INTERNATIONAL TROPICAL TIMBER ORGANIZATION

ITTO

PROJECT PROPOSAL

TITLE:	GUATEMALAN FOREST PRODUCTIVITY INFORMATION SYSTEM
SERIAL NUMBER:	PD 495/08 Rev.4 (F)
COMMITTEE:	REFORESTATION AND FOREST MANAGEMENT
SUBMITTED BY:	GOVERNMENT OF GUATEMALA
ORIGINAL LANGUAGE:	SPANISH

SUMMARY

This project document contains a proposal entitled: “Guatemalan Forest Productivity Information System”. For many years, various forest sector stakeholders have attempted to generate information on forest growth, sites and productivity in the country. However, these efforts have been limited due to institutional, technical and financial constraints.

This project responds to the need to generate information on natural forest and forest plantation productivity so as to provide data to support best practices for sustainable forest management planning and implementation, increase forest productivity and thus enhance the value of forestry activities, which will in turn lead to lower deforestation rates and reduced environmental vulnerability.

The project seeks to develop technological packages for major forest species based on the establishment of networks of permanent sample plots at the national level. It envisages broad-based dissemination, awareness and training processes, as well as a cross-cutting approach with major stakeholders, including the academic sector (universities and secondary education centres in the forestry field), the private sector (forest owners and communities) and the government sector (national forest administration agencies).

EXECUTING AGENCY:	NATIONAL FOREST INSTITUTE – INAB	
COLLABORATING AGENCIES:	--	
DURATION:	36 MONTHS	
APPROXIMATE STARTING DATE:	UPON APPROVAL	
BUDGET AND PROPOSED SOURCES OF FINANCE:	**Source**	**Contribution in US$**
	ITTO	**492,588**
	Gov’t of Guatemala	116,410
	TOTAL	**608,998**

TABLE OF CONTENTS

ACRONYMS

ACOFOP	Asociación de Comunidades Forestales del Petén (*Forest Communities Association of Peten*)
AGROCYT	Fondo Competitivo de Desarrollo Tecnológico Agroalimentario (*Competitive Fund for Agro-Food Technological Development)*
CONAP	Consejo Nacional de Áreas Protegidas (*National Council for Protected Areas*)
CONCYT	Consejo Nacional de Ciencia y Tecnología (*National Council for Science and Technology)*
DIGEBOS	Dirección General de Bosques y Vida Silvestre (*General Forest and Wildlife Directorate)*
DIGI	Dirección General de Investigación (*General Directorate for Research)*
ENCA	Escuela Nacional Central de Agricultura (*National Central School of Agriculture)*
ESTEFFOR	Escuela Técnica de Formación Forestal (*Technical Forest Training School)*
FMP	Forest Management Plan
HDI	Human Development Index
IARNA	Instituto de Ambiente y Recursos Naturales (*Institute for the Environment and Natural Resources)*
IIA	Instituto de Investigaciones Agronómicas (*Agricultural Research Institute)*
INAB	Instituto Nacional de Boques *(National Forest Institute)*
INAFOR	Instituto Nacional Forestal (*National Forestry Institute)*
ITERN	Instituto Técnico en Recursos Naturales (*Technical Institute for Natural Resources)*
ITTO	International Tropical Timber Organization
MIRASILV	Manejo de Información sobre Recursos Arbóreos en el Componente de Silvicultura *(Information Management for Tree Resources in the Silvicultural Component)*
NGO	Non-Government Organization
PFN	Programa Forestal Nacional (*National Forestry Programme)*
PINFIN	Programa de Incentivos Fiscales (*Fiscal Incentives Programme)*
PINFOR	Programa de Incentivos Forestales (*Forest Incentives Programme)*
PROCAFOR	Programa Regional Forestal de Centroamérica *(Regional Forestry Programme for Central America)*
PSP	Permanent Sample Plot
SEF	Sistema de Educación Forestal *(Forest Education System)*
SEMAFOR	Sistema para la Evaluación, Monitoreo y Análisis Forestal *(Forest Analysis, Monitoring and Evaluation System)*
SIFGUA	Sistema de Información Forestal de Guatemala *(Guatemalan Forest Information System)*
URL	Universidad Rafael Landívar *(Rafael Landívar University)*
USAC	Universidad de San Carlos de Guatemala *(University of San Carlos de Guatemala)*
UVG	Universidad del Valle de Guatemala *(University of Valle de Guatemala)*

PART I: PROJECT RELEVANCE, CONTEXT AND IMPACT

1.1 RELEVANCE

1.1.1 Relevance to ITTO

The project 'Guatemalan Forest Productivity Information System' will promote the generation of information for national forest development. Various national forest sector stakeholders, such as the academic, private and government sectors, will be the beneficiaries of this project. Its main objective is to improve forest management and promote the efficient utilisation of better quality timber through forest management planning and implementation, while contributing to the formulation of national forest policies aimed at the sustainable utilisation and conservation of timber producing forests and their genetic resources.

The project is consistent with the following objectives and goals of ITTO:

a. To contribute to the process of sustainable development;
b. 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;
c. To encourage members to support and develop industrial tropical timber reforestation and forest management activities as well as rehabilitation of degraded forest land, with due regard for the interests of local communities dependent on forest resources;
d. To encourage members to develop national policies aimed at sustainable utilization and conservation of timber producing forests and their genetic resources and at maintaining the ecological balance in the regions concerned, in the context of tropical timber trade.

Thus, the project is consistent with the following goals and actions established in the area of reforestation and forest management:[1]

GOAL 1: Support activities to secure the tropical timber resource base

Actions

1. Support the effective enforcement of forest laws and regulations that ensure sustainable forest management and secure the production base.

2. Promote the conservation, rehabilitation and sustainable management of threatened forest ecosystems, inter alia mangroves[2], in collaboration with relevant organizations.

3. Review the current situation regarding any undocumented forestry activities relating to the objectives of the Organization.

4. Encourage members and assist them, where appropriate, to:

    - Assess the current and potential productivity of major tropical forest types, taking into account the need to promote future growth and effective regeneration;
    - Incorporate operational knowledge of forest ecosystem behaviour in planning and management prescriptions.

[1] ITTO Yokohama Action Plan 2002-2006. ITTO.

[2] In addition to their ecological and socio-economic importance, mangrove forests provide timber and timber-related products that are internationally traded. ITTO has been actively involved with international initiatives relating to mangroves and may support projects which enhance the sustainable management of mangrove forests within the scope of the ITTA.

GOAL 2: Promote sustainable management of tropical forest resources

Actions

1. Promote the implementation of sustainable forest harvesting, including RIL.

2. Monitor and assess the environmental, social and economic costs and benefits of forest plantation development and utilize that information to promote, where appropriate, new plantations within the ITTO Guidelines for the Establishment and Sustainable Management of Planted Tropical Forests.

3. Encourage members and assist them, where appropriate, to:

    - Implement forest inventories and determine the sustainable yield capacity of each forest management unit through the application of appropriate resource assessment methods and incorporate these into forest management plans;
    - Improve the formulation and implementation of plans for sustainable forest management, with particular emphasis on harvesting limits;
    - Implement appropriate forest harvesting, including RIL, as a component of sustainable forest management;
    - Improve the productive capacity of natural forests, where appropriate, through intensified silvicultural practices, better utilization of lesser-used species, the promotion of non-timber forest products, guided natural regeneration, enrichment planting and reforestation;
    - Implement research and development activities in the management of secondary tropical forests, restoration of degraded tropical forests and rehabilitation of degraded forest land, taking into consideration ITTO guidelines;
    - Promote and support research in forest dynamics (growth and yield studies) in different forest types and under various management schemes;
    - Strengthen training institutions and intensify training of forestry personnel and other stakeholders in silviculture, RIL and resource assessment, and in the management of both natural forests and timber plantations.

Specifically, the project will contribute to the following:

- An information generation system based on a network of permanent forest sample plots.
- Development of at least 12 forest technological packages.
- Implementation of a SIFGUA-linked dissemination and promotion strategy.
- Capacity-building for adequate system operation.

1.1.2 Relevance to Guatemala

This project will significantly contribute to the enforcement of the Guatemalan Forest Policy, which is based on the principles of sustainability in the use of forest resources, production competitiveness and strategic information monitoring and management, among others, with a view to contributing to increased competitiveness in the forest sector through information systems, improved productivity, search for forest product markets, and promotion of forest-industry integration, ensuring the demand for forest products.

Specifically, the project will contribute to the development of policy guidelines such as promotion of natural forest management for production purposes, promotion of plantation forestry and contribution to the search for and use of markets and forest product designs, through the implementation of a technical information system on forest productivity in Guatemala, the establishment of a network of permanent sample plots (PSP), and the development and dissemination of technological packages on at least 12 forest species.

If this information system were not to be developed, poor management practices would be perpetuated, which would lead to the underutilisation of forest resources, even in forests under management plans, due to the lack of information to technically support forest activities. As a result, forest products would be undervalued, deforestation rates would increase and the environment would become more vulnerable in both the country and the Central American region.

1.2 CONTEXT

1.2.1 Social and economic context

The main indicators that define the socioeconomic context of the project area are the following[3]:

- There has been an upward trend in population growth. In 1994, the national population census estimated a total population of 8,331,874, which amounts to an estimated density of 77 inhabitants per km^2. However, the 2002 census estimated the total population to be 11,237,196, which amounts to an estimated population density of 103 inhabitants per km^2. Based on this latest census, the population density for 2005 was projected at 117 inhabitants per km^2. It is estimated that the population growth rate for the period 2005-2015 will be 2.4%

- The HDI (Human Development Index) of Guatemala has been relatively stable. It has gone up from 0.634 in 2000 to 0.689 in 2005 and Guatemala is currently rated 118 out of a list of 177 countries, below all other Central American nations. The HDI is higher in urban areas than in rural areas and is also higher among non-indigenous groups than among indigenous communities.

- The human poverty index classifies Guatemala as number 54 out of a list of 108 countries. In general terms, extreme poverty levels rose from 15.7% in 2000 to 21.5% in 2004, while the income distribution went from a Gini index of 55.5 in 2000 to 55.1 in 2007. These figures show that there has been an increase in poverty levels as well as a slight increase in the inequality gap in the country.

- With regard to employment by economic activity, the two main activities of the population continue to be agricultural activities (39%) and services (38%).

- Regarding literacy rates, it was estimated that in 2000 the literacy rate of the national population was 67.8% with this figure increasing in 2004 to about 73%. There are still serious gender gaps as well as differences between rural and urban areas. The literacy rate among men has been stable with slight reductions, while the rate among women has slowly increased, with better results reported for women living in rural areas.

Despite the progress made in the political and social stability that the country now enjoys, the poverty situation prevailing in Guatemala is not very encouraging and is the cause of increasing and sustained inequalities. Furthermore, the considerable levels of illiteracy and low levels of schooling that prevail in the country should also be included in this scenario, together with the population's very limited access to basic services.

1.2.2 Environmental context

Guatemala has a total land area of 108,889 km^2. More than a third of the national territory is under forest cover[4] (**3.86 million ha**) and **approximately** half of the total forest cover is found in Petén (**49.7%).** Although broadleaved forests[5] (3.3 million ha) account for approximately 85% of the total forest cover, it is estimated that only 30% of the total timber processed by the forest industry in Guatemala derives from broadleaved species and 70% is sourced from coniferous forests (PAFG, 2003).

Since 1976 Guatemala has been promoting the establishment of plantations through different programs and/or projects. As a result of these programs, designed and implemented by different institutions such as INAFOR (1974 – 1988), DIGEBOS (1988 – 1997), and INAB since 1997, it is estimated that over a period of **35 years**, about **131,500 hectares** have been planted, without including rubber tree (*Hevea brasilensis*) plantations, which account for more than 50,000 hectares.

The Fiscal Incentives Program (Programa de Incentivos Forestales – PINFIN) has been the longest running program, having been operational for more than 20 years. However, only a total of about 20,000 hectares was planted through this Program in clear contrast with the achievements of the current PINFOR program, which in its first five years of existence has surpassed all that was achieved by earlier programs, thus demonstrating the effectiveness of this policy instrument. Over a period of **13 years (1998 – 2010)** PINFOR has managed to establish more than **102,000 hectares** of forest plantations, doubling the annual rate achieved by previous reforestation programs.

[3] Human Development report 2007-2008. UNDP
[4] Based on an analysis of the **2006** forest cover map.
[5] Mixed broadleaved forests (coniferous + broadleaved), broadleaved species-crops associations.

The national forest cover is made up of two major components that are under the responsibility of the Government of Guatemala, i.e. forest areas outside protected areas which are under the direct responsibility of INAB, accounting for **47.46%** of the total forest cover and covering an area of **1,835,384 hectares**, and the Guatemalan Protected Areas System (Sistema Guatemalteco de Areas Protegidas – SIGAP), currently covering **52.54%** of forest areas, **or a total of 2,032,215 hectares**, which are administered by CONAP.

These components can also be influenced by changes to social or environmental factors, which in the short term can generate modifications to activities related to the establishment of forest plantations or can channel plantation establishment activities to other fields of endeavour. For example, if the establishment of plantations becomes a viable option for projects related to carbon sequestration, this activity can create greater interest in other sectors (coffee growers, sugar growers, etc.) as a result of the additional benefits that can be obtained through the sale of carbon credits. Another option could be the development of national environmental services markets linked to the water-forest relationship.

1.3 INTENDED SITUATION AFTER PROJECT COMPLETION

After project completion, a technical information system based on permanent sample plots will have been established. After being systematized and disseminated in technological packages, this system will provide information on the productivity of Guatemalan forests. In turn, this information will be used to support decision-making in the planning and sustainable forest management implementation processes.

Capacities will have been built for the sound functioning of the system and thus, users will have witnessed a change of attitude with regard to a spontaneous interest in generating information to technically support forest management plans, which will eventually translate into better management practices, improved income levels, and conservation of resources.

The national forest service, represented by INAB and CONAP, will have better technical-scientific information available to formulate forest policies and forest management plans, and to define sustainability criteria and indicators. Furthermore, it will have access to an alternative system for forest cover monitoring.

The universities and secondary education centres involved in the forestry field will have accomplished their role as intermediaries between science and society and on a more concrete level, will have access to forest teaching, extension and research facilities. Once the aforementioned impacts are achieved, it will be possible to affirm that the project will have had a positive impact on deforestation and environmental vulnerability.

1.4 IMPACTS

1.4.1 Social and economic impacts

The information system on the productivity of Guatemalan forests will indirectly improve forest planning and the implementation of forest management activities. This will in turn reduce the pressure exerted on forest resources and will thus contribute to maintaining the forest cover that generates environmental services that benefit society in general and will improve the quality of end-products produced by forests under sustainable management.

With regard to the economic impact of the project, the results of the implementation of an information system will be positive in terms of economic profitability. The project will contribute to the implementation of forest management practices suitable to the specific conditions of Guatemalan forests and plantations, which will generate higher value-added products.

The costs of establishing permanent sample plots and analyzing the information collected, which are the main tools used for the implementation of this system, are relatively low and can be afforded even by any forest owner.

The above activities will be possible when the information generated through the permanent plots is systematized and reliable technological packets are available on the development and productivity of Guatemalan forests, thus facilitating the reorientation of the planning and implementation of sustainable forest management in the country.

PART II: PROJECT IDENTIFICATION PROCESS

2.1 ORIGIN

At the sectoral level, the efforts to generate forest information so as to establish a sound basis for sustainable forest management planning and interpretation have been disperse.

Several efforts have been made in Guatemala to establish a forest information system to assess the dynamics of different forest associations and improve silvicultural practices, in both plantations and natural forests. These efforts have been isolated both institutionally and geographically.

From 1995 to 2005, the Regional Forest Programme for Central America – PROCAFOR, through Project 7 on Sustained Management and Utilization of Natural Coniferous Forests in Guatemala, after recognising that the forest information generated by thesis studies was of restricted validity, promoted the establishment and monitoring of a network of PSPs in natural coniferous forests. The support provided included budget allocations for the partial funding of research work carried out by students for the preparation of degree theses and technical assistance in project formulation, data collection and information processing, using existing mechanisms and structures already in place at universities and education centres related to the forestry field, as well as conclusion of technical cooperation agreements between relevant institutions. Thus, a total of 108 permanent sample plots have been established to date under this program, and out of this total, 56 have been monitored. These plots are located in various regions of the country and have been established following a prioritization of areas and taking into account the support and availability of university centers, which have assigned students who have been working on these issues with the financial and technical support of INAB.

With regard to broadleaved forests, several efforts were made from 1996 to 2000 to establish permanent sample plots, particularly in northern Guatemala (Department of Petén), including through initiatives undertaken by CATIE/OLAFO (Conservation Program for Sustainable Regional Development), CATIE/CUDEP, CATIE/NPV, ProPetén and Centro Maya. Through these efforts, a number of permanent plots were established in areas with the highest species representativeness and where the local communities and/or landowners were willing to cooperate. However, this work was abandoned for a while and the sample plots were never monitored, to the point that several of these experimental units were eventually lost. In 2005-2007, INAB and CONCYT, through the AGROCYT financial mechanism, implemented a research project to reactivate the network of permanent sample plots in this type of forests, which led to the establishment and restoration of some plots. To date, 59 out of a total of 120 plots have been recovered in this forest type.

At the plantation level, some reforestation companies have recorded data from their own plantations since around 1995. However, the information collected has never been made available to the forest sector and these efforts have not been very significant.

At the institutional level, after the launching of the Forest Incentives Programme (1997-1998), it became clear that there was a need to implement a monitoring and evaluation system through the establishment of permanent sample plots to assess and document plantation development. Thus, a cooperation and technical assistance agreement was signed in 2003 between INAB and CATIE. According to this agreement, support will be provided to INAB over a period of 3 years (2003-2005) for the establishment of a permanent sample plot network. At the beginning, the idea was to establish permanent sample plots in all reforestation projects supported by the Forest Incentives Programme. However, as the work progressed, it became evident that due to the lack of financial and technical support, this would not be possible. Therefore, species and areas were prioritized in the oldest plantations.

Furthermore, in 2007 a decision was made to include Article 32 of the PINFOR Regulations, which stipulates that reforestation project owners, with areas of 45 hectares or more, should establish and maintain permanent sample plots from the third year onwards; these regulations were updated in 2010, through Resolution No. JD.01.35.2010 of 27 December 2010 and the requirements under Article 32 were moved to Article 33. Thus, out of a total of 940 plots established in plantations, **560** permanent sample plots are currently being monitored at the national level. These PSPs allow for the collection of data on 31 forest species **with up to 8 types of measurements taken in some plots.**

Table 1. Number of permanent sample plots established and under monitoring by forest type

Forest Type	No. of plots established	No. of plots under monitoring
Natural coniferous forest	108	56
Natural broadleaved forest	120	59
Plantations	940	**560**
TOTAL	**1,168**	**675**

As can be seen in Table 1 above, out of the 1,168 permanent sample plots established, **675** are being monitored. These plots have been prioritized in terms of areas, species and age, taking into account the institutional and private support available to ensure their sustainability. No statistical analysis has been conducted to date in order to assess the size of the sample area and its adequacy. Neither has a statistical design been developed for the distribution of plots. Therefore, one of the first activities to be carried out in this project (1st year of implementation) is a consultancy study for the statistical assessment of the quantity and distribution of permanent plots so as to determine the need to expand or reduce the size of the sample area and redirect the distribution of permanent sample plots as appropriate.

The permanent sample plot network in plantations is currently better consolidated than the natural forest plot network. At present, **560** permanent sample plots located in different regions of Guatemala are being monitored, including the assessment of 31 species in pure plantations and 21 species in mixed plantations (with different species associations).

In January 2009, INAB published a technical report prepared by J. Cojom, showing preliminary growth results derived from the analysis of data taken from 633 permanent sample plots, as the behaviour of species should be assessed on the basis of a full harvesting cycle so sound scientific and technical results can only be generated over a period of at least 10 years. At present, the maximum number of consecutive measurements in permanent sample plots is five.

The aforementioned report also shows average data for age, diameter at breast height (DBH), total height, volume (m^3/ha), mean annual increment (MAI in DBH, height and volume), current annual increment (CAI in volume) and site index category for the following species:

No.	Technical name	Common name
1	*Abies guatemalensis*	Pinabete o pachac
2	*Acrocarpus fraxinifolius*	Cedro rosado o Mundani
3	*Alnus jorullensis*	Aliso
4	*Azadirachta indica*	Nim, Neem
5	*Caesalpinia velutina*	Aripin, Malinche
6	*Calophyllum brasiliense*	Santa María
7	*Casuarina equisetifolia*	Casuarina
8	*Cassia siamea*	Cassia de flor amarilla
9	*Cedrela odorata*	Cedro
10	*Tabebuia donnell smithii*	Palo blanco
11	*Cupressus lusitánica*	Cipres común
12	*Enterolobium cyclocarpum*	Conacaste, Guanacaste
13	*Gmelina arborea*	Melina
14	*Gravilea robusta*	Gravilea
15	*Guazuma ulmifolia*	Caulote
16	*Nectandra especie*	Aguacatillo
17	*Pinus ayacahuite*	Pino blanco
18	*Pinus caribaea var. Hondurensis*	Pino caribe, Pino del Petén
19	*Pinus maximinoii*	Pino candelillo
20	*Pinus oocarpa*	Pino de ocote
21	*Pinus pátula*	Pino pátula o candelabro
22	*Pinus pseudostrobus*	Pino triste
23	*Pinus rudis*	Pino de las cumbres
24	*Pinus tecunumani*	Pino de la Sierra

25	*Pterocarpus macrocarpus*	Sangre
26	*Sickingia salvadorensis*	Puntero
27	*Swietenia macrophylla*	Caoba
28	*Tabebuia rosea*	Matilisguate
29	*Tectona grandis*	Teca
30	*Terminalia oblonga*	Volador
31	*Vochysia guatemalensis*	San Juan

This analysis revealed the areas where individual species showed better or worse initial growth. It should be pointed out that for each species, a distinction was made between plantations with and without silvicultural management, with the main indicator being density reduction as a result of thinning.

Site index charts were presented for plantations showing better and worse development and species for which a calculation model was available. This allowed for a comparison between plantations, taking into account that site index is a reflection of site quality influenced by the implementation of forest management practices or lack thereof.

In addition, the study included curve charts showing growth dynamics data collected from consecutive measurements of DBH, height and volume/ha in the permanent sample plots under study, with up to 5 consecutive measurements in some cases. Plantation quality was assessed through the allocation of codes to describe stem form and defects as well as health status. The report included code analyses and summaries for each species, which can be used as a tool for the development and implementation of pruning and thinning schedules.

Another variable studied was forest management, characterized mainly by the implementation of thinning practices. The analysis also included comparisons between plantations with and without thinning for the same species and age in areas for which this information was available.

With regard to natural forests (both coniferous and broadleaved forests), measurements have been taken in 56 permanent sample plots in coniferous forests and 59 plots in broadleaved forests, but this information has not yet been processed so no results are available on the evaluations conducted. **However, CONAP is implementing an initiative aimed at the establishment of an office to monitor the plots established in natural broadleaved forests and Protected Areas, specifically in the Multiple Use Zones of these areas.**

In 2004, INAB recognised the significance of all these forest research efforts and agreed to adopt a 'system' approach for the three permanent sample plot networks. Thus, a PSP System Institutionalisation Council was established through Management Agreement No. 97-2004. The objective of this Council is to formulate and follow up a project to ensure the continuity and integration of the three PSP networks.

The above gave rise to a more ambitious project concept – an information system on forest productivity in Guatemala.

2.2 STAKEHOLDERS

2.2.1 Stakeholder identification and analysis

On the basis of the formulation and analysis of a problem tree, the following project stakeholders were identified: the government sector, the academic sector, the private sector, forest planners and donor agencies.

The government sector, represented by the National Forest Institute (INAB) and the National Council for Protected Areas (CONAP) through their technical units and regional and sub-regional directorates.

The academic sector, represented by secondary education centres and national universities with forestry courses, such as the University of San Carlos of Guatemala - USAC (related faculties and regional centres), University of Valle de Guatemala -UVG, Rafael Landívar University - URL, National Central School of Agriculture (ENCA), Technical Forest Training School (ESTEFFOR), Technical Institute for Natural Resources (ITERN); Forest Education System (SEF) and forest research institutes and centres such as the Institute for Agricultural Research (IIA) and the General Directorate for Research (DIGI) of USAC and the Institute for the Environment and Natural Resources (IARNA) of URL.

The private sector, represented by forest owners, both individually and collectively (associations, municipalities, local organized communities and cooperatives); forest organizations such as the Forestry Society (Gremial Forestal), the Forest Communities Association of Peten (ACOFOP) and the Consensus-Building Roundtables. Also, forest stewards, represented by the formulators and executors of forest management plans operating at the national level in an organized and independent manner.

The different stakeholders were duly consulted through workshops, meetings and interviews. The following matrix shows the results of these consultations.

Stakeholder inputs and actions matrix

Stakeholder	Policy	Financing	Activities	Access	Monitoring
INAB	▪ Implements National Forest Policy outside protected areas.	▪ Contributes to the implementation of the project.	▪ Provides technical assistance. ▪ Provides human and logistic resources. ▪ Disseminates the project.	▪ Facilitates contacts with other stakeholders (private sector and forest stewards).	▪ Participates in the Project Advisory Committee.
CONAP	▪ Implements National Forest Policy inside protected areas.		▪ Supports information dissemination and transfer processes.	▪ Facilitates contacts with other stakeholders (forest concessions and forest organizations in PAs).	▪ Participates in the Project Advisory Committee.
Universities and secondary education centres	▪ Responsible for forest academic training, research and extension.	▪ Contribute to the implementation of the project.	▪ Support the establishment and monitoring of the PSPs. ▪ Support the development of technological packages. ▪ Support the information dissemination and transfer processes. ▪ Provide human and logistic resources.	▪ Provide sites/venues for training events.	▪ Monitor their own commitments. ▪ Participate in the Project Advisory Committee.

Stakeholder	Policy	Financing	Activities	Access	Monitoring
Forest owners (organized local communities)			▪ Authorize and participate in the establishment and monitoring of PSPs. ▪ Protect forests from natural and human threats (forest fires, forest pests and illegal logging). ▪ Participate in awareness raising courses	▪ Allows access to forests. ▪ Provide sites for training events and awareness campaigns.	▪ Participate in the Project Advisory Committee. ▪ Sign agreements that provide for the monitoring of the information system.
Forest Stewards		▪ Pay the fees for participation in training courses.	▪ Support the establishment and monitoring of the PSPs. ▪ Transfer of information.	▪ Act as intermediary between forest owners and other project stakeholders.	▪ Monitor their own commitments.
Donor agencies		▪ Contribute to project financing.			▪ Ongoing project support.

2.2.2 Stakeholder involvement

In general terms, it was possible to ascertain that stakeholders recognise the need to implement the project. Convinced of this fact, they provided valuable inputs about their activities and responsibilities in the project, achieving at the same time a very positive level of consensus.

The project has been mainly formulated by personnel from INAB and from the Forest Education System (SEF), the organization that represents universities, secondary education centres and the Forestry Society (Gremial Forestal). Other stakeholders have indirectly participated in the formulation of the project by providing inputs during meetings, training courses, interviews and workshops.

Both CONAP and the representatives of forest owners and forest stewards showed support for the implementation of the project. They recognized the importance of expected outputs in ensuring better planning and improved implementation of sustainable forest management practices.

2.3 PROBLEM ANALYSIS

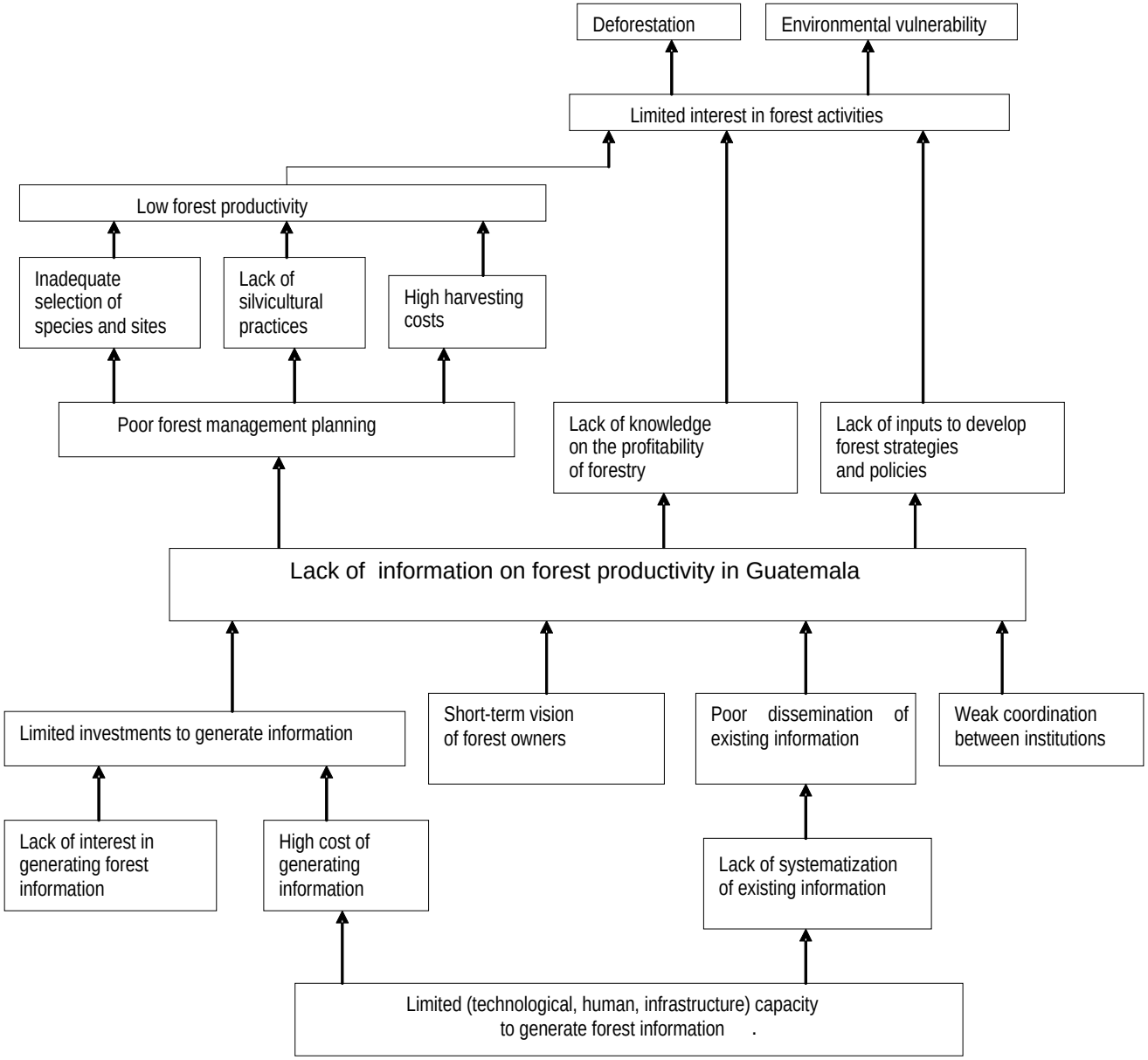
The general lack of capacities in Guatemala to generate forest information, together with the lack of interest, the short-term vision of forest owners and the weak coordination that exists between research institutions, are the main causes that have prevented to date the generation of basic forest information.

“The lack of an information system on forest productivity in Guatemala limits planning and sustainable forest management implementation activities. This leads to low forest productivity and undervaluation of forest resources, resulting in deforestation and increasing national and regional environmental vulnerability”.

In view of this, the permanent sample plots constitute essential tools in the identification and scientific analysis of the variables that define growth dynamics and forest productivity. Thus, a network of PSPs will contribute to the integration of an information system on forest productivity in Guatemala, making this information available to the different stakeholders of the sector.

The above discussion is depicted in the following flow chart.

PROBLEM TREE CHART



2.4 TECHNICAL AND SCIENTIFIC ASPECTS

The project will primarily promote research on the growth dynamics of trees and forest stands with a view to identifying good sustainable management practices in harmony with the environment.

The project will gather data and analyse major forestry variables in order to make projections on growth patterns, models, and responses to silvicultural treatments. A database will be established that will be made available to the public through the SIGFUA project, with the support of a Geographic Information System.

Measurements should be taken on an annual basis. Technically, these measurements must be taken after a given forest growth period. In Guatemala, this growth period is in winter, between the months of May and October, and therefore measurements should be taken in the months directly following this period, i.e. from October to December.

The main variables to be measured in both plantations and natural coniferous forests are as follows: diameter (taken at a height of 1.3 meters) and total height. These measurements should be recorded in millimetres and decimetres respectively. As an additional item, data should also be compiled on stem forms and the phytosanitary status of trees.

Stem form and defects codes include the following:

1 = foxtail	A = recoverable broken stem
2 = slightly twisted	B = non-recoverable broken stem
3 = very twisted	C = without crown
4 = warped base	D = replant
5 = biforked	E = rare species
6 = leaning	F = coppice
7 = diseased	G = thinning
8 = pests	H = natural regeneration
9 = asymmetrical crown	I = dominant
	J = co-dominant
	K = suppressed
	L = straight stems with no form defects

Phytosanitary status codes include:
A: vigorous
B: standing dead tree
C: fallen dead tree

Affected Part:
D: main stem affected
E: higher branches affected
F: stem and branches affected

Dead crown:
G: less than one third of the crown dead
H: from one to two thirds of crown dead
I: more than two thirds of crown dead

In addition to the aforementioned variables, data will be compiled from natural broadleaved forests on commercial height of trees, position and shape of crowns, presence of vines and regeneration sampling to determine the density and current status of regeneration. The following bio-physical variables will also be considered:

a) Site index;
b) Physiographic variables:
    i. Altitude;
    ii. Slope;
    iii. Topography;
    iv. Surface stone content;

v. Susceptibility to flooding;

c) Climatic variables:
   i. Temperature;
   ii. Rainfall;

d) Soil variables:
   i. Soil reaction (pH);
   ii. Exchangeable soil bases;
   iii. Soil depth.

These variables will be incorporated into the results obtained in the regression analysis of forest variables (growth data) so as to identify the characteristics of the sites showing the best development results for the species under study.

After these variables are compiled, the data collected will be entered into the following software:

- Plantations: MIRASILV
- Natural coniferous forests: PMP2K PLUS
- Natural broadleaved forests: SEMAFOR

The input of the different variables into the relevant software will facilitate **the development of reports, that will constitute the basis for the preparation of** technical reports, which will include data on growth and yield models. A growth model is a representation of a forest's natural dynamics, which generally includes data on growth, productivity and other changes to the composition and structure of a given stand. The term growth model is generally used in relation to a system of equations that provide growth and production forecasts for a given stand under a wide range of conditions. In this case, these will be developed through a multiple regression analysis formulated with annual measurements taken of different variables such as diameter, height, basal area and volume, in relation to the age of the species under study.

The development of the Permanent Forest Sample Plot Network System will facilitate the establishment and evaluation of plots for a period of at least three years, in both natural (coniferous and broadleaved) forests and forest plantations. This will provide information that will help strengthen the formulation of forest management plans for both plantations and natural forests.

The project will help to identify suitable biophysical conditions and the best sites for tree growth. This will contribute to the development of thematic maps to identify suitable areas for the growth of forest species within the framework of the Forest Incentives Program – PINFOR and other forest promotion programs. **At present, there are preliminary maps available of potential areas for the planting of 14 species (according to the species prioritization carried out by PINFOR); however, only 5 of these maps are backed by applied research, while the others have been prepared solely on the basis of documentary information and are yet to be field-checked and validated.** An analysis will subsequently be made to determine site quality through the development of site index curves at a given base-age, on the basis of specific growth and increment data obtained through the measurements and re-measurements taken. All the information generated will be made available in technological packages, which will also be a part of the statistical database that will be used to feed information into project PD 340/05 Rev.2 (M) "Guatemalan Forest Information System – SIFGUA".

2.5 RISK ANALYSIS AND MITIGATION

A risk identified for this project is the possible lack of interest of target beneficiaries in the information to be supplied, if they fail to understand the importance of the monitoring and evaluation of the system. The following measures have been taken to minimize this risk:

- The project was formulated by a team of professionals on the basis of records of information requests by users to INAB offices for the implementation of forest management plans and reforestation and ecological restoration projects.

- Furthermore, the development of the project was also based on the needs of key private, public and academic sector stakeholders, who contributed with ideas and suggestions which have been duly taken into account in this project document.

Another possible risk is that the systematisation process will not be scientifically sound and, therefore, the baseline information could lack reliability and contain erroneous data. In order to mitigate this risk, the project was formulated on the basis of technical and scientific data verified at the local level. The project

formulation also took into account the methodologies to be applied, the software to be used, the analysis and validation tools to be used, and the technical and scientific knowledge of the personnel who will participate in this project.

The neglect and lack of monitoring of the permanent sample plot network to be established is also a potential risk. This, in fact, was the main reason for the failure (to a certain extent) of the previous attempts to establish a PSP network. In view of this possibility, the following mitigation measures will be taken:

- The National Forest Institute (INAB) has undertaken to open an Information System coordination office on forest productivity, through which it will ensure an ongoing monitoring and technical assistance service through the regional and sub-regional offices of INAB.

- Furthermore, partnerships will be negotiated with the academic and the private sectors for the maintenance of plots and annual plot measurements.

- Access will be given to the information produced. This will ensure that silviculturalists will be committed to the maintenance of the system, the maintenance of plots and the compilation of annual measurements. Access to the information will be ensured through the connection of this project to SIFGUA, as well as by the regular publication of the outputs achieved.

The lack of political support is also a potential risk. However, this risk is reduced by the government's public and explicit confirmation (availability of funds for the implementation of PINFOR projects) that forest activities are a development strategy for the country.

A change of forest policy is another possible risk. However, after ten years of continuous efforts taking into account the guidelines of the current forest policy, there has been no radical change, nor are any changes expected or perceived, to the policy of promoting the sustainable management of the country's forest resources.

PART III: PROJECT DESIGN

3.1 OBJECTIVES

3.1.1 Development objective

Contribute to improving the planning and implementation of sustainable forest management in Guatemala.

3.1.2 Specific objective

Generate information on forest productivity in Guatemala through the establishment of a permanent forest sample plot system.

3.2 OUTPUTS

Specific objective 1

Generate information on forest productivity in Guatemala through the establishment of a permanent forest sample plot system.

Output 1.1	Information system based on permanent forest sample plots established.
Output 1.2	At least 12 technological packages developed to provide strategic data for decision-making in the planning and implementation of sustainable forest management.
Output 1.3	Dissemination and outreach strategy on Guatemalan forest productivity implemented.
Output 1.4	Capacity built for the adequate operation of an information system on forest productivity in Guatemala.

3.3 LOGICAL FRAMEWORK

PROJECT ELEMENTS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Development objective			
Contribute to improving the planning and implementation of sustainable forest management in Guatemala.	Increase in the forest area under sustainable management from 30,000 to 45,000 ha per year.	INAB and CONAP forest management plan statistics.	The forest sector and the Government recognise forest management as the main strategy for forest utilisation and conservation in Guatemala.
	At least 60% of FMPs are consistent with technical guidelines for sustainable forest management.	INAB and CONAP forest management plan statistics.	
Specific objective			
Generate information on forest productivity in Guatemala through the establishment of a permanent forest sample plot system.	Availability of baseline information on the development and productivity of at least 12 forest species.	Documents prepared (technological packages)	The private, government and academic sectors work jointly to generate information.
		Databases, maps and thesis documents.	
Output 1.1			
Information system based on permanent forest sample plots established.	1,168 permanent plots monitored, duly identified and demarcated in the field.	Specific software and databases fed with forestry measurement information.	Forest owners allow access to selected sites and participate in PSP establishment and monitoring activities.
		Field data forms duly completed.	The academic sector actively participates in the establishment and monitoring of PSPs.
		List of technical personnel participating in establishment and monitoring activities.	

PROJECT ELEMENTS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Output 1.2			
At least 12 technological packages developed to provide strategic data for decision-making in the planning and implementation of sustainable forest management.	Species prioritization studies for the development of technological packages.	List of prioritized species.	The information collected from the PSPs is adequately systematized in coordination with academic and private sector institutions.
	12 technological packages.	Edited and printed material for technological packages.	
Output 1.3			
Dissemination and outreach strategy on Guatemalan forest productivity implemented.	Annual reports addressed to the forest sector.	Report documents published.	Forest sector stakeholders are interested in knowing the productivity of forests in Guatemala.
	At least 5 printed and digital publications on the technological packages developed.	Printed and digital documents, publications file.	There are spaces available in different printed and digital communication media (journals and web pages).
	Availability of GIS-based permanent sample plots.	Web-based access to GIS; link to SIFGUA	
		Printed maps	
Output 1.4			
Capacity built for the adequate operation of an information system on forest productivity in Guatemala.	Training program designed.	Training program document.	Active participation of the academic sector to coordinate training events.
	At least 12 training events implemented.	List of trained personnel; training materials.	Forest sector stakeholders are interested in participating in training events.

3.4 IMPLEMENTATION STRATEGY

The "responsible" management of natural forests is still an isolated practice in the region, although it is a well known fact that there are case studies that have demonstrated its technical feasibility and social viability. The lack of management actions is closely linked to the lack of conditions that would promote a change in destructive traditional practices. Despite the pressure that is being exerted both at the national and international levels, it should be realized that a shift from this situation to one where the long term objectives of economic profitability, social equity and forest ecological conservation prevail, will imply a series of changes by the direct users of these forests, which will inevitably require some time to develop so as to produce the desired results. In this context, the role of the State in general and that of the private sector, NGOs and researchers in particular, are key factors in ensuring that the process is initiated, advanced and consolidated.

The management of natural forests requires the implementation of a series of actions, such as forest management practices, the study of natural regeneration patters (mortality and recruitment rates), growth dynamics patterns and the application of silvicultural treatments.

The objective of this project is to establish a standardized data bank using the annual measurements taken in permanent plots. This information, together with the data obtained from inventories, will be used to develop a model that will simulate forest growth patterns pre and post harvesting and to evaluate the consequences of a number of given management parameters (minimum cutting diameter, felling cycle, percentage of seed trees) in relation to harvesting potential, taking into account current production levels by tree age and density and site quality in strategic ecosystems. The project will also develop growth and yield tables, which will be used as models for projections and for the formulation of management plans.

This will help to bridge the gap that currently exists in the planning of forest management activities due to the lack of basic silvicultural information as well as the lack of data on the dynamics of different forest associations. In addition, this will contribute to improving the planning and implementation of sustainable forest management activities in the forests of Guatemala.

The National Forest Institute will be the executing agency of the project. The Institute will provide technical support and will facilitate the training events and the systematisation of the information generated.

Technically qualified personnel will be hired for the implementation of the Project to facilitate the coordination and integration of the various stakeholders identified during the project implementation period: forest owners, forest stewards, universities and secondary education centres. The results of this coordination process will be the establishment of strategic, horizontal cooperation partnerships that, through the signing of agreements and letters of understanding, shall clearly specify the responsibilities and expected benefits of each party concerned.

In previous national projects (INAB's Monitoring Office, CATIE-CONAP and PROCAFOR) the number of plots required in the country was established as follows: 940 PSPs in forest plantations, 108 PSPs in natural coniferous forests and 120 PSPs in natural broadleaved forests. Even though these projects led to the establishment of a number of plots, many of them have now disappeared due to a lack of monitoring and/or have not had any maintenance. This project will locate and/or relocate PSPs at the national level on the basis of technical and bio-physical criteria with special emphasis on the priority forest regions of the country.

This activity will be implemented using the methodologies developed by Project 7 PROCAFOR for natural coniferous forests; the methodology developed by Pinelo, G. and Manzanero, M. for natural broadleaved forests; and the methodology developed by Ugalde, L. and CATIE for forest plantations. The decision to use the above methodologies in PSP establishment, measurement and re-measurement and in data analysis is based on the fact that these methodologies have already been tested and validated at the local level and have been adjusted to the specific conditions of Guatemala and Central America.

The project will firstly evaluate the statistics related to the plots established by previous projects and according to the results of this exercise, the project will then begin the establishment and monitoring of the required permanent sample plots. In the case of natural broadleaved forests, at least 96 new permanent sample plots will be established so as to reach the number of permanent plots originally established in this type of forest (120 PSPs). However, the final number of sample plots required will be provided by the results of the consultancy on the statistical evaluation of plots established in previous

projects. Thus, depending on the results of that consultancy, it might be necessary to increase the number of permanent sample plots in the future.

The information will be recorded, processed and systematized in technological packages. Forest Technological Packages are an integrated and sequential set of scientific and technical applications and knowledge that facilitate increased productivity, particularly in forest plantations, under a framework of sustainability and effectiveness. In other words, these packages define and establish the techniques and methodologies for the appropriate management of a given species. The main objective of creating Forest Technological Packets is to increase the profitability and productivity, mainly in forest plantations, a process that seeks to obtain as much information as necessary about the species and to identify, propose and implement techniques and procedures that will generate the best forest production results. Thus, these technological packages can be a very useful tool for the forest sector, as they help silviculturalists avoid unnecessary waste of time, effort and money.

The Forest Technological Packages will provide information to producers on the advantages and disadvantages of selecting a given species for production, including information on seed provenance, selection of most appropriate soils and/or sites for the growth of that species, its range, optimization and harvesting, the management of pests and diseases, and even the requirements for its silvicultural management, which could be an issue for the forest industry sector and even for the care of the ecosystem and the environment.

A Forest Technological Package comprises several stages of research and development that are inter-related and adjusted to previously established methodologies and techniques. Generally, it starts with the silvicultural management stage and goes all the way up to the wood technology stage, a process that can last an average of up to 20 years. However, this project involves the launching of a process, which will be then completed with the institutional support of INAB and other forest sector stakeholders.

The technological packages to be developed will include at least the following information:

- Identification of best sites per species.
- Thematic maps indicating the best sites per species.
- Importance of provenance and selection of seeds and plant material.
- Plantation establishment method.
- Growth and increment rates per species.
- Proposal for growth and productivity monitoring and evaluation methodology.
- Plantation and natural forest silviculture.
- Pest and disease management.

In order to start the forest technological package development process, 10 priority species were selected through the Forest Incentives Programme (PINFOR), on the basis of an analysis of 31 species, taking into account the demand for these species in the local and international markets, as well as local biodiversity and growth aspects. The other two species were selected on the basis of their extensive range and their demand and importance in the national market (see table 2).

Table 2: List of species selected for the development of technological packages

No.	Technical name	Common name
1	*Abies guatemalensis*	Pinabete o pachac
2	*Calophyllum brasiliense*	Santa María
3	*Cedrela odorata*	Cedar
4	*Gmelina arborea*	Melina
5	*Pinus caribaea var.Hondurensis*	Caribe Pine, Peten Pine
6	*Pinus maximinoii*	Candelillo Pine
7	*Pinus oocarpa*	Ocote Pine
8	*Swietenia macrophylla*	Mahogany
9	*Tabebuia donnell-smithii*	Matilisguate
10	*Tectona grandis*	Teak
11	*Cupressus lusitánica*	Common Cypress
12	*Vochysia guatemalensis*	San Juan

These species are renowned for the quality of their timber which has multiple uses in different industries (construction, cabinet making, etc.). They are fast-growing species with a wide natural range and, in general, have no major pest problems and are in demand both at the national and international levels.

However, although the project only envisages the development of 12 Technological Packages, criteria will also be established for the formulation of more technological packages in the future.

The development of the forest technological packages will be coordinated by the project's technical personnel with the support of the National Forest Institute. However, an international consultant will be hired to design and develop these packages. The consultant will also have the support of the middle and higher academic sector and will use the information collected from the PSPs established at the national level, as well as information from any other complementary technological studies undertaken.

The contribution and participation of the universities will be vital as they have great scientific potential, both in terms of teaching staff (staff with masters and PhD degrees) and students of related disciplines with research potential, as well as equipment and laboratories.

This information will then be published in printed format and will also be incorporated into a geographic information system that will be available to all stakeholders through the use of an inter-institutional platform linked to Project PD 340/05 Rev.2 (M): "Establishment of a National Statistical Information System in Guatemala – SIFGUA".

This project will generate, update and analyse technical information on the dynamics of natural forest ecosystems and forest plantations to support sustainable forest management throughout the process, starting from the collection of primary information. SIFGUA, on the other hand, is aimed at the integration of general forest information (trade, harvesting, reforestation and forest fire statistics, among others). Thus, SIFGUA will provide the hardware for the storage of data generated by this project and will also facilitate access to information for all users. It can therefore be concluded that these two projects are complementary in nature.

During the three-year implementation period, the project will organize awareness campaigns aimed at different stakeholders so as to guarantee the effective and efficient establishment and monitoring of permanent plots.

The project will implement a training program aimed at developing the skills and capacities of forest sector stakeholders, in the use of the methodologies and tools identified for the monitoring and evaluation of coniferous and broadleaved plantations and natural forests, after these have been duly updated and validated.

An international consultant will be hired for the implementation of this activity. This consultant will be responsible for the design and implementation of a training program detailing the curricula and logistic arrangements for the 12 training workshops envisaged by the project.

The 12 training workshops will be scheduled as follows:

- 4 training workshops on the methodology for the monitoring and evaluation of forest plantations (MIRASILV),
- 4 training workshops on the methodology for the monitoring and evaluation of natural coniferous forests (PROCAFOR – PMP2K +),
- 4 training workshops on the monitoring and evaluation of natural broadleaved forests (SEMAFOR).

These workshops will be geared to forest owners, silviculturalists, forestry teaching staff and students, and forest technicians. The National Forest Institute, as the project executing agency, will provide technical assistance and coordinate the training events.

In order to disseminate the information generated and the results obtained, the project will implement a strategy comprising the following activities:

- Publication and distribution of technical reports;
- Regional workshops to present project outputs;
- Publication of main outputs in printed format;
- On-line publication of outputs through the web pages of the private, academic and government sectors.

The main project outputs and results, together with the technical information generated through technological packages for at least 12 forest species, will be disseminated during these events in coordination with and with the participation of the different stakeholders involved in the process.

Finally, the project experiences will be systematized so as to reflect the lessons learned that could be most useful to support future projects or activities. Throughout the process, the project will fully incorporate and subscribe to gender and equity issues.

1

3.5 ACTIVITIES

Output 1.1 Information system based on permanent forest sample plots established.

Activity 1.1.1 Collection of information from existing permanent sample plot networks.
Activity 1.1.2 Statistical evaluation of distribution and quantity of existing permanent sample plots.
Activity 1.1.3 Establishment of at least 96 new permanent sample plots.
Activity 1.1.4 Annual monitoring of existing permanent sample plots.
Activity 1.1.5 Systematization of monitoring information collected from permanent sample plots.

Output 1.2 At least 12 technological packages developed to provide strategic data for decision-making in the planning and implementation of sustainable forest management.

Activity 1.2.1 Updating of software for permanent sample plot databases.
Activity 1.2.2 Prioritization of species to develop technological packages.
Activity 1.2.3 Development and integration of guides, tables, curves and strategic information for prioritized species.
Activity 1.2.4 Editing and printing of technological packages.

Output 1.3 Dissemination and outreach strategy on Guatemalan forest productivity implemented.

Activity 1.3.1 Preparation and submission of annual reports addressed to forest sector stakeholders.
Activity 1.3.2 Publication of results in printed media, web pages and link to SIFGUA.
Activity 1.3.3 Design and publication of geographic information system on permanent forest sample plots.

Output 1.4 Capacity built for the adequate operation of an information system on forest productivity in Guatemala.

Activity 1.4.1 Design and implementation of ongoing awareness and training program for forest sector stakeholders.
Activity 1.4.2 Implementation of results dissemination strategy.
Activity 1.4.3 Systematization of project experience.

3.6 WORK PLAN

OUTPUTS/ACTIVITIES	RESPONSIBLE PARTY	SCHEDULE																																	
		YEAR 1												YEAR 2												YEAR 3										
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
Output 1.1: Information system based on permanent forest sample plots established.	Project Coordinator																																			
Activities **1.1.1:** Collection of information from existing permanent sample plot networks	Project Coordinator																																			
1.1.2: Statistical evaluation of distribution and quantity of existing permanent sample plots	Project Coordinator and Forest Statistics Consultant																																			
1.1.3: Establishment of at least 96 new permanent sample plots	Project Technicians																																			
1.1.4: Annual monitoring of existing permanent sample plots	Forest sector stakeholders																																			
1.1.5: Systematization of monitoring information collected from permanent sample plots	Project Technicians and Forest Consultant																																			
Output 1.2: At least 12 technological packages developed to provide strategic data for decision-making in the planning and implementation of sustainable forest management	Project Coordinator																																			
Activities: **1.2.1:** Updating of software for permanent sample plot databases	Project Coordinator																																			
1.2.2: Prioritization of species to develop technological packages	Project Technicians																																			
1.2.3 Development and integration of guides, tables, curves and strategic information for prioritized species	Project technicians, academic sector and forest consultant																																			
1.2.4: Editing and printing of technological packages	Project Coordinator																																			
Output 1.3: Dissemination and outreach strategy on Guatemalan forest productivity implemented.	Project Coordinator																																			
Activities: **1.3.1:** Preparation and submission of annual reports addressed to forest sector stakeholders	Project Coordinator																																			
1.3.2: Publication of results in printed media, web pages and link to SIFGUA	Project Coordinator																																			
1.3.3: Design and publication of geographic information system on permanent forest sample plots	Project Technicians																																			
Output 1.4: Capacity built for the adequate operation of an information system on forest productivity in Guatemala.	Project Coordinator																																			
Activities: **1.4.1:** Design and implementation of ongoing awareness and training program for forest sector stakeholders	Project staff / academic sector																																			
1.4.2: Implementation of results dissemination strategy	Project staff																																			
1.4.3: Systematization of project experience	Coordinator /Consultant																																			

3.7 INPUTS AND BUDGET

Project budget by activity and component

		Budget Components (US $) (Total)						
Outputs/Activities + non-activity based expenses		**10. Project Personnel**	**20. Sub-Contracts**	**30. Duty Travel**	**40. Capital Items**	**50. Consumable Items**	**60. Miscella-neous**	**GRAND TOTAL**
Output 1.1: Information system based on permanent forest sample plots established.								
1.1.1 Integration and strengthening of existing permanent sample plot networks	I	6,347.00						6,347.00
	E	4,007.14						4,007.14
1.1.2 Statistical evaluation of distribution and quantity of existing permanent sample plots.	I	12,210.00						12,210.00
	E	4,007.14						4,007.14
1.1.3 Establishment of at least 96 new permanent sample plots.	I	6,210.00		7,000.00				13,210.00
	E	14,907.14						14,907.14
1.1.4 Annual monitoring of existing permanent sample plots.	I	6,210.00	63,000.0	15,000.00	36,000.00			120,210.00
	E	25,807.14						25,807.14
1.1.5 Systematization of monitoring information collected from permanent sample plots.	I	6,210.00						6,210.00
	E	4,007.14						4,007.14
Subtotal 1		**89,922.70**	**63,000.00**	**22,000.00**	**36,000.00**	**-**	**-**	**210,922.70**
Output 1.2: At least 12 technological packages developed to provide strategic data for decision-making in the planning and implementation of sustainable forest management.								
1.2.1 Updating of software for permanent sample plot databases.	I	7,762.50	15,000.00		12,500.00			35,262.5
	E	4,007.14						4,007.14
1.2.2 Prioritization of species to develop technological packages.	I	7,762.50						7,762.50
	E	4,007.14						4,007.14

		Budget Components (US $) (Total)						
Outputs/Activities + non-activity based expenses		**10. Project Personnel**	**20. Sub-Contracts**	**30. Duty Travel**	**40. Capital Items**	**50. Consumable Items**	**60. Miscella-neous**	**GRAND TOTAL**
1. 2.3 Development and integration of guides, tables, curves and strategic information for prioritized species.	I	27,962.50		33,300.00				61,262.50
	E	4,007.14						4,007.14
1.2.4 Editing and printing of technological packages.	I	7,762.50						7,762.50
	E	4,007.14						4,007.14
Subtotal 2		**67,278.56**	**15,000.00**	**33,300.00**	**12,500.00**	**-**	**-**	**128,078.56**
Output 1.3: Dissemination and outreach strategy on Guatemalan forest productivity implemented.								
1.3.1 Preparation and submission of annual reports addressed to forest sector stakeholders.	I	10,350.00					3,000.00	13,350.00
	E	4,007.14						4,007.14
1 3.2 Publication of results in printed media, web pages and link to SIFGUA.	I	10,350.00						10,350.00
	E	4,007.14						4,007.14
1 3.3 Design and publication of geographic information system on permanent forest sample plots.	I	10,350.00						10,350.00
	E	4,007.14						4,007.14
Subtotal 3		**43,071.42**	**-**	**-**	**-**	**-**	**3,000.00**	**46,071.42**
Output 1.4 Capacity built for the adequate operation of an information system on forest productivity in Guatemala.								
1.4.1 Design and implementation of ongoing awareness and training program for forest sector stakeholders.	I	31,050.00	19,500.00	5,000.00				55,550.00
	E	4,007.14						4,007.14
1. 4.2 Implementation of results dissemination strategy.	E	4,007.14						4,007.14
1.4.3 Systematization of project experience.	I	4,000.00						4,000.00
Subtotal 4		**43,064.28**	**19,500.00**	**5,000.00**	**-**	**-**	**-**	**67,564.28**

		Budget Components (US $) (Total)						
Outputs/Activities + non-activity based expenses		**10. Project Personnel**	**20. Sub-Contracts**	**30. Duty Travel**	**40. Capital Items**	**50. Consumable Items**	**60. Miscella-neous**	**GRAND TOTAL**
II. Capital items used for various activities	I							
	E				20,610.00			20,610.00
Subtotal 4					**20,610.00**			**20,610.00**
III. Consumable items used for various activities	I					12,000.00		12,000
	E					6,000.00		6,000.00
Subtotal 5						**18,000.00**		**18,000.00**
IV. NON-ACTIVITY BASED ACTIVITIES								
Sundry	I						6,000.00	6,000.00
Contingencies	I						6,000.00	6,000.00
Auditing	E						1,000.00	1,000.00
Secretary/Administrative Assistant	I	23,400.00						23,400.00
Subtotal 6		**23,400.00**					**13,000.00**	**36,400.00**
Subtotal (ITTO)		**177,800.00**	**97,500.00**	**60,300.00**	**48,500.00**	**12,000.00**	**15,000.00**	**411,100.00**
Subtotal (Ex. Agency)		**88,800.00**	**-**	**-**	**20,610.00**	**6,000.00**	**1,000.00**	**116,410.00**
TOTAL		**266,600.00**	**97,500.00**	**60,300.00**	**69,110.00**	**18,000.00**	**22,000.00**	**527,510.00**

(I): ITTO Contribution; (E): Executing agency contribution.

Contribution of the Executing Agency (INAB) to the project budget

	Budget Items		TOTAL	Year 1	Year 2	Year 3
10		**Project Personnel**				
	11	Project Coordinator	56,100	18,700	18,700	18,700
	13	Regional Technical Directors (9)	32,700	10,900	10,900	10,900
	19	**Component Total**	**88,800**	**29,600**	**29,600**	**29,600**
40		**Capital Items**				
	41	Office space	15,000	5,000	5,000	5,000
	42	1 Vehicle	5,000	2,000	2,000	1,000
	43	Office furniture	610	610		
	49	**Component Total**	**20,610**	**7,610**	**7,000**	**6,000**
50		**Consumable Items**				
	51	Miscellaneous consumable items	4,500	1,500	1,500	1,500
	52	Office supplies	1,500	500	500	500
	59	**Component Total**	**6,000**	**2,000**	**2,000**	**2,000**
60		**Miscellaneous**				
	62	Auditing costs	1,000		1,000	
		Component Total	**1,000**	**0**	**1,000**	**0**
		SUB-TOTAL	**116,410**	**39,210**	**39,600**	**37,600**
		TOTAL	**116,410**			

ITTO budget by year

		Budget Components	Input	Unit Cost	TOTAL	YEAR 1	YEAR 2	YEAR 3
10.	**Project Personnel**							
	11.	***National Experts (long term)***						
		11.1 Technical assistants (3)	W/M (36)	1,150	124,200	41,400	41,400	41,400
		11.2 Secretary – administrative assistant	W/M (36)	650	23,400	7,800	7,800	7,800
	13	***National Consultant(s) (short term)***						
		13.1 Forest Consultant	Consultancy (1)	4,000	4,000	4,000		
		13.2 Forest Statistics Consultant	Consultancy (1)	6,000	6,000		6,000	
		13.3 Training & Systematization Consultant	Consultancy (1)	4,000	4,000	4,000		
	14.	***International Consultant(s)***						
		14.1 Expert in forest technological packages	Consultancy (1)	12,000	12,000	4,000	4,000	4,000
	15.	***Fellowships and Training***						
		15.1 Training on project-related issues (project personnel)	Training events (3)	1,400	4,200	2,800	1,400	
	19.	***Component Total***			**177,800**	64,000	60,600	53,200
20.	**Sub-contracts**							
	21.	***Sub-contract*** *(Updating of software for systematization of information on permanent sample plots)*	Contract (1)	15,000	15,000	15,000		
	22.	***Sub-contract*** *(Training logistics on system establishment and monitoring methodologies)*	Contracts (12)	1,625	19,500	6,500	6,500	6,500
	23.	***Sub–contract*** *(Support to system strengthening)*	Contracts (30)	2,100	63,000	21,000	21,000	21,000
	29.	***Component Total***			**97,500**	42,500	27,500	27,500

		Budget Components	Input	Unit Cost	TOTAL	YEAR 1	YEAR 2	YEAR 3
30.	**Travel**							
	31.	***Daily Subsistence Allowance (DSA)***						
		31.2 Project team	Days (900)	30	27,000	9,000	9,000	9,000
	32.	***International Travel***						
		32.1 Project team	Fares (3)	3,600	10,800	3,600	7,200	
		32.2 International consultant	Fares (3)	7,500	22,500	7,500	7,500	7,500
	39.	***Component Total***			**60,300**	20,100	23,700	16,500
40.	**Capital Items**							
	43.	***Vehicle 4x4***	Vehicle (1)	22,000	22,000	22,000		
	44.	***Equipment***						
		44.1 Computer equipment (Computer centres)*	Computer centre (5)	2,500	12,500	12,500		
		44.2 Forestry equipment (GPS, increment borer, clinometer, bark gauge, hypsometer, diameter tape and tape measure, etc)	Measuring equipment (3)	3,000	9,000	9,000		
		44.3 Other (photocopier, photographic camera, audiovisual equipment, etc)		5,000	5,000	5,000		
	49.	***Component Total***			**48,500**	48,500	-	-
50.	**Consumable items**							
	52.	***Fuel and utilities***			6,000	2,000	2,000	2,000
	54.	***Office supplies***			6,000	2,000	2,000	2,000
	59.	***Component Total***			**12,000**	4,000	4,000	4,000
60.	**Miscellaneous**							
	61.	***Sundry (document printing and dissemination, etc)***			9,000	3,000	3,000	3,000
	63.	***Contingencies***			6,000	2,000	2,000	2,000
	69.	***Component Total***			**15,000**	5,000	5,000	5,000
		Sub-Total			**411,100**	**184,100**	**120,800**	**106,200**

		Budget Components	Input	Unit Cost	TOTAL	YEAR 1	YEAR 2	YEAR 3
80.	**Project Monitoring and Administration**							
	81.	***ITTO Monitoring and Review***			30,000	10,000	10,000	10,000
	82.	***ITTO Mid-term evaluation***						
		ITTO Mid-term evaluation			15,000			
		ITTO Ex-post evaluation						
	83.	***ITTO Programme Support Costs (8%)***			36,488			
	84.	***Donor Monitoring Costs***						
	89.	***Component Total***			**81,488**			
100.		**GRAND TOTAL**			**492,588**			

* Computer centre: computer, printer, desk, chair.

Capital items: This budget component includes the purchase of a vehicle, which is justified due to the need to carry out management actions for the initial strategic partnerships. Furthermore, this vehicle will help improve the supervision and monitoring of all personnel involved at the national level, thus ensuring effectiveness and efficiency in compliance with the proposed timeframe and goals.

ITTO budget summary by component and by year

Budget Components			Total	Year 1	Year 2	Year 3
10	Project Personnel		**177,800**	64,000	60,600	53,200
20	Subcontracts		**97,500**	42,500	27,500	27,500
30	Travel Costs		**60,300**	20,100	23,700	16,500
40	Capital Items		**48,500**	48,500	-	-
50	Consumable Items		**12,000**	4,000	4,000	4,000
60	Miscellaneous		**15,000**	5,000	5,000	5,000
	Subtotal 1		**411,100**	**184,100**	**120,800**	**106,200**
80	Administration, Monitoring and Evaluation					
	81	ITTO Monitoring and review	**30,000**	10,000	10,000	10,000
	82	ITTO Mid-term evaluation	15,000			
		ITTO Ex-post evaluation				
	Subtotal 2		**456,100**			
	83	ITTO Programme Support Costs (8%)	**36,488**			
100	**Grand Total**		**492,588**			

3.8 SUSTAINABILITY

An initiative of this nature is a long-term effort. The 3-year project implementation period is only a starting point, so it is necessary to develop actions to ensure its continuity and sustainability. The level of project ownership built in the academic and private sectors will determine future project sustainability. In view of this, a post-project strategy is proposed based on the following courses of action:

Coordination office

1. Currently, INAB has a forest plantation and natural forest monitoring and evaluation section, which will become the coordination office of the Guatemalan Forest Productivity Information System. This office will be responsible for monitoring project activities, establishing strategic partnerships, issuing agreements and letters of understanding, following up training activities, and identifying financing sources for the sustainability of the information system.
2. Plot data collection and analysis will be carried out on an annual basis in plantations and every two years in natural forests. This will generate yearly reports on plantation and natural forest behaviour in Guatemala, which will be disseminated among all interested stakeholders through different communication networks and media and particularly through SIFGUA.
3. The maintenance and monitoring of the permanent sample plots will be mainly under the responsibility of INAB's forest plantation and natural forest monitoring division and forest research project, which will receive the support of plot owners and municipal forest offices, as well as students from universities and other education institutions in the conduction of their supervised field work.
4. In order to ensure the continuity of project activities, INAB will conclude agreements and memoranda of understanding with universities and middle education institutions of Guatemala.
5. **The project will coordinate with CONAP, specifically with the office responsible for the monitoring of permanent sample plots established in natural broadleaved forests of the Multiple Use Zones of Protected Areas, so as to strengthen and ensure the smooth flow of information between both parties.**

Infrastructure and capacities

6. Relevant stakeholders should make use of the infrastructure established in terms of office facilities, computer equipment, forest measuring equipment and databases, so as to avoid unnecessary investments. They should also use the facilities and resources already established by previous projects and/or initiatives (e.g. SIFGUA, geographic information systems of different universities in the country, etc.).
7. Project activities include awareness, training and outreach programs to motivate, disseminate and develop capacities and conditions required for spontaneous continued action by forest owners (private sector, communities, municipalities, co-administrators, etc.) and forest planners.

Financing

8. In addition to INAB's budgetary contribution to ensure the continuity of project actions, the coordination office will obtain funds through the income derived from training courses, sale of dissemination documents and materials, and provision of technical assistance.

Systematization

9. The systematization process to be carried out after project completion will be based on a prospective approach. It will produce a technical report which will include follow-up and refinement actions as required to adjust to existing conditions. The implementation of these actions will be under the responsibility of the coordination office. The entire process will be linked to SIFGUA in accordance with that project's requirements.

PART IV: IMPLEMENTATION ARRANGEMENTS

4.1 IMPLEMENTING INSTITUTIONS AND STAKEHOLDERS

4.1.1 Executing Agency

The National Forest Institute will be responsible to ITTO for the implementation of the project and will have *inter alia* the following responsibilities: project design and management, provision of outputs, recruitment of work team and designation of consultants, establishment of advisory committee, and submission of technical and administrative-financial reports.

The National Forest Institute is a public semi-autonomous institution characterised by its expediency, expertise and transparency in the implementation of forest projects.

4.1.2 Collaborating agencies, consultants and other stakeholders

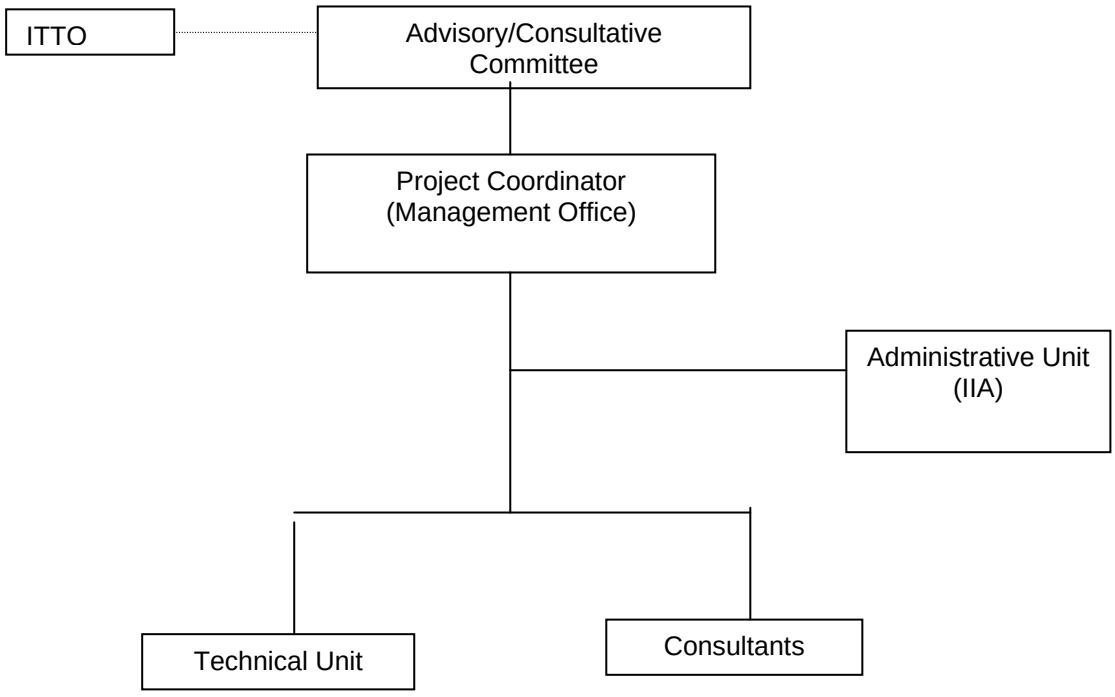
The project collaborating agencies will include the National Council for Protected Areas – CONAP, which will facilitate access to forest concessions located within protected areas; the Forest Education System – SEF, which will support coordination with universities and secondary education centres; the National Forestry Programme – PFN, which will support project management and promote the participation of Forest Policy and Consensus-Building Roundtables, which will in turn support coordination with forest owners, communities and forest managers; and the Forestry Society, which will support coordination with forest owners.

In addition, active associations of forest managers will also participate, including the Association of Forest Communities of Petén – ACOFOP, as well as forest research institutes such as the Institute for the Environment and Natural Resources – IARNA, the Agricultural Research Institute – IIA, the General Directorate for Research – DIGI, and the Forest Cluster.

The benefits and responsibilities of each of the above collaborating agencies have been duly agreed on through consultation workshops, various fora, direct consultations and letters of understanding.

4.2 MANAGEMENT STRUCTURE OF THE PROJECT

The project management structure is shown in the following organizational chart:



The Project Advisory Committee will be made up of a representative each from the executing agency (National Forest Institute), the Forest Education System – SEF (universities, secondary school centres and the Forestry Society), the National Council for Protected Areas – CONAP and the Environmental Impact Institute – IIA. The committee will meet every six months to analyse project progress and make recommendations for the next activities to be implemented. To ensure better control, the minutes of these meetings will be duly recorded in a document to be prepared by the Project Coordinator and later distributed to the members of the Committee.

Project coordination will be under the responsibility of the coordinator, an administrative unit, a technical unit and the consultants to be hired. The coordinator will be responsible for ensuring the achievement of project objectives. The financial administration of the project will be under the responsibility of a secretary/accountant and an independent institution to manage the disbursement of funds provided by ITTO. The technical unit will comprise three specialists in forest management, geographic information systems and database management.

The project will receive ongoing technical support from ITTO.

4.3 MONITORING AND REPORTING

Project implementation monitoring will be under the responsibility of the advisory /consultative committee made up of representatives from various stakeholders of the Guatemalan forest sector (institutional, academic and private sectors), who will schedule regular meetings to assess the progress made in the implementation of operational plans and general activity plan. In addition, the submission of (verbal and written) reports will be scheduled on a six-monthly basis or as stipulated by the advisory committee. Reporting will be under the responsibility of the Project Coordinator.

The execution of the project budget will be monitored through the executing agency's internal audits (conducted by the Project Coordination Unit of the National Forest Institute) as well as external audits (ITTO) to ensure the appropriate use of funds.

Reporting and evaluation

Project activities will be monitored taking into account the following considerations:

(a) Administrative and financial aspects: The project administrative unit will be responsible for the preparation and production of reports to be submitted to relevant institutions in accordance with the procedures established by ITTO and the Government of Guatemala; and
(b) Technical aspects: Technical aspects will be monitored using the logical framework matrix and on the basis of the project work plan.

a. Administrative and financial reports

Administrative and financial reports will be prepared on a six-monthly basis to show project progress. The project administrative unit will be responsible for the preparation of these reports in accordance with ITTO procedures. These reports will be sent to the members of the advisory committee 4 weeks before the date of each scheduled meeting.

Furthermore, these reports will be made available 4 weeks before the date of the annual monitoring visit and 2 months before the ITTO Council Session.

b. Technical reports

A monthly assessment will be carried out on the progress made in the implementation of activities under the Yearly Plan of Operations to facilitate internal monitoring by the implementation unit and other institutions as required. In addition, a six-monthly progress report will be submitted to the advisory committee. The technical unit, in conjunction with the Project Coordinator, will be responsible for the preparation of reports in accordance with ITTO technical procedures. These reports will be sent to the members of the advisory committee 4 weeks before the date of each scheduled meeting.

Furthermore, these reports will be made available 4 weeks before each annual monitoring visit and 2 months before the ITTO Council Session.

c. Project completion report

The Project Coordinator will be responsible for the preparation and submission of the project completion report, which will contain comprehensive information on budget execution and the implementation of planned activities, including *inter alia* a description of main project outputs and achievements. This report will be submitted to ITTO and other relevant agencies within 3 months of project completion.

d. Monitoring visits (ITTO)

The project will be subject to a series of monitoring visits for ITTO monitoring and advice. At least one annual visit is envisaged as planned by ITTO.

e. Evaluation

A final evaluation will be carried out to assess the degree of achievement of project objectives and will include *inter alia* an audit to be conducted by the Implementing Unit and ITTO in coordination with the project administrative unit.

ANNEX I. PROFILE OF THE EXECUTING AGENCY

Expertise of the executing agency

The National Forest Institute (INAB), an autonomous, decentralised government agency with legal capacity, equity capital and administrative independence, is the competent coordinating authority responsible for the public agricultural sector in the forestry field as established by the current forest legislation of Guatemala (1996).

The Institute's main functions are: a) Implement forest policies; b) Promote and encourage forest development in the country through sustainable forest management, reforestation, forest resource based crafts and industry, and watershed protection and development; c) Promote forest research; d) Coordinate the implementation of forest development programmes; and e) Develop programmes and projects aimed at forest conservation.

Its mission is: "To promote and implement national forest policies and facilitate access to technical assistance, technology and forest services for foresters, municipalities, universities, (national and international) investor groups, and other forest sector stakeholders, through the design and promotion of strategies and actions aimed at generating increased economic, ecological and social development in the country".

INAB has expertise in the following areas:

- Incentive-based forest development and promotion.
- Promotion of sustainable forest management.
- Forest protection.
- Administration, regulation and control of the forest sector.
- Forest promotion, training and education.
- Technical and economic forestry information and research.
- Institutional strengthening.
- Improvement of forest production.
- Support to local governments for forest administration.
- Forest extension.
- Forest conservation.
- Geographic information systems.
- National forest inventories.

Infrastructure

INAB's facilities to carry out activities related to tropical forests are located in most of the departments where these forests are found. The Institute has the required technical, administrative and scientific units to carry out its mandate and achieve its objectives. It comprises 9 Regional Directorates, which are distributed as follows:

No.	Region	Department	No. of sub-regions
I	Metropolitana	Guatemala	Nil
II	Las Verapaces	Alta Verapaz and Baja Verapaz	7
III	Nororiente	Chiquimula, El Progreso, Izabal, Zacapa	4
IV	Suroriente	Jutiapa, Jalapa and Santa Rosa	3
V	Centro	Chimaltenango and Sacatepéquez	2
VI	Occidente	Quetzaltenango, San Marcos, Sololá and Totonicapán	4
VII	Noroccidente	Huehuetenango, Quiché	4
VIII	El Petén	Petén	4
IX	Costa Sur	Escuintla, Retalhuleu, Suchitepéquez	4
TOTAL			**32**

Each of these Regional and Sub-regional Directorates of INAB has offices equipped with furniture, telephone, fax machines and computer equipment. In addition, they have their own budget and vehicles and motorcycles at their disposal. All of these Directorates are staffed with technical, administrative and legal personnel.

Budget of the Executing Agency (in US$)

YEAR	PERSONNEL	CAPITAL ITEMS	CONSUMABLE ITEMS	CATIE (*)	TOTAL
2005	2,761,901.18	200,000.00	1,680,487.74	2,118,463.40	6,760,852.32
2006	3,296,709.75	551,546.73	1,869,619.31	1,886,359.27	7,604,316.06
TOTAL	6,058,691.93	751,546.73	3,550,107.05	4,004,822.67	14,365,168.38

(*) NOTE: INAB is implementing 15 projects through the Tropical Agricultural Research and Teaching Centre (CATIE) (with a budget of US$ 4,427,872.73 for 2002 and 2003). These projects are related to the fields of forest management, forest research, municipal strengthening, forest extension, conservation of protected areas, and forest fire prevention and control, among others.

Personnel

a)	Experts with post-graduate degrees	25
b)	Experts with university degrees	82
c)	Mid-level technicians	243
d)	Administrative personnel	76

Personnel qualifications

INAB's professional staff participating in the project will include: 9 technical directors, 32 sub-regional directors and 32 forest technicians. Seventy-five percent (75%) of these professionals have sound forestry knowledge given their background (forest engineers, foresters, forest technicians) and twenty-five percent (25%) have basic knowledge and field experience (agricultural engineers, agricultural technicians).

ANNEX II. PROFILE OF THE COLABORATING AGENCY

National Standards Council for Sustainable Forest Management in Guatemala – CONESFORGUA

The National Standards Council for Sustainable Forest Management in Guatemala (CONESFORGUA) is a non-profit, civil society organization established in 2003 to support forest development in Guatemala by generating and promoting sustainable forest management and forest product processing standards. CONESFORGUA has taken on the responsibility of following up the forest certification process in the country so as to promote good forest management practices in Guatemala.

Since its inception, it has promoted an information sharing and participation process at all levels, with a view to disseminating knowledge about forest management and certification as well as developing standards for the management of natural forests, forest plantations and non-timber forest products.

CONESFORGUA's main objective is "to provide an ongoing discussion forum to address important topics related to sustainable forest management and forest product processing standards, with representatives of all interested stakeholders of the forestry and related sectors". Furthermore, CONESFORGUA has the following additional objectives:

- **To facilitate enabling conditions for the implementation of a fair, transparent and systematic evaluation process on sustainable forest management and forest product processing in Guatemala.**
- **To lead and facilitate a participatory process aimed at the formulation of a national standards and forest product processing proposal.**
- **To raise awareness and promote the objective, significance, uses and benefits of sustainable forest management and forest product processing standards.**
- **To submit the sustainable forest management and forest product processing standards adopted at the national level to the relevant bodies for their adoption at the international level.**
- **To support actions aimed at improving Guatemala's trade relations and economic-financial instruments in the forest sector.**

Main activities implemented by the organization since its inception by thematic groups:

1. Administration and development of the organization:
- **Rules of procedure for the operation of the organization; Strategic Plan; Registry of operational activities; Accounting and tax records; Monthly meetings of the Board of Directors, Annual Assemblies.**

2. Formulation and development of standards:
- **National standards for natural and planted forests based on the generic standards currently used in the country.**
- **National standards for small forests under low management intensity (in progress).**
- **Participation in the discussion on the formulation of a national green seal.**

3. Technical assistance for forest management and certification:
- **Promotion, technical assistance, training.**

4. Support and technical assistance for thematic fora under the National Forestry Agenda.
- **Participation in the Forest Cluster, the Pine-Oak Partnership, the National Forest Programme; also, involvement in forest certification initiatives in the Central American region and Latin America in general.**

5. Communication and dissemination:
- **Participation in workshops and in the development of induction guidelines, leaflets and other materials on forest management and certification issues.**

Financing, mainly through the formulation and submission of projects and/or technical proposals to:

External/international cooperation:
WWF, FAO, ICCO Holland, DANIDA through NEPENTHES, GTZ, Rainforest
Internal/national cooperation:
INAB, PRONACOM, Forestry Society (Gremial Forestal), Members

Main achievements:

- ✓ **The establishment of the organization**
- ✓ **National recognition of the organization in the areas of forest management and certification.**
- ✓ **The development of standards**

Main challenges

- ✓ **Increasing its membership**
- ✓ **Reviewing standards and adapting them to the realities of the country**
- ✓ **Development of technical tools to support forest management and certification**
- ✓ **Self-sustainability**

Projects in progress with GFP/PFN

1. Development of a national certification proposal for the harvesting, transport and marketing of forest products.

Development of a national certification proposal: within the framework of the National Legality Promotion Strategy, CONESFORGUA plans to develop and implement an activity, as part of the strategy, aimed at reaching an agreement with relevant stakeholders about the most appropriate mechanisms to reduce illegal forest activities in the country (95% according to IARNA, URL, Environmental Profile of Guatemala, 2009).

2. Development of a self-sustainability plan for the organization:

Development of an institutional strategic plan, linked to the identification of actions that will ensure the self-sustainability of the organization.

ANNEX III. TERMS OF REFERENCE

II.1 PROJECT STAFF

- 1 National Coordinator (responsible for project implementation)
- 1 Administrative Secretary
- 3 Technical Assistants
- 1 National Consultant (Statistics)
- 1 National Consultant (Forest Management)
- 1 National Consultant (Experience systematization in Guatemala)
- 1 International Consultant (with wide experience in the development of technological packages for forest species)
- 30 Research Assistants (University students)

1. National Coordinator (INAB Counterpart)

Qualifications:

- University degree in the field of forestry, natural resource management or related discipline.
- Knowledge of government and private forest sectors in Guatemala.
- Knowledge of current forest legislation and other related policies.
- Experience in personnel management.
- Leadership skills with ability to coordinate staff and work in a team.
- Good command of computer packages.
- Experience in forest productivity and development monitoring (good command of MIRASILV, PROCAFOR and SEMAFOR technologies).
- Ability to negotiate with forest sector stakeholders (academic, government and private sectors).

Duties:

The Coordinator will be responsible for:

- Preparing yearly work plans and organising and supervising the implementation of project activities;
- Supervising project budget execution;
- Participating in the selection of (temporary and permanent) project personnel;
- Coordinating with the advisory committee, universities, government organisations, private institutions and individual users;
- Developing a training program in coordination with the project technical staff;
- Conducting a performance assessment of the staff under his/her supervision;
- Supervising the preparation of reports and technical documents (technological packages);
- Preparing and submitting project progress reports.

Duration of contract: 36 months.

2. Administrative Secretary

Qualifications:

- Bilingual secretary, accounting secretary, preferably with studies in administration and/or auditing procedures.
- Experience in the administration of financial resources, particularly international cooperation funds for projects executed by the Government of Guatemala.
- Good command of computer packages.

Duties:

- Management of ITTO and counterpart funds (requisitions, purchases, payments);
- Prepare and submit reports on budget execution as required by ITTO and the executing agency;
- Prepare a project final administrative-financial report.

Duration of contract: 36 months.

3. Technical Assistant(s) (3)

Qualifications:

- University degree in the field of forestry, natural resource management or related discipline.
- Knowledge of government and private forest sectors in Guatemala.
- Knowledge of current forest legislation and other related policies.
- Ability to work in a team.
- Good command of computer packages.
- Experience in forest productivity and development monitoring (good command of MIRASILV, PROCAFOR and SEMAFOR technologies).

Duties:

- Participate in the development of yearly work plans;
- Coordinate with forest sector stakeholders (universities, government organisations, private institutions and individual users);
- Participate in the development of a training program;
- Train forest sector stakeholders in the use of MIRASILV, PROCAFOR and SEMAFOR tools;
- Supervise the implementation of fieldwork related to the establishment of a network of permanent sample plots and the collection of study variables;
- Systematize the information generated for each species.
- Prepare technical reports (technological packages);
- Organise and implement dissemination workshops on the information collected.

Duration of contract: 36 months.

4. National Consultant (Forest Statistics)

Qualifications:

- University degree with a specialisation in applied statistics, preferably with experience in forest statistics.
- Ability to work in a team.
- Time availability as required.
- Good command of computer packages.

Duties:

- Carry out a statistical analysis to assess sample size and adequate distribution of the permanent sample plot network at the national level, considering factors such as number of species, area under forest cover, age, location, etc.

Duration of contract: 4 months.

5. National Consultant (Sustainable Forest Management)

Qualifications:

- University degree in Systems Engineering or related discipline with extensive experience in forest management.
- Time availability as required and ability to work in a team.
- Experience in management of computer packages and databases.
- Creative skills.

Duties:

- Advise the project technical staff on the systematization of information, data processing and preparation of guides, tables and development curves.

Duration of contract: 5 months.

6. National Consultant (Systematization of experiences)

Qualifications:

- Professional with experience in project formulation, evaluation and systematization.

Duties:

- Facilitate the systematization process so as to reflect the lessons learned during the implementation of the project.
- Support the preparation of a document to continue and/or replicate the project experience.

Duration of contract: 6 months.

7. International Consultant (with experience in the development of technological packages for forest species)

Qualifications:

- University degree in the field of forestry, natural resource management or related discipline.
- Experience in management of computer packages and databases.
- Proven experience in forest research, preferably in the development and publication of technological packages for forest species.

Duties:

- Advise the project technical staff on the systematization of information, data processing and preparation of guides, tables and development curves.

Duration of contract: 5 months.

8. Research Assistants (university students)

Qualifications:

- University students in the field of forestry, natural resource management or related discipline.
- Completed course curriculum with due authorisation from the relevant university to conduct supervised professional work experience.
- Ability to work in a team.
- Good command of computer packages.
- Preferably with a knowledge of forest productivity and development monitoring (good command of MIRASILV, PROCAFOR and SEMAFOR technologies).

Duties:

- Support the coordination with forest sector stakeholders (universities, government organisations, private institutions and individual users);
- Support the training of forest sector stakeholders in the use of MIRASILV, PROCAFOR and SEMAFOR tools;
- Coordinate the implementation of fieldwork related to the establishment of a network of permanent sample plots and the collection of study variables;
- Support the systematization of the information generated for each species.
- Support the preparation of technical reports (technological packages);
- Support the organisation of dissemination workshops on the information collected.

Duration of contract: 6 to 10 months (as per the requirements of the relevant university).

II.2 SUBCONTRACTS

1. Logistics for the implementation of training program:

The implementation of training workshops and/or courses will require a venue with the following services:

- Room and furniture to hold the event with capacity for at least 30 people.
- Meals.
- Accommodation.
- Computer laboratory.

Duration of contract:

A separate contract will be signed for each event; the duration of each contract will depend on the nature and content of the individual event.

2. Upgrading of PMP2K+ and SEMAFOR:

The company to be hired for software adjustment/upgrading should meet the following requirements:

- Qualified personnel (specialised in computer systems and programming).
- Extensive experience in software development, particularly in the forestry field.
- Time availability to attend work meetings with project staff.
- Ability to work in a team.

Duties:

- Adjust and/or redesign each software package so as to update the programming language, incorporating statistical functions and forestry calculations as requested by the project staff.

Duration of contract: 6 months

3. Research Assistants (university students)

Qualifications:

- University students in the field of forestry, natural resource management or related discipline.
- Completed course curriculum with due authorisation from the relevant university to conduct supervised professional work experience.
- Ability to work in a team.
- Good command of computer packages.
- Preferably familiar with monitoring of forest productivity and development (good command of MIRASILV, PROCAFOR and SEMAFOR technologies).

Duties:

- Support the coordination with forest sector stakeholders (universities, government organisations, private institutions and individual users);
- Support the training of forest sector stakeholders in the use of MIRASILV, PROCAFOR and SEMAFOR tools;
- Coordinate the implementation of fieldwork related to the establishment of a network of permanent sample plots and the collection of study variables;
- Support the systematization of the information generated for each species.
- Support the preparation of technical reports (technological packages);
- Support the organisation of dissemination workshops on the information collected.

Duration of contract: 6 to 10 months (as per the requirements of the relevant university).

ANNEX IV: MODIFICATIONS MADE IN RESPONSE TO THE RECOMMENDATIONS OF THE 36th ITTO EXPERT PANEL

No.	Expert Panel Recommendation	Modification made
1	Modify discussion in Section 1.1.1 (Relevance to ITTO) to focus more clearly on the importance of establishing permanent forest sample plots (PSPs) and its linkage to Goal 2.10 of the ITTO Action Plan	*The following was added on pages 3-4:* *c. To encourage members to support and develop industrial tropical timber reforestation and forest management activities as well as rehabilitation of degraded forest land, with due regard for the interests of local communities dependent on forest resources;* *Thus, the project is consistent with the following goals and actions established in the area of reforestation and forest management:*[6] *GOAL 1: Support activities to secure the tropical timber resource base* *GOAL 2: Promote sustainable management of tropical forest resources* *Specifically, the project will contribute to the following:* ➢ *An information generation system based on a network of permanent forest sample plots.* ➢ *Development of at least 12 technological packages.* ➢ *Implementation of a SIFGUA-linked dissemination and promotion strategy.* ➢ *Capacity-building for adequate system operation.*
2	Discuss the linkages, if any, to current project PD340/05 Rev.2 (M) 'Establishment of a National Forest Statistical Information System in Guatemala' and explain how existing hardware, software and personnel will be involved	The following was added on page 16: *This information will then be published in printed format and will also be incorporated into a geographic information system that will be available to all stakeholders through the use of an inter-institutional platform linked to Project PD 340/05 Rev.2 (M): "Establishment of a National Statistical Information System in Guatemala – SIFGUA".* *This project will generate, update and analyse technical information on the dynamics of natural forest ecosystems and forest plantations to support sustainable forest management throughout the process, starting from the collection of primary information. SIFGUA, on the other hand, is aimed at the integration of general forest information (trade, harvesting, reforestation and forest fire statistics, among others). Thus, SIFGUA will provide the hardware for the storage of data generated by this project and will also facilitate access to information for all users. It can therefore be concluded that these two projects are complementary in nature.*
3	Explain how the number of PSPs (1,168) was selected to be established and monitored as part of the forest productivity information system	The following clarification was added on page 16: ***I****n previous national projects (INAB's Monitoring Office, CATIE-CONAP and PROCAFOR) the number of plots required in the country was established as follows: 940 PSPs in forest plantations, 108 PSPs in natural coniferous forests and 120 PSPs in natural broadleaved forests. Even though these projects led to the establishment of a number of plots, many of them have now disappeared due to a lack of monitoring and/or have not had any maintenance. This project will locate and/or relocate PSPs at the national level on the basis of technical and bio-physical criteria with special emphasis on the priority forest regions of the country.*

[6] ITTO Yokohama Action Plan 2002-2006. ITTO.

No.	Expert Panel Recommendation	Modification made
4	Explain why 12 species are necessary to be included in the technology packages, and how these species were selected relative to others	The following was added on page 17: *At least 12 forest species are being considered based on an analysis carried out by INAB to prioritise the species to be used in the Forest Incentives Programme. These so-called "priority species" have been selected from a list of 31 species. The analysis took into account the demand for these species in the local and international markets, as well as local biodiversity and growth aspects. However, even though the project envisages the development of only 12 technological packages, the criteria will be established for the production of additional technological packages after project completion.*
5	Elaborate on the technical and scientific aspects	The following was added on page 12: *The project will primarily promote research on the growth dynamics of trees and forest stands with a view to identifying good sustainable management practices in harmony with the environment.* *The project will gather data and analyse major forestry variables in order to make projections on growth patterns, models, and responses to silvicultural treatments. A database will be established that will help provide information to the SIFGUA project, with the support of a Geographic Information System.* *The development of the Permanent Forest Sample Plot Network System will facilitate the establishment and evaluation of plots for a period of at least three years, in both natural (coniferous and broadleaved) forests and forest plantations. This will provide information that will help strengthen the formulation of forest management plans for both plantations and natural forests.* *The project will help to identify suitable biophysical conditions and the best sites for tree growth. This will contribute to the development of thematic maps to identify suitable areas for the growth of forest species within the framework of the Forest Incentives Program – PINFOR and other forest promotion programs. An analysis will subsequently be made to determine site quality through the development of site index curves at a given base-age, on the basis of specific growth and increment data obtained through the measurements and re-measurements taken. All the information generated will be made available in technological packages, which will also be a part of the statistical database that will be used to feed information into project PD 340/05 Rev.2 (M) "Guatemalan Forest Information System – SIFGUA".*
6	Elaborate on risk analysis and mitigation	The following analysis was added – pages 12: 2.5 Risk analysis and mitigation *A risk identified in the risk analysis is the possible lack of interest of target beneficiaries in the information to be supplied, if they fail to understand the importance of the monitoring and evaluation tools provided by the system. The following measures have been taken to minimize this risk:* *a) The project was formulated by a team of professionals with different areas of expertise on the basis of records of information requests by users to INAB offices for the implementation of forest management plans and reforestation and ecological restoration projects.* *b) Furthermore, the development of the project was also based on the needs of key private, public and academic sector stakeholders, who contributed with ideas and suggestions which have been duly taken into account in this project document.* *Another possible risk is that the systematisation process will not be scientifically sound and, therefore, the baseline information could*

No.	Expert Panel Recommendation	Modification made
		lack reliability and contain erroneous data. In order to mitigate this risk, the project was formulated on the basis of technical and scientific data verified at the local level. The project formulation also took into account the methodologies to be applied, the software to be used, the analysis and validation tools to be used, and the technical and scientific knowledge of the personnel who will participate in this project. *The lack of political support is also a potential risk. However, this risk is substantially reduced by the government's public and explicit confirmation (availability of funds for the implementation of PINFOR projects) that forest activities are a development strategy for the country.* *A change of forest policy is another possible risk. However, after ten years of continuous efforts taking into account the guidelines of the current forest policy, there has been no radical change, nor are any changes expected or perceived, to the policy of promoting the sustainable management of the country's forest resources.*
7	Discuss the application of Project 7 PROCAFOR; Pinelo, G and Manzanero, M.; and Ugalde, L. and CATIE methodologies in the establishment and monitoring of PSPs	A justification was added on page 16: *The decision to use the above methodologies in PSP establishment, measurement and re-measurement and in data analysis is based on the fact that these methodologies have already been tested and validated at the local level and have been adjusted to the specific conditions of Guatemala and Central America.*
8	Include qualifications of personnel to be involved in the project	The following was added on page 30: Annex II contains the terms of reference of the personnel to be recruited for the implementation of this project. The following was added on page 33: *INAB's professional staff participating in the project will include: 9 technical directors, 32 sub-regional directors and 32 forest technicians. Seventy-five percent (75%) of these professionals have sound forestry knowledge given their background (forest engineers, foresters, forest technicians) and twenty-five percent (25%) have basic knowledge and field experience (agricultural engineers, agricultural technicians) with specific skills in the use of Arc View software, global positioning equipment and MIRASILV software.*
9	Revise budgets to include evaluation costs and ITTO programme support costs (8%) in all budget tables and further explain the need for vehicle purchases; and	*After a rigorous analysis including a revision of calculations and an assessment of needs and activities not originally considered, it has been concluded that the same budget should be maintained, including ITTO programme support costs at 8%.* *The following was added on page 26:* *Capital items: This budget component includes the purchase of a vehicle, which is justified due to the need to carry out management actions for the initial strategic partnerships. Furthermore, this vehicle will help improve the supervision and monitoring of all personnel involved at the national level, thus ensuring effectiveness and efficiency in compliance with the proposed timeframe and goals.*

ANNEX V: MODIFICATIONS MADE IN RESPONSE TO THE RECOMMENDATIONS OF THE 37th ITTO EXPERT PANEL

Expert Panel Recommendation	Modification made
1. Further elaborate on the technical and scientific aspects of the project proposal, particularly as regards the statistical designs and methodologies that were utilized to determine the number of PSPs to be established for each type of forest in Guatemala and that currently add up to 1,168 plots. Confirm that this number of samples and their distribution among natural and planted forests is still valid today.	*Page 7, from paragraph 2:* Several efforts have been made in Guatemala to establish a forest information system to assess the dynamics of different forest associations and improve silvicultural practices, in both plantations and natural forests. These efforts have been isolated both institutionally and geographically. From 1995 to 2005, the Regional Forest Programme for Central America – PROCAFOR, through Project 7 on Sustained Management and Utilization of Natural Coniferous Forests in Guatemala, after recognising that the forest information generated by thesis studies was of restricted validity, promoted the establishment and monitoring of a network of PSPs in natural coniferous forests. The support provided included budget allocations for the partial funding of research work carried out by students for the preparation of degree theses and technical assistance in project formulation, data collection and information processing, using existing mechanisms and structures already in place at universities and education centres related to the forestry field, as well as conclusion of technical cooperation agreements between relevant institutions. Thus, a total of 108 permanent sample plots have been established to date under this program, and out of this total, 56 have been monitored. These plots are located in various regions of the country and have been established following a prioritization of areas and taking into account the support and availability of university centers, which have assigned students who have been working on these issues with the financial and technical support of INAB. With regard to broadleaved forests, several efforts were made from 1996 to 2000 to establish permanent sample plots, particularly in northern Guatemala (Department of Petén), including through initiatives undertaken by CATIE/OLAFO (Conservation Program for Sustainable Regional Development), CATIE/CUDEP, CATIE/NPV, ProPetén and Centro Maya. Through these efforts, a number of permanent plots were established in areas with the highest species representativeness and where the local communities and/or landowners were willing to cooperate. However, this work was abandoned for a while and the sample plots were never monitored, to the point that several of these experimental units were eventually lost. In 2005-2007, INAB and CONCYT, through the AGROCYT financial mechanism, implemented a research project to reactivate the network of permanent sample plots in this type of forests, which led to the establishment and restoration of some plots. To date, 59 out of a total of 120 plots have been recovered in this forest type. At the plantation level, some reforestation companies have recorded data from their own plantations since around 1995. However, the information collected has never been made available to the forest sector and these efforts have not been very significant. At the institutional level, after the launching of the Forest Incentives Programme (1997-1998), it became clear that there was a need to implement a monitoring and evaluation system through the establishment of permanent sample plots to assess and document plantation development. Thus, a cooperation and technical assistance agreement was signed in 2003 between INAB and CATIE. According to this agreement, support will be provided to INAB over a period of 3 years (2003-2005) for the establishment of a permanent sample plot network. At the beginning, the idea was to establish permanent sample plots in all reforestation projects supported by the Forest Incentives Programme. However, as the work progressed, it became evident that due to the lack of financial and technical support, this would not be possible. Therefore, species and areas were prioritized in the oldest plantations. Furthermore, in 2007 the Executive Board of the National Forest Institute issued the regulations for the Forest Incentives Programme – Resolution No. JD.01.01.2007 of 9 January 2007 – which in its Article 32 stipulates that reforestation project owners with areas of 45 hectares or larger should establish and maintain permanent sample plots from the third year onwards. Thus, out of a total of 940 plots established in plantations, 715 permanent sample plots are currently being monitored at the national level. These PSPs allow for the collection of data on 31 forest species with up to 6 measurements per plot. Table 1. Number of permanent sample plots established and under monitoring by forest

<table>
<tr><th>Expert Panel Recommendation</th><th>Modification made</th></tr>
<tr><td></td><td>type

<table>
<tr><th>Forest Type</th><th>No. of plots established</th><th>No. of plots under monitoring</th></tr>
<tr><td>Natural coniferous forest</td><td>108</td><td>56</td></tr>
<tr><td>Natural broadleaved forest</td><td>120</td><td>59</td></tr>
<tr><td>Plantations</td><td>940</td><td>715</td></tr>
<tr><td>TOTAL</td><td>1,168</td><td>830</td></tr>
</table>

As can be seen in Table 1 above, out of the 1,168 permanent sample plots established, 830 are being monitored. These plots have been prioritized in terms of areas, species and age, taking into account the institutional and private support available to ensure their sustainability. No statistical analysis has been conducted to date in order to assess the size of the sample area and its adequacy. Neither has a statistical design been developed for the distribution of plots. Therefore, one of the first activities to be carried out in this project (1st year of implementation) is a consultancy study for the statistical assessment of the quantity and distribution of permanent plots so as to determine the need to expand or reduce the size of the sample area and redirect the distribution of permanent sample plots as appropriate.

The permanent sample plot network in plantations is currently better consolidated than the natural forest plot network. At present, 715 permanent sample plots located in different regions of Guatemala are being monitored, including the assessment of 31 species in pure plantations and 21 species in mixed plantations (with different species associations).</td></tr>
<tr><td>Also describe the variables to be measured, the periodicity of the measurements, and the types of growth and yield models to be developed.</td><td>Page 15:

2.4 Technical and scientific aspects

The project will primarily promote research on the growth dynamics of trees and forest stands with a view to identifying good sustainable management practices in harmony with the environment.

The project will gather data and analyse major forestry variables in order to make projections on growth patterns, models, and responses to silvicultural treatments. A database will be established that will be made available to the public through the SIGFUA project, with the support of a Geographic Information System.

Measurements should be taken on an annual basis. Technically, these measurements must be taken after a given forest growth period. In Guatemala, this growth period is in winter, between the months of May and October, and therefore measurements should be taken in the months directly following this period, i.e. from October to December.

The main variables to be measured in both plantations and natural coniferous forests are as follows: diameter (taken at a height of 1.3 meters) and total height. These measurements should be recorded in millimetres and decimetres respectively. As an additional item, data should also be compiled on stem forms and the phytosanitary status of trees.

Stem form and defects codes include the following:

1 = foxtail
2 = slightly twisted
3 = very twisted
4 = warped base
5 = biforked
6 = leaning
7 = diseased
8 = pests
9 = asymmetrical crown

A = recoverable broken stem
B = non-recoverable broken stem
C = without crown
D = replant
E = rare species
F = coppice
G = thinning
H = natural regeneration
I = dominant
J = co-dominant
K = suppressed
L = straight stems with no form defects</td></tr>
</table>

Expert Panel Recommendation	Modification made
	Phytosanitary status codes include: A: vigorous B: standing dead tree C: fallen dead tree Affected Part: D: main stem affected E: higher branches affected F: stem and branches affected Dead crown: G: less than one third of the crown dead H: from one to two thirds of crown dead I: more than two thirds of crown dead In addition to the aforementioned variables, data will be compiled from natural broadleaved forests on commercial height of trees, position and shape of crowns, presence of vines and regeneration sampling to determine the density and current status of regeneration. After these variables are compiled, the data collected will be entered into the following software: – Plantations: MIRASILV – Natural coniferous forests: PMP2K PLUS – Natural broadleaved forests: SEMAFOR The input of the different variables into the relevant software will facilitate the preparation of technical reports, including growth and yield models. A growth model is a representation of a forest's natural dynamics, which generally includes data on growth, productivity and other changes to the composition and structure of a given stand. The term growth model is generally used in relation to a system of equations that provide growth and production forecasts for a given stand under a wide range of conditions. In this case, these will be developed through a multiple regression analysis formulated with annual measurements taken of different variables such as diameter, height, basal area and volume, in relation to the age of the species under study. The development of the Permanent Forest Sample Plot Network System will facilitate the establishment and evaluation of plots for a period of at least three years, in both natural (coniferous and broadleaved) forests and forest plantations. This will provide information that will help strengthen the formulation of forest management plans for both plantations and natural forests. The project will help to identify suitable biophysical conditions and the best sites for tree growth. This will contribute to the development of thematic maps to identify suitable areas for the growth of forest species within the framework of the Forest Incentives Program – PINFOR and other forest promotion programs. An analysis will subsequently be made to determine site quality through the development of site index curves at a given base-age, on the basis of specific growth and increment data obtained through the measurements and re-measurements taken. All the information generated will be made available in technological packages, which will also be a part of the statistical database that will be used to feed information into project PD 340/05 Rev.2 (M) "Guatemalan Forest Information System – SIFGUA".
Clarify how the project's proposed outputs are to directly achieve and/or contribute to the development and specific objectives and their indicators, or refocus these.	*Page 20:* 3.4 Implementation strategy The "responsible" management of natural forests is still an isolated practice in the region, although it is a well known fact that there are case studies that have demonstrated its technical feasibility and social viability. The lack of management actions is closely linked to the lack of conditions that would promote a change in destructive traditional practices. Despite the pressure that is being exerted both at the national and international levels, it should be realized that a shift from this situation to one where the long term objectives of economic profitability, social equity and forest ecological conservation prevail, will imply a series of changes by the direct users of these forests, which will inevitably require some time to develop so as to produce the desired results. In this context, the role of the State in general and that of the private sector, NGOs and researchers in particular, are

Expert Panel Recommendation	Modification made
	key factors in ensuring that the process is initiated, advanced and consolidated. The management of natural forests requires the implementation of a series of actions, such as forest management practices, the study of natural regeneration patters (mortality and recruitment rates), growth dynamics patterns and the application of silvicultural treatments. The objective of this project is to establish a standardized data bank using the annual measurements taken in permanent plots. This information, together with the data obtained from inventories, will be used to develop a model that will simulate forest growth patterns pre and post harvesting and to evaluate the consequences of a number of given management parameters (minimum cutting diameter, felling cycle, percentage of seed trees) in relation to harvesting potential, taking into account current production levels by tree age and density and site quality in strategic ecosystems. The project will also develop growth and yield tables, which will be used as models for projections and for the formulation of management plans. This will help to bridge the gap that currently exists in the planning of forest management activities due to the lack of basic silvicultural information as well as the lack of data on the dynamics of different forest associations. In addition, this will contribute to improving the planning and implementation of sustainable forest management activities in the forests of Guatemala. The National Forest Institute will be the executing agency of the project. The Institute will provide technical support and will facilitate the training events and the systematisation of the information generated. Technically qualified personnel will be hired for the implementation of the Project to facilitate the coordination and integration of the various stakeholders identified during the project implementation period: forest owners, forest stewards, universities and secondary education centres. The results of this coordination process will be the establishment of strategic, horizontal cooperation partnerships that, through the signing of agreements and letters of understanding, shall clearly specify the responsibilities and expected benefits of each party concerned.
2. Further describe the technical and scientific content of the technological packages to be developed and in what way these will assist potential stakeholders establish or improve the management of natural or planted forests in Guatemala.	*Pages 20-21:* In previous national projects (INAB's Monitoring Office, CATIE-CONAP and PROCAFOR) the number of plots required in the country was established as follows: 940 PSPs in forest plantations, 108 PSPs in natural coniferous forests and 120 PSPs in natural broadleaved forests. Even though these projects led to the establishment of a number of plots, many of them have now disappeared due to a lack of monitoring and/or have not had any maintenance. This project will locate and/or relocate PSPs at the national level on the basis of technical and bio-physical criteria with special emphasis on the priority forest regions of the country. This activity will be implemented using the methodologies developed by Project 7 PROCAFOR for natural coniferous forests; the methodology developed by Pinelo, G. and Manzanero, M. for natural broadleaved forests; and the methodology developed by Ugalde, L. and CATIE for forest plantations. The decision to use the above methodologies in PSP establishment, measurement and re-measurement and in data analysis is based on the fact that these methodologies have already been tested and validated at the local level and have been adjusted to the specific conditions of Guatemala and Central America. The project will firstly evaluate the statistics related to the plots established by previous projects and according to the results of this exercise, the project will then begin the establishment and monitoring of the required permanent sample plots. The information will be recorded, processed and systematized in technological packages. Forest Technological Packages are an integrated and sequential set of scientific and technical applications and knowledge that facilitate increased productivity, particularly in forest plantations, under a framework of sustainability and effectiveness. In other words, these packages define and establish the techniques and methodologies for the appropriate management of a given species. The main objective of creating Forest Technological Packets is to increase the profitability and productivity, mainly in forest plantations, a process that seeks to obtain as much information as necessary about the species and to identify, propose and implement techniques and procedures

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<tr><th>Expert Panel Recommendation</th><th>Modification made</th></tr>
<tr><td></td><td>that will generate the best forest production results. Thus, these technological packages can be a very useful tool for the forest sector, as they help silviculturalists avoid unnecessary waste of time, effort and money.

The Forest Technological Packages will provide information to producers on the advantages and disadvantages of selecting a given species for production, including information on seed provenance, selection of most appropriate soils and/or sites for the growth of that species, its range, optimization and harvesting, the management of pests and diseases, and even the requirements for its silvicultural management, which could be an issue for the forest industry sector and even for the care of the ecosystem and the environment.

A Forest Technological Package comprises several stages of research and development that are inter-related and adjusted to previously established methodologies and techniques. Generally, it starts with the silvicultural management stage and goes all the way up to the wood technology stage, a process that can last an average of up to 20 years. However, this project involves the launching of a process, which will be then completed with the institutional support of INAB and other forest sector stakeholders.

The technological packages to be developed will include at least the following information:

▪ Identification of best sites per species.
▪ Thematic maps indicating the best sites per species.
▪ Importance of provenance and selection of seeds and plant material.
▪ Plantation establishment method.
▪ Growth and increment rates per species.
▪ Proposal for growth and productivity monitoring and evaluation methodology.
▪ Plantation and natural forest silviculture.
▪ Pest and disease management.</td></tr>
<tr><td>Further explain the scientific and/or technical reasoning behind the selection of 12 tree species and identify these. Specify in more detail the training component envisaged for the stakeholders.</td><td>Pages 21-22:
In order to start the forest technological package development process, 10 priority species were selected through the Forest Incentives Programme (PINFOR), on the basis of an analysis of 31 species, taking into account the demand for these species in the local and international markets, as well as local biodiversity and growth aspects. The other two species were selected on the basis of their extensive range and their demand and importance in the national market (see table 2).

Table 2: List of species selected for the development of technological packages

<table>
<tr><th>No.</th><th>Technical name</th><th>Common name</th></tr>
<tr><td>1</td><td>Abies guatemalensis</td><td>Pinabete o pachac</td></tr>
<tr><td>2</td><td>Calophyllum brasiliense</td><td>Santa María</td></tr>
<tr><td>3</td><td>Cedrela odorata</td><td>Cedar</td></tr>
<tr><td>4</td><td>Gmelina arborea</td><td>Melina</td></tr>
<tr><td>5</td><td>Pinus caribaea var.Hondurensis</td><td>Caribe Pine, Peten Pine</td></tr>
<tr><td>6</td><td>Pinus maximinoii</td><td>Candelillo Pine</td></tr>
<tr><td>7</td><td>Pinus oocarpa</td><td>Ocote Pine</td></tr>
<tr><td>8</td><td>Swietenia macrophylla</td><td>Mahogany</td></tr>
<tr><td>9</td><td>Tabebuia donnell-smithii</td><td>Matilisguate</td></tr>
<tr><td>10</td><td>Tectona grandis</td><td>Teak</td></tr>
<tr><td>11</td><td>Cupressus lusitánica</td><td>Common Cypress</td></tr>
<tr><td>12</td><td>Vochysia guatemalensis</td><td>San Juan</td></tr>
</table>

These species are renowned for the quality of their timber which has multiple uses in different industries (construction, cabinet making, etc.). They are fast-growing species with a wide natural range and, in general, have no major pest problems and are in demand both at the national and international levels.

However, although the project only envisages the development of 12 Technological Packages, criteria will also be established for the formulation of more technological packages in the future.</td></tr>
</table>

Expert Panel Recommendation	Modification made
	The development of the forest technological packages will be coordinated by the project's technical personnel with the support of the National Forest Institute. However, an international consultant will be hired to design and develop these packages. The consultant will also have the support of the middle and higher academic sector and will use the information collected from the PSPs established at the national level, as well as information from any other complementary technological studies undertaken. The contribution and participation of the universities will be vital as they have great scientific potential, both in terms of teaching staff (staff with masters and PhD degrees) and students of related disciplines with research potential, as well as equipment and laboratories. This information will then be published in printed format and will also be incorporated into a geographic information system that will be available to all stakeholders through the use of an inter-institutional platform linked to Project PD 340/05 Rev.2 (M): "Establishment of a National Statistical Information System in Guatemala – SIFGUA". This project will generate, update and analyse technical information on the dynamics of natural forest ecosystems and forest plantations to support sustainable forest management throughout the process, starting from the collection of primary information. SIFGUA, on the other hand, is aimed at the integration of general forest information (trade, harvesting, reforestation and forest fire statistics, among others). Thus, SIFGUA will provide the hardware for the storage of data generated by this project and will also facilitate access to information for all users. It can therefore be concluded that these two projects are complementary in nature.
	Page 22: During the three-year implementation period, the project will organize awareness campaigns aimed at different stakeholders so as to guarantee the effective and efficient establishment and monitoring of permanent plots. The project will implement a training program aimed at developing the skills and capacities of forest sector stakeholders, in the use of the methodologies and tools identified for the monitoring and evaluation of coniferous and broadleaved plantations and natural forests, after these have been duly updated and validated. An international consultant will be hired for the implementation of this activity. This consultant will be responsible for the design and implementation of a training program detailing the curricula and logistic arrangements for the 12 training workshops envisaged by the project. The 12 training workshops will be scheduled as follows: ▪ 4 training workshops on the methodology for the monitoring and evaluation of forest plantations (MIRASILV), ▪ 4 training workshops on the methodology for the monitoring and evaluation of natural coniferous forests (PROCAFOR – PMP2K +), ▪ 4 training workshops on the monitoring and evaluation of natural broadleaved forests (SEMAFOR). These workshops will be geared to forest owners, silviculturalists, forestry teaching staff and students, and forest technicians. The National Forest Institute, as the project executing agency, will provide technical assistance and coordinate the training events.
3. Further update and/or include additional background information on the technical and scientific developments as regards the recent establishment and monitoring of PSPs in Guatemala as per INAB's web site and the recently released study on the "Initial Growth and Productivity of Forest Plantations established under PINFOR"	*Pages 8-9:* In January 2009, INAB published a technical report prepared by J. Cojom, showing preliminary growth results derived from the analysis of data taken from 633 permanent sample plots, as the behaviour of species should be assessed on the basis of a full harvesting cycle so sound scientific and technical results can only be generated over a period of at least 10 years. At present, the maximum number of consecutive measurements in permanent sample plots is five. The aforementioned report also shows average data for age, diameter at breast height (DBH), total height, volume (m^3/ha), mean annual increment (MAI in DBH, height and volume), current annual increment (CAI in volume) and site index category for the following species:

Expert Panel Recommendation	Modification made
by P.F. Jose Israel Cojom Pac.	

No.	Technical name	Common name
1	*Abies guatemalensis*	Pinabete o pachac
2	*Acrocarpus fraxinifolius*	Cedro rosado o Mundani
3	*Alnus jorullensis*	Aliso
4	*Azadirachta indica*	Nim, Neem
5	*Caesalpinia velutina*	Aripin, Malinche
6	*Calophyllum brasiliense*	Santa María
7	*Casuarina equisetifolia*	Casuarina
8	*Cassia siamea*	Cassia de flor amarilla
9	*Cedrela odorata*	Cedro
10	*Tabebuia donnell smithii*	Palo blanco
11	*Cupressus lusitánica*	Cipres común
12	*Enterolobium cyclocarpum*	Conacaste, Guanacaste
13	*Gmelina arborea*	Melina
14	*Gravilea robusta*	Gravilea
15	*Guazuma ulmifolia*	Caulote
16	*Nectandra especie*	Aguacatillo
17	*Pinus ayacahuite*	Pino blanco
18	*Pinus caribaea var. Hondurensis*	Pino caribe, Pino del Petén
19	*Pinus maximinoii*	Pino candelillo
20	*Pinus oocarpa*	Pino de ocote
21	*Pinus pátula*	Pino pátula o candelabro
22	*Pinus pseudostrobus*	Pino triste
23	*Pinus rudis*	Pino de las cumbres
24	*Pinus tecunumani*	Pino de la Sierra
25	*Pterocarpus macrocarpus*	Sangre
26	*Sickingia salvadorensis*	Puntero
27	*Swietenia macrophylla*	Caoba
28	*Tabebuia rosea*	Matilisguate
29	*Tectona grandis*	Teca
30	*Terminalia oblonga*	Volador
31	*Vochysia guatemalensis*	San Juan

This analysis revealed the areas where individual species showed better or worse initial growth. It should be pointed out that for each species, a distinction was made between plantations with and without silvicultural management, with the main indicator being density reduction as a result of thinning.

Site index charts were presented for plantations showing better and worse development and species for which a calculation model was available. This allowed for a comparison between plantations, taking into account that site index is a reflection of site quality influenced by the implementation of forest management practices or lack thereof.

In addition, the study included curve charts showing growth dynamics data collected from consecutive measurements of DBH, height and volume/ha in the permanent sample plots under study, with up to 5 consecutive measurements in some cases. Plantation quality was assessed through the allocation of codes to describe stem form and defects as well as health status. The report included code analyses and summaries for each species, which can be used as a tool for the development and implementation of pruning and thinning schedules.

Another variable studied was forest management, characterized mainly by the implementation of thinning practices. The analysis also included comparisons between plantations with and without thinning for the same species and age in areas for which this information was available.

With regard to natural forests (both coniferous and broadleaved forests), measurements have been taken in 56 permanent sample plots in coniferous forests and 59 plots in

Expert Panel Recommendation	Modification made
	broadleaved forests. However, this information has not yet been processed so no results are available on the evaluations conducted.
4. Further elaborate on risk analysis and mitigation. Review the statement in the first paragraph under 2.3 Problem Analysis and the fourth paragraph under 2.1 Origin, and historically analyse the reasons why the previous attempts to establish PSPs in Guatemala failed and provide for alternatives on how to mitigate these.	*Page 16:* A risk identified for this project is the possible lack of interest of target beneficiaries in the information to be supplied, if they fail to understand the importance of the monitoring and evaluation of the system. The following measures have been taken to minimize this risk: – The project was formulated by a team of professionals on the basis of records of information requests by users to INAB offices for the implementation of forest management plans and reforestation and ecological restoration projects. – Furthermore, the development of the project was also based on the needs of key private, public and academic sector stakeholders, who contributed with ideas and suggestions which have been duly taken into account in this project document. Another possible risk is that the systematisation process will not be scientifically sound and, therefore, the baseline information could lack reliability and contain erroneous data. In order to mitigate this risk, the project was formulated on the basis of technical and scientific data verified at the local level. The project formulation also took into account the methodologies to be applied, the software to be used, the analysis and validation tools to be used, and the technical and scientific knowledge of the personnel who will participate in this project. The neglect and lack of monitoring of the permanent sample plot network to be established is also a potential risk. This, in fact, was the main reason for the failure (to a certain extent) of the previous attempts to establish a PSP network. In view of this possibility, the following mitigation measures will be taken: – The National Forest Institute (INAB) has undertaken to open an Information System coordination office on forest productivity, through which it will ensure an ongoing monitoring and technical assistance service through the regional and sub-regional offices of INAB. – Furthermore, partnerships will be negotiated with the academic and the private sectors for the maintenance of plots and annual plot measurements. – Access will be given to the information produced. This will ensure that silviculturalists will be committed to the maintenance of the system, the maintenance of plots and the compilation of annual measurements. Access to the information will be ensured through the connection of this project to SIFGUA, as well as by the regular publication of the outputs achieved. The lack of political support is also a potential risk. However, this risk is reduced by the government's public and explicit confirmation (availability of funds for the implementation of PINFOR projects) that forest activities are a development strategy for the country. A change of forest policy is another possible risk. However, after ten years of continuous efforts taking into account the guidelines of the current forest policy, there has been no radical change, nor are any changes expected or perceived, to the policy of promoting the sustainable management of the country's forest resources.
Clearly indicate INAB's commitment towards the permanency of a national network of permanent plots of forest species that will guarantee the continuity of its activities after project completion, as results will only start becoming evident after a decade or more.	*Page 33:* 3.8 SUSTAINABILITY An initiative of this nature is a long-term effort. The 3-year project implementation period is only a starting point, so it is necessary to develop actions to ensure its continuity and sustainability. The level of project ownership built in the academic and private sectors will determine future project sustainability. In view of this, a post-project strategy is proposed based on the following courses of action: **Coordination office** 1. Currently, INAB has a forest plantation and natural forest monitoring and evaluation section, which will become the coordination office of the Guatemalan

Expert Panel Recommendation	Modification made
	Forest Productivity Information System. This office will be responsible for monitoring project activities, establishing strategic partnerships, issuing agreements and letters of understanding, following up training activities, and identifying financing sources for the sustainability of the information system. **Infrastructure and capacities** 2. Relevant stakeholders should make use of the infrastructure established in terms of office facilities, computer equipment, forest measuring equipment and databases, so as to avoid unnecessary investments. 3. Project activities include awareness, training and outreach programs to motivate, disseminate and develop capacities and conditions required for spontaneous continued action by forest owners (private sector) and forest planners. **Financing** 4. The search for financing sources should not be limited to the formulation of new project proposals. The coordination office will be able to generate funds through the income derived from training courses, sale of dissemination documents and materials, and provision of technical assistance. **Systematization** 5. The systematization process to be carried out after project completion will be based on a prospective approach. It will produce a technical report which will include follow-up and refinement actions as required to adjust to existing conditions. The implementation of these actions will be under the responsibility of the coordination office. The entire process will be linked to SIFGUA in accordance with that project's requirements.

ANNEX VI: MODIFICATIONS MADE IN RESPONSE TO THE RECOMMENDATIONS OF THE 38th ITTO EXPERT PANEL

No.	Expert Panel Recommendation	Modification made
1	Provide additional justification as regards the establishment of 96 new plots in addition to the existing plots (830 active and 338 abandoned plots), and very few plots have been established in the natural tropical forests in Northern Guatemala	*Page 20* The project will firstly evaluate the statistics related to the plots established by previous projects and according to the results of this exercise, the project will then begin the establishment and monitoring of the required permanent sample plots. In the case of natural broadleaved forests, at least 96 new permanent sample plots will be established so as to reach the number of permanent plots originally established in this type of forest (120 PSPs). However, the final number of sample plots required will be provided by the results of the consultancy on the statistical evaluation of plots established in previous projects. Thus, depending on the results of that consultancy, it might be necessary to increase the number of permanent sample plots in the future.
2	Identify bio-physical variables (if any) to be measured in addition to tree characteristics (e.g. site class or soil characteristics) and explain how they will be used in growth models and regression analysis	*Pages 15-16* The following bio-physical variables will also be considered: a) Site index; b) Physiographic variables: i. Altitude; ii. Slope; iii. Topography; iv. Surface stone content; v. Susceptibility to flooding; c) Climatic variables: i. Temperature; ii. Rainfall; d) Soil variables: i. Soil reaction (pH); ii. Exchangeable soil bases; iii. Soil depth. These variables will be incorporated into the results obtained in the regression analysis of forest variables (growth data) so as to identify the characteristics of the sites showing the best development results for the species under study.
3	Provide estimates of total cost to maintain plots after project completion, along with estimated cost per plot	*Page 33* However, plantation and natural forest owners will be responsible for ensuring the maintenance of permanent sample plots after project completion. Two annual clearings will be carried out in each plot at an estimated annual cost of US$13.75 per plot, thus amounting to a total of approximately US$16,000 per annum (considering a total of 1,163 plots established).
4	Clearly describe INAB's long-term commitment to provide for the continuity in the monitoring of the permanent sample plots established by the project and the periodic analysis of the data collected. Specify the institutional arrangements to be put in place to ensure the continuation of activities initiated by the project	
5	Adjust the costs for ITTO monitoring and review to US$10,000 per year, include US$15,000 for mid-term/ex-post evaluation, and recalculate ITTO's Programme Support Costs so as to conform to the standard of 8% of total ITTO project costs	

ANNEX VII: MODIFICATIONS MADE TO UPDATE THE PROJECT DOCUMENT

No	Project section	Modification made	Page(s)
1	Environmental context	Forest cover data was updated up to 2006 for both inside and outside Protected Areas. PINFOR's statistics were also updated.	5 - 6
2	Origin	A paragraph was included outlining the amendments made to PINFOR's regulations in 2010. Furthermore, the table showing the number of permanent sample plots established and under monitoring was also amended.	7 - 8
		A paragraph was included outlining an initiative that was recently implemented with CONAP to follow up PSPs in natural broadleaved forests.	
3	Technical and scientific aspects	A paragraph was included to indicate that a number of preliminary maps have been generated but the information in some of them is yet to be field checked and validated.	9
4	Sustainability	A paragraph was added to outline the coordination to be established with CONAP during and after project implementation.	16
5	Annex II	The profile of the collaborating agency, responsible for the administration of the project, was included as Annex II.	40 - 41