Finding incentives for the conservation of rubber agroforests

Rubber agroforests have been a key component of the ecology and biodiversity of Sumatra and Borneo since the first half of the 20th century. During booms in rubber prices, farmers in Malaysia, Indonesia and later Thailand were encouraged by government officials and traders to develop the cultivation of rubber *(Hevea brasiliensis),* a species that had been imported from Brazil at the end of the 19th century. Farmers started to plant rubber seeds or seedlings in their traditional slash-and-burn rice fields, letting them grow with the natural, secondary vegetation. By doing this, they created 'plantations' which are in fact nothing else than a secondary forest with a high concentration of rubber trees – this pattern is known locally as 'jungle rubber' or 'rubber forests' (Gouyon *et al.,* 1993).

Because these complex agro-forests develop with very little human intervention and can remain intact for more than 45 years, they exhibit a physiognomy and functioning close to those observed for natural forest ecosystems (Michon and De Foresta, 1995). Research conducted by ICRAF over the last 10 years indicate that their level of vegetal biodiversity may reach as much as 60 to 80% of what is found in primary forests in similar areas (Van Noordwijk *et al.,* 2002).

While most complex rubber agroforests have disappeared in Malaysia and Thailand, there are still over 1 million ha of rubber agroforests in Indonesia, located mostly in the lowlands of Sumatra and Borneo. There are very little primary forests left in those areas, especially in Sumatra. The remaining logged over and secondary forest areas, which have little economic value, are quickly being converted to agriculture and industrial plantations. Rubber agroforests, which offer the possibility to combine latex extraction and timber production – from rubber and other species – are amongst the last areas where remnants of the biodiversity of lowland dipterocarp forests can be conserved in Sumatra and Borneo.

Rubber agroforestry systems offer many economic advantages to smallholders. They have relatively low development costs and present minimal risks. However, they offer a smaller return on land and labour than other land uses, such as the monoculture of high-yielding hevea clones, oil palm, and, in areas close to urban markets, intensive food crop production. Even if the costs and risks associated with these alternatives have limited their development, they are gradually replacing rubber agroforests. This is what happened in other rubber producing countries, where the government and donors subsidized programs to develop high-yielding rubber monoculture plantations. Already it is getting more and more difficult to find areas of agroforests with an age and area adequate for biodiversity conservation. Ten years from now, at the present rate of changes, there may not be enough rubber agroforestry areas left in Sumatra and Borneo to perform this function.

In the absence of specific incentives, there are no reasons why smallholders should forego the benefits of more profitable land uses for the sake of biodiversity conservation. This means that the conservation community must be ready to reward the services rendered by smallholders willing to conserve their agroforests instead of converting them to higher-productivity land uses. Several options have been considered to this extent, such as yearly payments per unit of area under conservation, but they are very sensitive to the continuous availability of funds.

Marketing agroforestry products to eco-sensitive markets

Another option, which could be combined with the previous one and represent a longer-term solution, would be to open access for rubber smallholders to eco-sensitive markets for the two main products of their agroforests, i.e. natural rubber and timber (from rubber trees and other species). Eco-sensitive markets are those in which buyers give the preference to products with production processes and lifecycles that are considered to be eco-friendly, i.e. having a better environmental and social[1] impact than alternative products. All sorts of goods are concerned, especially those originating from the stewardship of renewable natural resources, such as agricultural and forestry products.

The demand for eco-friendly products is growing fast, especially in Europe (especially Germany, the UK, Netherlands and Scandinavia), and in North America. The number of new products making environmental claims, or eco-labelling, grew from 0.5% in 1985 to a high of 13% in 1992, and the increase has continued after the Rio Earth Summit conference. At the same time, confidence in manufacturers', first party claims sunk to an all-time

[1] Social concerns (such as workers's rights, child's labour issues, etc.) may be of equal importance to purely environmental concerns, depending on the product and the market.

low, with only 15% of consumers believing the claims made (source: SCS). For this reason, a number of certification schemes have been created to make sure that claims that a product is eco-friendly can be verified by independent third parties following adequate standards.

Numerous labels were thus gradually created to represent various concerns of consumers and other stakeholders. Some are only concerned with particular aspects or impacts of the production, distribution or lifecycle of a product. For example, a label may claim that a product can be recycled, that it is free of particular substances deemed dangerous such as CFCs or GMOs, or that it avoid specific damages to the ecosystem, such as tuna captured without harming dolphins. Other labels are related to more complex standards, which may combine different aspects of the production, distribution and lifecycle of a product. This includes for example organic production standards, fair trade labels, which can be used for different kinds of products, including products from forestry and agroforestry. There are also a number of standards specifically created for forest products, the most well-known one being the one developed by the Forest Stewardship Council (FSC) with input from various NGOs such as WWF, Greenpeace and the Rainforest Alliance, which had developed its Smartwood forest certification program before the creation of the FSC in 1993. This scheme is mostly used for timber, but standards for non-timber forest products (NTFPs) have also been developed and have been used for various exudates such as maple syrup or chicle gum.

Of the two main products from rubber agroforests (rubber and timber), timber is the only one for which there is an eco-sensitive demand, i.e. a group of buyers who are ready to give the preference to timber coming from eco-friendly sources. Most of these buyers are using the FSC's standard as their reference, although there are also a number of competing schemes. This is particularly true in North America and in Europe, where groups such as B&Q in UK, IKEA in Sweden, Home Depot in the US and Carrefour in France are increasingly committed to developing eco-friendly purchasing policies that give the preference to FSC certified products. This paper will hence consider the possibility to market timber from rubber agroforests to these existing segments.

In the case of natural rubber, things are more complex, because there has been no eco-certification for this product and no particular demand in that direction. More than 50,000 manufactured products are produced out of rubber - mechanical products and industrial supplies, such as sealing rings, gaskets, rubberised fibres, etc., but also household and consumer goods like mattresses, balloons, boots, etc. The tire industry, however, consumes about 2/3 of the natural rubber produced in the world.[2] Tires are partly purchased by carmakers, and partly by consumers as replacement. The tire is an important component of a car's image, and tire makers are aggressively targeting consumers through their communication campaigns. Environmentally friendly elements of cars and tires are increasingly mentioned in advertisement campaigns, a sign that the automotive industry is reaching out to eco-sensitive markets. This indicates a potential to promote natural rubber products to eco-sensitive markets, including consumer and business markets, and in particular in the tire industry. In this report, we will hence investigate the feasibility of developing eco-certification schemes for natural rubber and using them to give an incentive to the conservation of biodiversity in rubber agroforests.

A number of questions need to be answered before trying to develop or adapt a certification process to enable the marketing of rubber agroforestry products to eco-sensitive markets as an incentive towards the conservation of Indonesian rubber agroforests, in particular:

- Within the markets for natural rubber and timber goods, which are the most likely ones to offer significant price premiums to eco-labeled products?
- Are these goods made of products sourced from Indonesian agroforests, and if not, what are the constraints explaining this and how could they be addressed?
- What are the desired environmental services that we hope to reward in Indonesian rubber agroforestry systems (e.g. which type of biodiversity), and how well are they represented by the standards - principles, criteria and indicators - used by existing certification schemes?
- What adaptations may be needed to existing certification schemes to make them work towards the conservation of Indonesian rubber agroforests?
- What would be the main constraints to implementing such certification schemes on a significant scale (including technical and financial constraints to verification, chain-of-custody and traceability issues, promotion issues, capacity of the actors involved, etc.)?

[2] (Source: Philippine-Dutch Trade Service Center)

What resources would be needed to invalidate them?

Preliminary objectives

Answering such questions would request a significant feasibility study over several months, involving the main actors at the various stages of the production, processing, shipment, sales and distribution of natural rubber goods and wood products. However, before initiating such a study, a preliminary identification study can be conducted to better assess the relevancy and the scope of such a feasibility study. Hence, the aim of the present preliminary study is to lay the ground for a feasibility study of a certification process to enable the marketing of Natural Rubber (NR) and timber to eco-sensitive markets as an incentive towards the conservation of biodiversity in Indonesian rubber agroforests. Since there are already numerous studies in timber certification, the present study concentrates mostly on the potential for natural rubber certification, which has not been investigated or developed until now. The possibilities to combine both wood and NR certification will be considered.

The first part of the paper considers the market for natural rubber and timber and their potential for eco-sensitive marketing of products from rubber agroforests. The focus will be on the rubber market, which potential for eco-sensitive marketing is far better known than for the timber market.

The second part presents and discusses various options to develop eco-certification for NR and wood products from agroforests, and their possible use as an incentive for conserving biodiversity in smallholder rubber agroforests.

The conclusion provides the basis to develop terms of reference for a feasibility study of an eco-certification process for rubber smallholder agroforestry systems.

GREEN RUBBER AND TIMBER MARKETS

This section present firsts an investigation of the potential and constraints to develop a market for "green rubber". It starts by describing the various uses of natural rubber and analyses the needs of the users, especially in terms of quality, since it may affect the possibility to market rubber from agroforests to specific users. Then it looks at the supply side, and in particular rubber agroforestry smallholders, and how it fits the needs of various market segments. This section also presents the result of a more specific investigation of the potential demand for eco-labelled products in these various market segments, in order to identify possible targets for green rubber from agroforestry.

The Users of Natural Rubber: a High-Tech Industry

Natural rubber is the name given to a number of polymers found in the latex of *Hevea brasiliensis,* which are appreciated for their plasticity, elasticity, as well as their shock and heat absorption and insulation properties. Latex is collected in liquid form after tapping cuts have been made in the bark of the tree. At this stage, it has a dry rubber content of only 30 to 40%, the rest being mostly water. Liquid latex is a highly unstable product; it tends to degrade very quickly by oxidation and fermentation. For this reason, it is normally coagulated shortly after harvest, and then later transformed into pure dry rubber through various kinds of processes. However, there is also a small market for 'latex goods', i.e. products that are made directly of liquid latex, as presented below.

Latex goods: gloves, balloons and mattresses

About 10 per cent of the 7.15 millions of tons of natural rubber produced in the world are made into latex goods (source: IRRDB). For these types of uses, the latex coming out of the tree is first preserved with ammonia. This is needed to make sure that the latex will not coagulate naturally, which happens normally within a few hours after tapping, and is triggered by a gradual decrease of the pH of the latex after it has been harvested. Latex is then usually concentrated by centrifugation, which increases its dry rubber content while preserving a thick liquid form.

Concentrated latex is used for the manufacture of several types of goods:

- Rubber gloves, predominantly consumed by the medical sector, especially in the United States, which represent the main use of natural latex;
- ther medical uses such as tubing, catheters, etc.;
- preservatives;
- toys, especially balloons;
- foam rubber, mostly used for bedding, especially to produce natural latex mattresses, which are high-quality, relatively expensive mattresses;
- elastic thread and adhesives, which are used in numerous industrial or consumer products.

Most of the latex goods are consumer products, with the important exception of medical gloves, which are for professional use.

Dry rubber goods and the tire industry

The remaining 90 per cent of latex is converted into dry rubber, which is stable and hence easier to handle, store and process. Most of the dry rubber is used to make tires and other automotive parts such as bearings, joints, motor mounts, shock absorbers, etc. Other uses include consumer goods such as shoes.

- Tires make up about two-thirds of the industrial use of natural rubber. Natural rubber is about 30% of the raw materials used in a car tire, and less than 10% of its cost. Other materials include synthetic rubber, carbon black (both made out of crude oil), synthetic cords such as rayon and nylon, steel wire, and numerous chemical compounds.

Tires are extremely complex industrial products. The design of a tire, and the characteristics of the raw materials used in it, determines key properties such as performance, safety and longevity. Tire making is a capital-intensive industry, and access to technology plays a key role in the competition between manufacturers. This has been reinforced lately by a growing trend of automation to reduce costs in tire making processes. Hence the tire industry is increasingly concentrated, with six major producers accounting for about 70% of the world market. The top three producers (Michelin, Bridgestone/Firestone and Goodyear) have market shares approaching 20% each, and are pursuing aggressive global expansion plans. For example, between 1981 and 2000; Goodyear absorbed Dunlop; Michelin took over Uniroyal and Goodrich; Bridgestone took control of Firestone, Continental of General, etc.

The world tire market is divided between car and light truck tires (about 60% of the market), heavy truck tires (26%), and various other vehicles such as civil works and agriculture equipment, airplanes, bicycles and motorcycles. About 27% of the tires are sold with a new vehicle, while the rest are sold as replacement.

40% of the tires on the world market are purchased directly by consumers for a private use, the rest being purchased by tire makers to equip new vehicles, or being used for commercial and industrial vehicles. While consumers will obviously base their choice of a car on the perceived quality of its tires, this means that tires are not pure consumer goods – carmakers and corporate owners of vehicle play a key intermediate position between tire makers and the final users. Besides, although 73% of the tires are purchased directly by users as replacement tires, the choice of the replacement brand is influenced by the existing brand – users will tend to give the preference to the type of tire they already have on their vehicle.

Hence, car and vehicle makers are key players in the tire market and their strategies have an important influence on the strategy of tire manufacturers. At the same time, tire makers are trying to make sure they do not depend entirely on the car industry by making sure that consumers will give a preference to their brand, and hence are conducting aggressive marketing campaigns to enhance the image of their tires. Carmakers and tire makers often make alliances in marketing through co-branded campaigns in which, for example, Renault and Michelin share the same advertisement for performance and safety of vehicles.

New trends in the tire markets are influenced by a change in geographical distribution of consumption. North America and Europe share about 33% of the market each, the rest being shared by Japan (11%), other Asian countries (11%), Africa and South America (5% each). Each of the "big three" in the tire market is specialized around a geographical zone: Europe for France-based Michelin, North America for USA-based Goodyear, and Asia for Japan-based Bridgestone (which, however, has a strong base in the USA after having bought Firestone). Since most of the natural rubber is for tire production, its market is linked to the demand for motor vehicles, and hence it is largely affected by economic growth. With the present economic slowdown, especially in the United States, Canada, Japan and Western Europe, demand for natural rubber is expected to weaken. The only booming market is China, which has a growing share of the world consumption.

The same is true for the world market of NR in general. The world consumption of natural rubber (NR) was around 7.25 million tonnes in 2001, slightly lower than 7.34 million tonnes in 2000. Of this consumption, 4.85 million tonnes, or 66%, was internationally traded *(see Appendix 1).* Four main countries or regions (the USA, Japan, China and Western Europe) are responsible for nearly 75% of the NR imports, in nearly equal shares. The bulk of growth in NR imports, however, is coming from China, which has doubled its imports from around 400 million tonnes a year in the late 1990s to more than 800 tonnes at present. China is expected to continue to experience strong growth, with total consumption around 1.17 million tonnes in 2001, making it the world largest natural rubber consuming country.

Table 1. Consumers' Direct and Indirect Tire Consumption

Figures in each cell are % of the world market	**Purchased by car industry to equip new vehicles**	**Purchased by final user to replace worn tires**	**Total**
Passenger vehicles	20%	40%	60%
Commercial and industrial uses	7%	33%	40%
Total	**27%**	**73%**	**100%**

Table 2. Geographical Distribution of Sales of the Three Biggest Tire makers

In %	**Michelin**	**Goodyear**	**Bridgestone**
Europe	50	30	11
North America	35	57	41
Asia, Africa, Middle-East, South America	14	13	48 (Japan: 41)
Total	**100**	**100**	**100**

Prices are a key element in the cutthroat competition between the tire makers. Between 1995 and 2002, the price of tires has dropped by 12%, and a nearly similar drop (10%) occurred for non-tire automotive parts (source: SNCP). As noted by the SNCP, this means that rubber manufacturers are not in a position to increase the price they pay to their suppliers, even in cases of increase in prices of raw materials, labor or energy. The competition with synthetic rubber is reinforcing the pressure on natural rubber prices. This means that potential price premiums for eco-certified tires would not necessarily be passed to growers of rubber trees.

An increasing competition with synthetic rubber

NR is a segment of a bigger market, the rubber polymers (or elastomers) market. In the world market, synthetic rubber (SR) consumption now accounts for about 60% of the total new rubber consumption, with production concentrated in European, American and Japanese multinational companies. There is only one chemical type of natural rubber. However, there are approximately twenty different chemical types of synthetic rubber, each with different grades and properties (source: Rubber Manufacturers Association). About one third of the market for rubber polymers is reserved for "specialty rubbers", all of them synthetic, which are selected for distinctive features and are not in competition with NR. Competition takes place in the rest of the market.

NR is still of great technical importance for the rubber industry, because of a unique combination of properties which make it difficult to replace. NR has a distinct advantage in all products that undergo heating because of strong shocks and pressure, such as heavy tires for trucks and aircraft, or engineering products like motor mounts and shock absorbers (Levin 1996). Therefore, most NR goes into heavier types of tires, with a lower portion of NR in passenger cars: 70% of the NR is used in heavy trucks, off-road tires and aircraft tires (Source: Malaysian Rubber Board). Over the last few decades, the general-purpose type of synthetic rubber, which competes directly with NR, has improved tremendously in consistency and specifications, and differences in the properties of natural and synthetic rubbers are gradually narrowing. This means costs and ease of use become increasing aspects in the competition.

When it comes to ease of use, rubber users have always given the preference to the synthetic, for several reasons. First, SR is produced in the countries that use rubber for manufacturing. This makes it easier to secure supplies, especially in times of wars or international crises, during which SR made most of its progress. Second, as a product of the industry versus a product of agriculture, SR displays more consistent properties, which makes it better suited to the high-technology processes involved in tire making. It also makes it easier for SR users to make processes more automatic, a key element in cost cutting and competitiveness. Third, dialogue is easier between tire manufacturers and the makers of SR because the supply chain is shorter and because they speak the same technical language, as noted by Levin (1996): 'In production of technical rubber goods, the technicians in general have more knowledge of synthetic than of natural rubber. The technical support from the NR-supplier is low and the variations in the natural polymer are bigger than in the manmade general purpose types.'

New trends in technology are likely to increase again the preference to synthetic rubber, due to increase concerns over safety requiring special synthetic rubber tire surfaces, while the trend to tubeless tires also reduces the natural rubber portion (Van Noordwijk, 2002). The share of natural rubber in the world elastomers market is hence likely to decrease from its present 40% to 30-35% over the next 20 years. With an estimated growth of the world rubber polymers market from about 18 million tons at present to about 28 million tons in 2020 (Burger and Smit, 1998), this means that the natural rubber market should still be growing, albeit slowly, reaching between 8 and 10 million tons in 2020.

When it comes to eco-friendliness, it is obvious that NR has an advantage, since it is a product of a renewable process based on tree plantations, while SR is made of fossil fuels.[3] Approximately seven US gallons of oil are used to produce a tire; five gallons are used as feedstock (from which the substances that combine to form synthetic rubber are derived), while two gallons supply the energy necessary for the manufacturing process (RMA). In general terms, dry natural rubber requires the use of about a tenth of the fossil fuel required to produce synthetic rubbers (source: IRRDB). In the long run, as fossil fuel reserves are gradually exhausted, this may become an important argument in favour of using natural rubber. We will see later

[3] Some authors are even contemplating the fact that natural rubber could one day be used as a fuel – after all, one kg of NR contains 70% of the energy contained in one kg of oil (Campaignolle, 1991).

how this feature is exploited by various industries in their communication and marketing efforts.

Natural Rubber Production: Issues of Quality

The predominance of Asian smallholders

The production of natural rubber is heavily concentrated in Asia, which accounts for 90% of the production (see Appendix 1). Producer countries export the majority of their output, with the exception of India and China, which are net importers, and Malaysia, which used to be the world largest exporter and is now consuming more than 70% of its production. Thailand remains the largest world producer and exporter, with 33% of the world's production, in steady increase due to past policies of subsidizing the replanting of smallholder plantations with high-yielding clonal varieties. Indonesia is the number two producer and exporter, with small increases in production. The output of Malaysia has been falling dramatically due to the increasing cost of labour, which prompted a shift towards less labour-intensive oil palm plantations. Vietnam and West Africa have an increasing share of the world market, since their production has benefited from investment in donor funded projects – however the potential remains limited by lack of land (Vietnam) or labour (Africa).

The majority of the NR in the world is produced in smallholder plantations, managed as family-based agriculture, generally on farms less than 10 ha in size. Smallholders occupy about 80% of the world's planted area and produce 65-70% of the NR in the world (Barlow *et al.*, 1994). The IRRDB estimates that there are 20 million people worldwide whose livelihood depends on smallholder rubber farming. Smallholders dominate the world production despite limited access to technology due to the fact that the main activity in rubber production, tapping, shows no economies of scale (Barlow *et al.* 1994). Besides, smallholders make a more effective use of labour by combining rubber production with other crops or activities, which also gives them a higher flexibility, since it is easy to stop tapping during periods of low prices. This feature combined with the overhead costs of large estates make smallholdings more competitive than large estates, provided they can access the same technology (Gouyon, 1995).

Based on the type of technology used and sources of technology, smallholders fall into three categories (Gouyon, 1997):

- low intensity managed plantations similar to the agroforestry system found in Indonesia, which was also found in the past in Malaysia and Thailand but have been replaced, in those countries, by clonal rubber plantations
- independent smallholders benefiting from financial and technical assistance by various types of subsidized schemes, such as the SRDP/TCSDP in Indonesia, the ORRAF in Thailand or the RISDA in Malaysia. Donors like the World Bank or the ADB have contributed to funding these schemes (especially in Indonesia and Thailand), which were also funded nationally by an export tax in the case of ORRAF and RISDA.
- "nucleus estates and smallholder" types of schemes where a private or state-owned company finances the development of plantations which are then diverted to smallholders under credit. Smallholders have then to sell their output to the 'nucleus' company, which deducts the credit from the sales value. These schemes and their variants have been heavily promoted by donors like the World Bank and are found, for example, in Indonesia (NES/PIR), in Malaysia (FELDA), and in West Africa.

In the last two cases, the smallholders use high-yielding clonal varieties in mono-specific plantations with intensive labour management and use of chemical inputs (mostly fertilizers). This results in a rather higher productivity and income per hectare and per labour day. This rise in productivity, which occurred in the major producer countries (Malaysia and Thailand) have contributed to driving the NR prices down despite a rise in labour costs in these countries. Indonesian smallholders rely on a low intensity model of management, which offers in average a lower productivity but with a lower economic risk – since the initial investment to develop the plantations are much smaller –and higher flexibility – with no debt to repay, the farmers can discontinue rubber production during terms of prices, as long as they keep other alternatives on their farms. Low labour opportunity costs, further reduced in dollar terms by the economic crisis lasting since 1997, has enabled Indonesia to remain a large rubber producer despite this lagging productivity.

Over the next 10 years, wages in Thailand and Malaysia are likely to be above wages in Indonesia. These two countries have been considerably slowing down their investments in NR production, and there is a lack of opportunity for large-scale expansion in other NR producer countries. Hence, Indonesia is likely to retain a comparative advantage

in the NR market – although for the unfortunate reason of low wages. Investments in clonal rubber would enable the Indonesian production and the income of its smallholders to increase significantly, but it is unlikely to happen on a large-scale since it would require government assistance. Most individual producers will not be willing or able to take this risk, and there is no likelihood of state or donor-funded project is this direction. The main force that may drive Indonesian NR production down is conversion of rubber plantations to oil palm, industrial forestry, or food crops, which is already happening. Recovering pulp and oil prices may drive this process further, however, the political uncertainty in the country is putting a halt to large-scale investment projects in this domain. Another factor of conversion is the need to produce food, and it is likely that some of the rubber plantations close to urban markets will continue to be converted to food crops – but this is not an option for the majority of smallholders who live isolated from markets.

In terms of price, there is no reason to be optimistic for NR production in the short term. A sluggish world economy will mean no particular rise in demand, and there is still ample supply to meet the existing demand from untapped plantations in existing producer countries and from new plantations reaching production age in countries like Vietnam that have been investing in recent years.. The very low prices during the last years have caused a drop in tapping and stocks and hence a rise in prices, but this is likely to be short-lived. Some authors are predicting a rise of rubber prices from US$1,5 to $3 during the next two decades (Burger and Smit, 1998), based on possible shortages of natural rubber on the market – however these types of predictions have to be taken with precautions. If rubber prices remain low, there will be further incentives to convert rubber agroforestry areas in Indonesia to higher paying uses such as oil palm, food crops, etc.

This means that the agroforestry alternative will not be sustainable, unless its environmental benefits – biodiversity conservation, watershed services if any, and carbon sequestration – are paid for. Another possibility to make natural rubber from agroforests competitive is to combine its production with the production of wood from rubber and other species. This has a good market potential. In that case, it would be possible to develop multi-purpose areas where NR production would be only one of the features, combined with timber production, carbon sequestration and biodiversity conservation.

Such a multi-purpose management will not happen by itself. If it takes place, it will have to be the result of strong, coordinated policies involving multiple actors: first, the smallholders themselves, who will need to have a clear financial interest in this; second, the buyers of wood and latex; third, the donors and conservation agencies, which may want to fund the biodiversity conservation component (NGOs, IGOs, government); and fourth, the actors of the carbon credit market.

The need for consistency

As indicated above, quality – i.e. technical properties – play a very important role in the choice of rubber supplies. However, despite attempts to standardize NR and to produce NR grades based on technical properties, suited to industry requirements, there are still a lot of paradoxes in the market for rubber based on quality.

During the first half of the 20th century, most latex was converted into dry rubber by coagulation in thin slabs, which were then laminated with small hand-operated machines and dried using smoke or natural solar heating. The resulting product, which is still produced by smallholders in Thailand and in parts of Indonesia, is called rubber sheets. Rubber sheets are inspected visually and are graded into five categories based on their colour and the presence of contaminants and imperfectly dried spots called ‘virgins’.

After the Second World War, when synthetic rubber started to become a competitor to natural rubber, the NR industry created new processes to offer a more standardized product, easier to handle than rubber sheets, in an attempt to mimic synthetic rubber. This new product has been called "crumb rubber". First, the latex is coagulated, either directly in the tapping cup or in special containers. In this form, which still contains about 50% water, it can be transported from the plantation to the processing factories. There, the coagulated materials are milled and washed to remove any material which may have contaminated the rubber during collection and transportation. After milling, the NR takes the form of creped sheets, which are then pressed into standard-size blocks and dried in industrial ovens. Today, the majority of the natural rubber sold in the world, especially to the tire industry, is processed in this way.

To make NR more attractive to the industry and more competitive with synthetic rubber, crumb rubber is sold based on its technical properties, using a standard process of sampling to grade the

different categories. This is called the "Technically Standardized Rubber" (TSR) system. Each of the main rubber-producing countries has its own TSR system. For example, Indonesia's crumb rubber is sold under various grades defined by the SIR scheme (Standardised Indonesian Rubber). TSR/SIR are graded based on their plasticity index and other factors such as dirt content, the lower index having the better properties. Of the standard grades in use, SIR/TSR 5 is theoretically better than SIR 10, itself better than SIR 20 and 50.

Grades with better properties, however, do not always command a significantly higher price than lower grades. TSR/SIR 10, for example, is not much more expensive than TSR/SIR 20, despite the fact that it is supposed to have better properties. Only the top of the range of NR grades, which are usually made directly of latex and not of coagulated slabs and dry rubber, command a price premium. This is the case of liquid concentrated latex, and of dry rubber types made directly from latex such as TSR/SIR. But the demand for such products, as has been seen above, is limited. In fact, the bulk of the market seems to be satisfied with rather low grades such as TSR/SIR 20, which are available in large quantities.

In fact the key element for NR users, as mentioned above, is consistency in properties, which is not always well captured by the existing grading system. Hence most transactions are done directly between NR suppliers and buyers. This is because despite attempts at producing a standardised product sold on the basis of technical properties, NR remains a heterogeneous product and users prefer to have a direct contact with their suppliers. Hence 70% of the buying of NR is done directly, and only 30% is done through traders and through the NR commodity markets. This makes it difficult to know the actual preferences of buyers and the real prices paid, especially since the whole industry has a habit of secrecy due to the need to protect their technology against competitors.

Quality constraints of Indonesian smallholder rubber

NR produced by smallholders in Indonesia has a relatively low reputation for quality. Most of the rubber is produced in slab forms. There has been some attempts to purchase latex in liquid form from smallholders, for example by a factory located in South Sumatra near the Sembawa research centre for estate crops, but this is limited by a number of constraints.

Firstly, many smallholder plantations, especially the agroforestry ones, consist of old trees with small production, and the latex from these trees tends to coagulate very quickly. Maintaining the latex in liquid form would require adding ammonium in the cups, with added costs. Secondly, the plantations are very scattered and many of them can be accessed only after one hour walking on narrow forest paths. This makes the transportation of liquid latex more difficult than transporting coagulated slabs.

For this reason most smallholders tend to produce slabs. The slabs are sold on the basis of humid weight, which varies quickly as soon as the slabs coagulate and start losing water by natural drying. To maintain their humid weight and avoid them losing too much water and obtain a product with a relatively stable water content, smallholders mix the rubber with wood and dirt collected at the bottom of the trees. Hence the resulting coagulated blocks are full of contaminants, which must be cleared out of the rubber in the milling factories producing dry crumb rubber for export. Even after such cleaning, there is still some contamination remaining. Contamination and the long process of storing and transporting the rubber from the villages to the factory negatively affects the quality and especially the consistency of the rubber from Indonesian farmers. Buyers who want to maintain a reputation of top quality, like Michelin, tend to avoid purchasing rubber from Indonesian smallholders.

There have been several projects to improve the quality of smallholder rubber in Indonesia. All of them have worked by creating a direct link between export milling factories and groups of smallholders. The smallholders committed to adopt processes leading to better quality and less contamination, and the purchasers committed to giving them a better price. This was the case for example in the Smallholder Rubber Development Program (SRDP), or in a project handled by the Sembawa research centre where smallholders produced crepes using a mini-creper machine. These projects have had a good success as long as there was intensive monitoring and assistance by a third party, but they failed to expand on a larger scale.

This stands in contradiction with the declarations of the industry, including buyers and exporters, both of whom have an interest in appearing committed to quality, and hence routinely make public complaints about the quality of Indonesian rubber, and the need to improve it. The fact that nothing changes seem to indicate that the

exporters are satisfied with the existing contaminated slabs they get from smallholders, which they ultimately manage to process into a relatively low quality product, for which there is, nonetheless, a demand on the world market. Until now, there has been no sufficient price incentive to make the efforts that would be required to change quality practices on a large scale. While this means that low quality rubber from smallholder agroforests has an outlet on the world market, it also means that it may remain shunned by higher end users, like Michelin, who have a deeper commitment to quality. Unfortunately, as will be seen later, these purchasers may also be the ones more interested in acquiring a green image. Hence the low quality of rubber from Indonesian rubber agroforests may be an obstacle to accessing eco-sensitive markets.

Strategies around Green Rubber

In this section, we present an analysis of the way different stakeholders in the NR industry are trying to integrate social and environmental concerns in their management and communication strategies. This analysis has been done primarily by studying documents presented by the different players, such as communications in symposiums, scientific papers, articles in the media and on websites, brochures, etc. We will compare the concerns of three main types of players who are engaged in the communication of environmental issues, i.e. the organizations linked with natural rubber production, the producers of latex goods, and the tire industry.

The production side: emphasizing the benefits of trees

What we refer to here are the various institutions with a mandate to study, research and/or promote the production of natural rubber, such as rubber research institutions, trade and producers associations, or export promotion boards from natural rubber producing countries. These stakeholders are trying to promote natural rubber, and are often making use of the "green" image that can be conveyed by reminding their targets about the fact that rubber is produced in tree plantations in the tropics.

Three main arguments are being used by these institutions to promote the 'greenness' of natural rubber:

- NR is a renewable material using very little fossil energy for its extraction and processing (as opposed to SR which is made of fossil fuels)
- it is produced from tree plantations, which provide a number of environmental services, such as regulation of micro-climate, habitat for flora and fauna, carbon sequestration and watershed services (protection from soil erosion, regulation of water flows).
- it is produced by smallholders and therefore contributes to the livelihood of farmers in developing countries

For example, an article by Kox (2000), published in the bulletin of the Rubber Stichting – a foundation researching but also promoting Natural Rubber trade – claims a number of environmental benefits of NR production, emphasizing watershed services and biodiversity in a very general manner: 'In the wet tropics, crops of trees have a clear ecological advantage over annual crops. The leaf coverage and the root system of trees regulate the microclimate allowing a range of secondary plants to flourish, while the soil is protected against dehydration and the erosive influence of rain. The trees also offer a habitat for a great variety of fauna.' The author acknowledges that the conversion of primary forest to rubber plantations may not be ideal, but this is quickly brushed away: 'Initially, a damaging consequence of the transformation from tropical rainforests to Hevea plantations is caused by the felling and burning of the primary forest. The soil is exposed to erosion from rainfall and leaching, and the richness of flora and fauna diminishes temporarily (sic)' (Kox, 2000). The potential for carbon sequestration is of course not forgotten: 'In many respects, a forest of mature rubber trees is equivalent to a tropical rainforest. An ecosystem of 33-year-old Hevea trees annually produces 450 tonnes of biomass per hectare, compared to 475 to 664 tonnes/hectare in Malaysian rainforests and 295 to 475 tonnes/hectare in Brazilian and Thai rainforests. Given the interest in the warming of the earth's atmosphere through CO_2 emissions, it is worth mentioning that a rubber plantation is hardly inferior to a primary tropical forest in terms of carbon fixing.' (Kox, 2000).

Another example from a promotion of latex gloves by the Malaysian Rubber Export Promotion Council, which emphasizes the renewable character of natural rubber and its supposed contribution to carbon sequestration: 'Unlike synthetic rubbers that are derived from depleting petrochemical source, natural rubber itself is a sustainable and renewable resource. It is estimated that rubber trees annually remove 363 million kilograms of carbon dioxide from the atmosphere and replace it with life-saving oxygen. This helps to combat the greenhouse effect and global warming which is of great concern to ecologists worldwide'.

Similar arguments can be found in the literature published by the IRRDB. Other authors insist on the possibility to use rubber trees to rehabilitate degraded lands, and on the possibility to combine them with food crops to create sustainable farming systems (Campaignolle, 1991). The social aspects are then put forward by reminding the target audiences that natural rubber is grown by smallholders and therefore provides livelihood to millions of people in poor countries.

- As can be seen in the examples above, the emphasis of this promotional literature is clearly on the watershed services provided by tree cover. Carbon sequestration, however, is increasingly mentioned, often with figures, probably because global warming is one of the most widely addressed environmental topic in the media at present. While some authors make a passing mention of biodiversity, no effort is made at differentiating between different types of rubber cultivation systems. The only articles mentioning the particular biodiversity conservation services rendered by rubber agroforestry systems come from ICRAF, and its research and industrial partners such as CIRAD and GAPKINDO. This indicates that the degree of awareness of this function is very limited. Discussions with conservation experts indicate that there is even a degree of skepticism as to the way agroforestry systems can perform biodiversity conservation roles, especially regarding macro-fauna (source: Jim Jarvie, pers. comm.).

As can be seen from the quotations above, a lot of the communication about the social and environmental services of natural rubber production have more to do with public relations than with science. Figures about carbon sequestration are mentioned without much reference to the way they are calculated and to the complexities and uncertainties behind such an exercise. The authors do not hesitate to play on the confusion between plantations and forests, giving the impression that the intensive monoculture of rubber can render the same environmental services as a natural forest.

The resulting impression is that the institutions researching and promoting NR production are all trying to exploit the "green" aspects of rubber plantations to project the image of a socially and ecologically beneficial production, but that this is done in a very general manner and without adequate support from environmental science. The fact that these institutions can get away with this is simply a reminder of the fact that ENGOs have not been paying much attention to the ecological or social impacts of NR production.

Latex goods suppliers: targeting the consumer with green products

The suppliers of latex goods at different levels of the supply chain – from manufacturers to retailers – were found to be communicating widely about the 'green' image of rubber tree plantations.[4]

Below are examples of the main types of consumer products which, based on an internet search, are advertised as "green" because they are made of natural rubber latex:

- carpet materials;
- carpet padding made from natural rubber (recommended as "environmentally-friendly" on the website of the Green Living Center);
- natural rubber adhesives used in the jute "bio-floor rug" advertised by the Green Home;
- natural rubber mats from India are advertised by The Green Culture;
- mattresses using natural rubber are often advertised by "green" stores and interior designers (for example on the site of A Happy Planet.com, The ecobedroom, Environmental Home Center). In most cases there is not too much emphasis on the benefits for the environment of rubber plantations, but more an emphasis on the fact that rubber, as a natural ingredient, is better for health (durability and comfort of latex mattresses, and the fact that NR mattresses are not using toxic fire retardant chemicals like synthetic fabric mattresses).

The arguments of the producers of these goods are similar to those mentioned by the NR promotional institutions, insisting on the renewable character of natural rubber production, the various environmental services supposedly provided by a rubber tree cover (watershed protection, biodiversity and carbon sequestration), and the socio-economic benefits to farmers in developing countries. The only difference is in the language, which is more tailored to a consumer public, while NR institutions target a wider audience of professionals in the industry, governments, and donors. It seems indeed quite obvious that the sources of information comes from the NR promoting institutions, as can be seen in the case of the balloon industry promotion, which is using

[4] Most of the quotations in this section were downloaded from the companies' websites. For a full list of the websites with their full internet address, see bibliography section.

figures on carbon sequestration from the MREPC. Since, as we have seen before, the environmental talk of the NR industry is not scientifically accurate, it is hence not surprising that the arguments used by the latex industry are even more simplistic.

For example, the Environmental Home Center, a retail store specializing on eco-friendly home goods, advertise natural rubber mattresses based on the fact that they come from a renewable source, mentioning the watershed protection services of trees and its social benefit to local populations: *'Natural latex is made from a milky substance that drips from the rubber tree when the bark is slashed. The process does not hurt the tree, making latex a sustainable crop that helps keep tree cover on land and provides an excellent source of local income in many developing countries. During production, the latex resin is whipped and then baked. The finished product is biodegradable. Environmental benefits of our natural latex: Uses a natural, readily renewable raw material; Provides an incentive to keep land covered with trees; Biodegradable.'*

Similar arguments, insisting on the green image of trees in a very general manner, can be found on the promotional literature of the Latex Mattress and Foam Center, a supplier of latex bedding material: *'Latex belongs to the species,* Hevea braziliensis*, which is cultivated on a large scale in Malaysia through a planned programme of replanting, thereby ensuring a sustainable supply of natural latex from a green environment.'*

Even greater enthusiasm, mixing up plantations and natural forests, is displayed on the website of Balloon Artists and Suppliers of Australasia, which are using the same figures on carbon sequestration as the MREPC: 'Rubber trees, from which the latex for balloons is harvested, are one of the main forms of vegetation in tropical rain forests, which in recent years have become crucial to maintaining the earth's fragile ecological balance. Harvesting latex can be more profitable to poor third world nations than raising cattle on the deforested land. Even when the trees producing latex for balloon manufacturing grow on plantations instead of in rain forests, they help the ecosystem, as the natural biology of the trees helps maintain our atmosphere and protect the ozone layer (sic). The demand for latex balloons actually is a huge contributor to a more positive environment in which global warming is increasingly worrying scientists and environmentalists. The balloon industry worldwide requires the latex from 16-million rubber trees that, in total, take up more than 363-million kilograms of CO2 gases annually from the earth's atmosphere'.

Again no differentiation between the various types of rubber growing systems is made. However, it is interesting that this literature is trying to capture the similarities between rubber plantations and rain forest, while being obviously aware that the similarities have limits, as shown in the last quotation above. This means that some of these suppliers would probably be happy to be able to promote a "super-green" type of latex goods, which would be coming from rubber growing systems re-creating an environment closer to natural forests than standard monoculture rubber plantations, which would enable them to differentiate themselves from their competitors. However, making this difference clear to their customers in a credible manner would require the backing of reputable scientific organizations or NGOs.

The tire industry: global high-tech brand strategies

The communication strategies of the tire industry are influenced by their double stake as a consumer industry and a supplier of components for the automotive industry, including very high-tech segments such as racecars and aircraft tires.

As indicated above, tires are a consumer product. Even when they are purchased as a component of a car and not as a "stand-alone" product, tires have a high visibility on a car – the brand of the tire is visible, which is obviously not the case of other spare-parts. Consumers expect tires to significantly influence their vehicles' performance especially in terms of driving comfort, speed, fuel consumption and, a growing concern, security. This means that the tire industry is a brand-based industry, in which manufacturers are ready to go to great lengths to protect the image of their firm and their products. Moreover, it is a global brand-based industry: with the degree of concentration going on in the tire market, the main players are competing on the world market. Even if Michelin is mostly a Europe-based company, they are competing against Goodyear and Bridgestone all over the world.

At the same time, the tire industry is also a supplier industry for the automotive industry. As such, they have to reassure their suppliers that they are responsible and reliable, and able to make products matching exactly the technical and price requirements of the carmakers.

Both concerns, in the end, are converging to bring the need to put the following elements forward:

- promoting the image of tires and tire-makers as relying on the latest state-of-the-art technology
- reliability of the product and the firm
- emphasis on technical performances, with safety being a growing concern.

Because social and environmental matters are an increasing part of consumers and stakeholders concerns, the tire industry is bound to integrate them in their brand and image-building strategies. However, because a basic principle of communication is that the messages have to be consistent with each other, the social and environmental concerns need to be integrated with the other aspects of the tire brands image mentioned above.

There are several ways tire companies manage to reach this type of convergence. Firstly, they do it by integrating environmental goals as part of the image of responsible, reliable and well-managed companies. This is very visible in this quotation from the introduction of the Environmental Health and Safety report of Goodyear: *'For more than a century, Goodyear has been building and protecting its good name, garnering respect and confidence worldwide under the distinctive winged-foot trademark. The Wings of Goodyear signify our commitment to the highest standards of ethics and integrity and encourage us to responsibly aim for formerly unimaginable goals.'* (Goodyear, 2001).

They also do it by putting the emphasis on environmental impacts of the tire that are converging with other performances, a strategy which is clearly used by Michelin, which links its efforts to increase the performances of its tires (reduced speed resistance, increased longevity, etc.) with the resulting environmental benefits (less fuel consumption, less waste, etc.)

The concerns with the environmental impact of the overall industrial processes are captured in the fact that most tire makers are engaged in ISO certification programs, including ISO 14001. For example, Goodyear plans to have all its sites certified by end of 2002, and Michelin plans to have 60 certified in the coming year.

In terms of green marketing, it is important to watch the strategies of the big three tire makers. In a heavyily concentrated, price competitive industry like tires, minor companies can be expected to follow the leaders. Therefore, they will embark on an environmental marketing policy only if the leaders do. The three leaders have different company cultures and different approaches to environmental concerns, which will need to be analyzed in more detail in further studies.

Michelin has the reputation of a very conservative firm, with a low degree of transparency, extremely conscious of its image as a top-quality tire maker, and jealous of its technology. It claims to be the company that invests the most in research and development. Like all major companies it has an "environmental" section in its corporate communication documents and strategy. As mentioned above, the environmental strategy of Michelin revolves mostly about the characteristics which are directly linked with the quality of its tires. Hence, Michelin focuses its environmental claims on the durability of its tires (which means less waste, less energy needed to produce them), their low rolling resistance (which translates into lower fuel consumption for vehicles) and their program for tires recovery.

By contrast, Goodyear presents a much more comprehensive environmental policy, centered around the concept of life–cycle of their product, and insisting on improving resource efficiency and reducing waste at all stages of the tire making, usage and disposal / recycle – an important concern for consumers worried about piles of used tires regularly found in dump areas.

Of the big three, Bridgestone is the one that seems to communicate less about its environmental ethos. This is probably because their main market base, Japan, is the less eco-sensitive of all the wealthy consumer markets. On the American market, Bridgestone got over the market of Firestone, but it first had to rebuild the quality image of Firestone which had been damaged. Hence the communication of Bridgestone/Firestone is centered around performances and security of its tires, with no obvious reference to the environment in its consumer communication.

None of the big tire makers communicate much about the origin of natural rubber. When understanding the environmental management and communication strategies of the big tire companies, it is important to remember that NR is only a small part of a tire, especially car tires, and that the environmental impacts of tire making, use and end-of-life processing are much wider than raw material origin. Concerns revoke around the whole life cycle of the tire. The main concerns of the industry are:

- reducing the energy consumption of cars through better tire technology

- improving the energy and raw materials use efficiency of tire plants
- reducing the use and emissions of solvents and other toxic ingredients during tire manufacture
- reducing the use of non-renewable raw materials for tires (petroleum-based synthetic polymers) by making tires last longer
- reducing waste associated with old tires by increasing their lifespan, increasing the re-use of tires and their recycling and recovery.

For the consumer, the conditions of natural rubber production are a distant concern when compared to these immediate issues. There is another reason why tire makers may not want to communicate too much about the plantations origin of natural rubber, and this is because it may be perceived as clashing with the "high-tech" image that tire makers are pursuing. For the makers of mattresses, emphasizing the natural image of natural rubber is an obvious advantage – consumers will feel reassured knowing that they rest on and get in close contact with a natural ingredient. For the makers of tires, this is not so obvious. It may become so as more carmakers are trying to sell their cars as environmentally friendly. But there is still a danger of conflicting messages.

This also means that for a tire maker, communicating about the use of "super-green" rubber from agroforestry may be even more delicate. Agroforestry plantations are perceived by part of the industry as simply not well-managed plantations; they have the reputation of producing a heterogeneous product, which is not well appreciated by the most demanding tire makers. In many cases it may simply not be possible for some tire makers, especially the top-of-the-market ones, to use rubber from agroforestry plantations because it does not match their technical requirements. Even if they do use NR coming from Indonesian agroforestry smallholders, tire makers may actually not want their customers to know it. Besides, as mentioned above, they may not want their competitors to know their sources of supply.

Hence tire makers may be more interested in becoming sponsors of conservation areas rather than to lose the flexibility to choose their supply based on sole technical factors, and link their image with a product coming from high-biodiversity rubber plantations at the risk of jeopardizing their image of a high-tech brand. For example, Goodyear has a sponsorship program to help the conservation of several charismatic endangered species such as the monarch butterfly, the humpback whale, leopard, orangutan, etc. Bridgestone sponsors a conservation area in Tennessee.

Conclusion: a potential around leading tire brands and latex goods

The market for natural rubber is divided into two totally different segments with different marketing and communication strategies, which hence exhibit different potential for marketing natural rubber based on "green" properties.

About 70% of natural rubber is used for tires. Of this, 60%, i.e. 42% of the whole market for NR, is consumed by three big global leaders in tire manufacturing, Michelin (Europe), Goodyear (USA) and Bridgestone (Japan). These three companies have very strong strategies to protect their brands and their image as reliable suppliers of tires for the automotive industry and consumers. Since they are market leaders, it can be assumed that they would also provide leadership in environmental fields, which means that any strategy to market "eco-friendly" rubber should start with these three big brands. Although the tire is partly a consumer product, it is perceived mostly as a technical good, which means that it's marketing is based on technical performances and security. The global tire companies have environmental management and communication strategies, and they make sure that the messages they communicate about their environmental management does not conflict with their image as high-tech companies. They may not want to source products from these agroforests that usually supply low-quality rubber, with inconsistent properties not compatible with the image of producing high-tech, reliable tires. Developing certification and direct market linkages between producer, customer, and end consumer may hence be difficult for the tire industry. However, they may still be interested in supporting the conservation of high-biodiversity agroforestry, and even fund the development of pilot projects on certification as part of environmental sponsorship programs – but it may be difficult for them to commit to buying rubber from eco-certified sources if it clashes with other requirements of their purchasing policies.

About 10% of the NR is sold as concentrated latex, which is used for a number of consumer goods, some of them having a good potential for "green" marketing. This is the case of all products that go into furniture, home goods, toys and clothing, such as mattresses, carpets, balloons, boots, etc. A number of companies in this sector are already advertising their NR products based on their environmentally friendly character. They bank on

the image of tree plantations in the tropics as substitutes for rainforests and providers of environmental services such as carbon sequestration, watershed protection and even biodiversity – although no difference is made between standard mono-specific plantations and agroforestry. These suppliers are obviously deriving their messages about the environmental benefits of rubber growing from the literature of institutions researching and promoting NR production such as research or trade and export promotion boards.

The rest of the NR consumption goes into various consumer and technical goods for which we see little potential for green marketing.

The table below provides a summary, based on the above discussion, of the potential for marketing green rubber to the various segments of the natural rubber industry.

Eco-sensitive Markets for Timber from Rubber Agroforests

Rubber agroforests can potentially produce two types of timber: rubber wood, and wood from other species found in the agroforests such as fruit trees (especially durian), soft wood species, and dipterocarpaceae. A typical mature agroforest, aged 30 years or above, may contain about 300 rubber trees per ha – a number which declines with age and fall below 100 in older agroforests – and around 200 non-rubber trees per ha, belonging to as much as 90 different species (Gouyon *et al.,* 1993). Both have the potential to be marketed to eco-sensitive buyers, but not without specific constraints.

Rubber wood: questions of quality, volume and costs

Rubber wood, a light coloured timber, used to be of very low market value in the past, and was used as fuel wood in the first generations of rubber plantations. The main constraint to its industrial usage was the fact that fungi very quickly attack it after harvest, which is due to the wood's high free sugar content. However, as the supply of quality tropical timber started to diminish, industrials showed interest in rubber wood. The Malaysian government and industry embarked on an ambitious program of research and promotion of the use of rubber wood, and developed chemical treatments that, if applied on the tree less than 72 hours after felling, enable it to be processed for a number of applications.

Rubber wood is now being used and marketed in many applications in which higher-value, less available hardwoods such as teak (*Tectona grandis*) have traditionally been used. These include furniture, flooring, wood panels and indoor building components.

It is not durable enough, however, for use in some situations requiring the durability of teak, such as boat building, bulwarks, construction and transmission line poles. Some of the large international furniture companies, such as IKEA, have been sourcing rubber wood products from Malaysia since the early 1990s for distribution to

Table 3. Potential for eco-marketing on the natural rubber goods market

Goods	Share of NR market	Sub-markets	Share	Potential for eco-marketing and constraints
Tires	70%	"big three" global brands Michelin, Goodyear and Bridgestone	60% of tire market 42% of total NR market	• high with the big three, especially Michelin (European market) and Goodyear (US) as they need to market their companies as responsible. • Has to be consistent with the need of the industry to buy high-quality rubber and to protect an image of reliable suppliers of a high-tech, technical product • direct linkages between suppliers of eco-certified products and manufacturers may be difficult to develop.
		Other companies	40% tire market 28% NR market	Will follow strategies of the leaders
Latex goods	10%	Consumer goods (home goods, toys, clothing…)	about half of latex goods market – 5% of NR market	• High – some companies are already marketing NR latex products as eco-friendly because they come from trees • Producers have to be able to deliver latex in liquid form with no contamination by foreign matters
		Other goods (medical gloves, etc.)	about half of latex goods market – 5% of NR market	Limited
Other goods	20%	Consumer goods	Small	Same as latex goods
		Industrial goods (automotive parts, etc.)		Limited since no visibility with consumer

their customers worldwide. Some of these large companies have linked up with furniture manufacturers to ensure that the supply of rubber wood products meets the companies' quality and design requirements; such linkages facilitate the transfer of technical skills and knowledge to local manufacturers (Killman and Hong, 2000).

Such large retailers are leading the demand for certified timber, especially FSC timber. Because they are under constant watch by NGOs and have to protect the reputation of their brands, they are developing purchasing policies that emphasize traceability, in order to avoid illegal timber, and the sustainability of the forest management practices of their suppliers. While they are not able to buy only FSC certified timber, mostly because the supply is not sufficient, they are increasingly committed to giving the preference to FSC certified sources, or at least to suppliers who are seriously engaged towards getting certified (see below, part II). In fact, these large companies face a shortage of tropical certified timber for the moment.

Any possibility for them to buy certified rubber wood would then probably be welcomed by these companies, especially if this wood comes from small producers, which limits the risks of social conflicts frequent in large plantations, and if it can contribute to the conservation of high-biodiversity areas.

As in the case of rubber for tire makers, however, the main challenge will be to meet the requirements of quantity and quality of these brands. While clonal monoculture plantations of rubber may yield in average around 35 m3/ha of hevea wood, smallholder agroforests would yield less than 10 m3/ha in average (Gouyon, 1999). There are many factors limiting the output of rubber wood from agroforests. Firstly, the quantity of rubber trees diminishes with age as they die, usually because of over-tapping, with insufficient recruitment from young seedlings to replace the initial stock. Secondly, the rubber seedlings found in agroforests tend to be conical and irregular in shape, which seriously limits the quantity of timber that can actually be used. Thirdly, poor tapping practices reduce the quality of the wood, causing interruptions in its normally homogeneous light colour. If the tapper accidentally cuts through the cambium, which happens often in smallholder agroforests, deposits and fungi introduced by the knife cause a black stain along the growth rings, which is considered a defect in the timber. In addition, the traumatic reaction of the cambial tissue produces calluses (Killman and Hong, *op.cit.*).

Another serious issue is transportation and processing. Most rubber agroforests are fairly isolated and scattered. With only a small quantity to harvest in each plantation, transport costs can exceed the value of the wood (Gouyon, 1999). This factor also makes it more difficult to make sure that the wood receives the proper post-harvest treatments to avoid damage by fungi.

This explains why rubber wood from agroforests in Indonesia is mostly used for local manufacture companies supplying the domestic market with low quality products. Export furniture companies using rubber wood have extreme difficulties in finding enough quality timber from smallholder agroforests (Gouyon, 1999). This also means that rubber smallholders will have a difficulty to compete with suppliers of rubber wood from monoculture plantations, which can supply a more homogeneous, less damaged product in larger quantities and usually with good access. Whether certification can produce a sufficient price premium to overcome this needs to be calculated. However, it should also remember that FSC certification could be used in monoculture plantations. Many large-scale plantation producers of hevea wood in Malaysia and Indonesia, or purchasers of wood from clonal monoculture smallholder plantations, could potentially become certified if the demand for certified rubber timber increases.

Hardwood species: a question of volume

The demand for hardwood products for export to eco-sensitive markets from Indonesia is at present much higher than the supply. Large retailers like Ikea and Home Depot are putting pressure on their suppliers from Indonesia to become FSC certified, especially as issues of illegal logging and destruction of the Indonesian natural forests become more well-known in the world. Large logging companies operating in natural forests, however, find it extremely difficult to meet the FSC Principles and Criteria. They are often unable to control illegal logging on their concessions, and are facing numerous conflicts over land tenure that in many cases exclude them from certification. As a result, there is only one logging company operating in a natural forest certified in Indonesia, PT Diamond Raya in Riau, and it is extremely controversial because of social conflicts (Colchester *et al.,* 2002).

The possibility of sourcing dipterocarp and other hardwood suitable for plywood and furniture from rubber smallholder agroforests would then be very appealing to many buyers. Competition would mostly be with natural forest management

companies, and not with plantations. This would put smallholders in a better position since they would not suffer from problems of remoteness – most smallholder plantations would actually probably be easier to access than most logging concessions in dipterocarp forests in Indonesia. Quality would probably not be an issue either, as long as the species are similar. The only possible issue would be volume, since the stock of timber from these species would be lower, on a per ha basis, than in natural forests. The consequence on costs and feasibility of meeting the needs of export industry would then need to be assessed.

Softwood: a question of demand

Apart from hardwood species for higher-end usages such as furniture, there is also the possibility of exploiting softwood species from rubber agroforests. This is already done by PT Xylo Indah Pratama, a company manufacturing pencil slats out of *pulai* wood *(Alstonia scholaris)* sourced in rubber agroforests from South Sumatra. This company obtained an FSC-certificate from Smartwood in 2000, and is exporting pencils to Europe, amongst others, through its manufacturing company located in Bandung, West Java.

The potential to replicate similar stories, which will depend on demand, needs to be investigated. For example, The Body Shop sells, in its Southeast Asian retail outlets, cosmetic accessories made of FSC-certified soft wood coming from Russia – which could easily be replaced with products from smallholder agroforests, provided there is an industry ready to process it in this form and export it. Numerous possibilities to use the softwood species from rubber agroforest exists, but since it would probably not be feasible to export raw logs or even semi-processed wood because of cost issues, they will depend on the existence of a demand, and a local manufacturing capacity – even of small-scale – to process it.

Conclusion: the need to investigate potential market linkages

Given the existing demand for eco-certified timber from Indonesia, which by far exceeds supply, there is a good potential for marketing wood from rubber smallholder agroforests to eco-sensitive markets. The success of this operation, however, depends on the capacity to create market linkages, i.e. to develop permanent links between groups of smallholders, and companies asking for eco-certified wood products – and ready to pay a premium price for them compared with other buyers.

Whatever the type of wood, there are a number of constraints that need to be investigated before wood from rubber agroforests can be marketed to buyers demanding eco-certified products. In the case of rubber wood, there are several issues linked to the fact that agroforestry smallholders are in competition with monoculture plantations, which tend to be far more competitive in terms of quality, volumes and costs. In the case of hardwood species, the questions of volumes harvested and the consequence of costs and meeting the needs of buyers need to be examined. In the case of softwood species, the main concern is to locate an export demand, which may vary considerably depending on the species and the possible uses, and to make sure that there is a local manufacturing capacity to meet it.

There are a number of organizations that specialize in developing market linkages between those demanding and those supplying certified timber. They could be approached for assistance within the present project. The most prominent one is the WWF's Global Forest and Trade Network (GFTN), which organizes, in each region of the world, groups of buyers committed to giving the preference to FSC certified products, and links them with suppliers. Other groups with a similar mandate active in Asia include the Tropical Forest Trust. Certifiers like Smartwood may also able to provide information on the demand for certified timber.

CERTIFYING RUBBER AND TIMBER FROM AGROFORESTS: POTENTIAL, CONSTRAINTS AND BENEFITS

There are several types of certification systems used to provide guarantees to consumers about the social and environmental impacts associated with various stages of a product's lifecycle. We are providing below an analysis of the main types that could potentially be used to provide incentives for conserving biodiversity in smallholder rubber agroforestry. The following points are considered in the analysis:

- the feasibility of certification, i.e. the relevancy of the standards and the possibility to make smallholder agroforestry systems compliant with the requirements of each certification scheme and to get them certified;
- the potential to create market linkages, i.e. what it would take to have purchasers of NR to give a premium to products coming from certified sources;
- the discrimination factor, i.e. what it would take to make sure that only products from high-biodiversity agroforestry sources could benefit from such market linkages, and not just products from any type of plantations.

Three types of options are considered:

- forest management certification, which certifies that timber or NTFP products are coming from well-managed forests or plantations meeting the criteria of economic viability, social fairness and environmental soundness ;
- organic certification and other 'environmentally-friendly production' certification schemes, which certify that products have been obtained without the use of chemicals in a way that protects soils and ecosystems;
- agroforestry certification, either from existing programs such as forest garden certification, or through the creation of a specific label for products from high-biodiversity agroforestry systems.

Forest Management Certification

Forest management certification schemes are designed to provide consumers with guarantees that a product – timber or non-timber – comes from a well-managed forest, usually based on a combination of economic, environmental and social criteria of good forest stewardship. The most widely recognized scheme in this category is the FSC, although it is challenged by competitors, most of them trying to create standards that are easier to comply with based on regional or national initiatives, such as the Pan-European Forest Certification, or the Malaysian Timber Certification Council. We present below the strengths and weaknesses of the FSC system, followed by an investigation of the feasibility of using it for products from rubber agroforests.

Strengths and weaknesses of the FSC system

The power of the FSC: support from environmental groups

Forest management certification was born relatively recently. In the 1980s, ENGOs started to run aggressive campaigns against products coming from forests, especially tropical forests, in which forest exploitation led to ecological destruction. These campaigns were mostly targeting companies with a high exposure, i.e. companies selling mass products to consumers such as furniture retailers and do-it-yourself (DIY) brands. ENGOs were running pickets in front of large retail outlets, and calling for boycotts of the companies accused of selling products from the destruction of forest resources. The boycott campaigns, however, soon found their limits, as consumers need to buy timber products. Retailers turned to ENGOs asking them to point them towards products that were acceptable from an environmental perspective. This led to the creation of the FSC in 1993, which was largely supported by large ENGOs such as WWF and Greenpeace – with WWF having a key role in helping define the standards by which FSC certification would operate.

It is important to realize that the ENGOs are a key element in giving power to the FSC and maintaining its credibility and its clout with the industry. Products coming from FSC certified operations can be marketed with the FSC logo under a precise set of rules of use. Yet the FSC and its logo have a relatively low degree of consumer recognition – much lower than, for example, the WWF and its panda, or an NGO like Greenpeace. Although this is starting to happen in a few countries, very few consumers are going into a shop looking specifically to products bearing the FSC logo and buying these instead of alternative products. More importantly, being able to state that it gives the preference to FSC certified products enables a company to enhance its green image in general, and to protect

itself from ENGOs attacks damaging their reputation and brand.

Basically, the process by which firms give the preference to certified products is not a direct consumer link as such:

Consumer →	Put pressure on firms to sell certified products →	Put pressure on their suppliers to get certified

But rather an indirect one going through the NGOs:

ENGOs →	threat to attack firms purchasing products from 'unsustainable' sources →	Put pressure on their suppliers to get certified

In both cases, the consumers make the difference. But the reason why they give the preference to firms selling certified products is because they generally perceive these firms as better through ENGO campaigns. This means that if ENGOs stopped supporting the FSC, the industry would immediately withdraw its support from the FSC too, since it would lose its credibility, its clout with consumers and its image and marketing benefits.

The role of certification bodies and working groups

The FSC does not carry out certification by itself. Its task is to define international standards based on the recommendations and votes of the members of its three chambers (social, environmental and economic), which are meant to represent respectively indigenous people or social groups, ENGOs, and the forest and timber industry. The FSC then accredits and supervises certification bodies (CBs), which carry out the audits in the fields (see Appendix 4). Each audited operation considered as meeting the Principles and Criteria of the FSC after an initial assessment is awarded a five year certification contract, usually with conditions, which means that they have to improve the quality of their social, environmental and economic management over time. Annual audits enable CBs to verify compliance with these conditions and maintenance of the certifiable character of the operation. The Principles and Criteria are concerned with economic viability and diversity of the forest products, social justice (respect of the rights of local people, especially indigenous communities, and forest workers) as well as ecological soundness.

The FSC works with an international generic standard, which has to be adapted to heterogeneous conditions of forestry throughout the world. This is supposed to be done through the formation of multi-stakeholder national initiatives and working groups, in charge of carrying consultations and tests to develop national standards adapted to each country, based on the FSC's Principles and Criteria. In a similar fashion, working groups are also in charge of developing specific standards for particular products, including NTFPs. However, due to the length and complexity of the process and the lack of resources, many tropical countries are carrying out certification without having had the time to fully develop local standards; this has attracted criticism from some NGOs (see for example Counsell and Loraas, 2002, Colchester *et al.,* 2003). In these cases, certification bodies normally use locally adapted versions of their own generic standards.

Achievements and Constraints Today

The FSC was founded in Toronto in 1993. Since its creation, the following achievements have been made:

- FSC certification has achieved worldwide recognition, and is the standard that is the most widely accepted by a diversity of stakeholders, especially industry and ENGOs. The WWF considers the FSC as the only international system meeting the criteria for credibility, i.e. its standards are recognized by most stakeholders, it uses verification through independent third-party audits, and the process is transparent and participatory (Ozinga, 2001). As a result, an increasing number of buyers from Europe and North America are giving preference to FSC certified products and developing purchase policies along the FSC standards. In Europe, consumers who give the preference to FSC-certified products may account for as much as 25% to 50% of major markets like Germany, Britain and the Netherlands (Gilley, 2000).
- Companies like IKEA or B&Q/Kingfisher have supported the FSC from the start. Others have expressed support more recently, such as Lowe, Home Depot and Carrefour. Some of these large brands, like Home Depot, have committed to phasing out purchase of wood from ancient or endangered forests unless it is certified, with a preference for FSC products. This gives a huge pressure to suppliers to meet FSC standards and get certified.
- FSC certification is applied on all continents for all types of forest management units including community forestry, small landowners, state-managed forest, plantations, etc. Today, more than 30 million ha. of forests have been certified worldwide;

- FSC standards are used for a wide range of forest products including, although on a limited scale as of now, NTFPs;
- Certification is increasingly recognized as having many benefits that go further than price premiums or expanded markets, such as helping companies achieve better management of their resources.

The FSC is relatively young and continuing to expand, and this means that its recognition and the recognition of its logo are likely to continue to grow – at least if existing shortcomings are properly addressed. Today, the FSC is still failing to meet some of its targets in a number of respects.

- One of the most important failures, which is a focus point of environmental and social groups who criticize the FSC, is the fact that access to certification is unequally distributed. Barriers to certification include access to information, cost of audits, cost of compliance, and sheer management or technical capacity (Bass *et al* 2001). Forest managers from the South are most likely to have difficulty to access certification, and as a result, more forests are certified in the North. This means that the FSC is still short of its target of becoming a significant instrument in protecting forest resources in the South. However, significant efforts are being made in that direction and the percentage of tropical forests certified, even if it still close to 10% only, is steadily growing.
- Communities and small landowners also have more difficulty to access forest certification. Firstly, there are economies of scale in the auditing process, as the relative cost of audits is greater per unit of area or product for small forest management units (FMUs). Secondly, small forests and community forests tend to be managed in a more informal way than large enterprises, with less documentation, written reporting and procedures. Documented forest management planning and systems require companies to submit many documents to meet FSC standards. This makes compliance more costly for small FMUs and communities, which have to produce new documents, which may be solely for the purpose of certification. Thirdly, small landowners and communities are less likely to be in a position to access or understand the information about certification, or to have the managerial capacity to conform to audit procedures.
- Most FSC certification bodies are for-profit companies. Such companies have little to no incentive to engage with clients who cannot pay profitable consulting fees to the certifiers, as is the case of small landowners and communities. The majority of community forests certified today were done by non-profit organizations like The Rainforest Alliance's Smartwood program (based un the USA) and The Soil Association's Woodmark program (based in the UK). In many cases, the only way communities can access certification is through aid programs.
- For these reasons, community forestry represents only 3% of all the certified area worldwide. This problem has been recognized by the FSC, especially since small forests and community forests are often managed under a relatively low intensity and are well integrated into local social fabric and economies, which means that they are less likely to have adverse social and economic impact. The FSC has recently launched an initiative to improve the access to certification for small and low intensity managed forests (SLIMF). One of the core goals of this program is to adapt certification standards to the conditions of these SLIMFs and hence reduce auditing and compliance costs. Part of this strategy is also to develop existing procedures for group certifications, resource managers and pool certifications, in which one single operator (for example the buyer of a product) manages the certification for its suppliers who can be a group of small producers. Making certification accessible to rubber agroforestry farmers would fit well within this goal, and it is likely to generate interest in the community of NGOs and donors that support access to certification for SLIMFs.
- Another shortcoming of FSC certification as of now is that its price benefits are highly variable, and depend on market access. A strong percentage of certified wood is actually sold, with no incentives at all, to non eco-sensitive markets, because of an inadequate match between the demand and the supply of certified products. Buyers from highly eco-sensitive markets such as Northern Europe and America are the only ones likely to offer a significant reward for certified products. For example, Indonesian suppliers of certified teak report that they receive a price premium of 5% –which may seem small at first but is significant for wood industries operating with high volumes and small margins. In many cases, however, things are made complex by the fact that selling certified timber enables them to gain access to different markets, especially the European and North American ones; which in

general pay higher prices than non eco-sensitive markets The price difference may then be as high as 35% to 100%. Capturing this premium, however, is conditioned by the fact that the suppliers must be able to meet the other requirements of such markets in terms of quality, quantity, timeliness, packaging, consistency, etc.

Because of its very success, especially with buyers, the FSC has been challenged by competing schemes, launched by governments and the forest industry organizations. This was a reaction against what they often perceived as an FSC process driven by international ENGOs, and an attempt to promote less costly certification standards and procedures that would be more easy and practical to implement. Amongst the first schemes thus created were the CSA (Canadian Standard), the SFI (Sustainable Forest Initiative, USA) and the PEFC (Pan European Forest Certification). Other countries that have created their own systems include Australia and Malaysia. Some of these schemes, like LEI and MTCC, often hope to achieve recognition by the FSC. In many cases, this proves to be difficult since their standards and methods may not be compatible; moreover, some of these schemes are questioned by environmental NGOs for not having enough independent verification means and stakeholder participation, or for allowing destructive forest management methods (Liimatainen and Harkki, 2001, Ozinga, 2001). As of now, the NGOs that helped found the FSC are still throwing their weight in defending it against competing schemes with lower standards, to avoid consumer confusion and make sure the standards are not downgraded (source: Emmanuelle Bérenger, WWF).

One of the few national schemes that have been able to establish a working cooperation with the FSC is the LEI (Indonesian Ecolabeling Institute), which uses standards and verification methods that have a high degree of compatibility with the ones recognized by FSC. Hence, LEI and FSC certification are carried together in Indonesia under a joined certification protocol (JCP), which stipulates that to be FSC certified, a FMU has to meet the LEI standards, and vice-versa.

The FSC is currently under attack by some of the relatively radical social and ENGOs, led by the Rainforest Foundation, which recently released a report criticizing the FSC for being biased in favour of large industrial forest companies, and failing to uphold its standards (Counsell and Loraas, 2002). In Indonesia, the same group of international NGOs are supporting a group of local NGOs, led by WALHI (the Indonesian Environmental Forum) and AMAN (the Alliance of Indigenous people of Indonesia), which have been calling for a moratorium on forest certification, arguing that tenure systems do not allow for adequate recognition of the rights of local communities and indigenous people (Colchester *et al.,* 2003). The future of certification will depend very much on the capacity of the FSC system to address these critics. If shortcomings are corrected, then the FSC will gain wider credibility and maturity. If this is not the case and the FSC cannot address the real issues behind these critics, the relatively more moderate NGOs with strong consumer visibility, like the WWF, may eventually have to withdraw their support to the FSC, which would deprive it of its power and credibility with consumers. However, this is unlikely to happen in the short term since these NGOs perceive FSC certification, as a major and badly needed tool to push the agenda of sustainable forest management in the tropics, despite imperfections which can hopefully be corrected.

Certifying smallholder products from agroforestry systems

Timber certification

As mentioned before, the FSC standard has been used over approximately 30 million ha worldwide for timber products, including products from smallholder forests. Recently, in 2000, Smartwood has awarded a certificate to a company, PT XIP (Xylo Indah Pratama), which purchases Pulai (Alstonia spp.) from rubber smallholder agroforests in Musi Rawas, South Sumatra.[5]

The experience of this certificate indicates that there is no particular obstacle from certifying smallholder timber production. The main challenges that could face an operation are the following:

- Establishing that the production of timber is sustainable, i.e. determining that the volumes harvested annually are not exceeding the capacity of regeneration of the timber species.
- Ensuring that no timber from illegal sources are entering the certified pool. This is always a risk, especially when smallholders' agroforests are located close to National Parks or logging concessions. Adequate chain-of-custody procedures are needed to alleviate this risk.

[5] A public summary of the certification report for PT XIP can be downloaded from the Smartwood's website, www.smartwood.org

Possible compliance of smallholder production with the FSC's Principles and Criteria are discussed more in detail below (table 4) for both timber and rubber production.

NTFP Certification

The issue of labelling NTFPs has been discussed at the FSC since 1996, i.e. nearly since its creation. A special Working Group was formed then, which is still operating. Specific clarifications with regard to NTFP policy have been added to the guidelines to certification bodies in 1998, and the FSC has encouraged CBs to experiment with NTFP certification (Brown et al., 2002). A special principle for NTFPs, Principle 11, is currently being drafted and considered for addition to the existing 10 principles of the FSC.

The organization that has taken the leadership in developing standards and practical experience in NTFP certification is the Rainforest Alliance's Smartwood program, followed more recently by the Soil Association's Woodmark programme. Both are non-profit organizations, which are highly concerned with the social aspects of certification and its accessibility for communities and small landowners. Both have developed their own generic standards for NTFP certification. Smartwood, however, has more experience in implementing these standards, having issued four certificates covering NTFPs in Mexico (for chicle gum/latex), Brazil (Acai Juice, palm hearts, and various ingredients in cosmetics covering 30 plant species) and the US (maple syrup). The Soil Association offers joint organic and FSC certification for NTFPs and has so far issued one certificate for tree bark (Brown et al., 2002).

As of now, two national standards for NTFPs have been endorsed by the FSC, for Brazil Nuts in Peru and Bolivia. Others are being developed in Brazil, for a large range of products, and for maple syrup in Canada. Another organization, the Falls Brook Centre in Canada, has also been active in providing input to develop guidelines for NTFP certification.

The most widely applied standard for NTFP at the global level is the one developed by Smartwood. It consists of two sets of guidelines, one concerned specifically with "stand-alone" NTFP certification (Smartwood, 1999), and the other one being an addendum meant to be used when NTFP production is assessed along with timber production (Smartwood, 2002). The Smartwood's NTFP guidelines are organized in the same way as the FSC's principles and criteria. They can be used for plants exudates like hevea latex. When looking at the standards for NTFP certifications and trying to evaluate the degree of compliance of agroforestry smallholders, it is important to remember that certifiers are required to be pragmatic when interpreting NTFP standards on rather small scale, extensive management systems where the relative degree of impact from harvest is bound to be less.

Based on an analysis of the FSC P&Cs, the Smartwood guidelines, and the experience of PT XIP, the feasibility of certifying smallholder rubber agroforestry systems using existing FSC approved standards for both timber and rubber production can be analysed.

Handling Certification for a Group of Smallholders

Handling certification for a high number of small individual producers requires adequate institutional arrangements. The certified unit is normally the forest management unit, which there is in each individual smallholding. However, it would be unpractical to conduct audits for hundreds or thousands of smallholders, each of them having a similar management system. The method used in such case is called group certification. In this system, a group of forest management units, also called a certification pool, receives a group certificate, which is handled by a manager or management entity. The manager is responsible, to the certifier, to produce the documents and other evidence that the members of the groups are running certifiable operations.

Field audits and consultations are conducted in a similar way as for any forest management audit. The certified operation needs to go through a full assessment, during which a team of foresters, ecologists and social scientists conduct an audit of the operation using documents, field visits and consultations with local stakeholders – including mandatory public consultations meetings. In the case of a group certification, this would require visits to a sample of the group members. If the manager has doubts about the feasibility of certification, the full assessment can be preceded with a shorter, and hence less expensive "scoping" visit that enables to identify possible problematic areas. After the initial full assessment, once the company has met pre-conditions for certification, it receives its certificate, which is valid for five years. However, during this period, the certifier conducts mandatory annual audits, to check whether the certified operation is maintaining compliance, and whether it is meeting the conditions set by the certifier – i.e. requests for improvements in management which are supposed to take gradually place during the five-year period of certification. A

different sample of the group members is visited during each annual audit.

In case of a group certificate, the management entity is responsible to handle the relations with the certifier during assessments and audits. Different types of managers may be used, depending on the local institutional setting. The manager can be the head of a cooperative or association if the small producers are organised as such; it can be a consultant providing services to the group's members. It can also be the buyer of the groups members' products, for example a trader, processor or manufacturer who is the interested in sourcing certified raw materials for its operations. This is the case of PT XIP in Indonesia, which produces certified pencil slats using *pulai* wood from rubber smallholders, and is responsible for ensuring the compliance of its group of suppliers with the conditions of its FSC certificate.

In the case of natural rubber, several options can be explored. ICRAF could act as the manager and handle the certification, which would be technically easy since it has a lot of information about the management system of smallholder agroforestry rubber. Adequate institutional arrangements, however, would be needed to ensure the proper relation between ICRAF and the group members, which may require the development of a formal organization of the group members. Another possibility is to have a trader or exporter acting as a resource manager, like in the case of PT XIP, with possible technical assistance from ICRAF or another qualified body. In any case, in order for the whole pool to be certified, the smallholders would have to take a number of commitments, such as:

- keeping their certified area under rubber cultivation in the future and maintaining the sustainability of its production as well as the characteristics that make it certifiable;
- acknowledging the fact that they are part as a certified pool of suppliers and that they understand the meaning and consequences.

For example, in the case of PT XIP, smallholders who supply timber to the company are asked to sign a letter acknowledging that they are part of a certified group of suppliers of *pulai* timber, and that they are committed to maintaining the sustainability of the supply of *pulai* in their agroforests. During annual audits, verification is conducted through interviews to check whether farmers really understand the meaning of this commitment and how they translate it into practice, for example by protecting young *pulai* trees in their agroforests, or by making *pulai* nurseries. In the meanwhile, the managers are expected to continually socialize and train the members about the implications of the membership of the group.

Separating the certified product from the non certified: chain-of-custody

The process of certification is meant to provide the final buyers of a product the guarantee that it comes from a certified operation. This means that the product has to be tracked through all its marketing, handling and processing chain to make sure that products from non-certified sources do not get mixed with certified products and do not end up carrying the FSC label. The FSC does, however, permit according to specific policies, the mixing of certain percentages of non-certified and certified materials, in what is known as percentage-based claims. To bear a label with the FSC logo, a final product must meet minimum percentage requirements for raw material sourced from certified sources (This percentage applies only to the portion of the raw material that comes from forests or plantations. Any raw material coming from non-forestry sources, e.g. plastic, agricultural products, metal, etc. and may be considered as FSC 'neutral' in establishing the percentage- based claim).

Any producer of certified materials who is also sourcing from non-certified operations must undergo a chain-of-custody (CoC) audit and certification. Certification bodies conducting forest management auditors are usually accredited to conduct CoC audits. These audits are meant to verify that the users of certified and non-certified materials – for example, furniture makers – are keeping a proper track of the different sources and are hence able to trace and inventory precisely how much percentage of certified materials has entered any final product. CoC certificate holders must adhere to strict labelling rules for use of the FSC logo, trademark, and on-product claims, which holds true for percentage-based labelling.

In the case of NR production from smallholder agroforests, CoC control would be a difficult operation since there might be several buyers in one area, sending the raw coagulated rubber through a complex chain of intermediaries to several exporters in the main provincial port, or sometimes in several destinations. In practice, traders or exporters participating in the operation would have to commit to separating rubber from certified suppliers from non-certified sources. Further studies would be needed to establish various options to this extend and their feasibility. In the case of timber, as indicated above, the main

difficulty would be to ensure that there is no entry of timber from non-certified sources, especially illegal ones, into the certification pool.

Lessons on handling timber supply can be learned from the case of PT XIP in South Sumatra. PT XIP buys timber from two sources, either directly from smallholders – usually the ones who control large areas of agroforests – or from intermediary suppliers. These intermediaries go around the villages, identify *pulai* sources, and make arrangements with the owners of the trees, in which they usually take charge of the harvesting process and then compensate the owners based on the volume of timber extracted. To have a better control over its sources, the company also sometimes sends its own team to make inventories of *pulai* sources in the villages, but still lets the intermediaries handle the harvesting and purchasing operations. The main difficulty arises from the fact that the buyers are constantly recruiting new sources of *pulai* who are not part of the certified pool. In each case, the new supplier has to sign the letter acknowledging that he has entered the pool and makes the related commitments. The letter has to be attached with the timber when supplied to PT XIP.

In the case of natural rubber, CoC is more complex, because smallholders sell their product to intermediaries on a weekly basis. The CoC management will work only if it can handle the certified rubber separately in a simple way, with minimal added transaction costs and limited need for control. Tracking the sources of rubber down to each individual smallholder may not be practical, especially if certified smallholders are adjacent to non-certified ones. Two options can be imagined:

- Ensuring that all the smallholders in a given area, at least from a given village, agree to enter the certified pool. Participating intermediaries could then separate the rubber from a given village or area, and separate it from the one coming from non-certified villages.
- Organize a group of certified smallholders who commit to selling all their product to the same buyer on a regular basis, with a sufficient volume so that the buyer can handle the certified products in a separate way. The buyer can then be either a staff, or an appointed intermediary working in hand with the final processing company.

The use of a percentage-based system would also be important for latex. As in the case of pulp and paper (which can use a 30% minimum threshold) it would be needed to have the collecting centres record input from a certified working area, such as a village, so that further down the chain the

intermediaries and collectors are able to mix certified and non-certified and come up with a percentage. A batch measuring system should be employed, whereby the concept of a rolling average be used. This would mean that over the period of 30 or 60 days, x percentage was attained, but on a given week or day, the average may be far below the rolling average (source: Jeffrey Hayward, Smartwood).

In order to ensure that there is competition between buyers and to avoid monopoly situations in which smallholders would end up getting a lower price for their certified rubber than for non-certified rubber sold on a competitive basis to any buyer, a system of tenders could be organised. This has already been organised in some areas of Sumatra, for example to sell the rubber produced by smallholders member of the SRDP project, who were able to produce rubber of relatively good quality in the form of thin slabs. These smallholders would then sell their product to processors/exporters from Palembang every week or fortnight. Exporters interested in buying the product from the group would have to sumbit a price bid, and the highest bidder would get the product. Similar tenders have been organised in different areas of Sumatra with mixed success – with problems arising in some cases from collusion between the buyers, who make arrangements to win the tender in turn and agree not to over-bid each other. Again this means that a system of control has to be put in place, comparing prices in the tender from prices in the open market – the tender system being interesting only if it enables the smallholders to get a higher price for their raw material than what they would obtain in the open market.

Compliance and gaps between the rubber agroforestry system and the FSC standards

Once a credible system is set in place for managing the certified pool and the chain of custody of its products; it then becomes possible to contemplate the certification of smallholders' agroforestry systems.

The table below provides a summary analysis of the compliance of rubber smallholder agroforestry systems (RAS) with the FSC's P&C, based on Smartwood's generic guidelines for forest management and the addendum on NTFP. Potential gaps are identified and ways to fill them are then suggested. The complete Principles and Criteria of the FSC can be consulted in Appendix 2.

Table 4. Analysis of the Compliance of Smallholder Rubber Agroforestry with the Principles and Criteria of the FSC and Smartwood Generic Guidelines

Compliance Analysis	Recommendations
Principle #1: Compliance with laws and FSC principles	
For rubber, no particular gaps can be foreseen in this area. Smallholders usually have all the necessary rights to harvest rubber on their agroforests. There is no particular risk of illegal harvest. For timber, things would be more complex, since permits are needed to sell timber, even if harvested from privately-owned, forested areas. The manager of the group of certified smallholders would need to establish to that the wood has been harvested with adequate permits, and that no illegal timber may be mixed with certified products.	To comply with Criteria 1.6, smallholders should commit to being part of the certification pool and maintaining the sustainability of their resource as mentioned above. Adequate chain-of-custody procedures need to be set up to avoid the risk of purchased of illegal timber.
P#2: Tenure and use rights and responsibilities	
No particular gaps. Smallholders normally enjoy a clear and stable tenure over their agroforests. Although they have no official title, the fact that they planted trees on the area serves to establish ownership under traditional laws, and the government usually acknowledges this. Smallholders can normally obtain a letter from the village head stating that they are legitimate owners of the land. Conflicts over land ownership do occur in smallholder rubber areas, but they are normally solved at the village level through traditional leadership and the village government. In the case of some timber species, there may be a need to check the possible existence of communal rights (at the level of the village or the family) controlling the felling of particular trees.	Certified areas should be clear of unsolved conflicts. If an area has a major conflict between owners, for example, and if there is no mechanism to solve this conflict during the certification period, it would be necessary to exclude these areas from the certification pool. The Smartwood NTFP guidelines stipulatethat “local communities should receive fair and adequate benefits for any use of their name or image in marketing of NTFPs”. This should be taken into account in the certification scheme, especially if any rubber product is marketed as coming from agroforests.
P#3: Indigenous peoples' rights	
Different types of smallholders should be considered in the case of agroforestry in Sumatra. Two groups can be considered as indigenous people (IP) in Sumatra. The true, original IPs are the *suku anak dalam.* They are a very small and marginal group of people, often called *kubus* by external parties, who live from hunting – gathering and shifting cultivation in Jambi and South Sumatra. A minority of them are starting to grow rubber. A more recently arrived group of people are the *Melayu.* They can be considered as indigenous under the FSC’s definition since (1) they are descendants of people who have inhabited Sumatra for several millenniums now (2) they tend to be politically dominated by people of Javanese descent who have exerted most of the power in Indonesia since independence (3) they tend to recognise their traditional *adat* rules more than the national official institutions; although the *adat* has been considerably weakened in Sumatra over the last 30 years of rule of Javanese-based power. In the case of Kalimantan, IPs usually belong to the generic group of *Dayaks*, although there are also *Melayu* farmers who have been established for long enough on the coastal areas to be considered as indigenous by now. Then finally, both in Sumatra and Kalimantan, there are people from Java or other islands that arrived in the course of the 20th century, especially within migration programs organised by the government. Most RAS are operated by indigenous *Melayu* farmers, or *Dayaks* in Kalimantan. Immigrant farmers tend to operate more intensive systems such as mono-specific plantations. This means that it is unlikely that there would be major gaps in this Principle.	In the case where non-indigenous farmers want to join the certified pool, it should be verified that the land they are cultivating has been obtained from indigenous inhabitants with ‘free and informed consent’ and that there is no conflict over the area. In case the certified RAS are in a *suku anak dalam* area, special attention should be paid to the relation of the rubber smallholders with the *anak dalam,* through consultation with these people or at least with sources having a good understanding of their livelihood. In particular, rubber smallholders should not be threatening or diminishing, either directly or indirectly, the resources or tenure rights of the anak dalam. Any resource or site of economic or cultural importance to these people should be identified and protected by the rubber smallholders.

P#4: Community relations and worker's rights	
Since members of local communities mostly operate RAS on a family basis, no particular gap is seen there. However, workers may still be employed occasionally for rubber tapping and timber harvesting. Rubber tappers are normally paid a share of the harvest, and harvesters on a piecemeal basis, and this would be considered acceptable since this is based on local customary rules. Issues of work safety may arise in the case of loggers, which are far from using adequate protection in smallholder operations in Indonesia.	Plans for gradual improvements of the safety of loggers, through training, supervision, supply of protection gear and incentives, would probably be requested.
P# 5: Benefits from the forest	
This principle is meant to ensure that 'Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits'. RAS, which are diversified systems in which a large range of products are used and harvested, and which maintains other functions of a natural forest, should be in a good position to comply with this principle. However, in the case of timber, it would be important to ensure that the volumes collected are sustainable. One criteria which may pose problems is criteria 5.1, which require smallholders to strive towards economic viability. Smartwood recommends in its guidelines that "efficient and processing harvesting methods and equipment are used to minimize ecological impacts and maximize economic viability". It could be argued that RAS smallholder's methods of cultivating, harvesting and processing rubber are not the most "efficient" and that alternative methods could be used to "maximize economic viability" – although in many cases these methods would mean a departure from the agroforestry system. In its guidelines to interpret criterion 5.1, SW also recommends that 'In the case of externally supported NTFP harvest operations, a plan exists to reduce the level of dependency on external support and to maximize levels of self-sufficiency and control'. This means that if the smallholders are part of a project where they maintain their agroforests in exchange for a 'conservation fee', all steps are taken to reduce their dependency on this fee.	The input of ICRAF to document the efficiency and viability of the smallholder's system would be essential and should normally enable to solve the issue of 'economic viability' by establishing that these low intensity methods, in appearance less "efficient", have their own economic rationale in the view of the conditions of the smallholders minimizing risk and maximizing the options for labour use in diversified farming systems. Compliance with criterion 5.1 would also be enhanced by encouraging smallholders to experiment with methods of improving the productivity of RAS for a variety of outputs (timber, fruits, rubber, etc.), which is already a program of ICRAF. Developing a certification system and seeking market incentives for rubber from RAS is obviously an effort to increase the economic viability and independence of rubber smallholders towards external support. Developing these efforts, besides inherent obvious benefits, would make the certified pool more compliant with P5 of certification, including criterion 5.1 and 5.2.
Principle #6: Environmental Impact	
Smallholder rubber agroforestry systems are unique in their capacity to maintain a number of forest ecological functions, especially diversity of plant species. They have minimal, if no, adverse environmental impact. Most of them have been developed on land converted from natural forest way before the FSC limit of 1994. Possible environmental damages could occur during land clearing operations taking place for the replacement of rubber agroforestry plantations. Issues of erosion and chemical uses will need to be assessed, as well as fire control. Communities are normally using local methods of fire control to make sure that fire does not spread accidentally to other plantations. Possible adverse impacts on fauna could also result from hunting by community members. Depending on the methods used for logging and removal / transportation of logs, various environmental impacts such as destruction of surrounding trees and erosion can occur.	New plantations created on fields converted after 1994 (the creation of the FSC and the limit date after which the FSC does not endorse plantations on newly cleared natural forest areas) would be excluded from the certification pool, and farmers joining the pool should commit to not clearing new natural forest areas. It would be important to check with communities that traditional methods of fire control – or any appropriate method – are in place and used when replanting old rubber groves, and that use of chemicals and erosion are kept to acceptable levels. Practices of hunting and fishing in the certified areas should be assessed and any negative impact limited. Documents analysing the environmental impact of smallholder rubber agroforestry systems would have to be supplied to assessors by the Resource Manager. The introduction of reduced impact logging may be needed.

Principle #7: Management Plan	
FSC certification does require forest managers to write, implement and regularly update or use a management plan, stating the long-term objectives of management, and the means of achieving them. This is a common problem for SLIMFs operators who tend to operate by informal, unwritten rules and goals. However, the FSC acknowledges that the management plan should be 'appropriate to the scale and intensity of the operations'. Small – size operations of low intensity with minimal adverse potential impact are not required to submit plans as detailed as large-scale industrial plantations or logging operations. In its guidelines, Smartwood recommend that management plans for NTFPs should include 'management objectives, and harvest areas, rates and techniques for target NTFPs, whether these are harvested by FMOs or third parties'. It also specifies that 'Harvest levels and methods should be rationalized through published literature, site-specific data and/or local knowledge.' It specifically recommends the following elements in the management plan: • Management objectives, • Resource use rights and socio-economic conditions of harvesters; • Harvest areas; • Rate, timing, and quantity of NTFPs to be harvested, based upon plant part used (e.g. exudates) and established best management practices for each NTFP; • Description of and justification for the amount of each NTFP harvested, the implemented harvesting technique and the equipment used; • Sources of information that sustain the rationale behind NTFP management activities, (i.e., based on site-specific field data, local knowledge or published regional forest research and government requirements).	Smallholders would not be able to submit a management plan in written form for their operations. In the case of rubber, it can be argued that these operations are carried under a rational system that has been empirically optimised through nearly 100 years of practice, and has hence demonstrated its sustainability. The group certificate manager would then play a crucial role in putting the informal, empirical elements of smallholders' management in a written form, based on the considerable amount of literature and research that has been carried about the socio-economic aspects and rationale of smallholder rubber agroforestry management. In the case of timber, things are more complex because the rate of timber extraction has accelerated over the last decades and may reach unsustainable levels. Again the group certificate manager would then need to monitor these levels and ensure that they are compatible with the regeneration of the timber stock. ICRAF could carry a key role in supplying and assembling the necessary information, helped with advisers having sufficient understanding of the way certification systems operate.
P#8: Monitoring And Assessment	
Like for the management plan, certified operations are required to maintain a monitoring system 'appropriate to the scale and intensity of the operations'. Smartwood further recommends in its NTFP guidelines to use such systems 'to provide quality control for forest management operations, identify social, ecological, economic and operational challenges, and report on the success or failure of management interventions to resolve problems.' The monitoring plan has to include: a) Yield of all forest products harvested. b) Growth rates, regeneration and condition of the forest. c) Composition and observed changes in the flora and fauna. d) Environmental and social impacts of harvesting and other operations. e) Costs, productivity, and efficiency of forest management. More specifically, SW recommends to monitor the following for NTFPs: • NTFP populations (impact of harvest, growth rates, loss or vigor or decline, recruitment); • Any outstanding environmental changes from NTFP management affecting flora, fauna, soil and water resources; • Socioeconomic aspects of NTFP use and harvest (changes in community and worker relations or conditions, changes in NTFP use or demand, etc.).	Monitoring needs to be adapted to the case of SLIMFs like smallholder rubber agroforestry. As stated by Smartwood in its guidelines: 'In some NTFP management operations, monitoring may be adequate but extremely informal. Assessors may need to move some operations toward more formal and documented monitoring systems, which in the end can serve to improve management quality and effectiveness.' The group manager can perform this function with technical assistance and research by ICRAF.

P# 9: Maintenance Of High Conservation Value Forests	
HCVF is a concept recently introduced by the FSC to protect forests that have unique conservation attributes in terms of ecology or social values – such as large scale landscapes with unique concentrations of biodiversity, rare and endangered ecosystems, ecosystems performing key environmental services and / or fundamental to the basic economic needs or cultural identities of communities. A rapid initial assessment indicates that smallholder rubber agroforestry could be considered as having attributes of HCVF. Specific assessment and monitoring of these values should then be performed to ensure that the certified operations maintain their existence. However, as indicated under principle 6 above, it is unlikely that smallholder management systems would threaten these values, as long as the smallholders agree to commit to maintaining their area under high-biodiversity agroforestry.	The group manager in cooperation with the smallholders should conduct the assessment of HCVF and their threats and the measures to conserve them..
P#10: Plantations	
No particular gap should arise from this principle as long as the recommendations mentioned above have been taken into account.	

The conclusion of this analysis – which does not preclude the results of any audits conducted by an FSC accredited certification body – seem to indicate that there is no major gap between the way rubber smallholder agroforestry systems operate for latex extraction and the P&Cs of the FSC. In the case of timber, the main point would be to limit timber extraction to sustainable levels and to ensure that no illegal timber may be mixed with the certified timber. Like for any SLIMF operation, the major gap would be the lack of documentation and formal management plans and monitoring. This could be addressed by asking the Resource manager and ICRAF to produce the documents needed – keeping in mind that documentation and management plan needs for SLIMFs are less stringent that for large-scale industrial operations.

Cost Issues

Determining the costs of achieving certification is beyond the scope of the present study. However, we can provide a number of indications of the cost structure.

There are three main categories of costs that will need to be covered before economic advantages can be gained from selling certified products to eco-sensitive markets, namely compliance costs, certification costs, and marketing costs.

Compliance costs are related to the changes in the operations' management that are needed to meet the conditions of certification. They can include changes in forest management practices, such as the introduction of reduced impact logging, the lowering of harvesting levels to ensure sustainability – which will increase overall unit production costs, increases in workers compensation or security, etc. They also include the costs of internal monitoring and training, and the production of documents establishing that the operation is compliant with certification requirements. These documents can include management plans, the description of chain-of-custody systems, standard operating procedures, etc. The cost of technical assistance to help the candidate operation to be certified also needs to be included here.

Direct certification costs are the costs of audits *per se*, which are normally supported by the candidate operation. The following cost ranges are given as an indication of order of magnitude. Real costs could be determined only by a certifier based on budgeting procedures, and would vary a lot depending on the size of the certified pool, and whether only timber or both timber and rubber production need to be evaluated.

Over a period of five years, the following costs of audits would possibly intervene:

- Initial scoping to determine possible gaps (not necessary, but usually recommended): between US$10,000 and 15,000
- Full assessment: between US$ 15,000 and 40,000
- Annual audits: between US$ 5,000 and 10,000.

Obviously, the costs per ha would decrease considerably if the certified pool was large enough. In Europe, the WWF has established that the costs per ha of group certification vary between € 0,12 and 2,25 (WWF, FSC Facts Sheet, May 2001).

Marketing costs also need to be evaluated. There is no interest in producing certified timber or rubber without marketing it to clients providing a price

premium. The cost of market research and changes in production, packaging and shipment needed to make the product compliant with the requests of the buyers need to be calculated.

Organic Growing Certification

A growing consumer demand

Unlike FSC certification, which is relatively new and has a low degree of consumer recognition, organic products are well known by consumers and command a strong demand. Most of the consumption takes place in five European countries that are amongst the most industrialized and have therefore a stronger demand for green products; i.e. UK, Germany, the Netherlands, France and Denmark. In all these countries, although organic farm products makes less than 3% of total food production, the growth rate of the sectors' turn-over is as much as 30% per year. In the USA and Canada, organic food consumption is also growing slowly, and it is starting to emerge in Japan. In fact, the demand for organic products tends to exceed the supply at present, and this leads to fraud in some countries (Gouyon, 2001).

The standards for organic growing are mostly based on the fact that there is no use of pesticides and other synthetic chemicals in the production process, and no contamination from the environment (e.g. from water or neighboring fields using pesticides) or through handling and processing. Other requirements are cultivation techniques that enhance soil conservation and respect biodiversity, although this varies between schemes. In Europe, organic cultivation is linked with the defense of small-scale family farming, while in the USA organic growing can be conducted in large scale faming enterprises.

There are several reasons consumers choose organic products. Concern for the environment is one, but it is not necessarily the most prominent. Consumers choose organic products because they believe they are good for their health, avoiding risks of contamination by toxic chemicals, and contain more vitamins – although the latter point is highly controversial, and although organic products have been found to be contaminated by extremely toxic fungi. Consumers also expect organic products to have better organoleptic properties. The trend to consume organic products is associated with a whole quest for a healthy lifestyle, found mostly in the upper middle class of large cities in wealthy industrial countries. It concerns mostly food products, which impact on health is straightforward.

Organic consumption, however, is starting to be recognized in other products such as clothing and bedding. There again, the desire to consume these goods is linked with health concerns. There have been reports of skin allergies developed by consumers due to the high pesticide content in cotton-made clothes. In the bedding industry, companies promoting natural ingredients attract the attention of consumers by alerting them to the dangers of being exposed to the chemicals contained in some synthetic materials, especially due to the need to make these products fire-proof.

Each main consumer country in Europe and North America have their own organic certification scheme, which makes things complicated for globally traded goods, since only the national organic label may enjoy consumer recognition in its own country. At the international level, the coordination is ensured by the IFOAM (International Federation of Organic Farming Movements), founded in 1972, which has about 750 member organizations and institutions in about 100 countries. The IFOAM has its own international standards and guidelines, and accredits certification bodies for audits. Efforts have been made, especially for NTFP certification, to combine FSC certification with organic certification through cooperation between FSC accredited certification bodies and the IFOAM. Some FSC certifiers, like the Soil Association (UK), or the partner of the Rainforest Alliance in Brazil, IMAFLORA, propose both types of certification.

Possible compliance and discrimination towards smallholder agroforestry systems

- As long as rubber agroforestry farmers do not use pesticides, which is the case, there might be a potential for organic certification of NR from agroforestry systems. Special attention would have to be paid to the use of coagulants, which are usually made of acids. Some of these acids could probably be accepted as natural ingredients, but this requires further analysis. If ammonium is used as an anti-coagulant to produce latex goods, again it would be needed to check how this affects the organic status of the product. Once this aspect of post-harvest additives is sorted out, compliance would be relatively simple as long as the farmers are willing to commit to their 'organic' way of growing rubber – organic certification can only be applied to farmers who are knowingly, purposively not using chemicals, and not just to farmers who do not apply chemicals for economic reasons or lack of knowledge, for

example. As in the case of FSC certification, this means that the smallholders would need to sign letters or make other forms of commitment towards maintaining a certifiable organic operation.

- Another advantage of organic certification is that unlike FSC certification alone, it would discriminate against rubber from non-agroforestry sources, which are in most cases using chemical fertilizers, as well as a number of pesticides at the nursery stages – and even sometimes in the plantation. Similar to what is already practiced for some NTFPs, organic certification could also be used for NR in combination with FSC certification, to increase the discriminating factor of the latter in favor of high-biodiversity agroforestry rubber. However, in the longer term, if a market demand for organic rubber emerged, some non-agroforestry plantation owners may be able to meet the criteria of this market by avoiding the use of chemical fertilizers and pesticides.

In terms of market linkages, it is obvious that the latex goods industry would welcome organic certification, which goes rather well with the image of healthy, environmentally friendly 'natural' products some suppliers are trying to project. Again it would help them back up some of the claims they are already making.

In the case of the tire industry, the link is far from obvious. Marketing a tire as being made from rubber sourced from 'well-managed' forests or plantations goes well with the image strategy of tire makers. However, marketing tires that are being made of an organic raw material clashes with the high-tech image of this industry. It also makes little sense since 80% of the ingredients of a passenger's car are made of products of the chemical industry anyway. Hence there is very little possibility that tire makers would be wanting to embark on a strategy of sourcing 'organic' rubber and marketing this – unless this is associated with FSC certification enabling them to bank more on the 'good management' claims of the FSC.

Labelling Agroforestry Products

Another alternative, if none of the existing widely known certification schemes seem to be work to provide the needed incentives, would be to develop a system of labelling - stating that a given raw material comes from high-biodiversity agroforests. As mentioned above, this label could be used in combination with other labels such as the FSC, to reinforce its discrimination in favour of smallholder agroforestry rubber. It could also be potentially used by itself.

There are already similar schemes based on claims about the environmental services of particular management systems for agricultural production. This is the case, for example, of the multiple labels used for environmentally- friendly coffee, such as 'shade-grown coffee', 'bird-friendly coffee', etc. (Gouyon, 2001).

The Rainforest Alliance, in addition to its programme of certifying timber and NTFP against the FSC standards, is also running a certification program called Conservation Agriculture. The objective of this programme is to enable participants (farmers, cooperatives, etc.) to meet 'comprehensive, rigorous standards for protecting biodiversity conservation and sustainability by integrating productive agriculture, conservation, workers, and local communities' (source: Rainforest Alliance). The programme has been implemented in South America in cooperation with the Sustainable Agriculture Network of NGOs for commodities like cocoa, banana, coffee and oranges. The potential to use this label for agroforestry products in Asia needs to be investigated with the Rainforest Alliance. Potential market incentives also need to be investigated.

Amongst the existing labels, the one that seems closer to agroforestry is the Forest Garden Products (FGP) label. This initiative was created in October 1997, through a collaboration between the NeoSynthesis Research Centre (NSRC, Sri Lanka), Counterpart International, Inc. (Washington, D.C., USA), and Counterpart Philippines (Cebu City, Philippines). This program has been supported by a five-year matching grant from the United States Agency for International Development. According to its own promoters, it aims to develop a *'flexible model silvicultural system that fosters the restoration of degraded land through the development of family-owned Forest Gardens by rural agriculturalists around the world. The Forest Garden Initiative offers farmers a new organic and environmentally-friendly farming system that increases their income while at the same time encouraging development of permaculture plantings that increase green canopy cover, promote biodiversity, and reduce local erosion.'* (Source: Forest Garden)

This concept is very similar to the concept of agroforestry and could then provide an option to certify rubber agroforestry systems in a way that would discriminate against the monoculture of rubber. In 1984, the NSRC conducted its first inspection and certification of Forest Garden

Products in Sri Lanka; the crops covered were coffee and cardamom. In 1991 organic production inspection and social development criteria were incorporated into the inspection system. A network on Analog Forestry was then developed at the national level first for Sri Lanka after a joint workshop sponsored by The NeoSynthesis Research Centre (NSRC) and The Asia Foundation in 1994. Today the network has become international and claims members in Australia, Costa Rica, Ecuador, Peru, and Canada. Since 2000, the Forest Garden Product Certification Service (FGP CS) is independent from NSRC and has its own board of managers; it claims to have attained enough experience to act as an independent third party verifier of the practice of analog forestry (Source: ibid).

It would be interesting to explore the possibilities to use this label for agroforestry products from Indonesia. Given the tenets of the program, it is likely that rubber agroforestry smallholders would be compliant; however, this can be ensured only after having analyzed the standards used by the FGP CS.

The main question, however, remains the degree of credibility of this label and its market recognition, which are conditions before an economic advantage can be gained by marketing products under this label.

In a similar fashion, ICRAF may consider developing its own standard, defining what it wants to certify as 'high-biodiversity agroforestry'. This standard could potentially be used for other products than NR. Since ICRAF has no degree of recognition or visibility with consumers, it would probably need to get its standard endorsed by well-known NGOs to give it more weight and credibility. Cooperation with the FSC could also be sought, as is already the case between FSC and IFOAM, for example, as long as the standard appears as complementary and not competing with the FSC certification programme.

Based on this standard, ICRAF would have then to define procedures for certification. To give more credibility to the scheme, it would be better to appoint independent certifiers - although ICRAF could probably conduct the verifications itself in the short term.

Being associated with claims of 'high-biodiversity' sources would probably interest some of the latex goods industry. In the case of the tire industry, this would probably fit with their strategy of sponsoring conservation efforts, as is the case of Goodyear or Bridgestone. However, in all cases, embarking in the development of a new certification standard and making its label known would be a very long and resource-consuming program, which should be considered only after all options for working with existing standards have been exhausted.

CONCLUSION AND RECOMMENDATIONS FOR FURTHER STUDIES

Using eco-certification to develop incentives towards the conservation of high-biodiversity smallholder rubber agroforests in Indonesia is a complex process that will need to be based on the following steps for timber and rubber production.

Developing FSC Timber Certification for Agroforests

Our preliminary study indicates that there is a good potential, both in terms of market and compliance, to certify timber from agroforests and derive an economic advantage in terms of better prices and wider market access. In the case of rubber wood, however, this would not necessarily give an advantage to agroforestry production vs. monoculture rubber. The FSC system is compatible with the certification of wood from monoculture plantation, and the rubber wood production from such plantations would be easier to market to eco-sensitive buyers based on quality, quantity and ease of access. However, the unmet demand for certified timber from tropical sources is so high that timber certification remains a very interesting potential avenue to provide incentives to agroforestry smallholders to conserve biodiversity if it integrates the multiple timber species found in those agroforests.

1. Study of the potential markets for certified timber from agroforests

There is a high potential demand for certified wood products from agroforests, including hardwood and softwood species, for eco-sensitive export markets in Europe and North America. These buyers are mostly demanding FSC certified products and have difficulty in finding enough such products in Asia, especially in Indonesia. This includes buyers of hevea wood for furniture, such as IKEA and other retailers, and buyers of other species, especially Dipterocarps. This potential market should be investigated in detail to determine their needs and identify suitable targets.

2. Study on the constraints on the supply side for certified timber production

Before trying to achieve certification, it is important to consider the other possible obstacles to the marketing of timber from agroforests to eco-sensitive markets. These buyers may have different requirements in terms of species, post-harvest treatment and processing, quality, quantity and timeliness of delivery that need to be investigated. The capacity of smallholders to meet these requirements would then need to be studied. Technical assistance to develop their capacity in these aspects may be needed.

3. Investigate issues of sustainability and control of illegal logging

The experience of PT Xylo Indah Pratama, which sources certified softwood from rubber agroforests, indicate that such operations can in principle become compliant with the FSC standards. In the case of PT XIP, however, compliance could relatively easily be achieved because the species harvested, *Alstonia,* grows fast and everywhere in secondary forests and agroforests around Sumatra. This may be different for hardwood timber species with slower growth, which are more endangered and more difficult to regenerate. In the case of timber production for commercial purposes from agroforests, which has been developing quickly over the last two decades, the certified operations will hence need to establish that they are harvesting sustainable levels of timber, and that they use non-destructive, low impact methods of logging. Another issue that will need to be investigated is the guarantees that can be offered that no certified timber, especially from illegal sources, is entering the certified supply pool.

4. Identifying adequate partners and institutional arrangements

Individual smallholders cannot export their products and cannot become certified in an economical way. A market linkage needs to be created between the smallholders and the export market, probably through an industrial partner interested in purchasing, processing and exporting the products.

Once this is secured, an adequate organization needs to be developed to manage the group certification of smallholders' production. This can be achieved through a group association or cooperative, or through the intervention of a buyer acting as certification manager. ICRAF, possibly with other qualified partners would probably need to provide technical assistance to the producers groups and certification manager to ensure that they become certifiable. As soon as possible, cooperation should be sought with partners experienced in certification, such as the Rainforest Alliance. A first scoping of the feasibility of the certification of the smallholder timber operation could then be arranged to identify possible gaps and ways to overcome then.

Options for the Certification of Rubber from Agroforests

Providing economic incentives to smallholders through the marketing of rubber to eco-sensitive markets is more complex. Our preliminary investigation establishes that particular segments of the rubber industry, especially latex goods manufacturers and tire makers, are increasingly trying to establish a 'green image', which could be achieved by purchasing rubber from agroforests and providing smallholders with a price premium for their product. However, this would meet a number of constraints in terms of quality of the product. Choosing the right standard and certification procedure is also another prerequisite. While we recommend concentrating on the timber, options to market certified rubber should also be investigated further on the side. Particular areas that need to be considered are described below.

1. Study of the potential markets for green rubber

Latex goods manufacturers and leading tire maker brands seem to be the main potential targets for green rubber marketing, along with other niche producers such as shoe makers. A detailed analysis of the needs of these industries should be conducted through direct interviews, identifying their technical requirements (quality, quantity, type of rubber, delivery) on one hand, and their strategy in the field of social and environmental responsibility of the other hand.

2. Study of the constraints on the supply side

Once this is done, the next step is to investigate whether smallholders are able to meet the technical requirements of potential eco-sensitive buyers. This might prove difficult given the low quality of smallholder rubber from agroforests, which is often contaminated with foreign matter, and the difficulty to provide a liquid latex supply from isolated agroforests. In theory, there is no reason why smallholders could not produce a good quality rubber, even in the liquid form, but changing existing practices would require significant price incentives.

3. Determining the right standard

There are several standards that could be used to certify rubber from agroforests. The FSC standard, which can be used for NTFPs, with the advantage that audits could combine the assessment of both timber and rubber production. This standard, however, would not discriminate between rubber from agroforests and rubber from monoculture plantations. Other options to be investigated include organic production. The IFOAM standard, an internationally recognized standard in this field, which is recognized by the FSC and sometimes used in conjunction with FSC certification. Other organizations have certification programs that could be used for agroforestry products, such as the Conservation Agriculture Program of the Rainforest Alliance, or the Forest Garden Products Certification Service developed in Sri Lanka and now used internationally.

For each of these possible options, the priority would be to investigate whether they are of interest to the potential buyers of eco-certified rubber, i.e. whether they are compatible with their marketing strategies. Tire makers would probably prefer a label like the FSC, insisting on social and environmental responsibility and widely recognized. Manufacturers of consumer latex goods such as mattresses might prefer organic labels. For labels from little-known organizations, the credibility and reliability of the certification procedures need to be checked.

The requirements of compliance of each of these standards would then need to be compared with the existing practices of smallholders to determine whether certification can be achieved at an acceptable cost.

4. Identifying adequate partners and institutional arrangements

Like in the case of timber, adequate arrangements will be needed to organize the group marketing of certified rubber, probably through a producers group and an industrial exporting partner. These arrangements will need to secure a commitment of the producers to maintaining a certified operation. Producers and traders participating in the operation will also need to commit to a chain-of-custody system enabling to separate certified from non-certified batches. An adequate management entity needs to be established to handle the certification procedures and maintain compliance.

Investigating Options for other NTFPs

Although it may seem like an even longer process, possible options to market other NTFPs from rubber agroforests to eco-sensitive markets can be considered. They could include products like damar or *kemenyan* (use for incense production), or medicinal products. Like in the case of rubber and timber, issues in marketing would need to be investigated first, before choosing the right standard and certification system.

Cost and Financing Issues

Developing a certification system for timber, rubber and other NTFPs will have a number of costs, including:

- costs of research to determine the right system
- costs of compliance, i.e. changes in the candidate operation to meet certification requirements (including changes in silvicultural or agricultural methods, production of adequate documentation on management procedures, and monitoring)
- direct costs of certification (initial and annual audits)
- costs of marketing the certified products to eco-sensitive markets

A detailed study of these costs needs to be conducted. They need then to be compared with possible ways to cover them. It is likely that price premiums will not be sufficient to cover them in the short term, especially since the project will need to start on a small, pilot scale. Pilot operations will be unlikely to generate enough production to reap significant price premiums. Additional funding will then have to come from donors. This is anyway the case of most community and small farmers-based certified operations in tropical countries.

There are a number of NGOs and international donors who are committed to the development of certification, especially for small producers and communities. They include, amongst others, the WWF, The Nature Conservancy, Conservation International, DFID (Department for International Development, UK), the Ford Foundation, NORAD (Norwegian Agency for Development Cooperation), and GTZ (German Agency for Technical Cooperation). Canadian cooperation could also be potentially approached, through CIDA (Canadian International Development Agency), or through the EEPSEA (Economic Environmental Program for Southeast Asia, located in Singapore and supported by Canadian cooperation funds).

Another possibility is to use sponsorship funding from companies active in the timber and rubber industry, which in the short term may be keener to provide aid funds than to commit to buying products from agroforestry sources. Large companies like Goodyear, for example, already have programs to sponsor conservation initiatives. They may be interested in supporting an initiative that is close to their core activity.

A Long Term Prospect

Using certification to provide incentives for the conservation of biodiversity of smallholder agroforestry in Indonesia has good long-term perspectives. It holds a significant potential of incentives, especially if timber and non-timber products can be combined and marketed to adequate buyers. However, identifying the right markets, developing linkages and forming the right institutional arrangements to handle certification will take time and will require resources that can be secured only through donors. The advantage is that the experience gained with rubber smallholders can also be used as an experience to develop similar systems for other types of agroforestry smallholder operations for various products throughout the world.

REFERENCES

Web sources

Certification

FSC website: www.fscoax.com

Rainforest Alliance Smartwood Program: www.smartwood.org

Rainforest Alliance Conservation Agriculture Program: http://www.rainforest-alliance.org/programs/cap/

SGS (Société Générale de Surveillance): www.sgs.com

Forest Garden: www.forestgarden.org

Falls Brook Centre: www.fallsbrookcentre.ca

Market Linkages for Certified Products

Global Forest and Trade Network in Asia: www.forestandtradeasia.org

Tropical Forest Trust: www.tropicalforesttrust.com

On-line stores advertising eco-friendly products

Ecochoices and The ecobedroom: www.ecochoices.com, www.ecobedroom.com

The environmental Home Center: www.environmentalhomecenter.com

The Green Culture: www.greenculture.com

The Green Living Center: http://www.greenliving.org

The Green Home: www.care2.greenhome.com

A Happy Planet (On-line store for organic fiber products): http://www.ahappyplanet.com

Rubber Production, Trade and Industry

Goodyear and the Environment: http://www.goodyear.com/corporate/environment.html

International Rubber Research and Development Board: www.irrdb.com

Latex Mattress and Foam Center: http://www.latexmattress.com.au

Rubber Manufacturers Association: www.rma.com

Malaysian Rubber Export Promotion Council: www.mrepc.com

The Rubber Stichting: http://www.rubber-stichting.ind.tno.nl

FAO Commodities: www.fao.org

Tun Abdul Razak Research Center (TARRC) – Malaysian Rubber Board : http://www.tarrc.co.uk

Bibliography

Barlow C, Jayasuriya S and Suan Tan C. 1994. *The World Rubber Industry*. Routledge, London, UK.

Bass S, Thornber K, Markopoulos M, Roberts S and Grieg-Gran M. 2001. *Certification's impacts on forest, stakeholders and supply chains*. Instruments for sustainable private sector forestry series. International Institute for Environment and Development, London.

Brown L, Robinson D, Karmann M. 2002. The Forest Stewarsdhip Council and Non-Timber Forest Product Certification: a discussion paper. FSC, Mexico, Oaxaca.

Burger K and Smit HP. 1998. Prospects for Natural Rubber after the Crisis in Asia. Economic and Social Institute. Free University, The Netherlands.

Campaignolle J. 1991. L'hévéa et la protection de l'environnement en milieu tropical humide. Bois et forets des tropiques, nr 227, 1st quarter 1991: 37-42.

Cashore B, Auld G and Newsom D. 2002a. Politics within Markets: regulating forestry through non-state environmental governance. Global Institute for Sustainable Forest Management, Yale School of Forestry and Environmental Studies.

Cashore B, Auld G and Newsom D. 2002b. Forest Certification (Eco-labeling) Programs and their Policy-Makign Authority: Explaining Divergence Among North American and European Case Studies. Global Institute for Sustainable Forest Management, Yale School of Forestry and Environmental Studies.

Colchester M, Sirait M and Wijardjo B. 2003. Implementation of FSC's Principles 2 and 3 in Indonesia, Obstacles and Possibilities. Study commissionned by Aman and Walhi, Indonesia.

Counsell S and Loraas KT. 2002. Trading in Credibility, the myth and reality of the Forest Stewardship Council. The Rainforest Foundation.

FSC. 2002. Increasing Access to FSC Certification for Small and Low Intensity Managed Forests, the SLIMFs initiative: a progress report. Forest Stewardship Council, Oaxaca, Mexico.

Gilley B. 2000. Green Light in the Forest. *Far Eastern Economic Review*, September 7th, 2000.

Goodyear. 2001. One planet to share: 2001 Environmental, Health and Safety report.

Gouyon A. 1999. The sustainable development of tree crops and the prevention of vegetation fires in South Sumatra Province, Indonesia. Forest Fire Prevention and Control Project (FFPCP), South Sumatra Regional Forestry Office and European Union, Palembang. http://www.mdp.co.id/ffpcp/Report10.htm.

Gouyon A. 1995. *Paysannerie et heveaculture dans les plaines de Sumatra: quel avenir pour un système agroforestier?* (Smallholders rubber in Sumatra: which future for an agroforestry system?). Doctorate Thesis, Institut National Agronomique Paris-Grignon.

Gouyon A and De Livonniere H. 1994. L'accord international sur le caoutchouc naturel, un dialogue reussi? (The International Natural Rubber Agreement: A Successful Dialogue?) In Griffon (Ed): *Economie des politiques agricoles dans les pays en developpement, Revue Francaise d'Economie*, 1994, pp 279-330.

Gouyon A, Foresta H de and Levang P. 1993. Does "jungle rubber" deserve its name? An analysis of rubber agroforestry systems in Southeast Sumatra. *Agroforestry Systems* 22: 181-206.

Heijden Van Der J. 2002. Competition, Fall and Recovery. *NatuurRubber* 27.

Kox HLM. 2000. Ecological Advantages of Natural Rubber Latex Production. *NatuurRubber* 17.

Jones KP. 1994. Natural Rubber as a green commodity, part II. *Rubber Developments* 47 (3/4), 37-41.

Jones KP and Lawson K. 2002. Towards A Green Recycling Policy? IRRDB.

Killmann W and Hong LT. 2000. Rubber Wood, the success of an agricultural by-product. *Unasylva* 201, FAO.

Levin NM. 1996. Quality and Processing Aspects of Natural Rubber. Natuurrubber 5, November 1996.

Liimatainen M and Harkki S. 2001. Anything goes? A report on PEFC-certified Finnish Forestry. Greenpeace Nordic and the Finnish Nature League, Finland.

Michon G and De Foresta H. 1995. Agroforests: an original agro-forestry model from smallholder farmers for environmental conservation and sustainable development. In *Traditional Technology for Environmental Conservation and Sustainable Development in the Asian-Pacific Region*, Proceedings

of the UNESCO - University of Tsukuba International Seminar on Traditional Technology for Environmental Conservation and Sustainable Development in the Asian-Pacific Region, held in Tsukuba Science City, Japan, 11-14 December, 1995.

Ozinga S. 2001. Behind the Logo: an environmental and social assessment of forest certification schemes. Fern, Moreton-in-Marsh, UK.

Suntana AS and Paramita Iswari. 2002. Achieving Sustainable Forest Management Through Forest Certification Programme. *Forest Initiatives* No 6, July 2002. Forest Liaison Bureau, European Union, Jakarta, Indonesia.

Smartwood. 1999. Generic Guidelines for Assessing the Management of Non-Timber Forest Products. Rainforest Alliance, USA

Smartwood. 2002. Generic Guidelines for Assessing Forest Management: Smartwood Addendum on Non-Timber Forest Products. Rainforest Alliance.

Smit HP. 2000. Natural Rubber in tne New Millenium. *Natuurrubber* 17.

Van Noordwijk M, Boutin D, Wibawa G and Joshi L. 2002. Options for smallholder rubber producers to increase Productivity While Maintaining 'Forest Functions'. Asia Rubber Markets Conference, 28-29 October 2002, Kuala Lumpur.

Van Noordwijk M. 2002. Brief report on 'Asia Rubber Markets Conference', 28-29 October 2002 Kuala Lumpur. World Agroforestry Center.

Wan Abd. Rahaman. 1994. Natural rubber as a green commodity, part I. *Rubber Developments* 47(1/2), 13.

GLOSSARY

Agroforests: complex agroforestry systems (Michon and De Foresta, 1995, see below).

Agroforestry systems:

1. **Simple agroforestry systems** represent associations of a small number of components, usually no more than five tree species and an annual species (paddy, maize, vegetables, forage herbs) or a treelet (bananas, cocoa, coffee).
2. **Complex agroforestry systems** are characterized by a high number of components (trees as well as treelets, liana, herbs), which are intimately associated. The physiognomy as well as functioning of such systems are close to those observed for natural forest ecosystems, either primary or secondary forests. Because of the dominance of tree components, of high plant diversity and of forest-like structure and functioning, these complex systems, that we define as "agro-forests", seem to concern more forestry scientists than agriculturists. However, they are not at all alien to tropical agriculture practitioners: agroforests characterize many peasant agriculture in the humid tropics (Michon and De Foresta, 1995).

Chain of custody: The channel through which products are distributed from their origin in the forest to their end-use (FSC).

Certification is the procedure by which a third party provides written assurance that a product, process or service conforms to specified standards, on the basis of an audit conducted to agreed procedures (Bass *et al.,* 2001).

Criterion (pl. Criteria): A means of judging whether or not a Principle (of forest stewardship) has been fulfilled (FSC).

Customary rights: Rights, which result from a long series of habitual or customary actions, constantly repeated, which, have, by such repetition and by uninterrupted acquiescence, acquired the force of a law within a geographical or sociological unit (FSC).

Eco-sensitive markets are market segments in which buyers choose between products based on the perceived social and environmental impacts of various elements of their life-cycle (author's definition).

Eco-friendly refers to products which life-cycle have a better social and environmental impact than alternative products for the same usage (author's definition).

Eco-marketing or **green marketing** refers to marketing strategies targeting eco-sensitive markets (author's definition).

Eco-labeling is the process by which a label is attached to a product to claim a number of environmental and social benefits resulting from the whole or specific elements of its life-cycle (author's definition).

Forest management/manager: The people responsible for the operational management of the forest resource and of the enterprise, as well as the management system and structure, and the planning and field operations (FSC Glossary).

High Conservation Value Forests: High Conservation Value Forests are those that possess one or more of the following attributes:

a) forest areas containing globally, regionally or nationally significant:
   concentrations of biodiversity values (e.g. endemism, endangered species, refugia); and/or
   large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance
b) forest areas that are in or contain rare, threatened or endangered ecosystems
c) forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)

d) forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health) and/or critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities) (FSC).

Indicators are qualitative or quantitative parameters, which can be assessed in relation to a criterion. An indicator describes in an objectively, verifiable way the features of a system. Minimum or maximum allowable value of an indicator is known as **threshold value**, i.e. a way of quantifying or qualifying or measuring performance. Thus in the context of certification, indicators are assumed to include a performance value, and are therefore called **performance indicators** (Smartwood, 1999).

Indigenous peoples: "The existing descendants of the peoples who inhabited the present territory of a country wholly or partially at the time when persons of a different culture or ethnic origin arrived there from other parts of the world, overcame them and, by conquest, settlement, or other means reduced them to a non-dominant or colonial situation; who today live more in conformity with their particular social, economic and cultural customs and traditions than with the institutions of the country of which they now form a part, under State structure which incorporates mainly the national, social and cultural characteristics of other segments of the population which are predominant." (Working definition adopted by the UN Working Group on Indigenous Peoples, used by FSC).

Natural Forest: Forest areas where many of the principal characteristics and key elements of native ecosystems such as complexity, structure and diversity are present, as defined by FSC approved national and regional standards of forest management (FSC).

Non-timber forest products: All forest products except timber, including other materials obtained from trees such as resins and leaves, as well as any other plant and animal products (FSC).

Other forest types: Forest areas that do not fit the criteria for plantation or natural forests and which are defined more specifically by FSC-approved national and regional standards of forest stewardship (FSC).

Plantation: Forest areas lacking most of the principal characteristics and key elements of native ecosystems as defined by FSC-approved national and regional standards of forest stewardship, which result from the human activities of either planting, sowing or intensive silvicultural treatments (FSC).

Principles: ***essential rules or elements – of forest stewardship (FSC); fundamental truths or rules used as the basis of reasoning or action (Smartwood, 1999).***

Verifiers describe the way indicators are measured in the field, i.e. data points or information that enhance the specificity or the ease of assessment of an indicator *(ibid)*.

Appendix 1. Natural Rubber Market Statistics

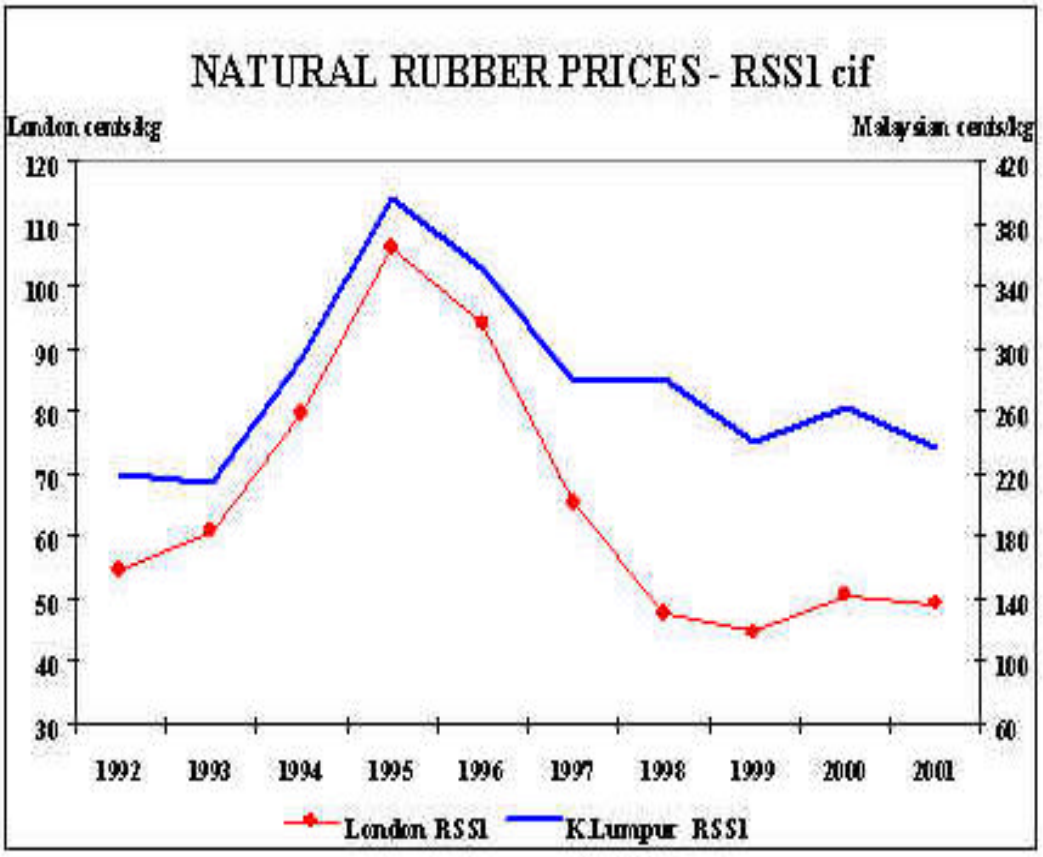
(source: FAO)

Imports				
	1996-98 Average	**1999**	**2000 1/**	**2001 2/**
		'000 tonnes		
World	**4524**	**4699**	**5300**	**4850**
United States	1078	1116	1192	980
Japan	711	755	802	760
China	421	402	820	860
Korea Rep. of	294	332	331	330
Germany	217	226	250	245
France	199	253	309	301
Spain	146	161	171	168
Canada	133	141	150	140
UK	124	131	133	130
Brazil	108	98	139	140
Others	1095	1084	1004	796

Exports				
	1996-98 Average	**1999**	**2000 1/**	**2001 2/**
		'000 tonnes		
World	**4623**	**4670**	**4970**	**4800**
Indonesia	1493	1495	1380	1400
Thailand	1813	1886	2166	2250
Malaysia	574	436	196	150
Sri Lanka	58	43	33	34
Vietnam	193	230	256	260
Nigeria	59	38	43	44
Liberia	57	100	127	130
Guatemala	28	27	30	30
Cambodia	32	34	35	38
Others	316	382	704	464

1/ 2000 : estimates 2/ 2001 : preliminary

Production	1996-98 Average	1999	2000 1/	2001 2/
		'000 tonnes		
World	**6580**	**6810**	**6810**	**7150**
Thailand	2026	2155	2346	2420
Indonesia	1582	1599	1556	1610
Malaysia	980	769	615	560
India	571	620	629	645
China	441	460	445	439
Sri Lanka	105	97	88	85
Vietnam	217	230	269	280
Côte d'Ivoire	102	120	113	105
Nigeria	74	58	63	64
Brazil	58	70	72	73
Others	424	633	614	869



Appendix 2 - The Standards: The FSC Principles and Criteria (P&C)

Introduction

It is widely accepted that forest resources and associated lands should be managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. Furthermore, growing public awareness of forest destruction and degradation has led consumers to demand that their purchases of wood and other forest products will not contribute to this destruction but rather help to secure forest resources for the future. In response to these demands, certification and self-certification programs of wood products have proliferated in the marketplace.

The Forest Stewardship Council (FSC) is an international body which accredits certification organizations in order to guarantee the authenticity of their claims. In all cases the process of certification will be initiated voluntarily by forest owners and managers who request the services of a certification organization. The goal of FSC is to promote environmentally responsible, socially beneficial and economically viable management of the world's forests, by establishing a worldwide standard of recognized and respected Principles of Forest Stewardship.

The FSC's Principles and Criteria (P&C) apply to all tropical, temperate and boreal forests, as addressed in Principle #9 and the accompanying glossary. Many of these P&C apply also to plantations and partially replanted forests. More detailed standards for these and other vegetation types may be prepared at national and local levels. The P&C are to be incorporated into the evaluation systems and standards of all certification organizations seeking accreditation by FSC. While the P&C are mainly designed for forests managed for the production of wood products, they are also relevant, to varying degrees, to forests managed for non-timber products and other services. The P&C are a complete package to be considered as a whole, and their sequence does not represent an ordering of priority. This document shall be used in conjunction with the FSC's Statutes, Procedures for Accreditation and Guidelines for Certifiers.

FSC and FSC-accredited certification organizations will not insist on perfection in satisfying the P&C. However, major failures in any individual Principles will normally disqualify a candidate from certification, or will lead to decertification. These decisions will be taken by individual certifiers, and guided by the extent to which each Criterion is satisfied, and by the importance and consequences of failures. Some flexibility will be allowed to cope with local circumstances.

The scale and intensity of forest management operations, the uniqueness of the affected resources, and the relative ecological fragility of the forest will be considered in all certification assessments. Differences and difficulties of interpretation of the P&C will be addressed in national and local forest stewardship standards. These standards are to be developed in each country or region involved, and will be evaluated for purposes of certification, by certifiers and other involved and affected parties on a case by case basis. If necessary, FSC dispute resolution mechanisms may also be called upon during the course of assessment. More information and guidance about the certification and accreditation process is included in the FSC Statutes, Accreditation Procedures, and Guidelines for Certifiers.

The FSC P&C should be used in conjunction with national and international laws and regulations. FSC intends to complement, not supplant, other initiatives that support responsible forest management worldwide.

The FSC will conduct educational activities to increase public awareness of the importance of the following:

- improving forest management; * incorporating the full costs of management and production into the price of forest products;
- promoting the highest and best use of forest resources;
- reducing damage and waste; and
- avoiding over-consumption and over-harvesting.

FSC will also provide guidance to policy makers on these issues, including improving forest management legislation and policies.

PRINCIPLE #1: COMPLIANCE WITH LAWS AND FSC PRINCIPLES

Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.

1.1 Forest management shall respect all national and local laws and administrative requirements.

1.2 All applicable and legally prescribed fees, royalties, taxes and other charges shall be paid.

1.3 In signatory countries, the provisions of all binding international agreements such as CITES, ILO Conventions, ITTA, and Convention on Biological Diversity, shall be respected.

1.4 Conflicts between laws, regulations and the FSC Principles and Criteria shall be evaluated for the purposes of certification, on a case by case basis, by the certifiers and the involved or affected parties.

1.5 Forest management areas should be protected from illegal harvesting, settlement and other unauthorised activities.

1.6 Forest managers shall demonstrate a long-term commitment to adhere to the FSC Principles and Criteria.

PRINCIPLE #2: TENURE AND USE RIGHTS AND RESPONSIBILITIES

Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.

2.1 Clear evidence of long-term forest use rights to the land (e.g. land title, customary rights, or lease agreements) shall be demonstrated.

2.2 Local communities with legal or customary tenure or use rights shall maintain control, to the extent necessary to protect their rights or resources, over forest operations unless they delegate control with free and informed consent to other agencies.

2.3 Appropriate mechanisms shall be employed to resolve disputes over tenure claims and use rights. The circumstances and status of any outstanding disputes will be explicitly considered in the certification evaluation. Disputes of substantial magnitude involving a significant number of interests will normally disqualify an operation from being certified.

PRINCIPLE #3: INDIGENOUS PEOPLES' RIGHTS

The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognised and respected.

3.1 Indigenous peoples shall control forest management on their lands and territories unless they delegate control with free and informed consent to other agencies.

3.2 Forest management shall not threaten or diminish, either directly or indirectly, the resources or tenure rights of indigenous peoples.

3.3 Sites of special cultural, ecological, economic or religious significance to indigenous peoples shall be clearly identified in co-operation with such peoples, and recognised and protected by forest managers.

3.4 Indigenous peoples shall be compensated for the application of their traditional knowledge regarding the use of forest species or management systems in forest operations. This compensation shall be formally agreed upon with their free and informed consent before forest operations commence.

PRINCIPLE #4: COMMUNITY RELATIONS AND WORKER'S RIGHTS

Forest management operations shall maintain or enhance the long-term social and economic well being of forest workers and local communities.

4.1 The communities within, or adjacent to, the forest management area should be given opportunities for employment, training, and other services.

4.2 Forest management should meet or exceed all applicable laws and/or regulations covering health and safety of employees and their families.

4.3 The rights of workers to organise and voluntarily negotiate with their employers shall be guaranteed as outlined in Conventions 87 and 98 of the International Labour Organisation (ILO).

4.4 Management planning and operations shall incorporate the results of evaluations of social impact. Consultations shall be maintained with people and groups directly affected by management operations.

4.5 Appropriate mechanisms shall be employed for resolving grievances and for providing fair compensation in the case of loss or damage affecting the legal or customary rights, property, resources, or livelihoods of local peoples. Measures shall be taken to avoid such loss or damage.

PRINCIPLE # 5: BENEFITS FROM THE FOREST

Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

5.1 Forest management should strive toward economic viability, while taking into account the full environmental, social, and operational costs of production, and ensuring the investments necessary to maintain the ecological productivity of the forest.

5.2 Forest management and marketing operations should encourage the optimal use and local processing of the forest's diversity of products.

5.3 Forest management should minimise waste associated with harvesting and on-site processing operations and avoid damage to other forest resources.

5.4 Forest management should strive to strengthen and diversify the local economy, avoiding dependence on a single forest product.

5.5 Forest management operations shall recognise, maintain, and, where appropriate, enhance the value of forest services and resources such as watersheds and fisheries.
The rate of harvest of forest products shall not exceed levels which can be permanently sustained.

PRINCIPLE #6: ENVIRONMENTAL IMPACT

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.

6.1 Assessment of environmental impacts shall be completed -- appropriate to the scale, intensity of forest management and the uniqueness of the affected resources -- and adequately integrated into management systems. Assessments shall include landscape level considerations as well as the impacts of on-site processing facilities. Environmental impacts shall be assessed prior to commencement of site-disturbing operations.

6.2 Safeguards shall exist which protect rare, threatened and endangered species and their habitats (e.g., nesting and feeding areas). Conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources. Inappropriate hunting, fishing, trapping and collecting shall be controlled.

6.3 Ecological functions and values shall be maintained intact, enhanced, or restored, including:
a) Forest regeneration and succession.
b) Genetic, species, and ecosystem diversity.
c) Natural cycles that affect the productivity of the forest ecosystem.

6.4 Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources.

6.5 Written guidelines shall be prepared and implemented to: control erosion; minimise forest damage during harvesting, road construction, and all other mechanical disturbances; and protect water resources.

6.6 Management systems shall promote the development and adoption of environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides. World Health Organisation Type 1A and 1B and chlorinated hydrocarbon pesticides; pesticides that are persistent, toxic or whose derivatives remain biologically active and accumulate in the food chain beyond their intended use; as well as any pesticides banned by international agreement, shall be prohibited. If chemicals are used, proper equipment and training shall be provided to minimise health and environmental risks.

6.7 Chemicals, containers, liquid and solid non-organic wastes including fuel and oil shall be disposed of in an environmentally appropriate manner at off-site locations.

6.8 Use of biological control agents shall be documented, minimised, monitored and strictly controlled in accordance with national laws and internationally accepted scientific protocols. Use of genetically modified organisms shall be prohibited.

6.9 The use of exotic species shall be carefully controlled and actively monitored to avoid adverse ecological impacts.

6.10 Forest conversion to plantations or non-forest land uses shall not occur, except in circumstances where conversion:

a) Entails a very limited portion of the forest management unit; and

b) Does not occur on high conservation value forest areas; and

c) Will enable clear, substantial, additional, secure, long-term conservation benefits across the forest management unit.

PRINCIPLE #7: MANAGEMENT PLAN

A management plan -- appropriate to the scale and intensity of the operations -- shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated.

7.1 The management plan and supporting documents shall provide:

a) Management objectives.

b) Description of the forest resources to be managed, environmental limitations, land use and ownership status, socio-economic conditions, and a profile of adjacent lands.

c) Description of silvicultural and/or other management system, based on the ecology of the forest in question and information gathered through resource inventories.

d) Rationale for rate of annual harvest and species selection.

e) Provisions for monitoring of forest growth and dynamics.

f) Environmental safeguards based on environmental assessments.

g) Plans for the identification and protection of rare, threatened and endangered species.

h) Maps describing the forest resource base including protected areas, planned management activities and land ownership.

Description and justification of harvesting techniques and equipment to be used.

The management plan shall be periodically revised to incorporate the results of monitoring or new scientific and technical information, as well as to respond to changing environmental, social and economic circumstances.

7.3 Forest workers shall receive adequate training and supervision to ensure proper implementation of the management plan.

7.4 While respecting the confidentiality of information, forest managers shall make publicly available a summary of the primary elements of the management plan, including those listed in Criterion 7.1.

PRINCIPLE #8: MONITORING AND ASSESSMENT

Monitoring shall be conducted -- appropriate to the scale and intensity of forest management -- to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.

8.2 Forest management should include the research and data collection needed to monitor, at a minimum, the following indicators:

a) Yield of all forest products harvested.

b) Growth rates, regeneration and condition of the forest.

c) Composition and observed changes in the flora and fauna.

d) Environmental and social impacts of harvesting and other operations.

e) Costs, productivity, and efficiency of forest management.

8.3 Documentation shall be provided by the forest manager to enable monitoring and certifying organisations to trace each forest product from its origin, a process known as the "chain of custody."

8.4 The results of monitoring shall be incorporated into the implementation and revision of the management plan.

8.5 While respecting the confidentiality of information, forest managers shall make publicly available a summary of the results of monitoring indicators, including those listed in Criterion 8.2.

PRINCIPLE #9: MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS

Management activities in high conservation value forests shall maintain or enhance the attributes, which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

9.1 Assessment to determine the presence of the attributes consistent with High Conservation Value Forests will be completed, appropriate to scale and intensity of forest management.

9.2 The consultative portion of the certification process must place emphasis on the identified conservation attributes, and options for the maintenance thereof.

9.3 The management plan shall include and implement specific measures that ensure the maintenance and/or enhancement of the applicable conservation attributes consistent with the precautionary approach. These measures shall be specifically included in the publicly available management plan summary.

9.4 Annual monitoring shall be conducted to assess the effectiveness of the measures employed to maintain or enhance the applicable conservation attributes.

PRINCIPLE #10: PLANTATIONS

Plantations shall be planned and managed in accordance with Principles and Criteria 1 - 9, and Principle 10 and its Criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

10.1 The management objectives of the plantation, including natural forest conservation and restoration objectives, shall be explicitly stated in the management plan, and clearly demonstrated in the implementation of the plan.

10.2 The design and layout of plantations should promote the protection, restoration and conservation of natural forests, and not increase pressures on natural forests. Wildlife corridors, streamside zones and a mosaic of stands of different ages and rotation periods, shall be used in the layout of the plantation, consistent with the scale of the operation. The scale and layout of plantation blocks shall be consistent with the patterns of forest stands found within the natural landscape.

10.3 Diversity in the composition of plantations is preferred, so as to enhance economic, ecological and social stability. Such diversity may include the size and spatial distribution of management units within the landscape, number and genetic composition of species, age classes and structures.

10.4 The selection of species for planting shall be based on their overall suitability for the site and their appropriateness to the management objectives. In order to enhance the conservation of biological diversity, native species are preferred over exotic species in the establishment of plantations and the restoration of degraded ecosystems. Exotic species, which shall be used only when their performance is greater than that of native species, shall be carefully monitored to detect unusual mortality, disease, or insect outbreaks and adverse ecological impacts.

10.5 A proportion of the overall forest management area, appropriate to the scale of the plantation and to be determined in regional standards, shall be managed so as to restore the site to a natural forest cover.

10.6 Measures shall be taken to maintain or improve soil structure, fertility, and biological activity. The techniques and rate of harvesting, road and trail construction and maintenance, and the choice of species shall not result in long-term soil degradation or adverse impacts on water quality, quantity or substantial deviation from stream course drainage patterns.

10.7 Measures shall be taken to prevent and minimize outbreaks of pests, diseases, fire and invasive plant introductions. Integrated pest management shall form an essential part of the management plan, with primary reliance on prevention and biological control methods rather than chemical pesticides and fertilizers. Plantation management should make every effort to move away from chemical pesticides and fertilizers, including their use in nurseries. The use of chemicals is also covered in Criteria 6.6 and 6.7.

10.8 Appropriate to the scale and diversity of the operation, monitoring of plantations shall include regular assessment of potential on-site and off-site ecological and social impacts, (e.g. natural

regeneration, effects on water resources and soil fertility, and impacts on local welfare and social well-being), in addition to those elements addressed in principles 8, 6 and 4. No species should be planted on a large scale until local trials and/or experience have shown that they are ecologically well-adapted to the site, are not invasive, and do not have significant negative ecological impacts on other ecosystems. Special attention will be paid to social issues of land acquisition for plantations, especially the protection of local rights of ownership, use or access.

10.9 Plantations established in areas converted from natural forests after November 1994 normally shall not qualify for certification. Certification may be allowed in circumstances where sufficient evidence is submitted to the certification body that the manager/owner is not responsible directly or indirectly of such conversion.

Appendix 3 – Draft Principle 11 of FSC Certification on NTFPs

Draft Principle 11 - Non- Timber Forest Products (drafted in 1997, still under discussion and not yet adopted)

Non-timber forest products (NTFPs) shall be managed in accordance with Principles and Criteria 1- 10, and Principle 11 and its Criteria. Harvest of NTFPs usually have lower impacts on the forest ecosystem than timber harvesting, can provide an array of social and economic benefits, particularly to community operations, and should be an important component of forest ecosystem management. NTFPs require special management and monitoring considerations in order to ensure the long-term viability of species and to minimize adverse social and ecological impacts.

11.1 The management plan must identify and provide specific guidelines for each NTFP species or species group considered for commercial harvest, and identify the most important NTFPs for subsistence use.

11.2 Management plans, operational activities and monitoring shall ensure long term ecological viability of NTFP populations. Management systems should address the ecological processes of, and Implement activities to minimize the ecological impacts of harvesting on, various types of NTFPs, including, but not limited to:

- products which require the removal of the individual
- products which affect the species' growth or productivity
- products which, when harvested, cause damage to trees or other forest products
- products which are critical to nutrient cycling products which have high wildlife value
- products which have very specific ecological interdependencies products which are harvested for subsistence use

11.3 Management plans that prioritize timber production should include specific provisions to describe and minimize short and long-term impacts on NTFPs.

11.4 The management plan shall address the social and economic impacts NTFP management, including subsistence utilization and traditional harvesting practices, and shall respect the cultural and religious significance of NTFPs to local and indigenous communities.

11.5 NTFP harvesting methods and levels must be appropriate to the species or species group, and should reflect scientific, local and/or indigenous knowledge.

11.6 The monitoring of timber harvesting should evaluate impacts on non-timber resources and the forest ecosystem. Monitoring should also include the impacts of non-timber forest products on timber resources.

11.7 In addition to Criterion 3.4, indigenous and local communities should receive fair and adequate benefits for any use of their name or image in marketing.
Whenever local or indigenous knowledge is the basis of an NTFP-related patent, the affected community should receive fair and adequate benefits.

Appendix 4 – Institutions involved in FSC Certification, roles and relations