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# Is There a Commercial Case for Tropical Timber Certification?

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Timber certification is not expected to provide significant commercial benefits to developing countries in the near future. Revenues from certification are limited by the share of trade destined for "eco-sensitive" markets and by the size of the "green premium." The costs of introducing timber certification on a broad scale limit eco-labeling's near-term impact on revenues in the tropical timber trade.



## Summary findings

Varangis, Crossley, and Braga estimate the potential commercial benefits that tropical timber producing countries could enjoy by adopting timber certification schemes. Such benefits are crucial for encouraging the supply of certified timber.

Timber certification is a reality: various countries and organizations have launched initiatives for it. The initial response among producing countries was less than positive, but some have come to realize its potential benefits and have begun to adopt timber certification schemes.

Tropical timber trade accounts for only a small fraction of tropical timber production, and most of that trade is concentrated among developing countries in Asia and Japan — markets where demand for certified timber is currently weak. Only a small part of the trade reaches the eco-sensitive markets of Europe and the United States, where there is demand for certified timber.

Developing countries can benefit commercially from timber certification in two ways: through the “green premium” (consumers’ willingness to pay a premium for

certified timber) and by averting losses of market share in the tropical timber market from not having timber certified.

Based on surveys, on discussions with nongovernmental organizations, on market participants and analysts, and on estimates of price elasticity, Varangis, Crossley, and Braga develop a scenario for estimating the potential commercial benefits from adopting timber certification. Under this scenario, benefits would not exceed US\$500 million a year (roughly 4 percent of all tropical-timber-related revenues earned by developing countries).

Timber certification is not expected to provide significant commercial benefits to developing countries in the near future. But timber certification could provide significant rents to individual firms that develop market niche strategies. And producing countries that pursue certification may enjoy longer-term social, economic, and environmental benefits by adopting the better forest management practices required for timber certification.

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**IS THERE A COMMERCIAL CASE  
FOR TROPICAL TIMBER CERTIFICATION?**

**by**

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## I. INTRODUCTION<sup>1</sup>

Environmental labeling programs have expanded rapidly over the last few years. Numerous product labels have already been introduced into the marketplace to indicate, or guarantee, that products do not contain ozone-depleting CFCs or have not been tested on animals, for example. Eco-labeling has evolved mainly in response to consumers demands for more information about the environmental impact of the production processes of products they are buying. Eco-labeling is expected to provide information on the environmental impact of a product enabling consumers to make an informed choice at the time of purchase. The consumers' response will be reflected back to the producer who will be able to see new market opportunities as consumers' awareness grows.

Timber Certification (TC) is another example of this trend. Environmental concerns in developed countries about the link between trade in tropical timber and deforestation have fueled demands for the use of trade measures as a way to influence production processes in exporting countries. Calls for bans of tropical timber and for consumer boycotts proliferated in developed countries in the 1980s, but were generally not successful and subject to controversy. More recently, however, TC has been identified as a potentially better instrument with which to promote sound forestry practices.

The TC approach is attracting attention from government, multilateral institutions and non-governmental organizations (NGOs). One of its strengths is that it can be designed as a market based (consumer driven) instrument. Moreover, as discussed below, it is less likely to foster trade disputes at GATT level than unilaterally imposed discriminatory trade instruments (such as import prohibitions). Last, but not least, it is argued that it can reward timber-producing countries that adopt better forest-management practices.

TC involves awarding an 'eco-label' or certificate to companies whose wood and its products have been produced according to "sound" environmental, social and economic criteria. According to its supporters, TC enables consumers to signal their preference for "responsibly produced" forest products to producers, contributing to better forest management (and possibly a reduced level of deforestation). Different levels of environmental awareness among the

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<sup>1</sup>Comments by L. Alan Winters, T.J. Synnott, Bill Mankin and an anonymous reviewer are gratefully acknowledged. The usual caveats apply.

consumers within a country or across countries can provide incentives to producers to implement product differentiation or market niche strategies.<sup>2</sup>

Most developed tropical timber importing countries are fully engaged in national and international debates on labeling of timber and its products. After producing countries' initial resentment of what was perceived as "developed countries' ecoimperialism" and/or an attempt to restrict timber market access, several timber producing countries have recognized that certification is a market reality and might even offer competitive advantages to those that pursue it. Moreover, the development of locally appropriate field-level criteria for TC can facilitate the achievement of "sustainable management," a concept that most timber producers made a commitment to by endorsing the International Tropical Timber Organization (ITTO) "Year 2000" program. Hence, many exporting countries are now seriously investigating the viability of creating or promoting national and international timber certification systems. However, there are many practical issues to be resolved before effective worldwide certification can be introduced. Currently, certified timber and timber products account for a very small share of world trade in all types of timber (approximately 0.5 percent of world trade; ITTO, 1994).

Environmental economics indicate that instruments such as TC would shift into private costs significant elements of social costs that private producers have been avoiding. An important impact of TC would be to change the management of timber resources in timber producing countries. Thus, a significant part of the commercial impact of TC would seem to be on the supply side. However, timber certification is also expected to have an impact on the demand side. An important question regarding timber certification is whether sufficient financial incentives exist to induce producers to become certified. **The central objective of this paper is to provide basic, preliminary analysis of commercial incentives of voluntary timber certification from a demand side perspective.** In this paper, financial incentives are considered in terms of increases in timber export revenues due to certification under the strong assumption that TC does not impose significant costs on timber producers (i.e., no changes in the supply curve occur). They do not include potential long-term financial, environmental, and social benefits due to better forest management and maintenance of biodiversity. Although

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<sup>2</sup>Other potential benefits of TC often mentioned include: i) improved control over illegal logging; ii) internalization of the externalities or social costs caused by timber production; iii) rationalization of investment in the timber industry; and iv) improved efficiency in timber-based industry.

certification is planned to apply to all types of timber, this paper focuses on certification of **tropical** rather than **all** types of timber.

The paper is structured as follows: Section II describes briefly the activities of various producing and consuming countries and organizations that are developing guidelines for TC, and assesses the amount of timber that has been certified to date. Section III analyses the volume, value, and direction of the global tropical timber trade and identifies those producing countries that are most likely to be affected by the demand for certified timber in developed countries. Section IV constructs a scenario in an attempt to assess the financial implications of TC for producer countries. Special attention is given to (i) the so-called "green premium"; (ii) the potential role of TC in recapturing timber markets lost to date and averting potential market share losses in the future; and (iii) the implications of TC becoming a condition for market access to developed economies. Section V summarizes and concludes.

## **II. GLOBAL CONTEXT FOR TIMBER CERTIFICATION**

Over the last few years, numerous initiatives related to timber certification have been launched in various countries and by many diverse organizations. These governmental, non-governmental and multilateral activities are tackling various aspects of TC. The approach mostly promoted is for a voluntary application of TC. Most recent initiatives are driven by NGOs and rely on consumer support rather than being unilaterally imposed through Government legislation. The main initiatives are summarized below.

### **Multilateral Initiatives**

The main initiative to develop TC standards and principles at present is the Forest Stewardship Council (FSC). The FSC, a non-governmental international organization, has been established with the intent of accrediting timber certifiers to strict principles and criteria. It is hoped that one globally recognized label (or symbol) can be developed to reduce confusion associated with the proliferation of different labels that make differing (and perhaps misleading) claims. The FSC has established its legal status and headquarters in Mexico, an operating framework, principles and criteria for good forest management and a unique label or identifying mark for wood products certified by certifiers accredited by the Council. It is now developing guidelines by which to award accreditation to certifiers. All work done by FSC is intended to complement, not supplement, national legislation and international treaties. The Council is supported mainly by environmental and social non-governmental organizations, although certifying companies, independent forestry consultants and the timber industry are also represented in it. Although the FSC provides for participation of business interests in the board of directors, the FSC may face problems related to the lack of support from the timber industry and trade communities. Many in the timber industry feel that business interests are not well represented in the existing FSC structure.

An alternative proposal for a TC scheme involves the ISO/TC207 (International Standard Organization/Technical Committee 207) work on environmental management systems. Timber certification can be viewed as part of a more comprehensive eco-labeling system developed by Sub-Committee 3 of the TC207. Although ISO has not specifically worked on timber issues, the Canadian Standard Association (CSA) is preparing a timber certification system to be submitted to the TC207/SC3 in the near future. CSA views that ISO is the appropriate place to seek



international harmonization and mutual recognition for any standardization scheme. Perhaps the main reason is that ISO is so far the only standardization organization recognized by GATT. Timber certification can be considered as an application of Article 7 of the "Technical Barriers to Trade (TBT) Agreement" negotiated in the Uruguay Round. The "Code of Good Practice and the Preparation, Adoption and Application of Standards" which is part of the TBT text, requires autonomous body to apply the same principles and rules as are required to be followed by central government bodies. It provides that where a system is still being developed by voluntary bodies, the notification obligation should be made to ISO/IEC information center (Jha and Zarrilli, 1993).

Also, in February 1994, UNCTAD and UNEP jointly launched an initiative to create a certification framework (scheme) for environmentally friendly products. The certification scheme focuses on the following three elements: (a) equivalency between environmental standards for all countries, (b) mutual recognition of principles and guidelines, and (c) internationally agreed upon guidelines for certification procedures. This initiative could also serve as a potential umbrella for timber certification initiatives. FAO, whose mandate on forestry issues covers all types of forests, expressed its willingness to help in the development of an appropriate timber certification system for all timbers, in cooperation with ITTO.<sup>3</sup> The ITTO also commissioned a recently completed study to review ongoing timber certification activities worldwide (ITTO, 1994). It was intended to provide the Organization with the basis for examination of policy implications and requirements of timber certification.

Some problems are anticipated in the world-wide implementation of TC. The current lack of acceptable multilateral standards and guidelines for TC by all governments may conspire against the transparency of TC initiatives and may create trade frictions between producer and consumer countries. Differences in standards, for example, can be used to discriminate among producers. Moreover, eco-labeling as a condition for market-access is a non-tariff barrier and, as such, GATT-illegal. Even if TC for tropical products is imposed unilaterally, only as an instrument to foster consumer awareness (that is, not as a condition for market access), it can be challenged based on the principle of non-discrimination of like products. If introduced on a

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<sup>3</sup>The ITTO has produced guidelines and criteria (for natural forests, for plantations and for biodiversity). However, it has turned down the idea of acting as a guardian of standards and principles because some of its producer members are unhappy with ITTO's limitation to only tropical countries.

voluntary basis, GATT-legality may not be an issue, but then the questions of credibility of competing standards and the effectiveness of the measure become paramount.

### **Importing Country Initiatives - and the Implied Demand for Certified Timber**

Germany, the Netherlands, the U.K., France, Austria, the European Union (EU), Canada and the U.S. are developing and refining, inter alia, the overall conceptual basis of certification, regulations for labeling of imported tropical forest products, appropriate mechanisms to undertake and monitor labeling programs, timber tracking systems and principles and criteria for "good" forest management.<sup>4</sup> Many of these countries have established national policies and guidelines on tropical timber imports. Most countries have set dates by which they hope to have achieved various degrees of certification.

The first attempt to regulate imports of "unsustainably" produced timber through ecolabeling was in **Austria** in 1992. The Austrian Parliament introduced legislation *requiring* mandatory labeling of tropical timber products. The law also introduced a voluntary quality label to identify timber and timber products from sustainable forests. In a related development, the Austrian Parliament approved a 70 percent increase in tariffs on tropical timber imports, earmarking the revenue for projects to support sustainable management of forest resources in tropical timber producer countries. Following protests by producing countries and questions about GATT-"legality", the legislation was amended. It was determined that eco-labeling should be introduced on a voluntary basis, rather than be imposed; that the conditions should apply to all timber, not only tropical; and that the import duty be dropped.

Since then different approaches to regulating trade in timber and timber products have been developed by other countries and debated in the European Parliament; some are on a voluntary basis, initiated by industry and NGOs in concert, while others are primarily Governmental proposals to establish national timber import regulation systems.

In the **United Kingdom** there is a strong movement spearheaded by NGOs to promote the consumption of sustainably produced timber and to oppose non-sustainably produced timber. In 1991, the World Wildlife Fund of UK (WWF-UK) set up the "1995 Group", which is a partnership between this NGO and 24 companies that buy and sell timber products. The

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<sup>4</sup>For a detailed description of these initiatives see ITTO (1994).

companies have pledged "to phase out the sale and use of all wood and wood products that do not come from well-managed forests by December 31st 1995" (WWF, 1994). The members of the group include the 4 largest home-improvement retail chains; the group as a whole represents a significant proportion of the UK trade in timber - over \$300 million worth annually. Additionally, the British Retail Consortium (BRC) that represents more than 90 percent of the retail industry in the UK, many of which trade in timber products, has publicly declared its support for timber certification. The UK Timber Trade Federation has also launched its "Forests Forever" campaign (funded by the timber industry) aimed at promoting a 'balanced' discussion of sustainable forest management and working with producers to further this goal. It adheres to the ITTO Target 2000.

The approach of the **Netherlands** is similar to that of Britain, but also includes the Government. In June 1993, a Covenant was signed by the Government, private sector and NGOs which called for all signatories to completely cease the **use** of non-certified (i.e., non-sustainably produced) tropical timber by December 31st 1995.<sup>5</sup> The development of the Covenant stemmed from a commitment made in an official policy in 1991 to the same effect. A study was presented in December 1993 to the Dutch Ministry of Housing, Physical Planning and Environment that outlines "a 'blueprint' for a certification system for (all) sustainably produced timber used in the Netherlands" (Environmental Strategies Europe, 1993). One notable recommendation is that the Netherlands enter into long-term agreements with both Governments and individual suppliers to buy a minimum volume of timber at above-market prices. This is intended to provide financial incentives to producers to become certified and guarantee certified timber supplies to the country.

**Germany's** "Projekt Tropenwald" was set up to investigate alternatives to bans and boycotts. It was founded by timber importers, processors and the timber trade union, but has sought to involve other constituencies, such as NGOs and Government. It is working towards having a voluntary system of certification, based on national regulations for timber labeling, for imported timber in place by the end of 1995.

A proposal was made in October 1993 by the ACP-EEC Joint Assembly to the ACP-EEC Council of Ministries and the European Commission to add to the Lomé Convention a "Timber

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<sup>5</sup>The Covenant is entitled "The Netherlands Framework Agreement on Tropical Timber".

Protocol'. The main objective of the protocol would be to establish a system of trade and aid measures to promote sustainable timber production systems and providing technical and financial incentives to producers. One specific proposal is to provide financial support for a limited time, on a per hectare basis, to cover the cost of producers of changing management systems to comply with sustainable forest management criteria. It is hoped that such criteria and indicators, based on those developed by the Tropenwald Initiative (Germany), the Soil Association (U.K) and the Rainforest Alliance (U.S.) will be field-tested in collaboration with tropical timber producing nations in the near future. Establishment of a system of certification and labeling of tropical timber products is also proposed under the scheme, using existing arrangements under the ACP-EEC convention for certificates of origin.

In the **United States** campaigns and activities of NGOs have succeeded in raising awareness of certification amongst their constituencies - mainly among consumers of high-value end products (such as furniture, musical instruments and window and door parts) -- to some degree. It was an initiative of WARP (the Woodworkers Alliance for Rainforest Protection) that led to the formation of the Forest Stewardship Council. The two most active operating certification companies are also American. However, less than one percent of wood on the market is currently certified (USDA, 1993). Although there has not been an initiative of retailers or suppliers to sign a declaration announcing the cessation of sale of unsustainably produced timber, as in some European countries, a handful of large wood-product retailers have declared their support of certification. A major "home-improvement" chain of shops has already begun to stock certified domestically produced timber products. However, there is significant resistance to labeling by tropical timber importers and manufacturers who argue that it is too impractical, will cost the US industry too much to conform to timber tracing and labeling requirements and may divert trade from the US were it to introduce certification.

In the case of **Japan**, the largest importer of tropical timber, support for TC initiatives remains limited (see Ahmad, 1994). Although Japan started the EcoMark (eco-labeling) program in 1989, the Japanese Government views TC as part of the general question of how to harmonize trade and environmental policies. In the case of TC, the Japanese Government is waiting for "convincing evidence" that certification and eco-labeling will indeed promote

sustainable forest management (ITTO, 1994).<sup>6</sup>

The **European Union's** EC commission sees TC as a first step towards a more comprehensive eco-labeling scheme based on life cycle analysis. The commission supports the harmonization of TC within the EU eco-labeling scheme and agreed that TC should be applied to all timbers, based on the principles of non-discriminating, transparency and acceptability for all parties concerned.

Other developed countries that are looking into the issue of TC and/or plan to implement a TC program are Belgium, Finland, Switzerland, Denmark, France, Canada, and Australia.

### **Producing Country Certification Initiatives**

In addition to the above activities of importing countries, a few other initiatives are being developed by producer countries. African producing countries have become very aware of European campaigns against tropical timber. They are therefore keen to develop a unified position in response, and promote a positive image for African timber. In response, a roundtable meeting of several members of the African Timber Organization (ATO) was held in March 1993.<sup>7</sup> It recommended that a certificate of origin be developed and introduced into the market.<sup>8</sup> The ATO was proposed as the governing body for the label, with ratification from ITTO. The conference agreed to launch a promotional campaign to generate support for the African labeling scheme among European NGOs and donors particularly, and to develop standards for forest management as the basis for evaluating forest operations. No timetable has been set yet to implement the labeling scheme.

**Indonesia** is the main producing country already developing a national system for timber certification. Indonesia has announced its intention to establish an "Ecolabeling Institute". Teams of experts are currently working to develop criteria of forest management appropriate to Indonesia and an institutional structure and financing plan for the agency. The Indonesian

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<sup>6</sup>However, there are signs of growing environmental awareness with regard to timber. Some Japanese prefectural and city governments have expressed their willingness to reduce or eliminate the amount of tropical timber products they use. Also, the Japanese Building Contractors Society has decided to reduce the consumption of tropical timber used for plywood forms by 35% within five years. However, this decision could be due to the fact that Japan is facing a rapidly reduced supply of tropical logs and sawnwood as a result of export bans and reduced logging by East Asian producers (*Japan Lumber Journal*, July 31, 1994 p. 9).

<sup>7</sup>Cameroon, Congo, Côte d'Ivoire, Gabon, Ghana and Nigeria

<sup>8</sup>The wording "African Timber of Controlled Origin" was suggested.

scheme is being prepared to aim at independent domestic inspection and enforcement of sustainable forest management standards and criteria.<sup>9</sup>

The reactions of other major tropical timber producing countries to timber certification are as follows: The Ministry of Primary Industry in **Malaysia** has been skeptical that a credible and workable TC scheme could be implemented sooner than the ITTO year 2000 initiative. However, at present, a purely local certification system, Malaysian Timber Producer Board Certificates, are being granted to some producers and are currently being used in exports to Australia. Moreover, WWF-Malaysia is providing support to assess the feasibility of establishing an independent TC system in Malaysia and exploring with some private producers improved forest management practices.

Other tropical timber producers that are in the process of preparing their own TC schemes are the **Philippines** and **Papua New Guinea**. However, it is reported that both countries have significant reservations, mainly toward the cost of TC and TC's impact on their competitiveness. **Brazil** is also in the process of developing a national certification scheme despite concerns over the high cost of certification on top of the cost of sustainable management. The Sociedade Brasileira de Silvicultura (SBS) is leading this initiative, called CERFLOR. This scheme is, however, more focussed on pulp and paper products in response to the EU demands for "eco-friendly" paper. The discussion has not yet moved to sustainability of plantations providing the raw material.

### **The Supply of Certified Timber**

There are few companies that are actually certifying timber products today. The quantity of timber being produced worldwide that is certified is very small. It is estimated that in 1993, approximately 1.5 million m<sup>3</sup> of timber and timber products (tropical and temperate) were certified; that is, less than 0.5 percent of world trade in timber (ITTO, 1994, p. viii). Most industry analysts doubt that a large number of producers will become certified in the near future. As a consequence, it is likely that the supply of certified wood (and wood products) on the market will remain below demand in the coming years. This is expected to foster a "green premium" (the capacity to charge higher prices for TC products vis-a-vis competing products

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<sup>9</sup>For more details about Indonesia's TC efforts see Ahmad, (1994).

made of non-certified timber and/or the capacity to increase market share for certified producers) and to create additional demand for the services of certifiers.

The largest program worldwide is the SmartWood Program of the American NGO Rainforest Alliance. The program certifies both timber producers and manufacturers and retailers. They have certified 5 sources to date, totalling 1.75 million ha in terms of producing area. A sixth source is likely to qualify soon and two others are in the process of upgrading their management systems to meet certifiable standards. SmartWood operates a two-tier system with categories for "well-managed" and "sustainably" managed forests. All 5 certified sources are in the well-managed category. It is expected that the annual supply from these sources will be around 750,000 m<sup>3</sup> in the near future. The Rainforest Alliance's SmartWood program is now moving into temperate timber certification.

Scientific Certification Systems (SCS)<sup>10</sup> have so far certified only 2 tropical wood producers under their Forest Conservation Program. They are: two 'ejidos' of Plan Piloto in Mexico, with a total area of 36,216 ha; and Portico of Costa Rica (a vertically integrated company that produces doors) with an area of 3,900 ha. The SCS system rates producers according to three elements: sustainable harvest, ecosystem health and community benefits, and financial considerations. If the producer scores higher than 60/100 in each category is provided with a label certifying that the wood comes from a 'Well-Managed' or 'State-of-the-Art Well-Managed' source.

SGS Silviconsult, a company specializing in commodity inspection, has developed a certification system that provides three separate certificates relating to the origin, quantity and quality and forest management system of the producer. The company has awarded four "Certificates of Forest Management" in tropical countries to date. It has also developed basic principles for establishment of an international wood certification program and is working with the Indonesian Government currently to develop an efficient wood-tracking system.

In the United States, Ecotimber International -- a company that specializes in importing and distributing certified timber (or so called ecotimber) -- is aiming to import 12,500 m<sup>3</sup> of

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<sup>10</sup>Others operating in the US are the Ecoforestry Institute, Forest Trust, Institute for Sustainable Forestry, Rogue Institute, Sigurd Olsen and the Silva Forest Foundation in Canada.

lumber by the year 2004. According to this company, this is expected to correspond to 5 percent of the projected US tropical lumber market in 10 years.



### III. GLOBAL TIMBER TRADE PATTERNS AND REVENUES

Timber certification most likely will have its initial impact on that portion of the tropical timber produced that enters trade and that is imported by those countries that have been involved in developing norms and guidelines noted in the previous section. It is therefore crucial to understand the dynamics of the tropical timber trade and more specifically, the particular producing countries and quantity of timber that could potentially be affected by certification.

While TC is intended to apply to all types of timber, the focus of this paper is on **tropical** timber products, excluding fuelwood. Hence, the figures presented will focus on the tropical timber trade. The FAO timber statistics used do not distinguish between tropical and non-tropical timber. The distinction is between non-coniferous (temperate and tropical together) and coniferous. With certain exceptions, the non-coniferous timber production of developing countries can be classified under tropical. Major exceptions are China, Argentina, Chile and the Near East. These are relatively large producers residing in the temperate zone. While some other developing countries located in temperate areas are still included in our data, their magnitude in both trade and production values and volumes are not significant to distort the analysis.

**Table 1: Production and Exports of Timber Products in Developing Countries, 1991**

Product	Export Volume (in 1,000 cubic meters)	Export Value in million US\$
Logs (NC)	25,868	2,420
Sawnwood (NC)	8,919	2,285
Wood-based panels	12,652	4,318
Total		9,023

Source: World Bank, IECIT, Calculations based on FAO, *Forest Products Yearbook* (1991) data.

Notes: (i) NC signifies non-coniferous; (ii) Wood-based panels are mainly veneer and plywood, but also include particle board and fiberboard.

Table 1 shows the timber **revenues** of timber exporting developing countries (excluding China, Argentina, Chile and the Near East). The total exports for non-coniferous logs plus sawnwood plus wood based panel was US\$9.02 billion in 1991. In addition, wood furniture and wood manufacturers, exports from developing countries (excluding the countries mentioned earlier) are estimated to account for around US\$1.64 billion.<sup>11</sup> Thus the value of the total timber export revenues for logs, sawnwood, wood based panels, wood furniture and wood manufactures from developing countries was around **US\$10.66** billion in 1991.

Timber certification is likely to affect the share of tropical timber imports destined to locations where consumer awareness for TC is high and where TC initiatives are proliferating. Table 2 indicates that around 70% of tropical timber is imported by developing countries and Japan and not by Western developed countries where demand for certified timber appears to be strong. The concern over environmental issues has not reached the vast majority of consumers in developing countries and hence certified timber is not likely to be in high demand in those markets, at least in the short to medium-run.

Developing countries likely to be most affected by TC are those that significantly rely on tropical timber exports and have a large share of their exports destined to countries that are developing TC initiatives (such as in Western Europe and North America). Table 2 shows that the two largest exporters of tropical timber non-manufactured products are Malaysia and Indonesia; trade accounts for a large part of their production. In 1990, Malaysia's exports of logs and timber products accounted for about 75% of timber production and for Indonesia the same portion was 60%. Other countries with high export shares are: Congo (62%), Côte d'Ivoire (57%), Gabon (78%), Ghana (49%) Liberia (64%), and Papua New Guinea (60%). Table 2 also shows that eighty two percent (82%) of global exports of tropical timber originate from Asia, particularly Malaysia and Indonesia, which together account for about two-thirds of world tropical timber exports.

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<sup>11</sup>Calculated from UN Trade Statistics.

**Table 2: Shares of Major Exporters and Importers in Tropical Timber Trade**

Major Exporters Country/Regions	Share of World Exports (%) 1990	b/	Major Importers Countries/Regions	Share of Imports (%) 1987
<b><u>Countries</u></b>				
Malaysia	41.5	(19.6)	Japan	28.1
Indonesia	23.8	(13.8)	China	9.2
Singapore a/	4.6	-	USA	7.5
Brazil	3.3	(19.6)	South Korea	6.2
Côte d'Ivoire	2.1	(1.4)	Singapore	6.2
Papua New Guinea	1.7	(1.8)	United Kingdom	4.7
Cameroon	1.5	(1.8)	Hong Kong a/	4.2
Congo	1.4	(0.8)		
Gabon	1.4	(0.6)		
<b><u>Regions</u></b>				
Asia	82.2	(52.6)	Asia	54.3
Latin America	5.4	(26.8)	EU	20.1
Africa	8.8	(17.9)		

Sources: World Bank, International Trade Division.

Notes: Timber trade in sawnwood, wood-based panels, (converted in roundwood equivalent) and logs.

a/ Transit country.

b/ Inside the parenthesis are the world production shares of each of the exporters in 1990.

The principal **trading partners of the major developing country exporters** for non-coniferous timber products (logs, sawnwood and panels) are broken down and presented in Table 3 (wood manufactures and wood furniture are discussed later). Asia is the largest importer (54.3%) of tropical timber products; China, Japan and South Korea account for a little less than half of the total of these tropical timber products imports from Malaysia, Indonesia, Papua New Guinea and Myanmar. These statistics show that the dominant pattern in tropical timber trade is **from Southeast Asian producing regions to East Asian import markets**.

**Table 3: Trading Partners of Major Exporters of Tropical Timber Products, 1991**

Exporter/Importer	Japan	Asia a/	E.U.	U.S.A.
	Importing country share of total exporter exports and (exports as a share of national production)			
Brazil	-	-	46.54	20.17
	-	-	(1.68)	(0.73)
Cameroon	3.16	-	67.72	-
	(1.26)	-	(27.10)	-
Congo	-	-	88.34	-
	-	-	(57.90)	-
Côte d'Ivoire	-	-	62.45	-
	-	-	(34.14)	-
Gabon	-	-	68.76	-
	-	-	(41.52)	-
Indonesia	33.80	37.73	9.10	8.54
	(24.04)	(26.83)	(6.47)	(6.07)
Malaysia	32.19	49.62	5.42	-
	(25.44)	(39.22)	(4.29)	-
Myanmar	1.62	92.85	-	-
	(0.30)	(16.58)	-	-
Papua New Guinea	56.31	39.35	-	-
	(30.49)	(21.31)	-	-

Source: World Bank, IECIT, calculations based on FAO, Forest Products direction of Trade.

Notes:

a/ Asia excludes Japan. Major Asian importers are: Korea, China, Thailand, India, Hong Kong, Singapore, and the Philippines.

- denotes that data were not available. However, it is expected that the share, even if available, would be small.

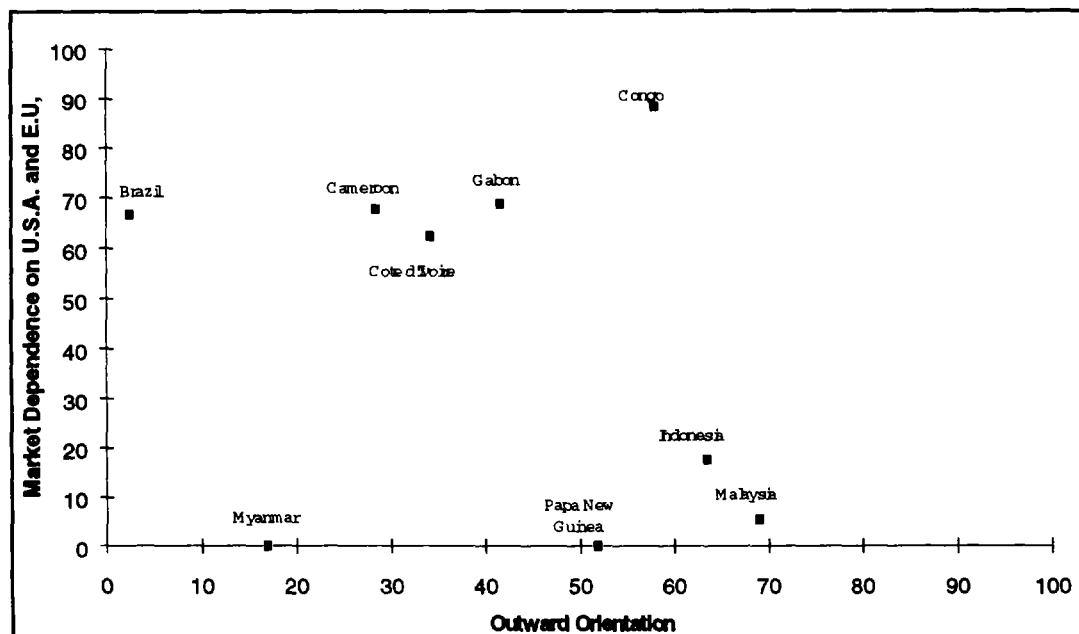
Timber products include: sawlogs and veneer-logs, sawnwood, and plywood.

The table also indicates countries that export large quantities of their production of non-manufactured tropical timber products that are most likely to be affected by demand in Europe and, to a lesser degree, U.S. for certified timber products. African producers will be most heavily affected, since they export a large percentage of their production to E.U. This is not the case for Indonesia and Malaysia however; they both export little of their overall production and only 12% and 4% of their total exports respectively go to the US and E.U. Other Asian timber exporting countries, such as Myanmar and PNG, may not be significantly affected by certification as these countries export to other markets in Asia in which there is little, if any, demand for certified timber. Although the E.U. and US account together for 66% of Brazil's timber exports, only a

little over 2% of production is actually exported to these two destinations. To the extent that TC will be more likely to affect those producers that export their products to these markets; they will be a very small number of the total.

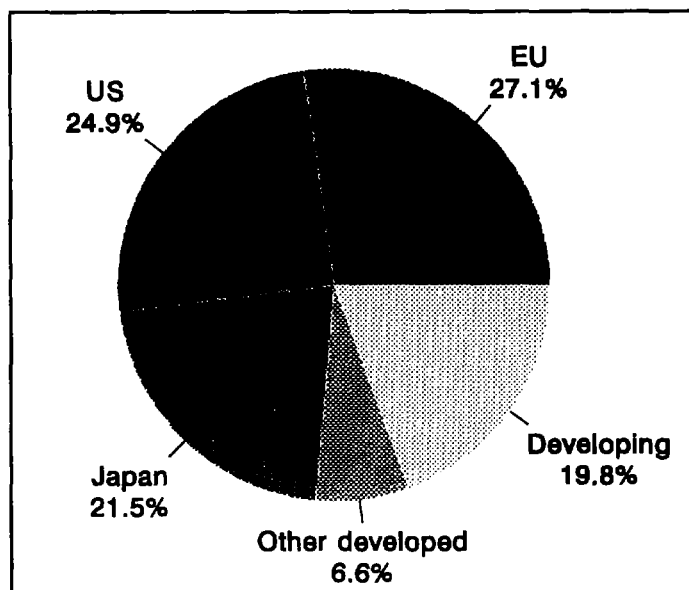
These points are further illustrated by Figure 1. A developing country is more likely to be affected by TC the higher the outward-orientation of its timber industry (as measured by exports as a share of national production) and the greater its market dependence on the EU and the United States (as measured by the exports to EU and the United States combined, as a share of total timber exports). As Figure 1 shows, African countries are the ones typically clustered in the high-exposure corner of the box.

**Figure 1: Exporting Country Exposure to Timber Certification**



It is worth noting, however, that a large share of developing country exports of woods manufacturers and furniture is going to developed countries, as figure 2 shows. For 1991, about 60% of these exports from developing countries were absorbed by developed countries excluding Japan. Thus those producing countries for which the US and Europe were not important markets for logs, sawnwood and panels may in fact be more strongly affected by TC than first indicated, as a significant share of their raw timber may be exported to an intermediate country (such as Singapore or Hong Kong) to be processed before being exported to the US and Europe.

**Figure 2: Major Importers of Wood Furniture and Wood Manufactures from Major Developing Country Producers <sup>a/</sup>**



<sup>a/</sup> Major wood furniture and wood manufactures developing country exporters are: Brazil, Chile, Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand. Other major exporters not in the group due to data unavailability are: China, and Hong Kong.  
Source: Calculation from U.N. Trade Statistics.

#### IV. LIKELY REVENUES AVAILABLE DUE TO TIMBER CERTIFICATION

This section assesses the potential financial benefits of timber certification to producers under the strong assumption that TC does not impose significant costs on timber producers. In theory, certification could increase export revenues of producing countries through the following mechanisms. *First*, certified timber sales may attract a "**green premium**", i.e. certified timber may be able to be sold at a higher price than uncertified timber. Surveys undertaken in Britain, other European countries and the US found that consumers would be willing to pay moderate premiums for environmentally friendly timber. More specifically, Winterhatter and Cassens (1993) reported that 34% of consumers surveyed in the US were willing to pay 6-10% price premium for sustainable wood, while Gerstman and Meyer's (1991) survey reported a willingness to pay a 1-5% premium from 75% of consumers surveyed. A Purdue University survey also indicated that among architects and designers surveyed, 57% were willing to pay between 1-5% premium and 36% were willing to pay between 6-10%. Results of two surveys in the United Kingdom have been reported by Haji Gazali and Simula (1994) and indicated that consumers were willing to pay around a 13% premium for tropical timber products.<sup>12</sup> *Second*, certified timber exporters **may avert further losses** of market share in those countries that are currently developing legislation or voluntary initiatives to exclude non-certified timber (see section II ).<sup>13</sup>

Table 4 presents the value of trade globally and by major consuming regions that will likely be affected by timber certification. The figures of Table 4 will be the basis for all further calculations. In order to calculate the potential financial benefits due to timber certification, a scenario can be developed by addressing the following questions:

- a) What is the likely size of the market ("niche") to be affected by certification?
- b) How the "green premium" will affect tropical timber prices?

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<sup>12</sup>A comparison with the results of a survey on organic food may help put the "green premium" for tropical timber issue in perspective. Van Ravensway and Hoehn (1991) reported that based on a national survey, the increase price that US consumers are willing to pay for health and environmental attributes is between 5-7% on average.

<sup>13</sup>There may also be additional financial gains through the recapture of markets that currently ban the use of tropical timber. Certified timber may recapture those markets that have for some time banned the use of tropical timber. Such bans are in effect in some 200 city councils in Germany and 51% of Dutch municipalities. A number of states and cities in the United States, have banned, or proposed a ban, on the use of tropical timbers in public construction projects. Among them are the states of Arizona, California, and New York and the city of Minneapolis. If certified timber does become available, these markets may accept tropical timber again.

- c) What is the size of the market that could be potentially lost in the future and how much of that loss could be averted by certification?

The assumptions made in answering these questions are analyzed and explained below.

**Table 4: Regional Value of Trade in Tropical Timber Products**

Region	Estimated value of logs, sawn and panels	Value of wood furniture and wood manufacture imports
World Total	9,023	1,640
All developed countries	5,414	1,310
All developed, except Japan	2,887	968
Europe (EU + EFTA)	2,075	492
USA	677	408

**Notes:**

(1) all figures are in million US\$

(2) scenarios are based on 1991 values of trade

(3) The following assumption were made:

(i) for logs + sawn + panels the shares of importers' values are the same as the shares of importers' volumes (see table 2)

(ii) 60% of log + sawn+ panel trade goes to developed countries. Japan's share is 28%, Europe's share is 23%, and the US share is 7.5%.

(iii) 80% of wood furniture and wood manufactures trade goes to developed countries. Japan's share is 21.5%, Europe's (EC12 plus EFTA) share is 30%, and the US share is 24.9%.

**a) Size of the "niche" market affected by certification**

Timber certification will most likely affect developed countries and in particular tropical timber markets in Europe and the US.<sup>14</sup> Concerns about the environmental impact of consuming tropical timber seems to be most significant in certain countries of Europe -- the United Kingdom, Germany, the Netherlands, and Austria. The first three countries are also among the six largest consumers of tropical timber products in Europe (the others are France, Italy and Spain). In the US, there is also significant degree of support within certain concerned groups.

<sup>14</sup>Johnson and Cabarle (1993) report that demand for wood from sustainable sources presently barely influences the Japanese local market.



Timber certification is expected to have most of its impact at the retail trade level, where the final consumer can directly exert their influence. So far, several retailers in Europe and the US have shown interest in timber certification. The tropical timber that goes to final consumption and it is "visible" by the consumer is estimated to be around 50-60% for Europe.<sup>15</sup> While there are no firm estimates available, the authors' discussions with NGOs, wholesalers, retailers and market exporters involved in the certification effort indicated that between 10-20% of the timber in the European tropical timber market will potentially be affected by certification, while certification is likely to affect between 5-10% of the US tropical timber market. In short, the "niche" market for which TC may become a major factor in influencing consumer decisions is only a small part of the total market for tropical wood in developed economies.

#### **b) The size and the distribution of the "green premium"**

Price increases either due to excess demand or due to certification cost recovery will be limited by the possibilities of substitution between tropical and other timbers or materials. However, price increases due to certification will be more prevalent in the "niche" market segments described earlier. The final impact on producer revenue will depend on relevant price-elasticities for these products and on the shift in demand for certified wood. For our calculations we consider the case of "green premium" as described in Annex 1. More specifically the "green premium" is assumed to be the difference between the price of the certified good and the price of the same good prior to the adoption of certification.

Some advocates of certification, however, claim that the main impact of certification will not be brought about through increased prices paid by the consumer. Rather, they argue that the consumer will pay the same price for certified timber; this will come about due to the introduction of improved inventory tracking systems under certification, enabling retailers to bypass a number of intermediaries in the trade, and buy more directly from the producer<sup>16</sup>. A larger share of the incremental revenue available would therefore be captured by the producer, as a result of reduced trade intermediation.<sup>17</sup> This could provide a greater incentive than a price increase on the final product (which would have been captured by wholesalers and/or retailers). However, further analysis is needed for a proper evaluation of these claims.

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<sup>15</sup>See FAO (1991) study on high-value markets for tropical sawnwood, plywood and veneer in the European Community.

<sup>16</sup>This has already happened in one retail store in the US which has actually cut the price of timber products made from certified timber because it is buying direct from the producer.

<sup>17</sup>The reduced trade intermediation will result in lower production cost that will shift the supply curve for certified timber to the right.

**c) Potential additional revenue gains through averting losses in markets that will require certification**

In view of the many countries that are considering introducing voluntary (and possibly) mandatory restrictions on import of non-certified timber, estimates can also be made of the quantity of timber that might be **displaced** in the future as a result of TC. It is assumed that the timber that is not accepted in the future in Europe (due to being non-certified) will be offered to other countries.<sup>18</sup> This, of course, will have a negative impact on non-certified tropical timber prices but positive impact on non-certified tropical timber revenues, assuming an elastic demand for tropical timber.

If certification is demanded by importing nations for **tropical** timber only, there is a strong possibility of trade diversion. As Varangis *et al.* (1993) argued, if Asian consumers (that absorb most of tropical timber trade) do not show preference for certified timber products, while consumers in Europe and North America do, tropical timber from uncertified (unsustainable) sources will flow to Asia while timber from sustainable sources will be diverted into North America and Europe. This assumes that not all tropical timber comes from unsustainable sources. Even in the extreme case of no tropical timber being able to qualify for certification, trade diversion is still likely to take place in the event that Asian consumers do not express preference for certified timber products. In this extreme case, the United States and Europe will probably consume very little or no tropical timber (because it will be rejected from their markets) while Asian importers may substitute tropical for temperate timber, absorbing almost all tropical timber exports. Indonesia, for example, has substantial opportunities to substituting Asian and Middle-Eastern markets for those of Europe and America<sup>19</sup>. Furthermore, the rejection of tropical timber products due to eco-labeling in Europe and the United States would reduce the price of these products and make them more attractive to Asian importers.<sup>20</sup> As already noted the adoption of eco-labeling programs in European countries is more likely to affect timber exports from African producers. However, Japan has been increasing imports of

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<sup>18</sup>This can be seen as a shift to the right of the supply for non-certified timber.

<sup>19</sup>The chairman of the Indonesian Wood Panel Association has reportedly said that Indonesia will not be affected by the anti-tropical timber campaigns in Europe and the United States, as it has been expanding its tropical timber exports to Asian and Middle-Eastern countries (*Asian Timber*, 1993, pg. 4).

<sup>20</sup>This is not just a valid description of only the intermediate dynamics as noted by Mattoo and Singh (1994). These authors assume that the supply for certified tropical timber is greater than the demand at the pre-labeling price. However, available estimates suggest that this is not an accurate description of the current situation. With supply of certified timber estimated at around one million cubic meters, demand is tentatively estimated to be at least two to three times as much. Thus, the situation of the existence of excess demand for certified timber is a more accurate representation of the tropical timber market.

African timber, particularly from Gabon. Hence, some degree of trade diversion could take place even for African timber. This could happen whether tropical timber certification is introduced on a voluntary basis or imposed unilaterally.<sup>21</sup>

Trade diversion can also take place even under the case where all timbers (tropical, temperate, and softwoods) are covered by certification. It could be the case that softwoods and temperate hardwoods could much more easily meet the certification criteria and/or compliance of softwood and temperate timber producers is much broader than in tropical timbers. In this case, trade diversion will likely take place in a similar manner to the tropical timber certification case. That is, most of tropical timber will be likely absorbed within developing countries (producers and major importers) substituting for other timbers.

In order to give a rough estimate of the potential market loss that could be averted if certification is adopted, the following scenario was developed:

First, it was assumed that if certification is not adopted, the whole market "niches" that are likely to be affected by certification will be lost. As stated earlier, certification is assumed to affect 20% of the European and 10% of the U.S. market. Thus, in the absence of certification, we assumed that these markets will be lost. These lost markets were estimated to be worth approximately \$622 million.

Second, it was assumed that timber exports destined for the lost market segments above will be diverted to non-European/U.S. destinations. This would increase exports to these destinations by 8.87%. Based on a price elasticity of demand of 1.7, the increase in exports will increase revenues in non-European/U.S. destinations by \$256 million.<sup>22</sup> Thus, the net future losses (gains) if certification is (not) applied for the market segments described above will be to the order of \$366 million (\$622-\$256 million).

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<sup>21</sup>The assumption here is that tropical, temperate and softwood timber products have a high elasticity of substitution, at least in the long-run, and that there is a low elasticity of substitution between timber products and non-timber products. In such a scenario, the rejection of tropical timber in Europe will increase prices of temperate and softwood timber products, in which case Asian importers will substitute tropical timber products for the latter.

<sup>22</sup>The formula applied for the calculation is:

$$dR = \left(1 - \frac{1}{e}\right) \frac{dQ}{Q} \cdot R$$

where, R is the revenue (PQ), Q is the quantity (exports) and e is the price demand elasticity.

Another aspect worth considering is the possibility of recapturing lost markets. Environmental concerns have already caused many European country Governments to ban (or consumers to discriminate against) tropical timber<sup>23</sup>. Because there are no sound estimates of the already lost market share for tropical timber we will not consider this potential effect in our calculations. However, the magnitude of this figure does not alter the thrust of the argument developed in this paper. Even if we assume that all the reduction in the import value by European consumers was due to environmental concerns during the period 1987-89 and 1991-92, it will result in a loss of US\$340 million. However, adjusting for the tropical timber price increase during the same period (about 13%), and assuming a price elasticity of demand of 1.7%, the decrease in the European value of imports falls to approximately US\$149 million. Including these US\$149 million in the potential benefits calculated in the following section will not significantly change the overall potential revenues available to developing countries due to TC.

#### **Computation of Likely Commercial Benefits from Timber Certification**

Based on the discussion above, the following is a rather optimistic scenario on how tropical timber certification will likely affect timber revenues from tropical timber producing countries. The assumptions underlying the scenario are that:

- (i) 20% of the European<sup>24</sup> market will be affected (market "niche" for certified timber).
- (ii) 10% of the American market will be affected (market "niche" for certified timber).
- (iii) 10% increment of revenues due to the "green premium" affecting the market "niches" for certified timber (i) and (ii) above).
- (iv) In the absence of certification, the whole market "niches" identified above, i.e., (i) and (ii) would be lost.

The figures for this scenario are shown in Table 5.

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<sup>23</sup>See Johnson and Cabarle (1993), and the *Economist* (1993).

<sup>24</sup>European countries included are the EU12 and EFTA countries.

If it is assumed that there will be no further losses in market share if certification is not adopted then, the incremental revenues due to certification total \$62 million -- the equivalent of 0.6% increment of the total value of tropical timber product export revenues of developing countries. If the market segments ("niches") affected by certification are totally lost in the absence of certification, the potential benefits associated to certification rise to \$428 million; the equivalent of 4% of export timber revenues of developing countries.

**Table 5: A Scenario for Timber Certification**

Source of revenue	Commercial benefits available, US\$ million
(i) through (iii) Incremental revenue from European and American market "niches"	62
(iv) Aversion of additional potential losses in the absence of certification minus additional revenues derived from related trade diversion	366
Total commercial benefits due to TC	428
Revenue as a % of export timber revenues of developing countries <sup>a/</sup>	4%

Note: Figures are based on 1991 trade values and flows.

<sup>a/</sup> The group of developing countries is defined as in FAO and excludes China, Argentina, Chile and the countries of the Near East.

As already noted, in these calculations we did not calculate the recapturing of markets already lost due to environmental concerns. However, previously we calculated that the value of tropical timber imports in Europe has dropped by about US\$149 million (after adjusting for price increases). Thus, even if we assume that all of it was due to environmental concerns and all of it could be recaptured with TC, the total potential commercial benefits of Table 5 would increase to US\$577 million, or 5.4% of the total timber export revenues of developing countries.

These figures indicate that the potential financial incentives of tropical timber certification from the perspective of producing countries are limited, at least for the short to medium term. Thus, if returns to TC are this low, producers may not have sufficient incentives to adopt it. However, individual producers that first become certified could establish themselves in a market niche and potentially profit from early entry in this market. In addition, producing countries may have other non-economic long-term benefits accruing from the adoption of better forest management practices and the maintenance of biodiversity.

### **Costs Associated with Timber Certification** <sup>25</sup>

The analysis developed above has not addressed the costs associated with TC. In practice, a TC scheme entails two type of costs at the company level. The first is the cost for the company to operate in the sustainable manner, according to a set of the agreed principles and criteria. The second is the cost of the certification process.

The cost of sustainable forest management, which is also referred to as compliance cost to TC scheme, varies widely across types of forests (heterogenous vs homogenous, tropical vs temperate and boreal). As pointed out by Haji Gazali and Simula (1994), the lack of reliable estimates on the cost of sustainable forest management is mainly caused by the lack of commonly agreed operational definitions of sustainability. In Sarawak, an ITTO study reported that adopting nearly zero impact logging would increase the cost of logging by adopting 100% or about US\$60 per cubic meter log. In the Philippines, Paris and Ruzicka (1991) reported that sustainable forest management would put an extra US\$38 per cubic meter log. As estimate by Dianasari (1993) for the externality costs of forest destruction due to logging in Indonesia, leads to additional cost of about US\$70 per cubic meter log.<sup>26</sup> Jaakko Pöyry (1993) estimated that the cost of compliance ranges between US\$0-13 per cubic meter log. Most of these estimates suggest that the cost of sustainable forest management per cubic meter log likely lies between 10-20% of the current average international tropical log price of about US\$350. Application of common principles and criteria for sustainable forest management is expected to eventually lower the compliance cost over time.

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<sup>25</sup>This section draws mainly on Ahmad (1994).

<sup>26</sup>According to Ahmad (1994), another rough estimate of the cost of sustainable forest management in Indonesia is to take the official forest plantation planting cost of US\$1,000 per hectare divided by about 30 cubic meter log harvested per hectare concession. It generates the estimated additional costs of about US\$35 per cubic meter log harvested.

For certification costs which will consist of inspection, timber tracking and monitoring costs, so far there are no reliable estimates. These costs will depend mainly on the availability of information on the forest inventory and adequacy of forest maps. In developed countries where expertise and information systems have been developed in the forestry field, the cost is estimated to range between US\$0.30-\$0.60 per hectare. In developing countries, rough estimates suggest that the certification cost will be in the range of 5-10% of existing logging costs. A significantly different cost estimate was reported by Septiani and Elliot (1994). SGS/Indonesia estimated a US\$1.30 cost for tracking per cubic meter timber while SGS/New Zealand came up with US\$7 per cubic meter.

In the context of costs for TC scheme, international mutual recognition and harmonization of principles, standard and criteria becomes a central issue to developing countries that export timber products. If each developed country that imports timber products were to impose its own requirements, or if each of them were to subscribe to different certification or accreditation systems, it is conceivable that the costs would become prohibitively high for developing country exporters to enter developed country markets.

At the national level, the eco-labeling and timber certification initiatives may also involve significant costs like foregone export earnings and/or opportunity costs in terms of the resources committed to develop the eco-labeling schemes. For example, the Indonesian Government recently announced its commitment to reduce the sustainable log harvest from 31.4 to 22.5 million cubic meter per year to be reached over the next five years. If this is considered to be a means of implementing the sustainable forest management, it will cost the country at least US\$300 million per year in the form of foregone foreign exchange revenue in terms of phywood exports (see Ahmad, 1994).

The rough estimates presented in this section indicate that the combined costs of compliance, the certification costs, and the foregone export earnings could be significant. These costs further qualify the financial benefits of implementing TC.

## V. Conclusions

In trying to answer the question "is there a commercial return to TC?", we found that even under some rather optimistic assumptions, the direct revenue impact of TC (that is the impact related to the "green premium") is small in aggregate terms. If one assumes that eco-labeling will become a condition for market access in Europe and the United States, then the appeal of TC increases. But even in this scenario the share of revenues from tropical timber exports affected by TC is unlikely to be large. The costs of adopting TC on a broad scale further qualify the potential revenue impact of TC. In this context, it is doubtful that TC would be financially self supporting. That is, one should not expect TC to provide significant financial benefits to developing countries in the near future.

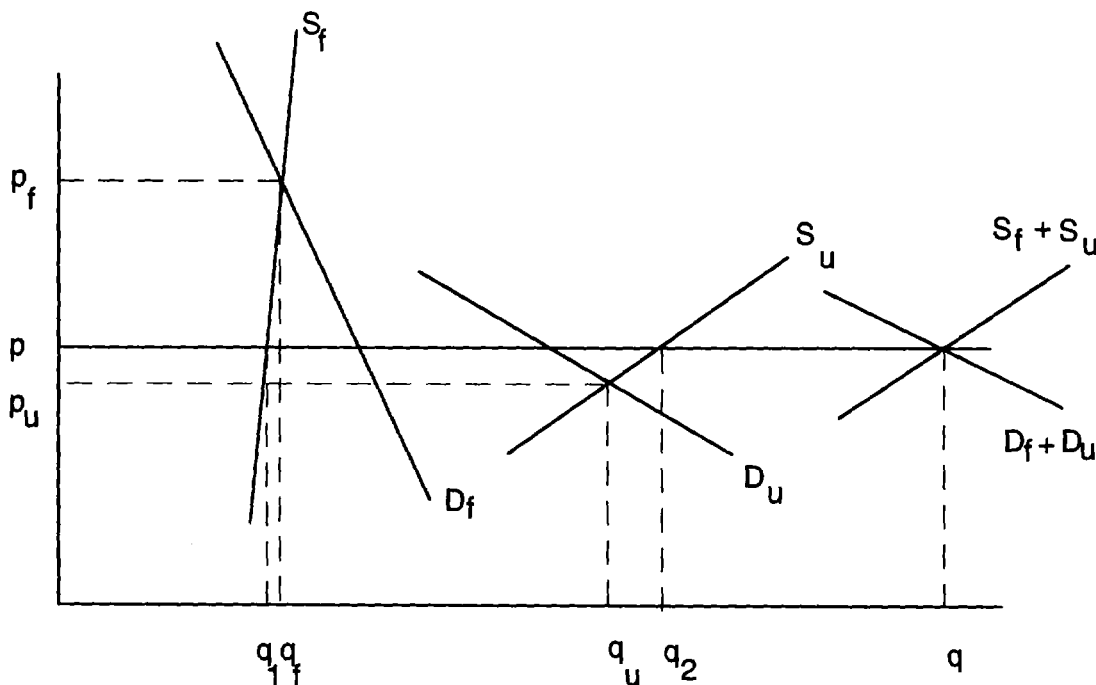
On a more positive note, TC may provide competitive advantages to firms participating in credible certification schemes. On a country level, producing countries may enjoy long-term economic, social, and environmental benefits due to better forest management practices. It remains true, however, that the implementation of such schemes on a broad basis continues to be a challenge not only from a technical perspective, but also in terms of the lack of accepted multilateral standards. Moreover, the costs of implementation of TC further qualify the dimensions of the economic benefits that can be appropriated by producer countries. Hopefully, TC will help in the development of appropriate criteria for forest management, that will be adopted not only by producers that export to sensitive markets, but **all** producers.

Enabling producers to capture greater revenues, however, will not ensure that improved forest management systems and decreased deforestation rates ensue. The policy environment in which most producers function is highly distorted. Market and policy failures in both the forest and related sectors are, in fact, the major causes of deforestation and forest degradation (World Bank, 1992). These failures must be addressed concurrently with the introduction of a certification system, to enable the market signals it creates to effectively and properly influence forestry in developing countries.



## ANNEX 1: THE MARKET FOR TROPICAL TIMBER AND ECO-LABELING

This annex summarizes the potential impact of eco-labeling in the market for tropical timber, following the analysis introduced by Mattoo and Singh (1994). Assume that we have two situations. One is the pre-label and the other the post-label situation. In the pre-label situation, there is a good that it is undifferentiated in the market and demanded both by consumers who are concerned about the environment and by consumers who are not. Now labeling is introduced and products are differentiated according to whether they are produced by environment friendly methods (F) or environment unfriendly methods (U). Let us also assume that consumers concerned about the environment buy exclusively environmentally friendly (F) goods when goods are differentiated, while the rest of the consumers buy the cheaper product, irrespectively of its method of production. Consider the case where after product differentiation, at the pre-labeling price ( $p$ ) the demand for the friendly good is greater than the supply (and the demand for the unfriendly good is less than the supply). See the graph below:



At the price prevailing at the pre-labeling case ( $p$ ), the total quantity produced is  $q$ , being allocated as  $q_1$  for the friendly and  $q_2$  for the unfriendly goods. In the post-label case, the friendly good sells at a premium  $p_f - p$  with quantity  $q_f$  clearing the market for the "friendly" good, while the unfriendly good sells at a discount  $p - p_u$  and again the quantity is  $q_u$ .

Under the above scenario the production of environmentally friendly good will increase ( $q_f - q_1$ ) and that of the environmentally unfriendly good will decrease ( $q_2 - q_u$ ). These descriptions seem appropriate for the tropical timber market based on available estimates of supply and demand. Note that in the opposite case where at price  $p$  the supply of environmentally friendly good exceeds the demand (and the demand of the environmentally unfriendly good exceeds the supply) the production of both goods will be unaffected, given the arbitrage between the two goods by the environmentally non-concerned consumers. In this latter scenario eco-labeling will not have an impact in encouraging (discouraging) the production of the environmentally friendly (unfriendly) good.

Change in the revenues due to TC. In calculating the additional revenues resulting from eco-labeling we assume very elastic demand and supply curves for the unfriendly good and rather inelastic schedules (curves) for the friendly good. A very elastic demand curve for non-certified (unfriendly) timber is possible given the existence of many substitutes. By doing so, the price discount  $p - p_u$  on the unfriendly good becomes small and for simplicity is ignored in our calculations. Furthermore, by assuming a highly inelastic supply curve for friendly goods (as appears to be the case of certified timber, at least in the short-to-medium term), the change in the revenues between the pre-labeling and post-labeling situations can be approximated by  $(p_f - p) \cdot q_f$ .

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