
**INTERNATIONAL TROPICAL TIMBER ORGANIZATION
ITTO
COMPLETION REPORT**

A – PROJECT IDENTIFICATION

- a) Title:** *INCREASING THE EFFICIENCY IN THE TROPICAL
TIMBER CONVERSION AND UTILIZATION
RESIDUES FROM SUSTAINABLE SOURCES*
- b) Serial Number:** *PD 61/99 Rev.4(I)*
- c) Executing Agency:** *FUNPAR - Foundation of the Federal University of
Paraná*
- d) Host Government:** *GOVERNMENT OF BRAZIL*
- e) Starting Date:** *September 1st, 2002*
- f) Duration:** *12 months*
- g) Project costs:** *USD 359,980.00*

PART I: Executive Summary

1 – BACKGROUND INFORMATION

1.1 – PROJECT DESCRIPTION

The project *PD 61/99 Rev.4(I): INCREASING THE EFFICIENCY IN THE TROPICAL TIMBER CONVERSION AND UTILIZATION RESIDUES FROM SUSTAINABLE SOURCES*, was developed 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.

The economic return 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. The use of 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.

The key problems intended to be solved by the project were related to the necessity of 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.

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.

The project proposing was 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 and wood residues at the mill site.

Taking in consideration the project specific objective and the key problems to be solved the following outputs were established:

- 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 Macaua) 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.

The project was planned to be implemented in 12 months. The total budget is US\$ 359,980.00, including direct costs and ITTO's monitoring and administration costs, as presented in table 1. ITTO total contribution was US\$ 299,980.00.

Table 1 – Project Budget by Component by Source

BUDGET COMPONENT	TOTAL	ITTO	FUNPAR
10. PROJECT PERSONNEL			
11. Project coordinator (12 m/m)	84,000.00	84,000.00	
12. Forest-based development specialist (1 m/m)	7,000.00	7,000.00	
13. Administrative Officer	24,000.00		24,000.00
19. Component Total	115,000.00	91,000.00	24,000.00
20. SUB-CONTRACTS			
21. Survey and assessment of forest/wood resources and of timber industries (5 m/m)	35,000.00	35,000.00	
22. Feasibility studies (11 m/m)	77,000.00	77,000.00	
23. Printing and publication services	10,000.00	10,000.00	
29. Component Total	122,000.00	122,000.00	
30. DUTY TRAVEL	0		
31. DSA (including for ABC monitoring)	25,000.00	25,000.00	
34. Transport cost (including for ABC monitoring)	25,000.00	25,000.00	
39. Component Total	50,000.00	50,000.00	

BUDGET COMPONENT	TOTAL	ITTO	FUNPAR
40. CAPITAL ITEMS			
41. Portable computer, portable printer, other peripherals and computer software			10,000.00
49. Component Total	10,000.00		10,000.00
50. CONSUMABLES ITEMS			
51. Office supplies (paper, films, diskettes, computer material, material for the workshops and other office materials)	5,000.00		5,000.00
59. Component Total	5,000.00		5,000.00
60. MISCELLANEOUS(communication expenses, administrative expenses, reproduction of material, and others)			
69. Component Total	10,000.00	10,000.00	
70. EXECUTING AGENCY MANAGEMENT COSTS			
71. Use of premises and facilities	15,000.00		15,000.00
72. Secretarial Support	6,000.00		6,000.00
79. Component Total	21,000.00		21,000.00
80. ITTO MONITORING EVALUATION AND ADMINISTRATION			
81. Monitoring and evaluation	10,000.00	10,000.00	
82. Administrative cost (6%)	16,980.00	16,980.00	
89. Component Total	26,980.00	26,980.00	
GRAND TOTAL	359,980.00	299,980.00	60,000.00

1.2 – POLICIES RELATED TO THE PROJECT

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 the 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.

The project is also in line with international environmental questions such as the global warming mitigation within the concept created by the Kyoto Protocol. 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.

In relation to subsectorial aims and programs, the project presents large synergy. 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.

2 – PROJECT ACHIEVEMENTS

2.1 – OUTPUTS ACHIEVED

All the outputs related to the specific objective were fully achieved, as follows:

- Output 1: All the necessary information regarding wood and wood waste production was collected to support the activities of the Output 2;
- Output 2: The assessment of the feasibility of SFM for combined production of wood for manufacturing traditional products and for power generation was carried out in two case study areas;
- Output 3 and 4: Due to realization of three workshops implemented in the main Brazilian Amazon States (Pará, Amazonas and Acre), the prospects of a more efficient utilization of forest resources and the government and private sector awareness to bring forest-based development in western Amazon were increased;

- Output 5: The final report of the project including recommendations on appropriate policies and measures related to the wood supply, electricity production opportunities and the complementarity of the traditional timber industries and power generating industry. Dissemination of the final report and project results for interested institutions on the project.

2.2 – SPECIFIC OBJECTIVE ACHIEVED

The specific objective of the project was successfully achieved. The set of implemented activities shown that the partnership between the conventional timber industries and the power generation industry is a way to facilitate 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.

2.3 – CONTRIBUTION TO THE ACHIEVEMENT OF THE DEVELOPMENT OBJECTIVE

The project contributed to the achievement of the development objective as it promoted the study of non-conventional ways to facilitate the implementation of forest management plans and increase the competitiveness of industrial operations. These studies results in concrete recommendations which were very important to contribute to sustainable forest-based development in the Amazon region.

3 – TARGET BENEFICIARY INVOLVEMENT

The target beneficiaries of the project had a strong involvement in the project activities. The tropical timber industry, the main target beneficiaries, actively participated in the in the data collection for the case studies and in the workshops.

The participation of Several Federal and State government institutions, also target beneficiaries on the process of discussion were also very satisfactory.

In a general analysis, the participation of any actor related to the tropical forest management in the amazon region was very important, as all institution 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.

4 – LESSONS LEARNED

4.1 – DEVELOPMENT LESSONS

Considering the development of the project, it is important to evidence the positive lessons from this phase:

- The participation of different professionals from several sectors related to energy, wood residues, timber, research, educational and governmental institutions was fundamental to the design of the energy generation case studies aiming to represent all the involved actors;

- The workshops carried out in the cities of Belém, Manaus and Rio Branco, which made possible the participation of a great number of professionals from local institutions, contributing to the quality of the case studies and also to the dissemination of the presented proposes;
- The involvement of educational institutions in the discussions, mainly during the workshops and providing information related to the forest sector and to the existing operating models and prototypes of energy generation;
- The contribution of the energy generation equipment industry, linked to executing initiatives involving energy generation using agricultural and forest biomass, qualifying the work results;
- Other previous similar experiences, such as the experience accumulated by ELETROACRE in wood biomass energy generation trough pilot projects implemented in the cities of Capixaba and Brasiléia in the State of Acre, were important to point out the limitations of this model of energy generation in which the instability of the raw material supply is one of the main restrictions;
- The flexibility of ITTO and ABC was very important to the necessary adjustments of the project, as one of the case studies was transfered to a new reality due to the commitment of all the wood residues in Itacoatiara region. This adjustment made possible to enrich the results of the project as a larger number of case studies was implemented and the biomass assessment was carried out in four regions instead of the two regions foreseen in the original proposal;
- The inclusion of the alto Solimões region added a new reality to the project, as a small energy consumer was involved. The results of this adjustment was important because it can be used by communities and isolated small wood industries
- The contribution of the Secretaria de Desenvolvimento Sustentável do Estado do Amazonas (Amazonas State Sustainable Development Secretary) to search development alternatives of a new case study in substitution to the Itacoatiara region;
- The availability and the interest of the Jari/Orsa group in the development of a case study involving its specific conditions was fundamental to scaling up the project scope and the its results.
- Dissemination and discussion of the project with stakeholders interested in its implementation is an important instrument for the implementations of the study recommendations.

Besides the success of the project results, some external aspects that made difficult the realization of the activities during the process may compromise the sustainability of the results achieved. The Brazilian forest sector is actually presenting operational difficulties due to several reasons such as internal administrative issues of the forest companies, market crisis, legal aspects (dispute for land occupation) and the lowness of control and regulation governmental organizations. The actual insecurity climate created by these reasons reduced the participation of this important actor in the workshops at the conclusion phase of the project.

4.1 – OPERATIONAL LESSONS

In relation to the project operationalization, the following relevant lessons were learned:

- The flexibility and the involvement of new actors interested in the project subject allows to extend the project scope;
- The structure and administrative experience of the executing agency as well as its experience in the conduction of this kind of project was fundamental to the solution of the faced problems;
- The experience of the project coordination team and the subcontracted companies was also very important to reach the project expected results and to solve the difficulties appeared during of its execution;
- The realization of mid-term agreements with the Govern of Amazonas state and with Orsa/Jari Group aiming to extend the project scope to two new regions was fundamental to the success execution of the project;

5 – RECOMMENDATIONS

Based on the lessons learned, the following recommendations for guaranteeing the sustainability of the results obtained by the project and for the elaboration of future project are relevant:

- The replication of the project PD 61/99 REV.4(I) trough the implementation of energy generation models based in wood biomass is an excellent alternative to combine sustainable forest management with the substitution of fossil fuels by renewable sources;
- Actions related to the sustainability of the forest production which creates a stable supply of raw material for energy generation are a key factor to the implementation of this kind of energy project. Some previous failures in similar cases were associated to the instability of the fuel supply (wood biomass);
- The participation of governmental institutions is fundamental to the implementation of the cases involving small communities and the isolated energy generation as the case of Alto Solimões;
- The industrial sector operating large sized unities have already the necessary conditions to the implementation of wood biomass energy generation systems due to the guarantee of energy consumers and available raw material;
- The feasibility of the implementation of the biomass energy generation plants depends of the regulation of industrial and forest wood residues utilization. This regulations is in charge of IBAMA and the National Ministry of Environment;
- The creation of governmental policies to regulate the use of wood residues is fundamental to the feasible implementation of this kind of project. Among the priority actions is the regulation of the wood residues utilization and the definition of possible indexes and quantities to be obtained in the forest harvesting and in the industrial transformation.
- Based on the discussions during the dissemination phase it is recommended that ITTO participates together with other institutions in the financing of pilot project, in the cases of Rio Branco or Alto Solimões.

PART II – MAIN TEXT

1 – PROJECT CONTENT

1.1 – PROJECT GENERAL DESCRIPTION

This project's development objective is to contribute to sustainable forest-based development in the Amazon region. To achieve this general objective, the following specific objective and outputs were established:

- Specific objective

To demonstrate that conventional timber industries in conjunction with a non-conventional wood consumer (the power generation industry) can facilitate 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.

- 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 Macaúa) 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 complementarity of the traditional timber industries and power generating industry in most of the region.

The workplan timetable developed for the implementation of this project is presented in table 2. The project effectively started on February 2003 and its total duration was of 37 months.

The total budget for this project was of US\$ 359,980 and the ITTO contribution was US\$ 299,980. The main inputs of the project were the subcontracts (34% of the total budget) and the project staff (32% of the total budget). The financial management of funds resulted in the additional interest/ investment earning of B\$178,897 during the period August 2002 to 28 February 2006.

The geographical coverage of the Project was concentrated 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.

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 m³ of logs of traditional species (15 to 20), but no demand or market outlet exists for the one million/m³ 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 m³ 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.

In relation to the management structure, the project was implemented by the Fundação da Universidade Federal do Paraná – FUNPAR, through the basic organization and standard procedures, used in the implementation of other ITTO projects. All the administrative work was carried out by the existing staff, but those directly involved in the project were hired using the project funds.

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

The Project was implemented in cooperation with ABC, IBAMA and MMA. As in previous projects implemented by FUNPAR a proper structure was arranged in order to ensure the effective participation of all organizations through the realization of regular meetings.

The Project Coordinator was responsible for ensure the cooperation with other organizations, such as the Forest Products Laboratory. Also it was responsible to ensure that existing knowledge at the private sector, particularly those company already involved in IPP projects, was fully considered in the implementation of the studies.

Table 2 – Workplan Timetable

OUTPUT/ACTIVITIES	RESPONSIBILITY PARTY	YEAR/MONTH																											
		2002 AND 2003 AUG/02 TO DEC/03			2004			2005			2006																		
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	
Preparation of detailed work plan	Project coordinator	■																											
Sub-contractor	Project coordinator	■	■	■																									
• OUTPUT 1																													
Activity 1.1 - Assessment Forest Resources	Project coordinator/Sub-contractors		■	■	■	■	■	■	■	■	■	■	■																
Activity 1.2 - Survey Forest Industry	Project coordinator/Sub-contractors			■	■	■	■	■	■	■	■	■	■																
Activity 1.3 - Analysis	Project coordinator/Sub-contractors					■	■	■	■	■	■	■	■	■															
• OUTPUT 2																													
Activity 2.1 - Feasibility Study	Project coordinator								■	■	■	■	■																
• OUTPUT 3 and 4																													
Activities 3.1/4.1 - Workshops	Project coordinator																		■	■									
Activities 3.2/4.2 - Workshop Proceedings	Project coordinator																		■	■	■	■	■	■	■				
• OUTPUT 5																													
Activity 5.1 - Publish and disseminate document	Project coordinator/Consultancy																		■	■	■	■	■	■	■	■	■	■	■

1.2 – ITTO PROJECT CONTEXT

This project purposes is in accordance with 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.

The project lies within the framework of the Committee of Forest Industry and it is mainly related to the increase of the efficiency of 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:

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.

2 – PROJECT CONTEXT

This project 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.

Within this context, there are several sectional policies at national level related to the Project purposes. First of all the Project is consistent with the Law 7735 of February 22, 1989 and decree No. 97628 of April 10th, 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.

The project is also 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 – PROJECT DESIGN AND ORGANIZATION

The executing agency of the project was FUNPAR - Fundação da Universidade Federal do Paraná, 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 African 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.

Besides the execution of FUNPAR, the project involved other organizations at government level, such the ABC (Brazilian Cooperation Agency), the MMA (Ministry of Environment and Natural Resources) and IBAMA (Brazilian Institute for Environment).

Aiming to strength the technical and scientific component of this project FUNPAR counted with the cooperation of other organization including the Forest Products Laboratory (LPF) 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 which were involved in the project.

FUNPAR basic organization and standard procedures, used in the implementation of other ITTO projects, was maintained for the implementation of this project. All administrative work was carried out by existing staff, but those involved with the project technical aspects were hired using the project funds.

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

The Project Coordinator was responsible for ensuring the cooperation with other organizations. It was also a responsibility of Project Coordinator to ensure that existing knowledge at the private sector, particularly those company already involved in Independent Power Producers- IPP projects, was fully considered in the implementation of the studies.

4 – PROJECT IMPLEMENTATION

Due to administrative problems occurred at the first 2-3 months of the project the implementation of some activities was delayed. The problems concerning the

appointment of the Project Coordinator, coupled by the problems that occurred in the bid process for the hiring of the sub-contractors can be pointed out as the main reasons that led to the long delay in the project's implementation.

During the project execution, the project staff has found difficulties in meeting some agreements, particularly those related to the inclusion of the Jari and of the Alto Solimões Regions, as described bellow:

- Itacoatiara Region Limitations

The pre-selected locations for this study were Rio Branco, Acre, and Itacoatiara, Amazonas. During the field survey, the sub-contractor noticed the existence of two power plants for energy generation using biomass as fuel in the Itacoatiara region, severely reducing the biomass availability from industry residues in that region. Therefore, it became necessary to select other regions for the case study.

- Inclusion of Jari Region

The Orsa Group officially showed interest participating in the project. The Project Coordinator presented in the Steering Committee meeting Orsa Group's interest, which was immediately backed up. Based on this support, negotiations were held with the Orsa Group with the purpose of including the Jari Region (states of Pará and Amapá) in the study. The level of forest biomass available for energy generation in that region will increase due to the implementation of a sawmill that will process tropical timber. The inclusion of the Jari Region demanded a field survey in order to obtain the basic information for the study, concerning forest resources and operations, the forest-based industry structure foreseen to the region, etc.

- Inclusion of other region in the state of Amazonas

In order to substitute the Itacoatiara Region in the study, the Alto Solimões (Upper Solimões River) Region was selected. This selection was made in agreement between the Project Coordinator and representatives, at the request of SDS/AM - "Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável do Amazonas" (State of Amazonas Secretariat on Environment and Sustainable Development). The state of Amazonas government is carrying out a program to stimulate sustainable forest management activities in the Alto Solimões region. The increase on the forest-based industrial activities level in this region will increment the level of biomass availability for energy generation. Similarly to the Jari Region, the inclusion of the Alto Solimões Region in the study required a field survey to obtain basic information.

In relation to the financial resources made available to the project, not all those attached to the expenses with hostelling and transportation were spent during the workshops realization, and that generated a project cash surplus.

Due to this new fact it was proposed the use of these resources for the project results dissemination next to the institutions involved with this theme. The remaining of the resources proposal was approved by ITTO in XXXX, and the new arrangement of the project resources (ITTO and Financial Application) considered the following actions:

- Sub-contractor: hiring of a specialized company for producing the project results divulging material (1,000 copies in Portuguese and 400 copies in English), executing the following actions: creation, diagramming, edition, translation

(English), finishing and printing;

- Travelling: general expenses regarding travelling (tickets, hostelling and local transportation) for the documents dissemination, including: governmental institutions in Brasilia, local institutions and State governments of Para, Amazonas and Acre;
- Miscellaneous: including the project final auditory activities and dispatch of the documents for the workshops' participants, universities, research institutions, public organizations, NGOs, private companies, among others.

With the new arrangement of the project financial resources and considering that the project objectives were reached and the activities were implemented, the executive agency believes that the inputs provided by ITTO and the counterpart were appropriated.

5 – PROJECT RESULTS

The project outputs 1 and 2 were reached through the realization of 3 case studies of wood biomass energy generation, in the regions of Rio Branco (AC), Alto Solimões (AM) and Orsa/Jari (PA). For each one of them, the following activities were developed:

- i. Data assessment on forest management;
- ii. Data assessment on forest industry – residues;
- iii. Data assessment on energy generation – biomass;
- iv. Technical and economical viability study of the energy generation based on wood biomass.

In an overall analysis, the project achieved its development objective. The project contribution to the development of sustainable forest-based in the Amazon region could be noticed specially in the interest of the institutions involved in the case studies, which shall effectively contribute for the solution of local problems, each one with its specific characteristics, as indicated as follows:

- i. Para's case study, Grupo Orsa, has great implementation possibilities, such as the substitution of the electric power generation based on fossil fuels for renewable sources. The project is viable and may increase the company's competitiveness through the substitution of raw material for the power generation, being able to reduce its operational costs;
- ii. Amazonas' case study indicated a possibility for helping isolated communities with difficulties to access electric power. The State government, through its SDS (*Secretaria de Desenvolvimento Sustentável*, or Department of Sustainable Development) has shown great interest in the solution proposal, going to implement a pilot with the participation of the State electric power companies.
- iii. Acre's case study was seen as one of the best alternatives for the solution of a serious problem regarding an environmental passive existent in the forest sector companies that operate in Rio Branco's Industrial District. These companies have problems to discard the timber biomass residues

generated in their industries.

In relation to the Outputs 3 and 4, the results of each case study were presented and submitted to a technical discussion in three workshops implemented in the main Brazilian Amazon States (Pará, Amazonas and Acre) in 18th to 22th July, 2005. The workshops had a satisfactory number of participants including the involvement of the some target beneficiaries of the project, such as the timber industry and government agencies. The complete list of participants in the workshops is presented in annex.

The main results obtained from the workshops implementation are listed below:

- i. Technical contributions to the improvement of the projects and the results of the case studies;
- ii. Contributions to the formulation of public policies aiming the use of wood residues in the energy generation;
- iii. Facilitation and encouragement of the future development of wood biomass power plants;
- iv. Contributions to the Improvement of the forest based industry efficiency and to the forest management, considering the value added to the wood residues;
- v. Critical analysis of the possibility of wood biomass generation considering industrial and forest management residues.

After the realization and the compilation of the workshop results, a final report was prepared by the project consultants, reaching the output 5. The document contains few recommendations on appropriate policies and measures to promote forest based industrial development linked to sustainable forest management plans, focusing the relation between electricity generation and traditional timber industry production.

As a result of the project discussions (workshop) and dissemination phases, in Rio Branco it is being prepared a project of an energy generation unit to meet local timber industry demand, as well as resolve the environmental liability in the region. The German cooperation has interest in financing the project.

6 – SYNTHESIS OF THE ANALYSIS

Specific Objectives Achievements	(x) Realized () Partly realized () Unrealized
Outputs	(x) Realized () Partly realized () Unrealized
Schedule	() In advance / on time (x) Delayed but not seriously () Seriously delayed

Actual Expenditures

- As planned
- More than 10% above planned
- More than 20% above planned

Potential for Replication

- No Potential
- Modest Potential
- Significant Potential

Potential for scaling-up

- No Potential
- Modest Potential
- Significant Potential

PART III – CONCLUSIONS AND RECOMMENDATIONS

a) Development Lessons

Considering the lessons learned during the project development phase, some aspects were fairly positive for its implementation success:

- The participation of different professionals from several sectors related to energy, wood residues, timber, research, educational and governmental institutions was fundamental to the design of the energy generation case studies aiming to represent all the involved actors;
- The workshops carried out in the cities of Belém, Manaus and Rio Branco, which made possible the participation of a great number of professionals from local institutions, contributing to the quality of the case studies and also to the dissemination of the presented proposes;
- The involvement of educational institutions in the discussions, mainly during the workshops and providing information related to the forest sector and to the existing operating models and prototypes of energy generation;
- The contribution of the energy generation equipment industry, linked to executing initiatives involving energy generation using agricultural and forest biomass, qualifying the work results;
- Other previous similar experiences, such as the experience accumulated by ELETROACRE in wood biomass energy generation trough pilot projects implemented in the cities of Capixaba and Brasiléia in the State of Acre, were important to point out the limitations of this model of energy generation in which the instability of the raw material supply is one of the main restrictions;
- The flexibility of ITTO and ABC was very important to the necessary adjustments of the project, as one of the case studies was transfered to a new reality due to the commitment of all the wood residues in Itacoatiara region. This adjustment made possible to enrich the results of the project as a larger number of case studies was implemented and the biomass assessment was carried out in four regions instead of the two regions foreseen in the original proposal;
- The inclusion of the alto Solimões region added a new reality to the project, as a small energy consumer was involved. The results of this adjustment was important because it can be used by communities and isolated small wood industries
- The contribution of the Secretaria de Desenvolvimento Sustentável do Estado do Amazonas (Amazonas State Sustainable Development Secretary) to search development alternatives of a new case study in substitution to the Itacoatiara region;
- The availability and the interest of the Jari/Orsa group in the development of a case study involving its specific conditions was fundamental to scaling up the project scope and the its results.
- The dissemination phase of the project allowed the discussion with stakeholders, including the encouragement of local solutions as in Rio Branco (under detailment phase and project preparation to be presented for the German cooperation).

Besides the success of the project results, some external aspects that made difficult the realization of the activities during the process may compromise the sustainability of the results achieved. The Brazilian forest sector is actually presenting operational difficulties due to several reasons such as internal administrative issues of the forest

companies, market crisis, legal aspects (dispute for land occupation) and the lowness of control and regulation governmental organizations. The actual insecurity climate created by these reasons reduced the participation of this important actor in the workshops at the conclusion phase of the project.

b) Operational Lessons

Considering the operational lessons learned during the project execution, the following conclusions can be taken:

- The flexibility and the involvement of new actors interested in the project subject allows to extend the project scope;
- The structure and administrative experience of the executing agency as well as its experience in the conduction of this kind of project was fundamental to the solution of the faced problems;
- The experience of the project coordination team and the subcontracted companies was also very important to reach the project expected results and to solve the difficulties appeared during of its execution;
- The realization of mid-term agreements with the Govern of Amazonas state and with Orsa/Jari Group aiming to extend the project scope to two new regions was fundamental to the success execution of the project;
- The fast answers given by ITTO and ABC related to the needs of the project team were very important to the project successful results.

In relation to the project timetable accomplishment, there were delays in the implementation the following phases:

- Biding process for the contracting of the companies responsible to the field assessments and studies for determining the potential biomass utilization and the available technology for energy generation;
- Negotiation for the substitution of the Itacoatiara case study by Alto Solimões;
- Negotiation for the inclusion of the Jari/Orsa case study;
- Release of the third installment of the project financial inputs.

b) Recommendations

- The replication of the project PD 61/99 REV.4(I) trough the implementation of energy generation models based in wood biomass is an excellent alternative to combine sustainable forest management with the substitution of fossil fuels by renewable sources;
- Actions related to the sustainability of the forest production which creates a stable supply of raw material for energy generation are a key factor to the implementation of this kind of energy project. Some previous failures in similar cases were associated to the instability of the fuel supply (wood biomass);
- The participation of governmental institutions is fundamental to the implementation of the cases involving small communities and the isolated energy generation as the case of Alto Solimões;
- The industrial sector operating large sized unities have already the necessary

conditions to the implementation of wood biomass energy generation systems due to the guarantee of energy consumers and available raw material;

- The feasibility of the implementation of the biomass energy generation plants depends of the regulation of industrial and forest wood residues utilization. This regulations is in charge of IBAMA and the National Ministry of Environment;
- The creation of governmental policies to regulate the use of wood residues is fundamental to the feasible implementation of this kind of project. Among the priority actions is the regulation of the wood residues utilization and the definition of possible indexes and quantities to be obtained in the forest harvesting and in the industrial transformation.
- Taking into consideration the discussions during the dissemination phase it is recommended that ITTO participates together with other institutions in the implementation of pilot plants, demonstrating its feasibility in the energy generation based on wood biomass. Emphasis must be given to the initiative of Rio Branco and possibly in Alto Solimões.

ANNEX

Workshop of Rio Branco – List of Participants

NAME	INSTITUTION	FUNCTION
1. Francisco Eulálio A. dos Santos	AGEAC	Diretor Geral
2. Roberto Ferreira dos Santos	ABC/MRE	Técnico em Cooperação
3. Valéria Cristina Rigueira Losito	ABC/MRE	Técnica em Cooperação
4. Ivana Guerreiro Lima	Amigos da Terra	Colaboradora Acre / Rondônia
5. Ana Paula Maia Jansen	UFAC – AGB	Vice-Diretora
6. Roberto Goulart Lopes	UFV	Coord. Curso de Arquitetura
7. Jô Luis A. Fonseca	ANAC	Gerente
8. Mayara Machado	Madeira Nova Canaã	Empresária
9. Agenor Gerônimo de Souza	SESE PP	Assistente Jurídico
10. Edson José de O. Freire	Guascor do Brasil Ltda.	
11. Aguiar Mendes Ferreira	FUNPAR	Consultor
12. Jorcely Gonçalves Barroso	UFAC	
13. Alexandre de Souza Tostes	SEPLANDS	Assessor de Projetos
14. Celso Santos Matheus	ELETROACRE	Diretor Técnico
15. Dennys C. Senna	ELETROACRE	Engenheiro
16. Ivana Guerreiro Lima	Amigos da Terra	Colaboradora Acre / Rondônia
17. Elenice Nadvorny Nascimento		Eng. Florestal
18. Mirian Albino de Oliveira	AGRESERV	Empresária
19. Sílvio Luiz Lopes Guedes	SEF	Gerente – Políticas
20. Débora Delgado França	WR	Turismóloga
21. Alberto Fernandes Rodrigues	MME	Coord. Prog. Luz para Todos
22. João S. Flores da Silva	AGEAC	Gerente
23. Olivar Pinto Mesquita	Guascor do Brasil Ltda.	Gerente Geral
24. Moisés Silveira Lobão	UFAC	Professor
25. Mário Sérgio Longin de Oliveira	Sec. Ext. e Prod. Familiar	Gerente de Extrativismo
26. André Gomes da Silva	IMAC-GEMAF	Gerente de Manejo Florestal
27. Sebastião Osório dos Santos	IMAC	Coop. Téc. Manejo Florestal
28. Edilson Marques da Silva	Esc. Manejo – IMAC/IBAMA	Engenheiro Florestal
29. Ana Paula Gomes da Silva	IMAC	Analista Ambiental
30. José Roberto V. Soares	Esc. Manejo Florestal – SEF	Engenheiro Florestal
31. Jânio Cândido Português	SEF	Engenheiro Florestal
32. Zenóbio Abel G. P. Gama e Silva	FUNTAC	Pesq. Economia Florestal
33. Adelaide Fátima de Oliveira	ASIMMANEJO	Presidente
34. Solange Chalub B. Teixeira	CETEMM/SENAI-DR	Diretora
35. Lidiane Magalhães Ferreira	SEBRAE	Analista Setorial
36. Ana Paula Maia Jansen	UFAC – AGB	Vice-Diretora
37. Cassiano Marques de Oliveira	SEBRAE/AC	Diretor Superintendente
38. Rosângela de Oliveira	SEMA / IMAC	Coordenadora do PGAI/AC
39. Rosana Cavalcante dos Santos	SEMA/IMAC	Coord. Resíduos Sólidos
40. Estêvão do Prado Braga	WWF	Téc. Desenv. de Mercados
41. Marcus Vinícius Neves de Oliveira	EMBRAPA	Chefe da Embrapa Acre

Workshop of Manaus – List of Participants

NAME	INSTITUTION	FUNCTION
1. Leonor Cristina Silva Souza	GREENPEACE	Voluntária
2. Gilson dos Santos	Agência de Florestas	Eng. Florestal
3. Roberto Ferreira dos Santos	ABC/MRE	Técnico em Cooperação
4. Valéria Cristina Rigueira Losito	ABC/MRE	Técnica em Cooperação
5. João Heitor Faraco Jr.	Agência de Florestas	Eng. Florestal
6. Mariano Colini Cenamo	CEPEA – ESALQ/USP	Pesquisador
7. Elisandra Campos Assunção	Agência de Florestas	Estagiária DPM
8. Suely D'Araújo	SEMULSP	Sub-Secretária
9. Jônatas D'Araújo	SEMULSP	Assessor
10. Joésio D. P. Siqueira	FUNPAR	Consultor
11. Malvino Salvador	Agência de Florestas	Presidente
12. Morgana Aguiar	Agência de Florestas	Eng. Florestal
13. Sérgio Gonçalves	Agência de Florestas	Eng. Florestal
14. Aguiar M. Ferreira	FUNPAR	Consultor
15. Cintia R. Souza	EMBRAPA	Pesquisadora
16. Fernando C. Lucas Filho	UFAM/CIDE	Pesquisador
17. Jardel A. A. Louzeiro	Agência de Florestas	Assessor I
18. Marcel da C. Hummel	Agência de Florestas	Estagiário
19. Jorge Luis G. Teixeira	FIEAM/CIEAM	Diretor/Consultor
20. Elenice N. Nascimento	FUNPAR	Eng. Florestal
21. Hans Peter	Sustainable Forestry	Empresário
22. Cláudio P. Machado	SUFRAMA	Servidor Público
23. Débora Delgado França	UP GRADE	Turismologa
24. Sávio Mendonça	SDS	Secretário de Recursos Hídricos
25. Frank Lopes Pereira	ACERIM	Empresário
26. José Luiz Chielle	FUNPAR	Consultor
27. Moisés Israel	FIEAM	Empresário
28. Nabor da Silveira Pio	UFAM	Professor
29. Raimar Aguiar	FIEAM/SICLAM	Presidente do Sindicato
30. Eduardo Coutinho da Cruz	UFAM.	Professor

Workshop of Belém – List of Participants

NAME	INSTITUTION	FUNCTION
1. Augusto César de Mendonça Brasil	UFPA	Professor
2. Evaristo Terezo	AIMEX	Consultor
3. Marcos Paulo Mamoré Fernandes	COSIPAR	Eng. Florestal
4. José Luiz Chielli	FUNPAR	Assessor Técnico
5. Carlos Fernando Guedelha Leão	USIPAR/BAC.	Coord. de Carvão e Suprimentos
6. Inês Graciette Leal	JURUÁ FLORESTAL	Gerente Administrativa
7. Luiz Carlos Fensterseifer	BORDEN QUÍMICA	Representante Comercial
8. Valéria Cristina Rigueira Losito	ABC/MRE	Técnica em Cooperação
9. Roberto Ferreira dos Santos	ABC/MRE	Técnico em Cooperação
10. Thais Yuri R. Nagaishi	UFRA	Estudante
11. Suelo Numazawa	UFRA	Prof. Chefe L. Prod. Florestais
12. Joésio Deoclécio Pierin Siqueira	FUNPAR	Consultor
13. Marco Lentini	IMAZON	Pesquisador
14. Ilana Gorayeb	PFCA	Advogada
15. Elenice Nadvorny Nascimento		Eng. Florestal
16. Maria Janete de S. Ribeiro		Eng. Florestal
17. Débora Delgado França	WR	
18. Adriana Alice da S. Ribeiro	PMB	Eng. Florestal
19. Vanise Barbosa de Almeida		Eng. Florestal
20. Leonardo M. Sobral	CIKEL	Gerente de Meio Ambiente
21. José Osvaldo O. de Barros	Sindicato Rural de Cametá	Secretário
22. Francisca Lúcia Porpino Telles	SECTAM	Diretora DMA/Eng. Química
23. Aguiar Mendes Ferreira	FUNPAR	Consultor Projeto PD 61/99
24. Justiniano de Queiroz Neto	AIMEX	Diretor Executivo
25. Crisomar Lobato	SECTAM/ZEE	Eng. Florestal – ZEE/SECTAM
26. Luiz Pinto Oliveira	SECTAM	Secretário Adjunto
27. Margarida F. Azevedo	MCM Consult	Sócia Gerente
28. Sérgio Augusto	SECTAM - DMA	Eng. Florestal
29. Carlos Victor Pereira Leitão	UFRA	Estudante
30. Joilson Roberto G Silva	UFRA	Estudante
31. Jessé Luís Padilha	UFPA	Estudante
32. Genésio Batista Feitosa	UFPA	Estudante