

# INTERNATIONAL TROPICAL TIMBER ORGANIZATION

ITTO

## PROJECT PROPOSAL

TITLE	INCREASING THE EFFICIENCY IN THE TROPICAL TIMBER CONVERSION AND UTILIZATION OF RESIDUES FROM SUSTAINABLE SOURCES
SERIAL NUMBER	PD 61/99 Rev.4 (I)
COMMITTEE	FOREST INDUSTRY
SUBMITTED BY	GOVERNMENT OF BRAZIL
ORIGINAL	ENGLISH

### SUMMARY

The project will study and assess the feasibility of timber production for traditional market outlets and power generation in two major wood industry-centered cities located in the western Amazon region. The objective of the project is to demonstrate that conventional timber industries in conjunction with the power generation industry can make sustainable forest industry a viable option. This project proposes to look at the potential of power generation to absorb non-commercial lesser-used species and logging waste. At present these raw materials constitute the larger and non-economical share of wood material produced by sustainably managed forest areas in the Amazon region. The project will also cover wood residues at the mill site.

The project deals specifically with the technical difficulties that traditional wood processing industries have in using the hundreds of tropical timber species available for harvest when implementing appropriate forest management plans. The project will primarily examine traditional technology (high pressure steam for energy generation), but will also consider co-generation (heat and steam) and techniques for the gasification of wood waste.

To achieve the right policies and attract investment the project will study the economics of sustainable forest management for the combined production of timber for traditional wood-using industries and for power generation. These studies will include resource availability and supply potential; market opportunities; prospects for sustainable production from environmental, social and economic view points; appropriateness of government policies; overall investment environment; and carbon sequestration benefits. The project aims to facilitate and encourage the future development of demonstration power generation plants running on timber and timber waste as a means of increasing utilization efficiency and the reduction of losses and waste.

EXECUTING AGENCY	FUNPAR (Foundation of the Federal University of Parana)	
DURATION	12 MONTHS	
APPROXIMATE STARTING DATE	JANUARY 2002	
PROPOSED BUDGET AND OTHER FUNDING SOURCES	Source	Contribution in (US\$)
	ITTO	299,980
	Executing Agency (FUNPAR)	60,000
	TOTAL	359,980

## TABLE OF CONTENTS

### PART I - CONTEXT

A. Relevance to ITTO .....	04
1. Compliance with ITTO objectives .....	04
2. Compliance with ITTO Criteria .....	04
3. Relationship to ITTO Action Plan and Priorities .....	05
B. Relevance to National Policies .....	06
1. Relationship to sectional policies affecting tropical.....	06
2. Relationship to subsectorial aims and programs .....	07
3. Institutional and legal framework .....	07

### PART II - THE PROJECT

1. Origin .....	09
2. <i>Project Objectives</i> .....	09
2.1. Development objective .....	09
2.2. Specific objective .....	09
3. Project Justification .....	10
3.1. Problem to be addressed .....	10
3.2. Characteristics of the region .....	10
3.3. Other relevant aspects of the "pre-project" situation .....	12
3.4. Intended situation after project completion .....	13
3.5. Target beneficiaries <i>and others affected</i> .....	14
<b>3.6. Project strategy</b> .....	<b>15</b>
3.6.1 - Reasons for selection .....	15
3.6.2 - Technical and scientific aspects .....	15
3.6.3 - Economic aspects .....	16
3.6.4 - Environmental aspects .....	20
3.6.5 - Social aspects .....	21
3.6.6 - Managerial aspects .....	21
<b>3.7. Reasons for ITTO support</b> .....	<b>22</b>
3.7.1 - ITTO aspects .....	22

3.7.2 - Relationship to other actions .....	22
3.8. Risks .....	23
4. Outputs .....	23
4.1. Specific Objective .....	23
5. Activities and inputs .....	24
6. Logical Framework Matrix .....	26
7. Work Plan .....	26
8. Institutional arrangement for project execution and operation .....	26
8.1. Management structure .....	26
8.2. Future operation and maintenance .....	26
8.3. Key staff .....	27
9. Prior obligations and pre-requisites .....	27
10. Possible future actions .....	27

### **PART III - MONITORING, REPORTING AND EVALUATION**

1. Arrangements for reporting .....	28
2. Arrangements for monitoring and review .....	28
3. Evaluation .....	28
4. Schedule of events .....	28

### **PART IV - BUDGET**

### **ANNEXES**

# **PART I - THE CONTEXT**

## **A. RELEVANCE TO ITTO**

### **1. Compliance with ITTO Objective**

This project meets the following objectives established under the International Tropical Timber Agreement, 1994:

- (c) To contribute to the process of sustainable development;
- (d) To enhance the capacity of members to implement the strategy for achieving exports of tropical timber and timber products from sustainable managed sources by the year 2000;
- (f) To promote and support research and development with a view to improving forest management and efficiency of wood utilization as well as increasing the capacity to conserve and enhance other forest values in timber producing tropical forests;
- (i) To promote increased and further processing of tropical timber from sustainable sources in producing member countries with a view to promoting their industrialization and thereby increasing their employment opportunities and export earnings.

### **2. Compliance with ITTO Criteria**

This project lies within the framework of the Committee of Forest Industry and it is mainly related the increase the efficiency of the tropical timber industry in order to support the adoption of sustainable forest management in tropical forests. It is also in line with the functions defined for the Committee of Forest Industry (ITTA 1994, Article 27), including the following:

- (a) Promote cooperation between member countries as partners in the development of processing activities in producing members countries, inter alia, in the following areas:
  - (v) Encouragement of investment and joint ventures,
- (b) Promote the exchange of information in order to facilitate structural changes involved in increased and further processing in the interest of all

member countries, in particular in developing member countries.

(c) Encourage the increase technical cooperation for the processing of tropical timber for the benefit of producing member countries:

### **3. Relationship to ITTO Action Plan and Priorities**

This project is consistent with the ITTO Action Plan and is related to the major objectives of the Committee of Forest Industry. This project proposal is directly related to the following goals and activities specified in the ITTO Libreville Action Plan:

Goal: Improve the tropical timber resource basis

Activity: Expand the productive capacity of natural forests through intensifies silvicultural practices such as better use of lesser-used species

Goal: Promote increased and further processing of tropical timber from sustainable sources

Activities: Increase awareness of investment opportunities to encourage public and private investment.

Commission and publish analytical studies that identify critical knowledge and information gaps.

Goal: Improve efficiency of processing tropical timber from sustainable sources.

Activities: Facilitate and encourage development of demonstrations, which address increased efficiency in the widest sense.

Create and publicize demonstration projects on, for example: fully integrated industries based upon sustainable forest management; efficient and socially sound community based forest industries; efficient low impact logging which is consistent with sustainable forest management whilst ensuring continuity of log supplies.

The project is also consistent with several Council decisions and priorities, in particular it is consistent with ITTO Decision 2(X) which calls for the implementation of projects related to the achievement of sustainability and

Objective 2000.

The project will also contribute to demonstrate that implementation of forest management for sustainable timber production is economically and financially feasible, even in certain remote forest areas in the Amazon region studied under other ITTO field projects.

## **B. RELEVANCE TO NATIONAL POLICIES**

### **1. Relationship to sectional policies affecting tropical timber**

There are several sectional policies at national level related to this Project Proposal.

First of all the Project is consistent with the Law 7735 of February 22, 1989 and decree No. 97628 of April 10 Th, 1989. These instruments have institutionalized the integrated plan for forests and industry, which establishes linkages between forest industries and their raw material sources. In the case of a natural forest the source should be covered by a forest management plan.

In this respect much has been discussed on the use of less known species, particularly in respect to the implication of LKS in the efficiency in tropical timber conversion.

Less known species are in fact a major problem when implementing forest management plans. The basics is that forest resources are not compatible with market, and thus selective logging is in fact the only alternative for the industry, as no operation would be feasible if no market is available. As a result a substantial part of the timber volume stays in the forest, increasing operation costs and thus reducing the competitiveness of tropical timber industry. This is particularly important in the Amazon region, where large species diversity is frequent.

Another import issue is a wood residue left at the mill as a result of the industrial conversion. This residue has limited or no value, as tropical timber industry are generally small or medium sized operation, not integrated and located in region where market for this material is non existent. As a result, instead a source of revenue, as in most cases for the temperate or boreal timber industry, wood residues became a source of costs for the tropical timber industry, as there is a need for proper disposal of this non-usable material, the wood residues.

Increasing the efficiency in the tropical timber conversion is in line with general national policies and priorities of better use of natural resources. This is particularly important for the tropical timber resources of the Amazon region, due to its high heterogeneity.

Finding an alternative for the use of residues is in line with several sectorial policies, including that related to better use of natural resources, increase the competitiveness of tropical timber products, and reduce the environmental impact by inadequate disposal of wood residues.

Another environment benefit will be related to the concept of the Kyoto Protocol on climate change, a global policy that has been supported by the Government of Brazil. The use of biomass for energy generation is on line with the internationally agreed actions in order to reduce carbon level in the world atmosphere.

## **2. Relationship to subsectorial aims and programs**

This Project is related to several subsectorial aims and programs. Among programs, involving timber, it is the national priority to increase exports to overcome the trade deficit faced by the country in the last years. In this respect timber products have been included by CAMEX- Export Trade Chamber (a Federal Government organization), as a priority subsection within the program to enhance exports, aiming to achieve US\$100 billion by the year 2002.

Timber products have in fact a relatively marginal contribution to Brazilian exports, and the inclusion on the CAMEX program is particularly due to the fact this subsection has a significant potential still to be explored. On the other hand it is clear that response of timber subsection in exports will depend, among other factors, on how competitive the Brazilian products can be in the international market, and therefore increase in the efficiency in the tropical timber conversion is of outstanding importance.

Energy available, at competitive cost, is another factor. Timber industry in the Amazon has long suffered from lack of energy, and most energy is based on diesel generation. As a result of recent national economic adjustments, prices of diesel fuel have been increased. Another factor contributing to the price increase of diesel is the recent changes in the oil prices. There is no doubt that increase in the energy cost will have a detrimental effect on the competitiveness of the tropical timber industry in Brazil, and use of residues for energy generation becomes a crucial matter.

## **3. Institutional and legal framework**

FUNPAR- Fundação da Universidade Federal do Paraná - is an organization created by the Federal University of Paraná to facilitate the implementation of research and development programs. This University was the first one to be established in Brazil (1922).

The Federal University of Paraná has a long involvement with forest and environment sciences. It started in 1960 with the creation of the first Forestry School in Brazil, taking advantage of support given by a FAO Program. At present Forestry School offers courses at B.Sc., M.Sc. and Ph. D. levels,

covering environment sciences, forest management, economics and wood science and technology.

The courses are offered to Brazilians and other nationalities. Many foresters presently working in tropical countries of Latin America and Africa have studied at the Forestry School of the Federal University of Paraná.

Involvement with the tropical forest and tropical timber industry has started with the establishment of the Forestry School, in the early 60's. During the last years FUNPAR has implemented several projects in the Amazon region, including relevant ITTO projects.

FUNPAR structure and facilities, as well as expertise in the field of forest industry and in the implementation of projects in tropical regions will be made fully available for the implementation of this project.

As in the implementation of other ITTO Project FUNPAR is proposing that this Project will also involve other organizations at government level. ABC (Brazilian Cooperation Agency), MMA (Ministry of Environment and Natural Resources) and IBAMA (Brazilian Institute for Environment) will be directly involved in the project as coordinating agencies.

Aiming to strengthen the technical and scientific component of this project FUNPAR will seek the cooperation of other organization including the Forest Products Laboratory (LFP) of IBAMA. This organization has dealt with energy projects in the Amazon region and their involvement will be important.

There are also private companies in Brazil with relevant experience in energy generation based on biomass. It is intended to involve especially those companies acting as the so-called IPP (Independent Power Producers) projects.

The IPP projects are becoming an important component in the energy matrix of Brazil. The idea is that private sector invests in power generation, thus reducing the need of public investments. This has been considered mostly in remote areas, where large power generation operations would not be feasible, as in many places in the Amazon region.

## **PART II- THE PROJECT**

### **1. Origin**

This project proposal derives from the increasingly consensual view that prospects for sustainable management of tropical forests for tropical timber



production are substantially enhanced by improving efficiency of utilization.

There is no doubt that the economics of forest management can be improved by finding uses and markets to lesser-used mature trees recommended for removal in forest management plans, and by finding uses and markets for both logging and timber processing waste. It is worth to be noticed that the use of residues (the economic value of wood residues) is in fact the most critical issue in the profitability of the non-tropical timber industry at the present days.

There is thus a need to consider sustainable forest management and timber production in conjunction with feasibility studies and assessments of market outlets for non-conventional products. These non-conventional products could be manufactured with the share of raw materials regularly made available when managing forests for timber production, but not readily absorbed by the conventional industries (mainly saw and plywood mills) and markets, including LKS and waste.

Besides materials made available when managing forests for timber production, there is also in the tropical timber industry, as a result of the processing activity, a significant portion of wood residues left unused at the mill site. These wood residues at the mill site could also be considered for the non-conventional products.

## **2. Project Objectives**

### **2.1 Development Objective**

The development objective of the project is to contribute to sustainable forest-based development in the Amazon region.

### **2.2 Specific Objectives**

To demonstrate that conventional timber industries in conjunction with a non-conventional wood consumer (the power generation industry) can facilitated the implementation of forest management plans and increase the competitiveness of the industrial operations, making the sustainable forest industry a viable option in selected Amazon region cities.

### **3. Project Justification**

#### **3.1 Problem to be addressed**

Growing conversion of tropical forest areas to other land use options clearly demonstrate, among other things, that in many part of the tropical region maintenance of land under forest cover is not financially attractive and competitive.

In the Amazon region three major problems constrain sustainable forest management and timber production. They are:

- (i) Far-away markets which only absorbs a few selected species (less than 20% of potential sustainable yield) coupled with complete absence of any significant local markets.
- (ii) Non-existence of markets for mixed species and logging waste which are necessarily produced if the heterogeneous Amazon forest is managed on a sustainable basis and maintaining its biodiversity.
- (iii) Non-existence in the site utilization and/ or local market for the mill residues.

This project proposes to look at the potential of power generation as the viable option to create the needed local markets to absorb non-commercial lesser-used species and logging waste. These raw materials constitute the larger and non-economical share of wood material produced by sustainable managing forest areas in the Amazon region. The project will also cover wood residues at the mill site.

#### **3.2 Characteristics of the Region**

The project will study and assess the feasibility of timber production for traditional market outlets and power generation in areas centered in two major cities located in the west Amazon region:

- (i) Rio Branco, capital of the State of Acre, and
- (ii) Itacoatiara, the second largest city in the State of Amazonas.

A map with the location of these two cities is presented in Figure 1.

Among the reasons for selection of these two cities is the fact that most of the

wood industry of Acre and Amazonas are concentrated in the cities of Rio Branco and Itacoatiara respectively.

The industries of Itacoatiara have an annual demand for about 300,000 m<sup>3</sup> of logs of traditional species (15 to 20), but no demand or market outlet exists for the one million/m<sup>3</sup> of non-traditional species which would be available by fully implementing the forest management plans prepared to meet the industry's needs.

As a result of this situation, forest management plans for sustainable timber production are not fully implemented, and the industries purchase a substantial part of their raw material needs from riverside suppliers, most often operating illegally, or at least in a manner not consistent with the sustainability requirements.

The industries in the city of Rio Branco have an annual demand for about 180,000 m<sup>3</sup> of logs, basically from traditional species. This demand is met mostly by utilizing part of the timber made available by activities related to conversion of forests to other land uses, including agriculture and cattle raising.

## Figure 1 - Location of the study areas

However, these activities are being strongly controlled and limited by the federal and state government, and under current legal requirements the timber industries must shift to sustainable produced timber.

In this context, the ITTO has funded projects that prepared forest management plans for sustainable timber production in two large forests in Acre: the Antimari State Forest (50,000 ha) and the Macaua National Forest (100,000 ha). While the state depends on forest-based development to counter and avoid further arguments for land conversion to agriculture and cattle raising, there are no markets for the bulk of the timber species to be produced in areas under sustainable management, as the wood industry only uses about 10 to 13 of the approximately 500 species most commonly available in the state.

On the other hand both the cities, Rio Branco and Itacoatiara, have limitations on electricity supply. Their entire demand for electricity is met by diesel generators. The demand in Rio Branco is around 50 megawatts, while in Itacoatiara is in the order of 20 megawatts. This demand has been restrained by limitations on the supply side.

Besides limitation on supply, costs of diesel generation has increased, both as a result of removal of subsidies, required in the national economic adjustment plan, as well as a result of the international prices of oil that have been increased recently and is expected, accordingly to the World Bank projections, to continue to increase in the next years.

This situation provides a unique opportunity to rest development based on the huge potential power generation markets. Replacing diesel with non-marketable timber species and logging and wood processing waste could be keyed to sustainable forest management and forest-based development in Rio Branco and Itacoatiara.

Experience gained could be replicated as, in almost all cities in the states of Acre and Amazonas, the situation is practically the same, and over 90% of their cities and towns whole depending on diesel-generated electricity.

### **3.3 Other relevant aspects of the “pre-project” situation**

On the contrary to other parts of the Amazon, forest-based development in the Brazilian western Amazon region has yet to take place. Most timber industries operating in the region are small, operate on unsustainable basis, and are reportedly not capable of meeting sustainable forest management costs, if only a few species can find markets.

The power-generating industry, on the contrary, has captive markets and could basically use all biomass that could be made available on a sustainable basis. Recent deregulation of the electricity sector allows independent power producers (so called IPP) to produce and sell electricity, through the established utility companies or directly to the consumers.

However, at present stage, there are no information or reliable data to provide the basis for formulating and implementing the right policies and measures, to take advantage of market opportunities and potential for forest-based development offered by the combined timber outlets, represented by the traditional wood industries and the power-generating industry.

Important questions need to be answered to get the right policies and attract investment, among them:

- (i) What are the economics of sustainable forest management for the combined production of timber for traditional wood-using industries and for power generation?
- (ii) What are the prospects for sustainable management and sustainable production of timber for both traditional uses and power generation in the two cases study areas (Rio Branco and Itacoatiara), with particularly reference to questions related to:
  - Resources availability and supply potential;
  - Market opportunities;
  - Prospects for sustainable production, from environmental, social and economic view points;
  - Appropriateness of government policies;
  - Overall investment environment; and
  - Carbon sequestration benefits.

### **3.4 Intended situation after project completion**

The following situation is expected to result from project implementation:

- (i) Complete information and data on the feasibility of forest management for sustainable production of timber to supply both, traditional wood industries and power generating plants, made available for two selected case study areas;

- (ii) Facilitated and encouraged future development of demonstration power generating plants running on timber and timber waste, mainly by independent power producers, as a means of increasing utilization efficiency and the reduction of losses and waste;
- (iii) Critical knowledge and information made available on the potential to link sustainable forest management, timber industries and power generating industries in the western Amazon region;
- (iv) Increased and facilitated prospects for development of demonstration units linking forest management, wood processing industries and wood and waste-based power generating plants, and finally
- (v) Prospects for investment in forest-based development in the western Amazon region increased.

### **3.5 Target beneficiaries and others affected**

The following target beneficiaries of this project have been identified:

- (i) Governments, timber consumers and electricity users will benefit from increased prospects for sustainable forest-based development based on sustainable produced wood raw materials to supply both traditional timber industries and to the power generating industry;
- (ii) Local communities, which stand to benefit from improved job prospects if the project results succeed (as expected) to demonstrate feasibility of the forest-based development and attract investment;
- (iii) Timber industry and local economies that will have available an alternative source of energy, and in principle at lower costs, and finally;
- (iv) All those concerned with forest conservation, and with the need to reduce carbon dioxide emissions, will benefit from the demonstration that sustainable timber production is a viable option in western Amazon, when combining use for traditional timber products and for power generation, the latter resulting in a net carbon sequestration equivalent to the replaced diesel presently consumed to generate electricity.

### **3.6 Project strategy**

#### **3.6.1 - Reasons for selection**

Brazil has established the necessary legal framework for the implementation of

sustainable management in tropical forests. These include laws and regulations at national and at state level. The country is also committed with international efforts related to sustainable development, and in line with this as signed several agreement and conventions, such as the International Tropical Timber Agreement, Climate Convention and Biodiversity Convention.

Actual implementation of sustainable management requires among other things political will all levels, public awareness and commitment of agents directly involved in the activity, living in the region and from the activity.

Other components are favorable local conditions, and particularly for the forest products industry adequate investment climate and mostly important remunerative market for their products. At the end it is the market the final source of finance to support sustainable management of forests.

This project was designed to cover the last aspects listed. Increasing the efficiency in the tropical timber conversion and utilization of residues will, among other things, facilitate the forest management implementation and enhance the capacity of the timber industry to invest in forest management. The overall result will be an important contribution to sustainability of tropical forests.

### **3.6.2- Technical and scientific aspects**

The project deals specifically with the technical difficulties that traditional wood processing industries have to use the hundreds of tropical timber species available for harvest when implementing appropriate forest management plans.

The project will study an important industry and market outlet: the power generating industry. This industry, in principle, does not discriminate species and which may provide the key to improve the economics of sustainable forest management in many areas in the west Amazon region.

The project will look into the traditional technology of producing high pressure steam for energy generation, but will also consider co-generation (heat and steam) and a modern technology such as gasifying the wood first, which is said to offer a more efficient, cleaner way of generating electricity from wood. The latter technology has reached demonstration stages and in Burlington, VT, U.S.A., a US\$ 17 million demonstration plant has started turning wood residues into gas, which is burned to fuel an electricity generator. Also in south Brazil, a GEF-funded US\$20 million project has proposed to put in place a similar plant to produce electricity from plantation wood.

As early mentioned Brazil is accumulating experience in energy generation based on biomass. The process started long time ago, in the 70's, when the country decided to invest in alternative sources of energy to overcome the problem faced

by the sharp increase in the oil prices.

During the 70's Brazil develop among other things the alcohol program based on sugar cane and on wood, develop more efficient use of wood for energy generation at the industry, and increase the use of charcoal at the steel industry. As a result the energy matrix of the country changed.

Along the last two decades the international scenario changed. Oil prices have declined since early 80's, and in many cases the economic reason for changing to alternative sources of energy, especially biomass lost support.

The economic cycle of low oil prices it seems now to be over. Last year the World Bank and other international organizations dealing with commodities have already foreseen a possible increase in oil prices. This has taken place along 1999, and during the last months oil prices have increased by almost 100%.

The increase in oil prices in the international market, and the recent devaluation of the national currency (by 60%), has had a significant impact in electricity generation cost in the most remote areas of Brazil, as it is the case of some regions of the Amazon, where most of the electricity is generated based on diesel fuel. The same applies to many others tropical countries.

### **3.6.3 - Economic aspects**

This project will look into the feasibility of sustainable forest management of tropical natural forests for timber production and power generation, with emphasis on economic and social aspects. It has a potential to improve significantly the economics of sustainable forest management by exploring a large non-traditional market (power generation). By doing so it will be possible to absorb the huge volume of lesser-used species and logging and processing waste which currently have no market.

The economics of replacing diesel with sustainable forest managed timber and waste will also be studied, to demonstrate that under western Amazon conditions, the substitution of wood and waste biomass for diesel, in electric power generating systems, is a viable option, which can provide for local employment, income and improve the competitiveness of the local industry.

Recent studies carried out in the Amazon region, pointed out that over the last month the costs of electricity generation in small and medium size plants, based on diesel, increased substantially. As an indication costs of electricity generation based on diesel changed from US\$0.04/Kwh to US\$0.075/Kwh, an increase of almost 100%.

This has affected strongly the timber industry, particularly in regions were



electricity is not available, and mills need to establish their own electricity supply, based on small diesel generators.

This is particularly the case of the two areas to be covered by this study where not only the mills have been affected. Local populations are directly affected by the closing down of the mills. They are also indirectly affected as the availability of electricity is reducing with the mills ceasing operations or making less available in an effort to reduce costs.

The region of Rio Branco in Acre State and of Itacoatiara in Amazonas States have chronic problems with electricity generation.

Recently a new diesel power plant, with 20 MW capacity, has been installed in Rio Branco. This new plant will cover partially the need for the capital Rio Branco, but the problem will continue as only part of the demand has been satisfied.

The development of the timber industry in Itacoatiara has been limited by energy generation. Local electricity company only provides electricity for small operation, and many shut downs have been faced by the local populations.

Both regions proposed for this study, Rio Branco and Itacoatiara, is the centre of timber industry in their respective states. Rio Branco and surrounding municipalities concentrates around 70% of the timber industry in Acre. The state has still a limited timber production (around 200 thousand m<sup>3</sup> per year), but has large forest reserves and the State Government is interested to promote the sustainable use of tropical forests.

Itacoatiara concentrate most of the large industries in the Amazon State. In the region is located the largest plywood mills of the state (Gethal and Carolina) and also relatively large sawmills (Mill/ Precious wood and Braspor). Also local government is supporting the timber industry development. Local log consumption is estimated to be around 400 thousand m<sup>3</sup>, and it expected to grow in the next years. In the region are located in a strategic position in relation to timber resources and access to market. Several investments have been recently made to up grade the local port.

In any case, the project will not simply study a new alternative to respond the specific requirements of local needs of the cities of Rio Branco and Itacoatiara. It goes further by identifying a technology appropriated to other smaller communities in the region and in other tropical regions.

The project will focus on investigations to assess a technology and thus developed an appropriated model for energy generation in regions where tropical forests industries operate. The model to be developed brings together at least components: lower costs for production of electricity, new forms of financing the facilities (IPP), and also a new element to be considered for the management of

tropical forests.

A preliminary analysis done at mill level indicates that electricity generation based on wood residues can reduce significantly the costs. For medium size electricity generation facilities based on biomass a cost of less than US\$0.04/Kwh is obtained.

The information available is preliminary, and a more in depth analysis on the technical, operational, economic, financial and environment feasibility of the electricity generation has to be carried out. The analysis has to take into consideration productions cost, no doubt an important component for the development of the timber industry in the Amazon and other tropical regions, but there are other factors to be also taken into account.

Besides local implications, the global perspective for a better environment has to taken into consideration. In line with this aspect, among the technical and scientific premises considered when proposing this project are the following:

- i) Tropical timber industry has to be feasible in order to be able to fully contribute to the national and global concerns related to the introduction of better forest management practices;
- ii) Wood residues disposal in remote areas are a cost and environment problem to be solved. Burning for energy generation, using the state of the art system, not only makes available electricity at lower costs, but also reduces smoke emissions, avoids rivers and soil pollution, a serious problems in tropical regions, and thus improves general environmental conditions;
- iii) Replacing diesel by wood residues is in line with the international efforts for carbon sequestration, a global concern reflected in the Climate Convention. The project will also look into the potential net reduction in CO<sub>2</sub> emissions resulting from diesel replacement and the resulting quantity of carbon stored. In this line the Global Environment Facility, GEF, estimated that the value would be approximately US\$10 per ton of carbon;
- iv) Creating value for unused wood resources will increase the whole value of the forests, facilitate the implementation of forest management plans and generate additional revenues needed to improve forest practices to ensure sustainability.

The experience has pointed out that the feasibility of the electricity generation is many times limited by the investment capacity. This is the case of small and medium size companies, and a broader view also the case of less developed

countries, where capital availability and capital costs are strong limitations.

The IPP are a form to overcome the capital limitation. IPP are normally companies formed by equipment producers, having in some case financial support from a bank. The IPP operates on basis of a pre arranged contract, that in general terms considers:

- i) The IPP develops the project linking the power plant to a to a electricity consumer and a supplier of fuel;
- ii) A contract is established among Th parties. The contract establishes prices for the fuel and for the electricity, demands agreed, and other aspects;
- iii) Based on the costs and prices agreed, and on an economic and financial analysis is established a period for the return of the investments;
- iv) The IPP operates the energy plant for an agreed in order to insure the return over the investment. After such a period a new contract can be established or the consumer takes the responsibility of the operation of the power plant.

Among the national companies operating as IPP and with experience in the use of biomass is KOBILIZ LTDA. This company is a producer of steam turbines and works in cooperation with other national equipment producers in order to offer a full package for energy generation based on biomass. The partner companies operating together with KOBILIZ are producers of boilers, wood residue preparation and handling equipment and electricity generator equipments

The experience of KOBILIZ, and others IPPs, will be important in the development of this project, as the company has a large experience in forest industry operations, and have also develop projects in the Amazon region. A preliminary contact has already been made with the company, and the company is willing to contribute with their expertise in the implementation of this project.

As expected, during for the feasibility analysis, in order to analyze technical alternatives, other companies involved in IPP operation, as well as other equipment producers, will also be contacted during the project implementation.

#### **3.6.4 - Environmental aspects**

Because of the nature of the project (survey studies, assessments and feasibility studies) it will have no direct immediate field environmental impact.

However, the project is designed to produce information and data, as well as recommendations on policies and measures, which can contribute to sustainable forest management, to greater and more efficient utilization of tropical timber.

The project will also contribute to increase the competitiveness of the tropical timber industry. Preliminary data points out that the use of the residues can be reduces substantially the costs of electricity generation, and thus contribute to the additional revenues needed to the sustainable forest industry.

Furthermore the project will contribute to another problem of the timber industry: adequate waste disposal. At moment waste disposal is in most cases a cost and environmental problem. Non-proper forms of wood residues affects water shades or, in case of burning, the air quality.

Benefits from the appropriated use of waste wood are only part of the equation that the project intends to solve. The project also considers a search for a new approach towards tropical forest management. In this line the project has taken, as a premise that, the use of sustainable produced wood for energy generation might be an important element in the equation to make feasibility the sustainable management of tropical forests.

On a global perspective the project will also contribute in the effort to identify options for the reduction of carbon dioxide emissions, thus in line with the global concerns reflected in the Climate Convention. All these aspects will directly benefit the environment.

### **3.6.5 - Social aspects**

The project does not involve direct participation of local communities, other than the fact that local communities in the project two case study areas will be the subjects of a survey when carrying out the feasibility studies.

However, the project has a great potential to induce and promote investment and forest-based development, which in turn would benefit local communities through creation of jobs and increased income.

Job creation will be the main direct impact, but as already mentioned local communities will also benefit from other aspects. Smoke produced by burning wood residues on open spaces, without control, has been a health hazard in many regions. By burning under controlled conditions, using advanced technology with proper burning control (primary and secondary air intakes), and a

need in case of energy generation, improves the environment conditions, and thus will benefit local populations.

In many tropical regions, as a result of costs and/ or availability, local populations have limited access to electricity. The project will deal with the possibility of producing energy surplus, and thus making available electricity more competitive costs for local populations. This is an important aspect to be considered in a energy producing project linked to the timber industry, as industrial operations, and thus demand, are intermittent, and the existence of alternative sources of consumption, in the case represented by local populations, have an important role to play in the feasibility of the system.

### **3.6.6 - Managerial aspects**

FUNPAR basic organization and standard procedures, used in the implementation of other ITTO projects, will be maintained for the implementation of this project. All administrative work will be carried out by existing staff, but those directly involved in the project have to be hired using the project funds.

The project will be managed by a Project Coordinator, in coordination with FUNPAR General Director. The Project Coordinator will be responsible for the technical and operational implementation of the project, while FUNPAR General Director and its staff will be responsible for the administration, covering legal and financial aspects.

The Project will be implemented in cooperation with ABC, IBAMA and MMA. As in previous projects implemented by FUNPAR a proper arrangement will be put in place in order to ensure the effective participation of all organizations. Regular meetings will be held to monitor the project development.

The Project Coordinator will be responsible for ensuring the cooperation with other organizations, such as the Forest Products Laboratory, which has already developed studies in the area of interest to this project. Also it will be the responsibility of Project Coordinator to ensure that existing knowledge at the private sector, particularly those company already involved in IPP projects, is fully considered in the implementation of the studies.

## **3.7 Reasons for ITTO support**

### **3.7.1 - ITTO aspects**

This project is being proposed to ITTO because the two main issues it addresses. They are:

- (i) Feasibility of sustainable forest management; and
- (ii) Promotion of forest-based industrial development.

These issues are in fact core priorities of the work of the Organization. These areas of work, as already presented, are among the objectives of the Organization, and also related to the ITTO's Objective 2000 as well as are related to a number of goals and activities set up in the ITTO Libreville Action Plan.

### **3.7.2 - Relationship to other actions**

Some aspects of the project (e.g. assessing wood waste, conversion technologies, improving the efficiency of wood utilization) are addressed in a project financed by the Common Fund for Commodities through ITTO (Project PD 39/93 Rev.4 (I)).

The project PD 39/93 Rev.4 (I) is surveying wood residues and other biomass potentially available for energy production in Malaysia (Asia) and Cameroon (Africa) besides considering and assessing various biomass conversion technologies.

It is felt that a similar study in the third producing region (Latin America) would be an important contribution to the efforts to increase the economics of sustainable forest management through increased wood utilization efficiency.

### **3.8 Risks**

No potential risks to the success of the proposed project have been identified at this point.

## **4. Outputs**

### **4.1 Specific Objective**

To demonstrate that conventional timber industries in conjunction with non-conventional wood consumer (the power generation industry) can make sustainable forest industry a viable option in selected Amazon region cities.

## Output 1

Data and information related to the two case studies, covering:

- Forest resources and timber processing industries;
- Wood production and consumption;
- Potential wood production under SMF, including the potential outputs of the two national/ state forests (Antimari and Macaia) which had SFM plans prepared under ITTO projects;
- Wood resources and waste potentially available for further development of timber processing industries and for electric power generation.

## Output 2

The feasibility of SFM for the combined production of wood for manufacturing traditional products and for power generation assessed in the two case study areas.

## Output 3

Increased government and private sector awareness of the potential of SFM/ traditional timber industry/ power generating to bring forth forest-based development in western Amazon.

## Output 4

Increased prospects for more efficient forest utilization through the promoted use of lesser used non-marketable species and wood waste.

## Output 5

Recommendations on appropriate policies and measures to promote industrial development linked to SFM plans in the western Amazon, with a focus on the electricity production opportunities and the complementary of the traditional timber industries and power generating industry in most of the region.

## 5. Activities and inputs

Activities	
<b>Output 1</b>	<b>Inputs</b>
<p>Activity 1.1</p> <p>Assessment of forest resources within a 100 km-radius of Rio Branco and Itacoatiara, including analysis of SFM plans and prospects.</p>	<ul style="list-style-type: none"> <li>•Project coordinator (2 m/m)</li> <li>•Consultancy work (forest resources specialist 2 m/m)</li> </ul>
<p>Activity 1.2</p> <p>Survey of forest industries and logging and timber processing waste in Rio Branco, Itacoatiara and adjacent areas.</p>	<ul style="list-style-type: none"> <li>•Consultancy services by subcontract (forest industry expert, 2 m/m)</li> <li>•Project coordinator (2 m/m)</li> </ul>
<p>Activity 1.3</p> <p>Analysis of wood resources and waste with a view to supply timber processing industries and biomass for power generation, in a complementary basis.</p>	<ul style="list-style-type: none"> <li>•Project coordinator (1 m/m)</li> <li>•Forest Industry expert (1 m/m)</li> </ul>
<b>Output 2</b>	
<p>Activity 2.1</p> <p>Carry out a comprehensive feasibility study of using logging and wood processing waste and wood raw materials produced in sustainable forest management units to supply integrated industrial operations comprising traditional timber producing enterprises and the electric power generation industry.</p>	<ul style="list-style-type: none"> <li>•Project coordinator (3 m/m)</li> <li>•Sub-contractor to consultancy services including :               <ul style="list-style-type: none"> <li>-Forest industry specialist (1 m/m)</li> <li>-Sociologist (2 m/m)</li> <li>-Forest resources specialist (2 m/m)</li> <li>-Economist (2 m/m)</li> <li>-Environmental expert (2 m/m)</li> <li>-Biomass power generation expert (2 m/m)</li> </ul> </li> </ul>
<b>Output 3 and Output 4</b>	
<p>Activity 3.1 and Activity 4.1</p> <p>Organizing and covering two workshops (Rio Branco and Itacoatiara) to allow discussion of the project studies results and to increase awareness of government and private sector of the potential for forest based development through the options considered.</p>	<ul style="list-style-type: none"> <li>•Project coordinator (2 m/m).</li> <li>•Travelling costs, costs of workshops documentation and organization.</li> </ul>



Activity 3.2 and Activity 4.2 Printing and distribution of workshop proceedings.	<ul style="list-style-type: none"> <li>•Costs of preparing, editing, printing and mailing workshop proceedings.</li> </ul>
<b>Output 5</b>	
Activity 5.1 Taking into account the overall project findings and the results of the two workshops, prepare, publish and disseminate a document with recommendations on appropriate policies and measures to promote forest-based industrial development linked to SFM plans in the western Amazon, with a focus on the opportunities to optimize the economics of production by targeting both conventional industries and the power generation industry.	<ul style="list-style-type: none"> <li>•Project coordinator (2 m/m)</li> <li>•Consultancy (forest-based development specialist, 1 m/m)</li> <li>•Publication costs.</li> </ul>

## 6. Logical Framework Matrix

The project logical framework matrix worksheets, presenting the indicators, means of verification and assumptions required to achieved the expected project outputs is presented in Annex 1.

## 7. Work Plan

The Work Plan who will guide the project management and implementation is presented in Annex 2. The plan included the schedule of activities and responsible for their implementation.

## 8. Institutional arrangement for project execution and operation

### 8.1 Management structure

The implementation of this project will be under the responsibility of FUNPAR. The responsible for the operational aspects will be the project coordinator, supported by the staff of FUNPAR covering the administrative aspects. As a first activity it will be prepared a Working Plan, containing all managerial and technical aspects to be considered in the implementation of this project.

Most of the technical activities will be done by sub contracts. A careful selection of the sub contractors will be carried out at the early stages of the project implementation. Sub contractor selection will follow ITTO rules, and will be

selected among those having relevant experience in the area. Monitoring of the sub contractors work will be done by the project coordinator.

A project steering committee will be established with participation of ITTO, FUNPAR, ABC and IBAMA.

## **8.2 Future operation and maintenance**

In principle, as a result of the nature of this project, no future specific operation and maintenance will be required. It is expected that by implementing this project the information made available will corroborate in the development of policies and finally facilitate decision making by the private sector, particularly the independent power producers (IPP), to invest in the region.

For this reason the involvement of government organizations, and particularly to the IPP is of outstanding importance for the future of the operations related to this project.

## **8.3. Key staff**

The key staff for this project is the project coordinator. Terms of reference of the project coordinator are presented in Annex III. A Curriculum Vitae of the Project Coordinator proposed is presented in Annex IV.

## **9. Prior obligations and pre-requisites**

As a result of the nature of this project no prior obligations or pre-requisites, that would have a significant implication on its implementation, have been identified.

## **10. Possible future actions**

Possible future actions will depend on the findings of this project. At this stage two main possible future actions are foreseen. On the government side it will be probably be necessary the development or the improvement of policies and other instrument to facilitate investments in the power generation. In having favorable condition the benefits will depend basically on investments to be made by the private sector, and thus the role of IPP is of outstanding importance as already stated.

## **PART III- MONITORING, REPORTING AND EVALUATION**

### **1. Arrangements for reporting**

The project coordinator will prepare progress reports to be submitted to ITTO as required. In addition technical reports, workshops reports and other reports, prepared by the several consultants involved will be made available to ITTO, to the other organizations involved (ABC, IBAMA and MMA) in order to facilitate the national monitoring process. The reports will also be made available to interested parties under request.

At the completion of the project a report summarizing the entire project finding will be made available. It will also be prepared a completion report, as requested by ITTO. The completion report will be made available within 2 months of the project termination.

### **2. Arrangements for monitoring and review**

The project will be subject to monitoring by ITTO in accordance to procedures established in the ITTO manual of Project Monitoring, Review and Evaluation. At national level the project will be monitored by the Brazilian Cooperation Agency (ABC) on behalf of the Brazilian Government.

### **3. Evaluation**

This project is subject to evaluation in accordance to Guidelines established by ITTO Manual of Project Monitoring, Review and Evaluation. Furthermore ABC will also evaluate the project according to the Brazilian technical cooperation guidelines.

### **4. Schedule of events**

The schedule of events for monitoring, evaluation and review activities will be established by consultations between ITTO, FUNPAR, IBAMA and ABC.

## PART IV- PROJECT BUDGET

Table 1 presents the consolidated budget of the project. The budget by activity is presented in table 2.

TABLE 1 - CONSOLIDATED BUDGET

COMPONENTS	ITTO CONTRIBUT US\$	FUNPAR CONTRIBUT
10. PROJECT PERSONNEL		
11. Project coordinator (12 m/m)	84,000	
12. Forest-based development specialist (1 m/m)	7,000	
13. Administrative Officer		24,000
SUBTOTAL	91,000	24,000
20. SUB-CONTRACTS		
21. Survey and assessment of forest/wood resources and of timber industries (5 m/m)	35,000	
22. Feasibility studies (11 m/m)	77,000	
23. Printing and publication services	10,000	
SUBTOTAL	122,000	
30. TRAVELLING COSTS		
31. DSA (including for ABC monitoring)	25,000	
32. Transport cost (including for ABC monitoring)	25,000	
SUBTOTAL	50,000	
40. CAPITAL ITEMS		
41. Portable computer, portable printer, other peripherals and computer software		10,000
SUBTOTAL		10,000
50. CONSUMABLE ITEMS		
51. Office supplies (paper, films, diskettes, computer material, material for the workshops and other office materials)		5,000
SUBTOTAL		5,000
60. MISCELLANEOUS ( communication expenses, administrative expenses, reproduction of material, and others)	10,000	
SUBTOTAL	10,000	
70. Executing Agency Management Costs		
71. Use of premises and facilities		15,000
72. Secretarial Support		6,000
SUBTOTAL		21,000
80. ITTO Administration, Monitoring & evaluation		
81. Monitoring and evaluation	10,000	
82. Administrative cost (6%)	16,980	
SUBTOTAL	26,980	
<b>GRAND TOTAL</b>	<b>299,980</b>	<b>60,000</b>

TABLE 2 - PROJECT BUDGET BY ACTIVITY

OUTPUT/ACTIVITIES	BUDGET COMPONENTS							GRAND TOTAL
	PROJECT PERSONNEL	SUB CONTRACTS	DUTY TRAVEL	CAPITAL ITEMS	CONSUMABLE ITEMS	MISC. AND CONTINGENCY	ITTO MONITORING EVALUATION, & ADMINISTRATION	
Output 1 Activities								
1.1	14,000	14,000						28,000
1.2	14,000	14,000	2,000					30,000
1.3	7,500	7,000						14,500
Output 1.1 sub-total	35,500	35,000	2,000					72,500
Output 2 Activities								
2.1	20,500	77,000	10,000					107,500
Output 2 sub-total	20,500							107,500
		77,000	10,000					
Outputs 3 and 4 Activities 3.1/4.1	14,000		30,000					44,000
Activities 3.2/4.2								
Outputs 3 & 4 sub-total	14,000		30,000					44,000
Output 5								
Activity 5.1	21,000	10,000						31,000
Output 5 sub-total	21,000	10,000						31,000
General project expenses			8,000			10,000	26,980	44,980
General sub-total			8,000			10,000	26,980	44,980
<b>GRAND TOTAL</b>	<b>91,000</b>	<b>122,000</b>	<b>50,000</b>			<b>10,000</b>	<b>26,980</b>	<b>299,980</b>

## ANNEX I

### PROJECT LOGICAL FRAMEWORK

**Development Objective:**

To contribute to sustainable forest-based development in the Amazon region.

**Specific Objective:**

To demonstrate that conventional timber industries in conjunction with a non-conventional wood consumer (the power generation industry) can make sustainable forest industry a viable option in selected Amazon region cities.

- **Output 1** – Data and information related to the two areas
  - Activity 1.1 – Assessment of forest resources within a 100 Km radius of Rio Branco and Itacoatiara
  - Activity 1.2 – Survey of forest industries and logging, and timber processing waste in Rio Branco, Itacoatiara and adjacent areas
  - Activity 1.3 – Analysis of wood resources and waste in view to supply timber processing industries and biomass for power generation
- **Output 2** – The feasibility of SFM for the combined production of wood for manufacturing traditional products and for power generation in the two case study areas
  - Activity 2.1 – Carry out a comprehensive feasibility study to supply integrated industrial operations – traditional products and power generation
- **Outputs 3 and 4** – *Increase government and private sector measures of the potential of SFM / traditional timber industry / power generation for development of western Amazonas and increase prospects for more efficient forest utilization*
  - Activities 3.1 and 4.1 – Organizing and conveying two workshops (Rio Branco and Itacoatiara)
  - Activities 3.2 and 4.2 – Printing and distribution of workshops proceedings
- **Output 5** – Recommendation on appropriate policies and measures to promote industrial development linked to SFM plans in the western Amazonas with focus on electricity production / traditional timber industry
  - Activity 5.1 – Prepare, publish and disseminate a document with recommendations on appropriate policies and measures to promote forest-based industrial development linked with SFM plans, focusing electricity / traditional timber industry production

**ANNEX I**  
**LOGICAL FRAMEWORK MATRIX**

PROJECT ELEMENTS	INDICATORS	MEANS OF VERIFICATION	RELEVANT ASSUMPTIONS
<ul style="list-style-type: none"> <li>• <u>Development objective</u></li> </ul> <p>To contribute to sustainable forest-based development in the Amazon region</p>	<ul style="list-style-type: none"> <li>• Utilization of LKS increased</li> <li>• Implementation of SFM plans facilitated and practices improved</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with IBAMA on improvements in the implementation of forest management plans</li> </ul>	-
<ul style="list-style-type: none"> <li>• <u>Specific objective</u></li> </ul> <p>• To demonstrate that conventional timber industries in conjunction with a non-conventional wood consumer (the power generation industry) can make sustainable forest industry a viable option in selected Amazon region cities.</p>	<ul style="list-style-type: none"> <li>• Representatives of government and private sectors, particularly IPP involved in the discussion to find ways to establish energy generation based on wood waste</li> </ul>	<ul style="list-style-type: none"> <li>• New policies and instruments under discussion by government</li> <li>• Involvement of private sector, especially IPP in the workshop and cooperation in the studies</li> </ul>	<ul style="list-style-type: none"> <li>• Willingness of government to support efforts on SFM</li> <li>• Willingness of IPP to participate in the Project</li> </ul>
<ul style="list-style-type: none"> <li>• <u>Output 1</u></li> </ul> <p>• Data and information related to the two areas of study</p>	<ul style="list-style-type: none"> <li>• Report available by the 6<sup>th</sup> month of the time schedule of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• Progress report</li> <li>• Steering Committee report</li> </ul>	<ul style="list-style-type: none"> <li>• There are no external risks and assumptions</li> </ul>
<ul style="list-style-type: none"> <li>• <u>Output 2</u></li> </ul> <p>• The feasibility of SFM for the combined production of wood for manufacturing traditional products and for power generation in the</p>	<ul style="list-style-type: none"> <li>• Report on the feasibility study completed by the 9<sup>th</sup> month of the time schedule of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• Progress report</li> </ul>	<ul style="list-style-type: none"> <li>• There are no external risks and assumptions</li> </ul>



PROJECT ELEMENTS	INDICATORS	MEANS OF VERIFICATION	RELEVANT ASSUMPTIONS
two case study areas			
<ul style="list-style-type: none"> <li>• <u>Outputs 3 and 4</u></li> <li>• Increase government and private sector measures of the potential of SFM / traditional timber industry / power generation for development of western Amazonas and increase prospects for more efficient forest utilisation</li> </ul>	<ul style="list-style-type: none"> <li>• Workshop organized and implemented</li> <li>• Workshop proceedings printed and distributed by 11<sup>th</sup> month of the time schedule of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• Workshop program</li> <li>• List of participants registered</li> <li>• Activity report</li> <li>• List of proceedings receivers</li> </ul>	<ul style="list-style-type: none"> <li>• Willingness of the government officials and representatives of private sector, particularly IPP representatives, to participate in the workshop</li> </ul>
<ul style="list-style-type: none"> <li>• <u>Output 5</u></li> </ul> <p>Recommendation on appropriate policies and measures to promote industrial development linked to SFM plans in the western Amazonas with focus on electricity production / traditional timber industry</p>	<ul style="list-style-type: none"> <li>• Report on the overall project findings completed at the end of the 12<sup>th</sup> month of the time schedule of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• Completion report</li> <li>• Published report</li> </ul>	<ul style="list-style-type: none"> <li>• There are no external risks on consumption</li> </ul>

**ANNEX II**  
**PROJECT WORKPLAN**

OUTPUTS/ACTIVITIES	RESPONSIBLE PARTY	SCHEDULE (MONTHS)												
		0	1	2	3	4	5	6	7	8	9	10	11	12
Preparation of detailed Workplan	Project coordinator													
<ul style="list-style-type: none"> <li>• <b>Output 1</b></li> </ul>														
Activity 1.1 – Assessment Forest Resources	Project coordinator/ <i>Sub- contractors</i>													
Activity 1.2 – Survey Forest Industry	Project coordinator/Sub-contractors													
Activity 1.3 – Analysis	Project coordinator/ <i>Sub- contractors</i>													
<ul style="list-style-type: none"> <li>• <b>Output 2</b></li> </ul>														
Activity 2.1 – Feasibility Study	Project coordinator/Sub-contractors													
<ul style="list-style-type: none"> <li>• <b>Outputs 3 and 4</b></li> </ul>														
Activity 3.1 / 4.1	Project coordinator													
Activity 3.2 / 4.2	Project coordinator													
<ul style="list-style-type: none"> <li>• <b>Output 5</b></li> </ul>														
Activity 5.1 – Publish and disseminate document	Project coordinator/Consultancy													

**ANNEX III**

**TERMS OF REFERENCE FOR THE PROJECT COORDINATOR**

**(PRELIMINARY)**

Position: Project Coordinator

The project coordinator will be engaged on the Project for a period of 12 months. His duties will include:

- To prepare a detailed work plan to be submitted to ITTO Secretariat;
- To select and hire the consultants and sub-contractors required to implement the project considering ITTO rules and procedures as well as FUNPAR requirements;
- To discuss with consultants hired on each respective terms of reference, objectives of the Project, available time and time-schedule established to execute each component of the Project, integration among the several consultants, and expected outputs;
- To coordinate with IBAMA, MMA and ABC on aspects related to their involvement in the project implementation;
- To contact other organizations and the private companies involved in IPP and discuss possible forms of this involvement and cooperation;
- To follow the work implementation of the consultants involved in the several activities, and make recommendations in order to improve performance and fully comply with the Project objectives;
- To review reports and other documents prepared by consultants before submission to ITTO Secretariat ;
- To prepare the necessary documents and reports for the Steering

Committee meeting;

- To organize the workshop in Rio Branco and Itacoatiara and to be actively involved in the implementation;
- To make the necessary arrangements to prepare, publish and disseminate the workshops proceedings;
- With the support of the consultant on forest-based development *specialist* to prepare the final document of the Project, and make the necessary arrangements to publish and disseminate;
- To organize and maintain all documents of the Project;
- To prepare the Project Completion Report to be submitted to ABC, IBAMA, MMA and ITTO Secretariat.

## **TERMS OF REFERENCE FOR THE FOREST DEVELOPMENT SPECIALIST**

### **(PRELIMINARY)**

Position: Forest Development Specialist

The Forest Development Specialist will be engaged on the Project for a period of one month. His duties will include:

- To discuss the project objective and the work plan with the project coordinator and propose the necessary adjustments if needed;
- To review information produced by the project, particularly the report prepared by the sub contractor involving aspects related to survey and assessment of forest/ wood resources and of timber industry, and the feasibility study of the electricity plants, for both regions covered by the study: Rio Branco and Itacoatiara;
- To discuss with the subcontractors to fully understand the reports, clarify on findings and recommendations made;
- To take active participation on the workshops to be carried out in Rio Branco and Itacoatiara for the presentation of the reports prepared by the sub contractors;
- To prepare a summary of the discussions held during the workshop, make suggestions and prepare relevant technical material to be considered in the final report to be published;
- To support the project coordinator, as required, in the preparation of the final document of the project for publication;

## **TERMS OF REFERENCE FOR THE MAIN SUB CONTRACTS (PRELIMINARY)**

Position: Subcontractor for Survey and Feasibility Study

The Subcontractor for the Survey and Assessment of Forest/Wood resources and of Timber Industries, and Feasibility Studies will be engaged for a total period of 11 months.

The Subcontractor duties under this project will have the following duties:

- To discuss the project objective and the work plan with the project coordinator and propose the necessary adjustments if needed;
- To collect information on existing forest resources in the companies in the region covered by this study (Rio Branco and Itacoatiara), including a review of the forest management plans approved by IBAMA;
- To determine the present production and potential sustainable timber production of forests identified, including the potential outputs of the two national / state forests (Antimari and Macuana) with had SFM plans prepared under ITTO projects;
- To collect information on costs of operations related for wood production for manufacturing traditional products and for power generation;
- To analyze the economic impact of integrating wood production of wood for power generation;
- To carry out a detailed survey in the regions covered by the project (Rio Branco and Itacoatiara) covering the following aspects:
  - Energy available in the region, costs, quality and other aspects;
  - Timber industry in operation in the region, demand and supply of electricity conditions;

- Evolution of costs of acquisition of electricity;
  - Existing structure, technology source and technical performance;
  - Investments in electricity generation and evolution of costs of production;
  - Wood waste production, types, present demand, forms of disposal, handling systems;
  - Perspectives: future production, investments in the production and energy sources;
  - Local infrastructure and other aspects related to the subject.
- Contact local authorities in order to collect information on local supply, and identify plans for electricity supply in the region;
  - To interview workers and local communities in order to make possible to assess the present situation and possible impacts on their economic and social relationship with the timber industry, and possible impacts of a supply of electricity of a power plant based on wood residues;
  - To collect information on equipment, producers and IPP, and assess the technology adopted and equipment performance;
  - To assess alternatives for financing a energy generation plant;
  - Considering local conditions, technology and equipment assessment develop the conceptual engineering and of an electricity plant;
  - To developed the conceptual engineering of the electricity plant;
  - Based on the conceptual engineering to specify equipments, constructions and engineering and other services needs for the construction of a electricity production plant;
  - To collect information on investments and inputs for cost calculations;

- To carry out the economic and financial analysis, considering as UNIDO or other equivalent manual as a basis, taking into consideration identified sources of finance and the involvement of IPP;
- To carry out a preliminary study on possible environmental impacts of implementation of a power plant based on wood residues, both at forestry and at the industrial site and surroundings;
- To keep the project coordinator informed on the development of the activities, and make the adjustments required;
- To prepare a final detailed report with the findings and recommendations, taking into consideration the objectives of the project, for the both regions (Rio Branco and Itacoatiara);
- To present the findings and recommendation in a workshop that will take place in Rio Branco and Itacoatiara.



## ANNEX IV

### CURRICULUM VITAE OF THE PROJECT COORDINATOR

NAME: Ivan Tomaselli

DATE OF BIRTH: July 12, 1951

CITIZENSHIP: Brazilian

EDUCATION: B.Sc. in Forestry  
Federal University of Paraná, Curitiba/PR, Brazil, 1972

MSc in Wood Technology  
Federal University of Paraná, Curitiba/PR, Brazil, 1974

PhD  
University of Melbourne, Melbourne, Vic, Australia,  
1977

LANGUAGES: Portuguese, English, Spanish, and French

#### PROFESSIONAL EXPERIENCE

1972 Tutor on Forestry Inventory, Federal University of Paraná,  
Curitiba

1973.74 Wood Technology Laboratory Responsible, Federal University of  
Paraná, Curitiba

1974 Voluntary Lecturer, Wood Technology, Federal University of  
Paraná, Curitiba

1973.74 Responsible forester of Reflorestadora Pioneira Ltda., Ponta  
Grossa/PR

1977.80 Visiting lecturer, Forestry Course, Federal University of Paraná,  
Curitiba

- 1978.80 Deputy Director of the Forestry Research Centre, UFPR, Curitiba/PR
- 1978.81 Director of the Forest Research Foundation of Paraná, Curitiba/PR
- 1980 Assistant professor, Forestry Course, Federal University of Paraná
- 1980.81 Team leader of the Niassa Forest Development Project, Mozambique
- Coordinator of the Wood Technology Studies of the Niassa Forest Development Project, Mozambique
- 1981 Professor on Wood Science and Technology at the Forestry Course (BSc, MSc and PhD), Federal University of Paraná
- 1981.86 Director of the STC Engenharia de Projetos, Curitiba/PR
- 1986.88 Director of Digisystem Ind. Sistemas Eletronicos Ltda., Curitiba/PR
- 1988.89 Industrial Director of Timberplac Ind e Com de Madeiras Ltda., Curitiba/PR
- 1989-... Director of STCP Engenharia de Projetos Ltda., Curitiba/PR

#### OTHER RELEVANT APPOINTMENTS

- 1977.78 Technical Supervision of the Project – Technical, Economical and Social Alternatives for the Forestry Sector of Paraná State: SUDESUL/IBDF/State Government-Curitiba/PR
- 1978 Member of the Technical Team of FAO/IBDF Project No. 06/BRA/65/I – Promotion of Investments and Training Program for the Forest Development in Amazon, Brasilia/DF
- 1978.80 Member of the Commission for the Creation of the PhD Program in Forestry and Wood Science - Federal University of Paraná, Curitiba/PR

- 1978.88 Deputy Leader of Project Group P5.03 – Energy from Forest Biomass, IUFRO
- 1979.81 Team Leader of the Forestry Technology Development Program, FINEP, Curitiba/PR
- 1979.82 Member of Regional Council on Engineering, Agronomy and Architecture, Curitiba/PR
- 1980.81 Member of the International Cooperation Group CNPq, Brasilia/DF
- 1982 Member of the Organizing Committee of the I Symposium on Scientific and Technical International Cooperation, Brasilia/DF
- 1982.83 Team Leader of the Wood Gazeification Research Program, IBDF/FUPEF, Curitiba/PR
- 1982.84 Head Leader of the Post Graduation Program (MSc, PhD) of the Federal University of Paraná, Curitiba/PR
- Member of the Technical Council of Paraná Forest Companies Association, Curitiba/PR
- 1983 Member of the Scientific International Cooperation Mission, Asuncion/Paraguay – CNPq
- 1983.85 Member of the Advisory Committee in Forestry – CNPq National Research Council, Brasilia/DF
- 1984.87 Member of the Industrial Development Council of Paraná State Government, Curitiba/PR
- Member of the Advisory Committee in Forestry – CAPES – Education Ministry, Brasilia/DF
- 1984.86 Chairman of the National Timber Standard Committee, ABNT, Rio de Janeiro/RJ
- 1986.1994 Chairman of the National Standard Committee for Commodities, ABNT, Rio de Janeiro/RJ

- Member of the Technical Advisory Committee of ABIMCI –  
Brazilian Plywood Association, São Paulo/SP
- 1986.88 Secretary of the Paraná Forest Institute, Curitiba/PR
- 1990 Member of the Panel of Experts for the Preparation of Draft  
Action Plan and Work Program on Forest Industry and Economic  
Information and Market Intelligence, ITTO, Amsterdam
- Member (Advisor) of the Brazilian Delegation for the International  
Tropical Timber Council (ITTTC) and for the renegotiations of the  
International Tropical Timber Agreement (ITTA)
- 1991 IIED Consultant for evaluation of the document “Convention for  
the Conservation and Wise Use of Forest” and trade related  
aspects, London/UK
- 1992 Technical Coordinator of the I International Congress on Tropical  
Plywood, Manaus/AM
- 1992.93 ITTO/ABIMCI Consultant for the Project “Introduction of Lesser  
Known Species in the Brazilian Plywood Industry”
- 1993 ITTO Consultant for the Evaluation of ITC Market News Service  
for Tropical Timbers, Yokohama/Japan
- Training on Operation and Management of the Irati Forest  
College/GTZ (Germany), sawmill, Irati/PR
- Evaluation of the project “Export Promotion and Development  
Assistance to Selected Enterprises Exporting Wood  
Manufacturers in Bolivia”, ITC-UNTAD/GATT,  
Geneva/Switzerland
- World Bank Consultant on Sustainable Forestry Development
- 1994 Ministry of Environment and Natural Resources – Consultant on  
Sustainable Forestry Development Policies
- 1996.99 Coordinator of ITTO Project PD 30/95 Rev.1 (F) Dissemination  
and Training on ITTO Guidelines and Criteria

## RESEARCH ACTIVITIES

Since 1973 have been responsible for several research programs in the following fields:

- Wood Properties

- Evaluation of properties of wood from plantations and native forests
- Implications of the basic properties on final uses of the material
- Laboratory procedures
- Effect of silviculture treatments on the wood properties and quality

- Wood Drying

- Development of new technologies for timber drying
- Effect of temperature on the properties of wood
- Drying effects
- Development of new equipments and control systems
- Basic research in wood drying
- Drying schedule development

- Energy Generation

- Energy consumption in the timber industry
- Biomass utilization for energy generation
- Alternative uses of forest site and of the industry
- Charcoal production

- Industrial Utilization

- New species for timber and plywood production
- Products quality evaluation and quality control
- Adjustments on existing equipments to increase production
- National and International trends on wood processing and wood products

## PUBLICATIONS

- Contribution to the Study of the Basic Density of Softwoods from Plantations*. Floresta 4 (3), p.26-28, 1973.
- Technological Studies of Guapuruvu (Schizolobium parahybum) - Part I - General Aspects and Wood Properties*. Floresta 5(1), p. 26-30, 1973.
- Technological Studies of Guapuruvu (Schizolobium parahybum) - Part II - Production of Plywood*. Floresta 5(2), p. 14-23, 1975.
- Timber Drying in Paraná and Santa Catarina States*. Floresta 6(2), p. 5-13, 1975.
- High Temperature Drying and its Utilization in the Brazilian Condition*. Floresta 7(1), p. 50-57, 1976.
- The Influence of High Temperature Drying on Some Physical and Mechanical Properties of Pinus radiata*. In Proceedings of 18th Forest Products Conference, CSIRO, Melbourne/Australia, 1977.
- Physical Aspects on Wood Drying*. In Proceedings of the Seminário Secagem Artificial de Madeira Maciça, CEAG-FUPEF, Curitiba/state of Paraná, p.62-67, 1977
- Drying Schedules*. In Proceedings of the Seminário Secagem Artificial de Madeira Maciça, CEAG-FUPEF, Curitiba/state of Paraná, p.78-85, 1977
- Drying Control*. In Proceedings of the Seminário Secagem Artificial de Madeira Maciça, CEAG-FUPEF, Curitiba/state of Paraná, p. 86-96, 1977
- Timber Stacking*. In Proceedings of the Seminário Secagem Artificial

- de Madeira Maciça, CEAG-FUPEF, Curitiba/state of Paraná, p.108-110, 1977
- Utilization of Wood Residues in the Brick Production*. In Proceedings of the III Congresso Florestal Brasileiro, Manaus/state of Amazonas, 1978
  - Aspects on High Temperature Drying of Timber*. Brasil Madeira 2(15), p. 24-27, 1979.
  - Wood Drying*. Fundação de Pesquisas Florestais do Paraná, Boletim 1, p.26, 1979.
  - Wood Technology: a lot to be done*. Charrua 2(2), p. 5, 1979.
  - Forestry Research Programs, and the Need for an Industry/University Integration*. Brasil Madeira, 3(29), p. 28-29, 1979.
  - Wood Properties and Utilization*. In: Apostila Curso de Extensão Universitária - Imperatriz, MA/MEC/UFPR, Projeto RONDON, pg. 68-80, 1979.
  - Formation of Researchers in Wood Science for Latin America*. Floresta 10(1), p. 63-68, 1979.
  - A Comparison of Wood Quality between Araucaria angustifolia and Pinus ssp. from Plantations*. In Proceedings of IUFRO Meeting on the Silviculture of Araucarias, Curitiba/state of Paraná, p.286-291, 1979
  - High Temperature Drying of Pinus radiata Wood - Part I Physical Aspects, Drying Rates and Wood Internal Temperature*. Melbourne/Australia, 1980
  - Wood Collapse and Brazilian Experience*. FUPEF, Boletim 3, p.21, 1980.
  - Development of Tables to Evaluate the Dried Weight of Wood Produced in Plantations at Guarapuava*. In Proceedings of IUFRO Meeting on Fast Growing Trees, Águas de São Pedro/state of São Paulo, 1980
  - High Temperature Drying*. Brasil Madeira 4(43), p. 42-45, 1980.
  - Energetic Alternatives - Biomass Contribution*. Brasil Madeira 5(53), p. 41-47, 1981.

- Janka Hardness - Problems in the Determination and How to Improve Precision.* Floresta 12(1), p. 62-65, 1981.
- Effects of High Temperature Drying in Some Physical and Mechanical Properties of Juvenile Araucaria angustifolia Timber.* Floresta 12(1), p.17-25, 1981.
- Forest Research at the Brazilian Universities.* In Proceedings of the Forestry Education Symposium, Curitiba/PR, p.123-130, 1982
- Utilization of Wood for Production of Charcoal for the Steel Industry.* In Proceedings of Seminar on Utilization of Timber for Energy Generation, Santiago Del Stero/Argentina, 1982
- Comparison of Energy Generation of 23 Species.* In Proceedings of 4º Congresso Florestal Brasileiro, 1982
- Liquidification of Wood.* Energy from Forest Biomass, New York/USA, Academic Press, p.209-220, 1982.
- Drying Veneers for the Plywood Industry.* Revista Madeira-Móveis 1(1),p. 27-33, 1983.
- Quality Control at the Timber Industry.* In Proceedings of 7º Encontro Nacional de Reflorestamento, Panel 6, p.35-45, 1983
- Native Forest Resources in Paraná State.* Paraná Florestal 1(2), p. 17-22, 1983.
- Development of a Photo-Sensitivity System for Temperature and Relative Humidity Control.* IBDF, Brasília/Distrito Federal, Série Técnica 7, p.13, 1983.
- Characteristics of Taxi-Branco-da-Terra-Firme (Sclerolobium paniculatum) for Energy Generation.* Bol. Pesquisa Florestal (EMBRAP) 6/7, p.33-44, 1983.
- Wood Drying Developments in Brazil.* In Proceedings of the Wood Drying Working Party - IUFRO Div. V Conference, Wisc./USA, pg. 63-68, 1984
- New Technologies for Wood Drying.* Silvicultura IX (34), p. 25-30, 1984.
- Perspectives on Energy Generation Based on Forest Biomass.* In Proceedings of the Simposio Florestas Plantadas nos Neotrópicos



- como Fontes de Energia, Viçosa/state of Minas Gerais, UFV, p. 371-385, 1985
- Chapas de Madeira Compensada para Formas de Concreto - Normas Brasileiras*. In Proceedings of II Simpósio Nacional de Tecnologia da Construção: "Formas para Estruturas de Concreto", EPUSP, São Paulo/state of São Paulo, p. 187-190, November-1986.
  - Increasing the Production on Veneer Jet Dryers*. O Compensado 1(3), p. 6, 1986.
  - Timber Drying: Process Control*. Móvel Press II (36), p.30-32, 1987.
  - Incentives and Restriction on Exports: Plywood*. In Proceedings of I Encontro Brasileiro de Economia Florestal, EMBRAPA, p. 307-321, 1988
  - National Standards and the Importance for the Timber Sector*. In Proceedings of II Seminar on Processing and Utilization of Wood from Plantations, p. 139-147, 1988
  - Degradation of Pinus radiata Wood when Drying at Temperatures up to 180°C*. In Proceedings of the Wood Drying Working Party - IUFRO Div. V Meeting, São Paulo/state of São Paulo, p. 68-82, 1988
  - Brown Stain in Pinus elliottii Timber*. In Proceedings of the Wood Drying Working Party - IUFRO Div. V Meeting, p. 94-100, 1988
  - Reduzir a Oferta de Madeiras Tropicais: Essencial para Equilibrar Oferta e Demanda*. O Compensado, October-1989.
  - Nobody Wants Deforestation*. O Compensado, p. 4, February-1989.
  - Wood Demands*. O Compensado, p. 6, May-1989.
  - Plywood Production at Amazon Basin - An Attractive Investment Opportunity*. In Proceedings on Roundtable in Opportunities and Constrains to Latin American Hardwood Based Industrial Development. IBDF/ITTO, Brasília/Distrito Federal, p.225-243, 1989
  - Sanctions on Tropical Timber - a Gamble?* O Compensado, p. 9, October-1989.

- Development of Plywood Industries*. In Proceedings of Seminar on the Production of Further Processing of Tropical Hardwood Timber of the African Region, ITTO, Accra/Ghana, February-1990.
- International Perspectives of Timber Market and the Implications for the Brazilian Product*. In Proceedings of Seminar on Alternative Markets for Plantation Wood, Porto Alegre/state of Rio Grande do Sul, AGEFLOR, August-1990.
- Developments in Wood Technology and Their Implication for Forestry Education*. In Proceedings of the International Conference on Forestry Education, FAO/IUFRO/University of Tuscia, Viterbo/Italy, October-1990.
- The Influence of the Stoking Time of Bracatinga Fuelwood in the Production of Energy*. Boletim de Pesquisa Florestal, No.21, EMBRAPA, December-1990.
- Over Supply of Timber Expected this Decade*. Sindicato dos Madeireiros do Paraná, Curitiba/state of Paraná, Industria Florestal, p. 1, January-1990.
- Sustainable Production of Tropical Plywood in Latin America/Caribbean*. In Proceedings of World Conference on Tropical Plywood, ITTO, Jakarta/Indonesia, December-1991.
- Forest Products Trade Aspects and Issues Related to Conservation and Wise Use of Forests*. International Institute for Environment and Development, July-1991.
- Effect of Drying Temperature on Dimensional Stability of Pinus Timber*. In Proceedings of IV EBRAMEM, São Carlos/state of São Paulo, p. 19-25, 1992
- Drying Equipments for Sawn Timber*. In Proceedings of II Forest Symposium of Rio Grande do Sul, AGEFLOR, Esteio/state of Rio Grande do Sul, p. 16-28, May-1992.
- Introduction of Lesser Known Species in the Amazonian Plywood Industry*. In Proceedings of I International Congress on Tropical Timber Plywood, ABIMCI, Manaus/state of Amazonas, p. 73-94, October-1992.
- Brazilian Forests: Perspectives and Public Reactions*. In Proceedings of the 45th Annual General Meeting, Association of

- British Columbia Professional Foresters, Vancouver/Canada, February-1993.
- International Market of Timber Products - Supply and Demand*. In Proceedings of III Forest Symposium of Rio Grande do Sul, AGEFLOR, p.98-108, 1993
  - Brown Stain in Pinus elliottii Engelm var. elliottii Sawnwood*. Bol. Pesq. Fl./Colombo/ n<sup>0</sup> 26/27, p. 41-45, Jan./December-1993.
  - Brown Stain Control in Pinus elliottii Engelm var. elliottii Sawnwood by Imersion in Alkaline Solutions*. Bol. Pesq. Fl./Colombo/ n<sup>0</sup> 26/27 , pg. 49-53, Jan./December-1993.
  - Temperature and Air Velocity Effects on the Rate of Drying of Pinus elliottii*. In Proceedings of the I Congresso Florestal Panamericano and VII Congresso Florestal Brasileiro, Curitiba/state of Paraná, p. 623-626, September-1993.
  - The Importance of Standardization for the Timber Industry*. In Proceedings of the I Congresso Florestal Panamericano and VII Congresso Florestal Brasileiro, SBS/SBEF, Curitiba/state of Paraná, p.307-309, September-1993.
  - Understanding the Market - A Priority*. Revista da Madeira, p.6-7, 1993.
  - Strategies for the Sustainable Development of the Wood Industry in Ecuador*. In Proceedings of the Symposium on Sustained Management, INEFAN/ITTO, Quito/Ecuador, February-1994.
  - Wood Industry and Forest Destruction: Any Correlation ?*. SINDINOTÍCIAS, Ano 1, N<sup>0</sup> 2, p.4-5, Rondônia, April-1994.
  - Wood Industry and Forest Destruction: Any Correlation?* Revista da Madeira IV, n<sup>0</sup> 22, p. 54, 1994.
  - Effects of Environmental Concerns in the National Market of Timber and Timber Products*. In Proceedings of III SEMADER, ABPM, Curitiba/state of Paraná, p. 25-31, April-1994.
  - Good Deals in House*. Revista Madeira, Ano III, n<sup>0</sup> 16, p. 4-5, Jul./August-1994.
  - Tropical Wood Primary Processing*. In Proceedings of II Congresso

- Internacional de Compensados e Madeiras Tropicais,  
ABIMCI/AIMEX, Belém/state of Pará, September-1994
- Practical Guide for Formulation, Monitoring and Evaluation of Forestry Projects*. FAO , Quito/Ecuador, p.75 , April-1995.
  - Marketing and Markets for Tropical Plywood - Perspectives for Producers*. In Proceedings of II World Conference on Tropical Plywood, AIMA/OIMT, Quito/Ecuador, p.73-80, May-1995.
  - Forest Products Industrialisation*. In Proceedings of 10<sup>o</sup> Simpósio de Política Florestal do Estado do Amazonas, UTAM, Manaus/state of Amazonas, June-1995.
  - World Market of Forest Products*. In Proceedings of XIII Jornadas Técnicas, Universidade Nacional de Misiones, Eldorado/Argentina, October-1995.
  - Grevillea, Cinamomo and Other Timbers - Production and Market*. IV SEMADER, Curitiba/state of Paraná, April-1996.
  - OSB - A Rising Product*. ABIMCI, São Paulo/state of São Paulo, Bol.Resenha - May-1996.
  - World Market of Forest Products*. 7<sup>o</sup> ENTEC, Contagem/state of Minas Gerais, August-1996.
  - Wood-based Panels in Brazil - Perspectives and Opportunities*. ITTO Newsletter, Volume 7, n<sup>o</sup> 1, p.16-17, January-1997.
  - National Market of Tropical Timbers*. Workshop: Forest Policies and Sustainable Development in the Amazon, Fundação Brasileira para o Desenvolvimento Sustentável, Rio de Janeiro, Caderno FBDS, n<sup>o</sup> 2, p.41-49, July-1997.
  - Uso da Queda da Temperatura an Passagem pela Pilha como Instrumento de Controle do Processo de Secagem de Madeiras*. Revista Árvore, v.21, n<sup>o</sup> 2, p.269-277, 1997.
  - A Exportação de Toras pode ser uma Alternativa Interessante a Curto Prazo*. R.Madeira & Tecnologia, Ano I, n<sup>o</sup> 05, p.24-25, Jul./August-1997.
  - Overview of Tropical Timber Economy*. In Proceedings of " Simposio Internacional sobre El Desarrollo de Productos Basicos en America

- Latina y Caribe ". Common Fund of Commodities-CFC.  
Caracas/Venezuela, p.21, 1997.
- O Caminho para sua Empresa*. Informativo STCP nº 1,  
Curitiba/Paraná, p.10-14, 1997.
  - A Indústria de Painéis no Brasil*. Informativo STCP nº 1,  
Curitiba/Paraná, p.16-20, 1997.
  - Contribuição da Madeira Tropical*. Informativo STCP nº 1,  
Curitiba/Paraná, p.24-28, 1997.
  - Wood Fiber Supply: Perspectives from Brazil and Other Latin  
American Countries*. In Proceedings of Conference on Monitoring  
the Global Wood Fiber Equation. Wood Resources International,  
Virginia/USA, p.19, 1997.
- O Caminho para sua Empresa*. Revista da Madeira, Ano 6, nº 35, 1998.
  - Planted Forests in Brazil*. In Proceedings of International Conference on  
Planted Forests in Sarawak, STA, Kuching/Malaysia, p.14, May-1998.
  - Forestry Industry Opportunities in Brazil*. In Proceedings of Conferencia  
de Productos Forestales: Madera Libre de Nudos en la Cuenca del  
Pacífico. Fundación Chile, Santiago/Chile, May-1998.