

INTERNATIONAL TROPICAL TIMBER ORGANIZATION

ITTO

PROJECT PROPOSAL

TITLE	INCREASING COMMERCIAL REFORESTATION COMPETITIVENESS IN COSTA RICA
SERIAL NUMBER	PD 849/17 Rev.2 (F)
COMMITTEE	REFORESTATION AND FOREST MANAGEMENT
SUBMITTED BY	GOVERNMENT OF COSTA RICA
ORIGINAL LANGUAGE	SPANISH

SUMMARY

Commercial reforestation rates in Costa Rica have been decreasing since the early 2010s, reducing the timber supply for the domestic market, which in turn has led to increased risks of illegal logging in natural forests both in protected areas and in private forest lands. Furthermore, reduced reforestation rates are expected to cause the loss of employment opportunities, to foster the use of timber substitutes and, at the global level, limit the country's possibilities to achieve REDD+ targets. This project will increase commercial reforestation competitiveness in Costa Rica, with a view to fulfilling the Costa Rican need for forest products and providing the country with the opportunity to increase greenhouse gas sequestration and achieve the country's REDD+ targets. The project seeks to develop and test an effective reforestation financing system that promotes management of forest plantations in the country, increases their m³/hectare/year productivity, and develops high value-added timber products to improve forest producers' income.

EXECUTING AGENCY COSTA RICAN INSTITUTE OF TECHNOLOGY, SCHOOL OF FORESTRY/RESEARCH CENTRE FOR FORESTRY INNOVATION (CIF)

COLLABORATING AGENCIES

DURATION 36 MONTHS

APPROXIMATE STARTING DATE UPON PROJECT APPROVAL

BUDGET AND PROPOSED SOURCE OF FINANCE	Source	Contribution in US\$	Equivalent in national currency
	ITTO	335,765	
	ITCR	86,400	
	TOTAL	422,165	

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PROJECT BRIEF

Historically, Costa Rica has shown deep commitment to sustainable development and, in particular, to the protection of natural resources, including forests and their environmental services, which are a core part of the natural heritage on which human development expectations and the fight against poverty are based.

Costa Rica is one of the few tropical countries that has been able to reverse deforestation and degradation of its natural forests through stronger public policies that have proved successful over 20 years of implementation of the current Forest Law. This Law is based on the ban of changes to forest land use, and it strengthens the protected area system by ensuring biodiversity conservation in critical areas of the country; it implements the Payment for Environmental Services scheme as a policy instrument to ensure forest conservation and promote improved carbon sequestration through the reforestation of forest plantations, and agroforestry systems.

Currently, Costa Rica has 2,647,470 hectares (51.7% of its territory¹) under forest cover, of which 1,548,583 hectares are primary forests² (30.2% of the national area). The maintenance of this forest cover over the past few decades has been a significant achievement resulting from a multiplicity of laws, policies and programmes, all of which has required significant resource investments. In this context, Costa Rica has proven that i) it has been able to maintain a large part of its primary forests; ii) it has reduced deforestation of its forests; and iii) it has promoted the regeneration of its forests.

However, since the early 2010s, there has been a gradual drop in commercial reforestation rates in Costa Rica, under the Payment for Environmental Services (PES) mechanism, which has led to reductions in timber supply for the domestic market, increased risk of illegal logging in our protected area forests, as well as the loss of employment opportunities, and the outgo of strong currencies resulting from the importation of timber.

Over the past five years, forest plantations, particularly those set up with the Payment for Environmental Services (PES) system and other State promotion mechanisms, have contributed approximately 1,875,000 m³ of sawnwood and generated close to 15,000 permanent jobs³.

Furthermore, growing trees for production and managing and conserving secondary forests are crucial endeavours if we want to achieve the goals of the National Forest Development Plan 2011-2020, the National REDD+ Strategy, and to achieve the country's goals of mitigating climate change and achieving carbon neutrality. Reforestation through forest plantations or natural forest regeneration are the only forest production activities that show potential to both reduce CO₂ emissions and increase carbon stocks in the country.

Over the past few years, FONAFIFO, in line with the National Forest Development Plan (2011-2020), allocated resources to reforest 7,000 hectares per year, and to plant 750,000 trees in agroforestry systems per year; however, only 50% of this goal has been achieved on average. Furthermore, it is estimated that there are only 75,000 hectares of remaining forest plantations, but data on their productivity (species, stocks and quality) is lacking.

It has been suggested that the major causes of the problems encountered by reforestation as a small and medium size producer business endeavour might include:

- a) lack of high value added products to increase forest producer income;
- b) the length of time involved in forest production cycles, and the resulting liquidity issues for their cash flow;
- c) lack of resources and high costs of increasing forestry productivity to produce timber and other products in adequate quantities and quality; and
- d) lack of competitive markets for the placement of the products and services derived from forest activity.

¹ Including forest plantations, mangroves, palm swamp forests (yolillales) and palm forests, as well as primary and secondary forests.

² According to Map of Types of Forest 2011-2012. Prepared by: E. Ortiz for SINAC. National Forest Inventory

³ Arce, Héctor; Rojas, Susana; Vega, Felipe; Barrantes, Alonso; Soto, Gabriela. 2013. Reforestation Commission Reports Prepared by Fondo de Financiamiento Forestal, Oficina Nacional Forestal, Cámara Costarricense Forestal. San José, Costa Rica. 47 p

This project will increase commercial reforestation competitiveness in Costa Rica, with a view to fulfilling the Costa Rican need for forest products and to providing the country with the opportunity to increase greenhouse gas sequestration and achieve the country's REDD+ targets.

The project plans to use operating funds mainly provided by ITTO, while the Costa Rican Institute of Technology - ITCR (Instituto Tecnológico de Costa Rica) will provide the human resources needed for implementation, and laboratory, offices and computer and specialised equipment from the Research Centre for Forestry Innovation - CIF (Centro de Investigación en Innovación Forestal) of ITCR's School of Forestry. Furthermore, it is proposed that ITTO funds be administered through ITCR, as this institution possesses the mechanisms to implement this kind of project, which will provide an administrative structure for recruitment and input purchase, and will provide accounting, auditing and financial reporting to ITTO.

The project pursues three specific outputs, which together will help increase commercial reforestation competitiveness in Costa Rica, with a view to fulfilling the country's need for forest products. The three specific outputs of the project include: a) develop an innovative financing system for commercial reforestation, with its corresponding control system; b) increased commercial reforestation productivity; and c) develop high value-added products that utilise timber from the country's forest plantations.

The proposal seeks USD 269,790 from ITTO (excluding ITTO administration costs), and ITCR will make a contribution of USD 86,400. The ITTO budget will be allocated as follows: 27.0% for personnel costs, 53.0% for operating expenses, and 20.0% for capital items. Furthermore, 100% of ITCR funds will be allocated for personnel costs; ITCR-funded administration costs have not been included, since the Institution will be using its own systems.

LIST OF ABBREVIATIONS AND ACRONYMS

CIF: Research Centre for Forestry Innovation (Centro de Investigación en Innovación Forestal)

ITCR: Costa Rican Institute of Technology (Instituto Tecnológico de Costa Rica)

ASIREA: Atlantic Region Sustainable Development Association (Asociación para el Desarrollo Sostenible de la Región Atlántica)

CACH: Hojancha Shire Agriculture Centre (Centro Agrícola Cantonal de Hojancha)

CODEFORSA: San Carlos Forest Development Commission (Comisión de Desarrollo Forestal de San Carlos)

COOPEAGRI: El General Agriculture, Industry and Multiple Services Cooperative (Cooperativa Agrícola Industrial y de Servicios Múltiples El General)

FONAFIFO: National Forest Finance Fund (Fondo Nacional de Financiamiento Forestal)

ONF: National Forest Finance Office (Oficina Nacional de Financiamiento Forestal)

PNFD: National Forest Development Plan (Plan Nacional de Desarrollo Forestal) (2011-2020)

PROCOMER: Costa Rica Foreign Trade Promoter (Promotora de Comercio Exterior de Costa Rica)

PES: Payment for Environmental Services Programme (Programa de Pago por Servicios Ambientales)

RHN: North Huetar Region (Región Huetar Norte)

RHC: Caribbean Huetar Region (Región Huetar Caribe)

RC: Chorotega Region (Región Chorotega)

RB: Brunca Region (Región Brunca)

MAP OF PROJECT AREA

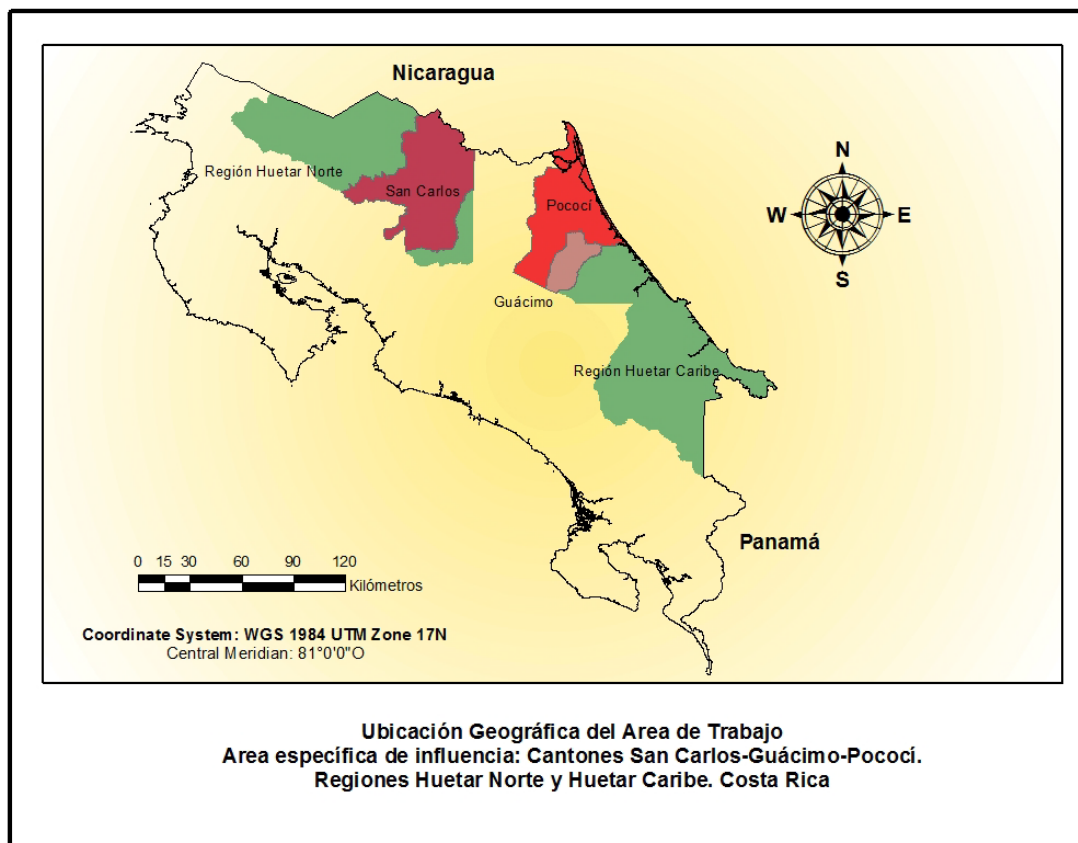


Figure 1. Geographic location of the project:
San Carlos-Guácimo and Pococí Shires

PART 1. PROJECT CONTEXT

1.1 Origin

The project proposal is the result of the outcomes of the Arce et al. (2013)⁴ study requested by one of the members of the FONAFIFO Board of Directors, and of the results of the work done by Santamaría (2015)⁵ who was involved in the design of Costa Rica's REDD+ programme submitted to the World Bank's Forest Carbon Partnership Facility (FCPF). The latter study followed the premise that growing trees for production is crucial to the fulfilment of the goals set in the National Forest Development Plan 2011-2020, and the country's REDD+ strategy.

Currently, forest plantations supply over 77% of primary industry, and natural, mature, secondary forests and single trees in pastures supply close to 20%. If commercial reforestation was encouraged, there would be no impact on forests, and supply could be maintained and even increased.

It is estimated that Costa Rica lacks sufficient plantations to counteract the current logging regime. Annual reforestation rates of 3,500 hectares are too low to sustain national production. The National Forest Finance Office (ONF) has calculated that 7,000 hectares of new plantations per year are needed⁶. Furthermore, early logging to produce pallets and other products, reduces the expectation that high volumes may be achieved in plantations, and it also reduces potential value adding of timber coming from those plantations. It is also estimated that the replacement of current imports would require approximately 376,000 m³ of roundwood, and this in turn would require 2,000 to 2,500 hectares annually of high productivity forest plantations.

Over the past five years, forest plantations, particularly those set up with the Payment for Environmental Services (PES) system and other State promotion mechanisms, have contributed approximately 1,875,000 m³ of sawnwood and generated close to 15,000 permanent jobs. If this timber had been imported, it would have caused a drain of at least \$ 412 million, while the State investment was approximately \$35 million. This shows that growing trees for production can be a very good investment for the country, not only because of its widely acknowledged environmental benefits, but also because it creates several production chains, employment and value adding (Arce et al, 2013).

Of the established plantations, there is information available on the technology, markets and prices for about 63% of the species, such as teak (*Tectona grandis*) and melina (*Gmelina arborea*). The remainder is a long list of species including cebo (*Vochysia guatemalensis*), acacia (*Acacia mangium*), pine (*Pinus sp.*), amarillón or roble coral (*Terminalia amazonia*) and cedar (*Cedrela sp.*). Excluding the latter, these species are scarcely known on the market. Additionally in 2012 569,579 trees were planted in agroforestry systems, with a total of 4,677,135 trees planted under Agroforestry systems (AFS) between 2003 and 2012 (Arce et al., 2013).

Santamaría (2015), and Arce et al. (2013) have indicated that over the past few years, FONAFIFO, in line with the National Forest Development Plan (2011-2020)⁷, allocated resources to reforest 7,000 hectares per year, and to plant 750,000 trees in agroforestry systems per year; however, only 50% of this goal has been achieved on average. Furthermore, it is estimated that there are only 75,000 hectares of remaining forest plantations, but data on their productivity (species, stocks and quality) is lacking. Ortiz (2005)⁸ estimated that the country had an area of 121,000 to 147,000 hectares mostly under melina and teak, and over 10 years this has been reduced to close to 75,000 hectares⁹. The low reforestation rate can be explained in many ways, of which the most important include:

⁴ Arce, Héctor; Rojas, Susana; Vega, Felipe; Barrantes, Alonso; Soto, Gabriela. 2013. Reforestation Commission Reports Prepared by Fondo de Financiamiento Forestal, Oficina Nacional Forestal, Cámara Costarricense Forestal. San José, Costa Rica. 47 p

⁵ Santamaría, Oscar. 2015. Estudio de mercado de los productos madereros y sus sustitutos para mejorar las condiciones para aumentar los acervos de carbono en productos de madera de larga duración. Informe de Consultoría. Programa REDD, San José, Costa Rica.

⁶ ONF (National Forest Bureau), CR. 2015. Usos y aportes de la madera en Costa Rica. Estadísticas 2014.

⁷ PNDF. 2011. National Forest Development Plan 2011-2020. Ministry of the Environment, Energy and Telecommunications. San José, Costa Rica.

⁸ Ortiz, Edgar. 2005. Mecanismos financieros para promover la reforestación en Costa Rica. Informe final de actividad de fortalecimiento de la investigación y extensión. School of Forestry, Vice-Chancellor of Research and Outreach. ITCR, Cartago, Costa Rica. 53 p.

⁹ According to Map of Types of Forest 2011-2012. Prepared by E. Ortiz for SINAC. National Forest Inventory.

- 1) High opportunity cost of land because of intense competition from other crops and livestock grazing, and other reasons;
- 2) In general, areas available for planting are small;
- 3) Poor integration of production with industry and markets (decisions are taken on the basis of aspects such as tree growth, and not on their use);
- 4) Low utilization rate of trees; data on production costs has shown that 53.3% of the cost difference between Chile and Costa Rica can be explained by the lower rate of utilization of logs in this country;
- 5) There is no network to share technical experience; this has resulted in complaints over the lack of technical assistance and forest production technological packages;
- 6) Efforts are too widespread, there are no priority zones.

Furthermore, the perception of different groups such as FONAFIFO regional officers, forest managers, producers and organizations points to the existence of other recurring themes impacting on reforestation activities in Costa Rica, including:

- 1) Lack of technical advice
- 2) Financial problems
- 3) Market problems (poor integration with the forest industry), as well as
- 4) Producer decisions, gathered under the 'attributable to the client' category in the PES system, including lack of land title deeds, property size, etc.

1.2 Relevance

1.2.1 Conformity with ITTO's objectives and priorities

The proposal was formulated in accordance with the objectives of the International Tropical Timber Agreement (2006), specifically:

a) Promoting and supporting research and development with a view to improving forest management and efficiency of wood utilization and the competitiveness of wood products relative to other materials, as well as increasing the capacity to conserve and enhance other forest values in timber producing tropical forests; and

b) Encouraging members to support and develop tropical timber reforestation, as well as rehabilitation and restoration of degraded forest land, with due regard for the interests of local communities dependent on forest resources.

Furthermore, the project is consistent with the ITTO Strategic Action Plan 2013-2018¹⁰, specifically with respect to the following strategic priorities:

Strategic priority 2. Increase the contribution of tropical forests to national and local economies, including through international trade, and develop and disseminate financial tools for communities and forest-based enterprises.

Strategic priority 4. Reduce tropical deforestation and forest degradation and enhance the provision of environmental services.

The project was prepared also in response to document ID:PS-4: Guidelines for the establishment and sustainable management of planted tropical forests, particularly recognising that "Planted forests are an important element of land use in the tropical world. Planted forests can fulfil many of the productive and protective roles of the natural forest. When they are adequately planned, planted forests can help stabilize and improve the environment. However, conservation of local plant and animal species and ecosystems and ensuring ecological stability at the landscape level require complementary action within integrated land-use and development plans".

The project is also consistent with the principles and actions recommended by ITTO for the establishment and sustainable management of planted tropical forests, illustrated in Table 1.

¹⁰ According to Document No. 19. ITTO Policy Development Series.

Table 1. Project responses to the ITTO Guidelines for the Establishment and Sustainable Management of Planted Tropical Forests

Subject	Principle	Recommended Action
Forest Policies	Principle 1: The forest sector offers major opportunities for sustainable socio-economic development and the improvement of the quality of life in tropical countries. All countries therefore need to understand both the existing and future demands for all benefits, goods and services from all types and categories of forests.	The location and extent of the planted forest estate that will be needed to supplement existing forests to meet these production targets and community demands for environmental services in a sustainable manner;
2.3 National forest inventory in relation to land assessment surveys	Principle 8: A national forest growing stock and land inventory should establish the status of all forests, independent of ownership status. Forest land and growing stock inventories must apply techniques which ensure reliability, continuity, accuracy and sufficiency of data.	
2.4 Permanent Forest Estate	Principle 11: Land allocation for the establishment of planted forests must consider the interests, legal rights and long-term plans of all sectors concerned with or affected by their development.	Identify, survey and delineate the various categories of sites, and allocate land to the various forms of forest in consultation with affected communities giving careful consideration to their legal claims on the land.
	Principle 12: Natural forest should not be cleared for the establishment of planted forests unless this is proved to be essential to justify retaining the land under forest cover.	
4.1.3 Needs research	Principle 33: Basic scientific and application-oriented research is the fundamental source of the information needed for sustainable timber production and other forms of forest use. The performance of the forest crop, the impact and effectiveness of forest management operations and the status of soil and site conditions all need to be continuously monitored so that timely corrective measures can be taken in response to any long-term trends of change.	
4.2 Technical requirements	Principle 34: The selection of sites must fully and comprehensively consider natural site conditions, logistic and economic features of the site as well as the social and political environment. In principle, production forests should be as close to the existing markets as other competing land users permit.	Select a suitable soil classification and undertake a careful and comprehensive soil and site survey. Carry out research on promising native species in order to establish their real potential as planted forest species for high quality timber production. In particular, research on genetic

		improvement should be initiated or expanded.
4.2.7 Pest Control and Disease Management	Principle 45: Pest control and disease management practices often become necessary to ensure the survival and effective growth of planted forests.	Carefully match species, provenance and genotype (clone) selections with site conditions and cultural practices to ensure vigorous tree growth capable of resisting the pressures of pest and diseases so that the use of chemical control methods can be reduced as much as possible. Develop and apply forest hygiene practices that minimize the spread of fungal or insect pests and diseases.

1.2.2 Relevance to the submitting country's policies

Over the past two decades, Costa Rica has formalised its public policy on forests through a National Forest Development Plan, the first version of which covered 2001-2010 and was the result of a participatory process including the various stakeholder sectors. The second National Forest Development Plan covers the period 2011-2020 and continues the path of the State's policy. The current Government of Costa Rica (2014-2018) decided to keep using this public policy tool as the guiding framework of the country's forest policy, and formalised it in an executive decree. In this sense, the Government defined priority areas and detailed them in the Forests and Rural Development Programme; this is a set of initiatives to strengthen the implementation of the National Forest Development Plan.

Crucially, the country has been adopting actions to 1) Extend and consolidate a National Protected Area System with a diversity of management categories; 2) Build operating capacities to combat illegal logging and enforce the ban on changes of use for forest land; 3) Strengthen actions to prevent and control forest fires; 4) Strengthen the Payment for Environmental Services scheme, both for forest conservation and for reforestation in plantations and agroforestry systems; 5) Build capacities to incorporate public lands into the State's Natural Heritage; and 6) Facilitate the acquisition of land to improve the integrity of Protected Areas and Forest Reserves with a view to hydroelectricity production.

Costa Rica expects that the carbon sequestration achieved in housing and furniture timber products, will help reduce 20% (5 million tonnes of CO₂) of the global goal. To achieve this carbon neutrality goal, it proposes an increase in the use of timber in the country, through a broad strategy encompassing three sectors: bioenergy, construction, and manufacturing, as well as increased use of timber furniture, doors and other timber products. Santamaría (2015)¹¹ proposes a strategic sequence based on five strategic axes; these have been taken into account in the design of this project, and include:

(1) Process management and leadership: to increase the use of timber in Costa Rica and reduce the use of substitutes of timber.

(2) Ensure timber supply: to increase carbon storage in long-lasting products. The strategy proposes, once it has determined raw material availability in the sector, to strengthen high productivity plantations, develop technological packages, streamline formalities for forest management plans, and define main guidelines for the various programmes.

(3) Improved competitiveness of the forest sector: this will require capacity building, not only at the managerial level but also at the worker level (education). Furthermore, it will require research and development of innovative processes, legislation changes and offers of finance for the sector, as well as technical and managerial support to enterprises.

¹¹ Santamaría, Oscar. 2015. Estudio de mercado de los productos madereros y sus sustitutos para mejorar las condiciones para aumentar los acervos de carbono en productos de madera de larga duración. Consultancy Report. REDD Programme, San José, Costa Rica

(4) The launch of the "momentum" to take the proposal to the community: to increase timber consumption there is a need to design an offer as the backbone of the subsequent creation of markets with appropriate marketing.

(5) Integration of the country's environmental, economic and social goals with the forest sector.

1.3 Target area

1.3.1 Geographic location

The project will have its central office within the facilities of the Research Centre for Forestry Innovation (Centro de Investigación de Innovación Forestal – CIF), which belongs to the School of Forestry (Escuela de Ingeniería Forestal) of the Institute of Technology of Costa Rica (Instituto Tecnológico de Costa Rica), headquartered at Cartago, Costa Rica.

The Project Objectives have been designed for country-wide impact, but work will start initially in two geographic zones that have potential to become clusters of forest production based on commercial reforestation. These two zones are: a) North Huetar (Huetar Norte – RHN), and b) Caribbean Huetar (Huetar Caribe – RHC). However, the project will have a particular impact on three shires within those regions: San Carlos in the RHN, and Guácimo and Pococí in the RHC. The outputs of the project have the potential to be applied in other regions of the country.

The above mentioned regions belong to the land division earmarked by the Ministry of National Planning (MIDEPLAN) for socioeconomic study and development. Although other zones in the country may offer potential as well, these were selected because CIF has been implementing forest research and outreach there, with local organisations (see Table 2)

Table 2. Local Organizations with which the Research Centre for Forestry Innovation (CIF) has worked over the past 5 years

Socio-economic Region	Specific Shires	Organization with which CIF has worked	Observations
North Huetar Region	San Carlos	CODEFORSA http://www.codefora.org/	ITCR's San Carlos University campus is based here, with laboratories, greenhouses and trial areas for genetic improvement. http://www.tec.ac.cr/eltec/ssc/Paginas/default.aspx
Caribbean Huetar Region	Guácimo and Pococí	ASIREA http://www.asirea.org/	ITCR recently opened an Academic Centre in this zone, which eventually will become a university campus http://www.tec.ac.cr/eltec/limon/Paginas/default.aspx

1.3.2 Social, cultural, economic and environmental aspects

North Huetar Region - San Carlos

The North Huetar Region (RHN) borders with Nicaragua in the north, with the Central Region in the south, with the Caribbean Huetar Region in the east and the Chorotega Region in the west. It comprises the Shires of Sarapiquí in the Province of Heredia, San Carlos, Guatuso, Los Chiles, Upala and the Sarapiquí Districts of the Alajuela Shire, Río Cuarto in the Grecia Shire, and Peñas Blancas in the San Ramón Shire in the Province of Alajuela. It covers close to 10,000 km².

According to MIDEPLAN (2009)¹², the main activities include: • agriculture, livestock and fisheries (37.0%), especially pineapples, hearts of palm, roots and tubers and basic grains • utilities and others (27.1%); • trade, hotels and restaurants (23.8%); • industry (6.8%); again pineapples, bananas, melons and fruit concentrates, tubers, ornamentals, timber and dairy products.

Small land-owners coexist with large property owners, leading to production diversification in agriculture and livestock. And with it, commercial activity and the services industry associated with urban centres in the region. In fact, there is a strong cooperative movement in this region, mainly in savings and credit, and agricultural input trade.

The RHN is mainly a rural region, with urban centres covering approximately 1% of the area. The major activities are agriculture, forestry and livestock. The diversification of the local economy includes also new expanding activities including eco-tourism, reforestation and hydropower projects; local community strategies include a combination of several income and sustenance activities such as subsistence agriculture and livestock. In some cases these activities are combined with their own manpower as labourers or agricultural workers.

The RHN is an environmentally rich region; it boasts nine of Costa Rica's twelve Life Zones and is one of the richest regions in terms of the number of forest plantations. This, together with its topography, contributes to its significant biodiversity and landscapes. Many of the national and international tourist destinations are found here. One of its major treasures is its water supply. It is situated in the largest watershed in Central America, and most of its main tributaries originate here.

However, despite its environmental richness, the major economic role of tourism for the country and the RHN, and Costa Rica's conservation policies, the RHN has been affected by several social and environmental conflicts around 'the boundary between conservation and production', an area that causes tension and contradiction expressed as a result of the clash in such as small space, between the economic production model of opening to exports, and the conservation model, compounded by weak institutions and low levels of the required control for monitoring and evaluation¹³.

Table 3. Forest Cover in the North Huetar Region, according to the Types of Forest Map 2011-2012

Type of forest	Area (hectares)	Percentage (%)
Mature forest	273212	25.7
Palm tree forest	7544	0.7
Secondary forest	59819	5.6
No forest	274788	25.9
Cloud	114222	10.8
Pastures	258756	24.4
Plantation forest	22846	2.2
Cloud shadow	51077	4.8
Total	1062264	

Source: Prepared by the authors using forest type layer, 2012
Available in Atlas Digital de Costa Rica 2014¹⁴.

¹² MIDEPLAN (2009). Costa Rica: Regional Statistics 2001-2008.

¹³ Valverde, J. and Acuña, Kathia. 2011. Desarrollo local en la Región Huetar Norte. Culturas y Desarrollo en Centroamérica (CUDECA). Universidad Estatal a Distancia (UNED), Costa Rica.

¹⁴ Ortiz, E. 2014. Atlas Digital de Costa Rica 2014. School of Forestry, ITCR, Cartago, Costa Rica. 1 DVD

Caribbean Huetar Region¹⁵ - Guácimo and Pococí

The Atlantic Huetar Region is a socioeconomic region on the Caribbean coast of Costa Rica. It covers the entire Province of Limón, and a district of Sarapiquí in the Province of Heredia. It has an area of nearly 9,167 km². The most important city is Limón.

It includes the Shires of Limón, Pococí, Siquirres, Talamanca, Matina and Guácimo in the Province of Limón. In the Province of Heredia it covers the Horquetas District of the Shire of Sarapiquí. It borders with Nicaragua in the north, with the North Huetar Region and the Central Region in the west, with the Caribbean Sea on the east, and with Panama in the south.

The region does not have much industry, and the industries located here have limited technological development and innovation. A significant aspect of the RHC industry is agricultural product processing, or agricultural industries. Because of their dominant role in the region, companies that process agricultural products have been established here, thus generating additional value adding. The Region's agricultural industries include:

- Juices, concentrates, purées and pastes made from the fruit produced in the Region
- Processing and canning of hearts of palm
- Waxing and peeling of cassava and other tubers
- Processing of leather to make various products
- Wood processing (furniture, pallets, boxes, loading platforms, etc.)
- Cocoa extraction, drying, grinding and processing
- Making chips from banana, cassava and other products.
- Processing of milk, mainly to make custard and cheeses.

Table 4. Forest Cover in the Caribbean Huetar Region, according to the Types of Forest Map 2011-2012

Type of Forest	Area (hectares)	Percentage (%)
Mature forest	480937	52.5
Palm tree forest	34621	3.8
Secondary forest	59185	6.5
Mangrove	44	0.0
No forest	104147	11.4
Cloud	50412	5.5
Wild lands	3390	0.4
Pastures	155790	17.0
Plantation forest	5133	0.6
Cloud shadow	23103	2.5
Total	916760	

Source: Prepared by the authors using forest type layer, 2012
Available in Atlas Digital de Costa Rica 2014.

Environmental aspects

The Huetar Norte (RHN) and Caribbean (RHC) Regions are located within the Atlantic seaboard of Costa Rica, a region that is characterized by very high precipitation levels, which range between 3,000 and 5,000 mm/year, with almost constant average annual temperatures that barely oscillate between 24 and 28°C. This places the RHN and RHC within the Holdridge life zones of Very-Moist Forest and Tropical Rainforest – evergreen forests with 3 and 4 tree strata, dominant trees of between 30 to 40 meters high, and a very high level of biodiversity.

Between 1940 and 1980, due to the pressure exerted by the meat industry, the country's colonization policies, and the construction of the railroad to the Atlantic, the forests of these

¹⁵ This region was called Atlantic Huetar Region until 2014.

regions were converted into pasturelands to give way to extensive cattle-ranching, banana plantations, and agricultural crops. At present, pasturelands, secondary forests, and forest plantations are being converted into pineapple plantations, which are gradually becoming the dominant crop in both regions.

The RHN is the region of Costa Rica that has the largest area of forest plantations and forests under sustainable management plans, and has been selected as the area where the country's first "forest production cluster" will be established. Like the RHN, the RHC has a very high percentage of mature forests, but most of these are protected under different modalities of protected wildlife areas, such as national parks, protection zones, and wildlife sanctuaries. However, there are about 40,000 hectares of pastures in both areas with potential for the development of commercial forest plantations. Given that in both regions there are grassroot forest organizations with a long track-record of social development that provide technical and administrative assistance to small and medium forest producers, such as CODEFORSA and ASIREA, there is vast potential to implement a project in these regions, such as the one hereby proposed.

1.4 Expected outcomes at project completion

The main expected project outcome is to progressively increase the rate of reforestation through the establishment of forest plantations with respect to the levels estimated in 2017. The project seeks to increase this reforestation rate until reaching the optimum levels established in the National Forest Development Plan 2020 (*Plan Nacional de Desarrollo Forestal* - PNDF), rising from 3,500 ha/year to 7,000 ha/year. It is envisaged that this will be achieved by developing a financing system for commercial reforestation activities and this project is expected to ensure that this system is applied in at least one forest cluster or project work area, with the participation of local organizations (CODEFORSA or ASIREA) so that it can later be replicated at the national level. In order to increase the reforestation rate, the project will also seek to improve the productivity of plantations by 20% (measured in m³/ha/year), so as to ensure the viability of the financing schemes developed by the project and the development of new products. As intermediate outputs, the project will have selected commercial value species, launched genetic improvement programs for selected species, developed zoning maps by species and soil type, and produced manuals aimed at small and medium producers. Finally, after project completion, the national forest sector will have strengthened capacities to innovate and develop new forest products from plantation raw materials, including the development of 15 product prototypes adjusted to the size and quality of the timber produced in forest plantations.

PART 2. PROJECT RATIONALE AND OBJECTIVES

2.1 Rationale

2.1.1 Institutional set-up and organizational issues

Given their power to influence the development and strengthening of the forest production sector in Costa Rica, the government institutions responsible for the State Forest Administration (AFE), with which this project will establish links, are: the Ministry of Environment and Energy through the National System of Conservation Areas (SINAC), the National Forest Financing Fund (FONAFIFO) and the National Forestry Office (ONF). These institutional stakeholders are essential to achieve project objectives, so it is envisaged that they will be part of the Consultative Committee proposed for the project and some will also be involved in the Steering Committee. During the formulation of the National Forest Development Plan (PNDF) it was noted that the forest sector of Costa Rica has a weak structure with limited coordination among the State Forest Administration (AFE) units. In view of this, the PNDF 2011-2020 proposes the development of “clusters” or forest production centers, in which private, academic and AFE institutions work together as a means to coordinate actions, promote forest activities and ensure active institutional stakeholder involvement to achieve a common regional objective.

To assist in the process of institutional coordination, this project will seek to support and facilitate the consolidation of the recently established forest cluster in the Huetar Norte Region (RHN), as well as encourage the development of a new production cluster in the Huetar Caribbean Region (RHC), so as to consolidate the the links between producers and AFE institutions at different levels.

The project plans to use operating funds mainly provided by ITTO, while the Costa Rican Institute of Technology (ITCR) will provide the human resources for implementation, and laboratory, offices, and computer and specialised equipment from the Research Centre for Forestry Innovation (CIF) of ITCR's School of Forestry. Furthermore, it is proposed that ITTO funds be administered through ITCR, as this institution possesses the mechanisms to implement this kind of project, which will provide an administrative structure for recruitment and input purchase, and will provide accounting, auditing and financial reporting to ITTO.

To implement the project, ITCR shall appoint a General Project Coordinator who will be recruited with ITCR funds; furthermore, specific coordinators will be appointed for each project output or component, who will be ITCR officials – see Table 6 below.

Table 6. Organizational structure for project implementation with ITCR personnel

Name and surnames	Occupation	Responsibility	Working hours (h/week)	Months in the project
Dr Edgar Ortiz Malavasi	Eng. Forester Biometrics and GIS	General Coordinator	4	36
MBA Alejandro Meza Montoya	Eng. Forester MBA	Sub component 1	8	36
Dr Freddy Muñoz Acosta	Eng. Timber Forest products	Sub component 3	8	36
M.Sc. Mario Guevara	Eng. Forester Forestry plantations	Sub-component 2	8	36
Dr Olman Murillo Gamboa	Eng. Forester Forest geneticist	Genetic improvement trials	8	24
M.Sc. Francisco Monge Romero	Eng. Industrial.	Budget, purchases and recruitment management	8	36
Dr Ronald Mora Esquivel	Experimental economist	Validation of finance system	8	18
M.Sc. Marta Sáenz Muñoz	Industrial designer Timber products	Product design	8	24
MBA Diego Camacho Cornejo	Eng. Forester Forest outreach worker	Outcome mainstreaming and transfer	8	24

2.1.2 Stakeholder analysis

Primary stakeholders

Direct beneficiaries of the project will include people associated with the organisations that have been working with the Research Centre for Forest Innovation (CIF) over the past five years, including CODEFORSA and ASIREA. However, project outcomes will also benefit small and medium forest producers who are members of other forest organizations in the country, such as COOPEAGRI and CACH.

CODEFORSA and ASIREA members are small and medium landowners who have incorporated forest production into their agricultural and livestock activities. The project will provide these organizations with a financing system for commercial reforestation, which will have been experimentally validated and tested in the field in at least one of the organizations. Furthermore, field data will be available to these organisations on their plantation timber and, at the national level, there will also be data available on plantation behaviour in different soil types; this will assist in the preparation of silvicultural guides or technological packages for reforestation using different species. These activities will increase the productivity of forest plantations established by forest producer members of CODEFORSA and ASIREA and will be complemented by genetic improvement activities by GENFORES¹⁶ and the development of high value-added products made from plantation timber, thus raising members' incomes.

Secondary stakeholders

The Forest Financing Fund (FONAFIFO) is the agency in charge of managing funding for the establishment of forest plantations and the forest industry in Costa Rica; therefore, the outputs of this project will contribute to increasing the reforestation rate in the country and improve its management, since new systems are required to allocate financial resources for the establishment of forest plantations.

Table 7. Description and analysis of project stakeholders

<u>Stakeholder group</u>	<u>Characteristics</u>	<u>Problems, needs and interests</u>	<u>Strengths</u>	<u>Relationship with the project</u>
<u>PRIMARY STAKEHOLDERS</u>				
<u>Producer associations (ASIREA and CODEFORSA)</u>	<u>Organizations that promote and implement forest plantation management, harvesting and marketing activities.</u>	<u>PES-dependent financing system that does not encourage the adequate management of plantations. Reforestation activities are carried out with low market value species without potential for competitive products.</u>	<u>More than 30 years experience working with communities. They have the appropriate organizational structure to take advantage of project outputs.</u> <u>They have the capacity to bring together producers and personnel for forest extension activities.</u>	<u>Main stakeholders in the use and promotion of project outputs in their respective areas of influence.</u>

¹⁶ GENFORES is a cooperative for the genetic improvement of forest species headquartered at CIF-ITCR, and whose Coordinator is Dr. Olman Murillo Gamboa

<u>Small and medium reforesters</u>	<u>Producer families that carry out reforestation activities under the PES program individually, through ASIREA and CODEFORSA or using their own resources.</u>	<u>They need adequate financing for reforestation activities. They need technical assistance and information to improve the productivity of their plantations and promote the marketing of their products.</u>	<u>They are the owners of forest plantations and lands suitable for the establishment of new commercial plantations. They have local knowledge that can help increase the competitiveness of commercial reforestation activities.</u>	<u>Will adopt and apply project outputs.</u>
<u>Timber industries</u>	<u>Primary and secondary timber processing companies sourcing timber from forest plantations.</u>	<u>They require a constant supply of raw materials to satisfy their needs in terms of both quality and quantity. They have very few options for producing products from small diameter logs.</u>	<u>They have installed industrial capacity, human resources and experience in the marketing of forest products.</u>	<u>Will develop capacity for the production and marketing of innovative products derived from the project.</u>
SECONDARY STAKEHOLDERS				
<u>FONAFIFO</u>	<u>Manages financing for the establishment of plantations and the forest industry.</u>	<u>Requires new systems to invest financial resources for the establishment of forest plantations</u>	<u>Has the required installed capacity and resources for the financing of forest activities.</u>	<u>Will take advantage of and adopt project outputs to improve its management capacity.</u>
<u>SINAC</u>	<u>Promotion, monitoring and protection of forest resources.</u>	<u>Requires projects, policies and management skills to implement the National Forest Development Plan.</u>	<u>Has the installed capacity to carry out forest resource promotion, monitoring and protection activities.</u>	<u>Will provide support to the project so as to improve its management.</u>
<u>National Forest Office</u>	<u>Proposes policies and strategies for forest development. It promotes forest activities and the use of wood.</u>	<u>Requires measures to be taken to increase the competitiveness of sustainable forest production.</u>	<u>Has the capacity to promote changes to forestry policy and regulations.</u>	<u>Will provide support to the project so as to improve its management.</u>
<u>Society of Agricultural Engineers</u>	<u>Regulates and monitors the professional performance of forest regents.</u>	<u>Improves the service offered by forest professionals to the Costa Rican society</u>	<u>Ensures the proper exercise of the duties and responsibilities of forest professionals.</u>	<u>Will provide support to the project so as to improve its management.</u>

<u>Ministry of the Environment and Energy (MINAE)</u>	<u>Establishes policies and follow up actions related to the National Forest Development Plan.</u>	<u>Ensures the formulation of and compliance with the National Forest Development Plan</u>	<u>Promotes environmentally friendly forest policies and projects.</u>	<u>Will provide political support to the project.</u>
TERTIARY STAKEHOLDERS				
<u>Mass media</u>	<u>Communication of current affairs and issues related to the management of natural resources</u>	<u>Require reliable information on the sustainable management of forest resources</u>	<u>Improve society's perception of the sustainable management of forest resources.</u>	<u>Will use project outputs to improve the dissemination of information on the sustainable management of forest resources</u>
<u>Ministry of Public Education</u>	<u>Education on the management of natural resources.</u>	<u>Requires reliable information on the sustainable management of forest resources to update education programs</u>	<u>Improves education programs related to the sustainable management of forest resources.</u>	<u>Will use project outputs to improve education programs related to the sustainable management of forest resources.</u>
<u>Ministry of Agriculture and Livestock</u>	<u>Institution responsible for agricultural and livestock policy</u>	<u>Implement programs aimed at strengthening the agroforestry sector.</u>	<u>It has the experience and organizational capacity to incorporate project outputs to improve their management procedures.</u>	<u>Will use project outputs to improve its management capacity.</u>
<u>Institute for Rural Development</u>	<u>Institution responsible for rural development in the country.</u>	<u>Implements and supports programs aimed at strengthening rural development.</u>	<u>It has the organizational capacity, knowledge and experience to incorporate project outputs to improve their management procedures.</u>	<u>Will use project outputs to improve its management capacity.</u>
<u>Local governments</u>	<u>Institutions responsible for municipal planning and development.</u>	<u>Implement programs aimed at strengthening municipal development.</u>	<u>They have the authority to manage and implement municipal development plans.</u>	<u>Will use project outputs to improve its management capacity.</u>

2.1.3 Problem analysis

Figure 2 shows the problem analysis of commercial reforestation in Costa Rica in a Problem tree. The main problem is the low competitiveness of commercial reforestation in Costa Rica, which results from low reforestation rates, failure to achieve the PNDF goals, the lack of investment by the private sector in commercial reforestation, and the increase of illegal logging in natural forests. The main causes include the lack of an efficient finance system, low plantation productivity levels, recorded at 130 m³/hectare, and lastly, the lack of high value added products from plantation timber to boost the sector and encourage forest producers to reforest.

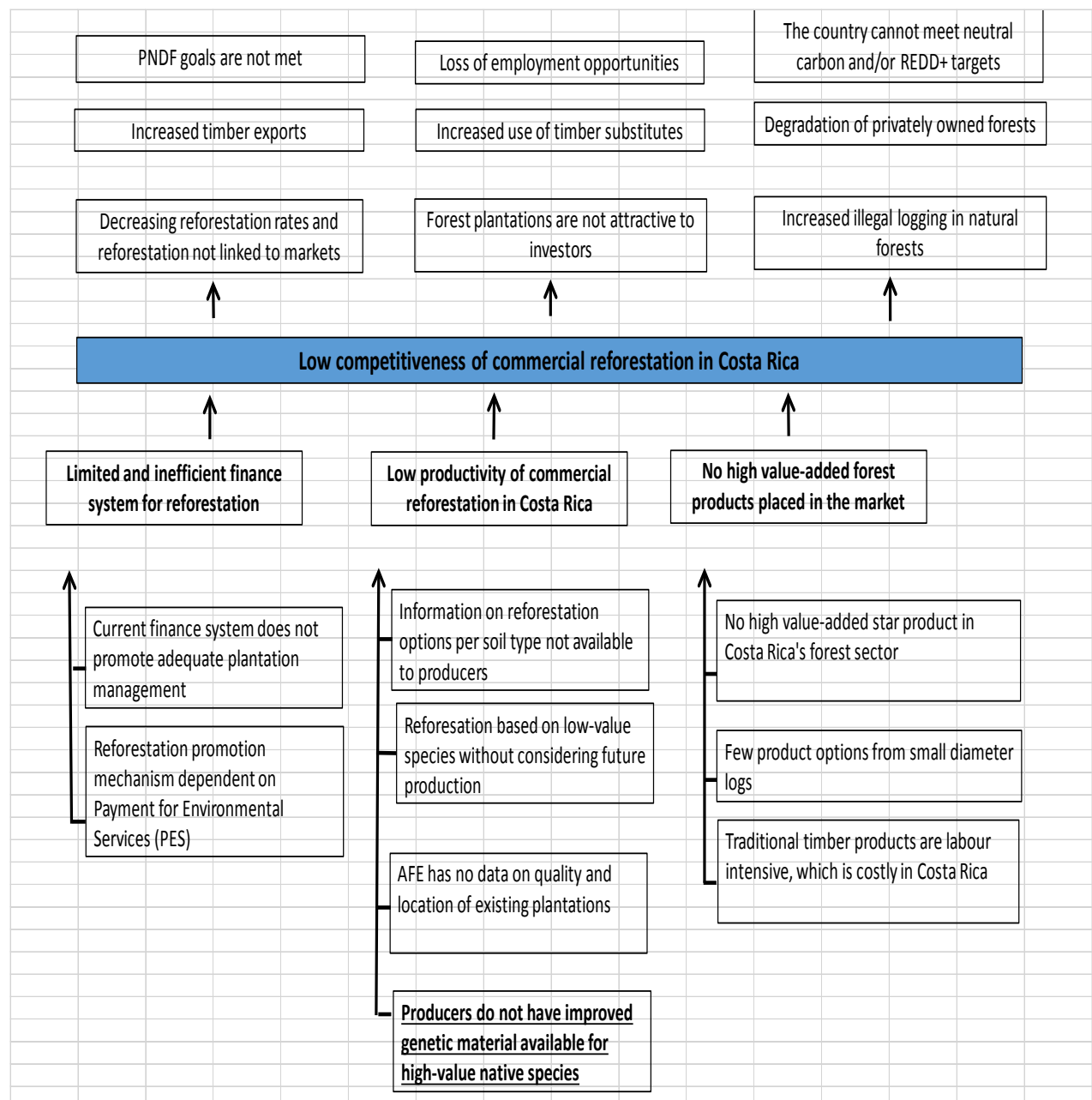


Figure 2. Problem tree of commercial reforestation in Costa Rica

2.1.4 Logical framework matrix

Table 7 shows the logical framework matrix of the project; additionally, Table 5 shows the expected outcomes of the project by component or major output of the project.

Table 7. Logical framework matrix of the project

PROGRAM COMPONENTS	INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Development objective: <u>Fulfil the needs of Costa Rican communities through commercial reforestation</u>	<u>Timber consumption from forest plantations is maintained or increases compared to 2017 levels</u>	State of the Nation reports and forest plantation timber consumption statistics	GDP growth rates are maintained or increased No new timber substitute products are developed
Specific Objective: <u>Increase the competitiveness of commercial reforestation in Costa Rica</u>	Gradual increase of plantation reforestation rates compared to 2017	State of the Nation reports and forest plantation timber consumption statistics	The national forest sector has the technical, economic and policy capacities to benefit from the outputs of the project
Output 1: An innovative financing developed for commercial reforestation with its corresponding monitoring system	Finance system for commercial reforestation is implemented in at least one forest production cluster or region in the country.	Report on outcomes of the implementation of the finance system at the experimental level and in the field	FONAFIFO has economic resources to maintain reforestation rates of at least 7,000 hectares/year Selected forest production cluster keeps operating for at least three years
Output 2: Commercial reforestation productivity is increased	<u>Baseline developed to assess the increase in forest plantation productivity.</u> <u>Guides developed for the establishment and management of high-value species by region, soil type and product.</u> <u>Genetic improvement tests established for three high-value native species by the end of the third year.</u> <u>Productivity projections (in m3 /hectare/year) increase by an average 20% with respect to 2017 levels</u>	<u>Report on location, quantity and quality of existing forest plantations.</u> <u>Plantation establishment and management guides published.</u> <u>Report on genetic improvement tests.</u> <u>Plantation productivity projections reports.</u>	Availability of forest species and soils suitable for commercial reforestation No increase in pests and diseases
Output 3: High value added timber products have been developed	<u>5 prototypes of plantation timber products have been characterised.</u>	<u>Product prototypes and technical characterisation reports.</u>	Availability of quantity and quality raw material Consumers favour innovative timber products

2.2 Objectives

2.2.1 Development objective and impact indicators

The Development Objective of the project is '**to fulfil the needs of Costa Rican communities through commercial reforestation**'. Impact indicators include: a) Consumption of forest plantation timber is maintained or increases compared with 2017 levels; this can be verified through State of the Nation reports and forest plantation timber consumption statistics.

2.2.2 Specific objective and outcome indicators

The Specific Objective of the project is 'Increased competitiveness of commercial reforestation in Costa Rica'. The Specific Objective may be measured through the outcome indicator: plantation reforestation rates increase gradually compared with 2017 levels. To achieve this objective, the project will implement three components and produce three outputs as shown in the Logical framework of the project: a) develop an innovative financing system for commercial reforestation, with corresponding monitoring system; b) increase commercial reforestation productivity; and c) develop high value-added products that use timber from the country's forest plantations.

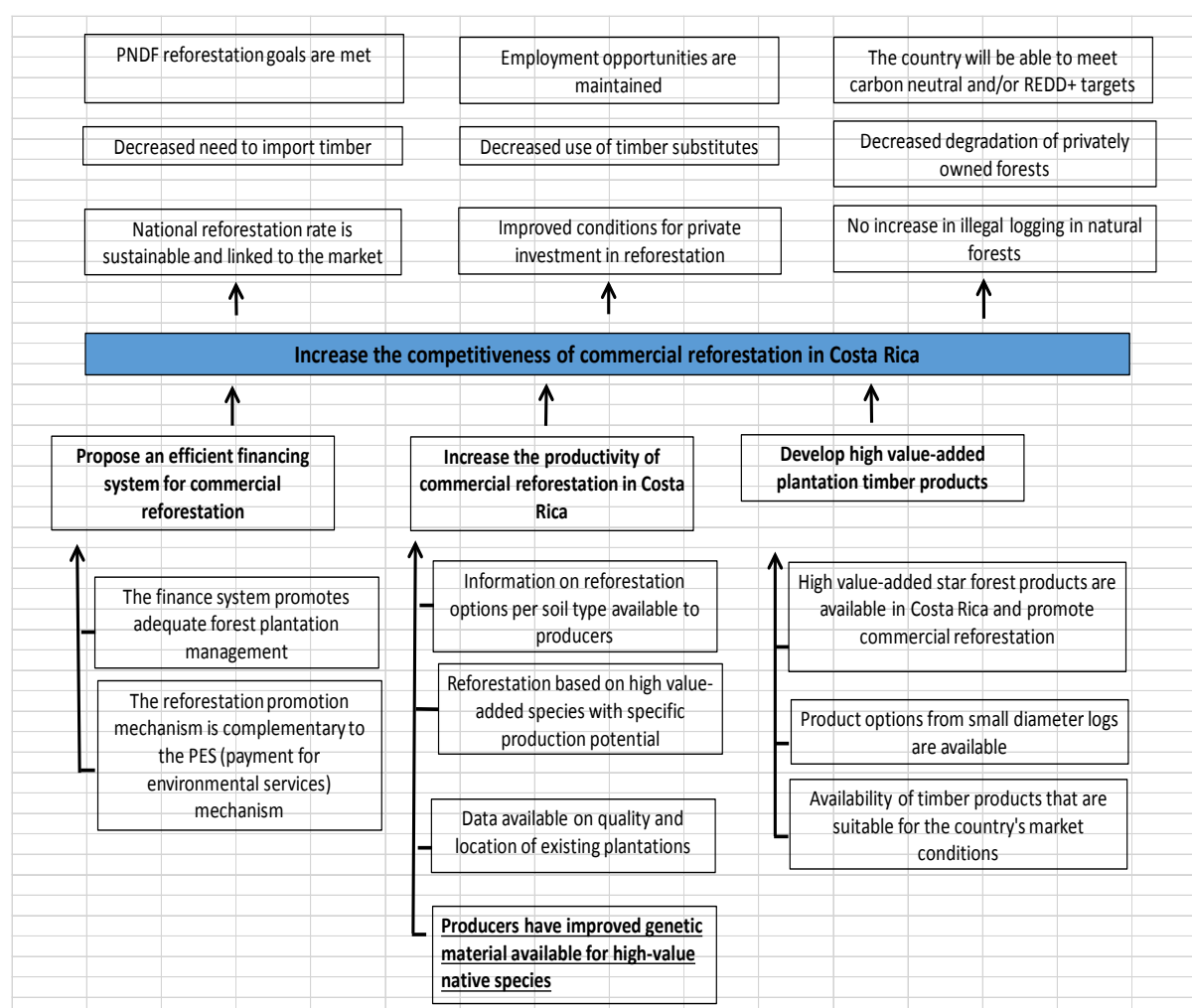


Figure 3. Project's objectives tree

PART 3. DESCRIPTION OF PROJECT INTERVENTIONS

3.1 Outputs and activities

3.1.1 Outputs

Output 1: An innovative financing system developed for commercial reforestation with its corresponding monitoring system

Output 2: Commercial reforestation productivity is increased

Output 3: High value-added timber products have been developed

3.1.2 Activities

For Output 1:

1. Compile proposals for finance mechanisms used globally
2. Select the most suitable proposal(s) for the country
3. Experimentally validate selected proposal(s)
4. Make information on reforestation financing options available to producers

For Output 2:

1. Determine the quantity, quality **and location** of existing forest plantations
- 2. Develop forest production systems with high-value species by region, soil type and product**
- 3. Inform the national forest sector on high-productivity plantation establishment and management options according to region, soil type and product**
- 4. Launch a genetic improvement programme for high-value native species that need it**

For Output 3:

1. Identify alternative high value-added products to be produced with plantation timber, profitability and markets
- 2. Assess the value of production alternatives to select the most promising ones**
3. Prepare prototypes for selected products
4. Determine the characteristics and applicability of designed products
5. Identify companies or investors to introduce developed prototypes into the market

3.2 Implementation approaches and methods

Financial instruments to promote the establishment and management of forest plantations.

Most countries with high forest plantation rates have encouraged the broad involvement of public institutions, either through direct public investment or through direct incentives, with a view to:

- a. Reduce the problems resulting from the lack of cash flow during relatively long periods of time required to recover planting and operating costs;
- b. Establish a minimum critical forest mass needed to establish and increase a competitive forest industry;
- c. Accelerate the initial development of forest plantations, for both industrial and social purposes.

However, in Latin American countries such as Chile and Brazil, business ventures currently avoid the use of subsidies, for operational efficiency reasons. In these cases, direct incentives have given way to so called 'enabling incentives' including:

- a) Political stability and balance of macroeconomic context;
- b) Trade openness and free international investment flow;
- c) Guaranteed stability of land ownership rights;
- d) Government credibility, institutional capacity and efficient legislation to effectively administer incentives policies;
- e) Research and outreach services to support producers
- f) Market development

g) Credit facilities

Arce et al. (2013) have stated that direct subsidies and loan schemes have led to unequal results; some are more generous than others and have favoured large-scale investors in particular. Based on the above, the conclusion is that

1. There are practically no small countries that have successful timber productions; most references point to Costa Rica and the PES scheme,
2. Most work has led to improved competitiveness in tree growing, creating conditions conducive to productivity increases; in this case, the use of by-products, species, sites, strategic use of current incentives should be studied. And Agroforestry systems and their timber production capacity should be demonstrated.
3. Industry and markets and how to create conditions conducive to improvement.
4. The use or regulation of enabling incentives relating to legal security, access to resources, infrastructure, etc.

Ortiz (2005) indicated that besides incentive and subsidy mechanisms, a new trend has emerged dominated by financial instruments to promote the establishment and management of forest plantations. Similarly to direct incentives, these mechanisms improve the flow of financial resources to plantations. This flow has two important features: 1. global profitability of the activity at the end of the cycle, which can be measured using financial indicators (Cost/Benefit, Net Present Value, Internal Rate of Return); and 2. cash flow of the activity, which does not simply mean more income but rather a uniform distribution of income over time. This kind of mechanism is not in itself a guarantee of success for the forest business, but it ensures investor involvement. As shown earlier, this kind of incentive should be accompanied by activity-enabling incentives.

Forest investors may be classified in two kinds: those who need ongoing and short-term income, and investors who wish to get the highest return on their investment and can wait longer, and who would be willing to sacrifice immediate or short-term income in exchange for higher profits, even if in the long term.

The first group comprises small and medium-size landowners who are unable to launch into a business whose income is irregular and long term. Usually, these investors own land and need ongoing income because they are heavily dependent on income derived from their land, so they look for production activities that generate short-term income, even if:

- a) the activity does not produce the best income for the labour or time invested; or
- b) the activity is not the best alternative land use, socially and environmentally (Ortiz, 2005).

Finance mechanisms for forest plantations target the second group of investors: small and medium-size producers. In general, these mechanisms: seek to improve the cash flow of the establishment and mainly the management of forest plantations. However, these same mechanisms are attractive to the second type of investors, so there is potential for their use to lead to a “crowding out” effect.

The “crowding out” effect

“Crowding-out” occurs when the Government, using public funds, promotes an activity that would have happened with private sector investment funds; in theory, it is a measure of the global efficiency of an incentive.

For example, the experience in Indonesia has shown that subsidies are not required to promote the establishment of short-cycle forest plantations. Furthermore, in the United States, it was found that where there is public finance for reforestation, the owners who would have invested in their land anyway, preferred to use public funds; furthermore, management intensity of forest plantations was no different from that of owners who used their own funds (Ortiz, 2005).

Increased productivity and competitiveness of forest plantations

Tiffen (1996)¹⁷ stated that 'even the poor can find capital when a production activity is profitable'. He concluded that low investment levels, particularly by small farmers, were not the result of the lack of capital, but rather of the lack of information on available technologies and, in particular, on market opportunities. He added that the reasons for inaction are not well understood, and that incentives become an unnecessary expense; technology transfer and forest outreach programmes should be implemented.

For example, to achieve Costa Rica's carbon neutrality goal, Santamaría (2015) proposes an increase in the use of timber in the country, through a broad strategy encompassing three sectors: bioenergy, construction, and manufacturing, as well as increased use of timber furniture, doors and other timber products. The strategy sequence includes:

1. Ensure timber supply. The author indicates that achieving carbon neutrality in long-lasting product carbon stocks requires sustainable supplies of raw material. The strategy proposes, once the availability of raw material in the sector has been determined, to strengthen high productivity plantations, develop technological packages, streamline formalities for forest management plans, and define main guidelines for the various programmes; and
2. Improved competitiveness of the forest sector. Changes and the relevant challenges require improved training in the sector, not only at the managerial level but also at the worker level (education). Furthermore, there is a need for research and development of innovative processes, legislation changes and offers of finance for the sector, as well as technical and managerial support to enterprises.

Santamaría (2015) states that social, economic, and environmental impacts of strategy implementation and its respective plan to increase the consumption of timber and its by-products, are estimated at 4,800 additional individuals working, and a further \$243 million per year in added value - 80% above current market figures.

Social linkage approaches and instruments

According to FAO (2016)¹⁸, communication strategies should respond to the needs and priorities of the stakeholders involved in the project and should integrate approaches, messages and channels to achieve overall project outcomes. To this end, lines of action should be established to bring stakeholders to jointly address communication-related issues and move forward to accomplish common goals.

Furthermore, FAO points out that there are multiple communication strategies that can be adapted for stakeholders to be informed and involved, usually through the use of several available media to produce the best communication results. For example, traditional means such as telephone calls, e-mails, personal visits, radio stations, person-to-person dissemination, memos and letters, are among the many information options available in addition to participatory events including workshops, meetings and field days, among others.

Gamboa (2011) states that strategic communication has multiple functions, including raising awareness about the project, helping generate social consensus, and promoting the image and credibility of project executing agencies, all of which can contribute to promote participation and gain support for these initiatives.

According to the author, once the strategy and the message to be conveyed have been defined, the best communication alternatives are selected in accordance with the preferences of the audience. The communication alternatives to be used will be identified in preliminary

¹⁷ Tiffen, M. 1996. Land and capital. Blind spots in the study of the 'resource-poor' farmer. In *The Lie of the Land*, Eds. M. Leach and R. Mearns, 168-185. London, Vielliers Publications.

¹⁸ FAO. 2016. *Manual de Comunicación para el Desarrollo Rural*. Roma, Italia.

perception studies, or through direct questions to the beneficiaries about how they wish to receive communication outputs, and the key to success lies in knowing the tastes and preferences of the stakeholders involved in the project.

The overall objective of the project will be achieved through three axes or strategic aims shown in the Problem Tree and Objectives Tree (see Figures 2 and 3). The methods implemented to achieve each of these aims are described below:

OBJ. 1: Propose an efficient financing system for commercial reforestation

Using information compiled by Arce et al. (2013) and Ortiz (2005), as well as updated information on forest finance systems that promote reforestation and appropriate management of plantations, each alternative will be assessed with an assessment matrix; this will help select one to three viable alternatives suitable for the objective of the project. The best alternative will be validated using an experiment or econometric set to test the selected system for different circumstances and players. Once the proposed mechanism has been validated and modified, it will be implemented in one of the project areas: Guácimo, Pococí or San Carlos, in coordination with ASIREA and/or CODEFORSA.

The choice of area will depend on the negotiations with FONAFIFO and the local organizations at these sites. This system may be implemented over at least two reforestation cycles during the implementation of the project, and will be evaluated using measurement variables including the increase in reforestation rate and quality of plantations established. The outcomes will be presented to the participating organizations and through mainstreaming workshops nationally.

OBJ. 2: Increase the productivity of commercial forest plantations

In the first instance, this objective will require an evaluation and localisation of existing forest plantations using the results of the National Forest Inventory as primary data, and the map of forest types used in the inventory, as well as field data compiled through sampling of various sites in the country. The plantation data thus collected will be cross-referenced with fertility and soil maps in order to obtain information on the best sites for the different tree species in Costa Rica. This outcome, together with information on timber demand and prices for the various reforestation species will help define the lists of species recommended for commercial reforestation by region, and also determine baseline productivity levels by species or group of species, and by region (define product and unit). Simultaneously, production systems will be developed for specific high demand or high added value products, associated with a genetic improvement programme for the species that so require, and the development and mainstreaming of management options for pests and diseases in forest plantations.

OBJ. 3: Develop high value-added plantation timber products

Jointly with the ITCR School of Industrial Design, and with knowledge on the availability of raw material resulting from strategic objective 2, timber products will be developed, assessed and launched on the market according to current world trends, exploring folding furniture alternatives and products that consumers can assemble. The project aims to identify **15** successful product alternatives, according to forest species, availability of raw material, profitability and market. These alternatives will be assessed to select the most promising **ones**, and to take **10 of them** to the prototype phase, of which at least **5** are expected to be described and evaluated directly by users, consumers or forest companies.

3.3 Work plan

Outputs & Activities	Responsible party	Schedule (in quarters)								
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Output 1: An innovative financing system is developed for commercial reforestation with corresponding monitoring system										
1.1. Compile proposals for finance mechanisms used globally	Ing. Alejandro Meza Montoya									
1.2. Assess the value of identified proposals	Ing. Alejandro Meza Montoya/ Dr. Ronal Mora									
1.3. Select the most suitable proposals for the country	Ing. Alejandro Meza Montoya/ Dr. Ronal Mora									
1.4. Experimentally validate selected proposals	Dr. Ronald Mora									
1.5. Implement the best validated system to a pilot area or "forest production cluster"	Ing. Alejandro Meza Montoya/ Ing Diego Camacho									
1.6. Make information on reforestation financing options available to producers	Ing. Alejandro Meza Montoya/Ing. Diego Camacho									
Output 2: Commercial reforestation productivity is increased										
2.1. Determine the quantity, quality and location of existing forest plantations	Dr. Edgar Ortiz-Malavasi									
2.2. Develop forest production system with high-value species by region, soil type and product	Dr. Edgar Ortiz-Malavasi/Ing. Mario Guevara Bonilla									
2.3. Inform the national forest sector about high-productivity plantation establishment and management options by region, soil type and product	Ing. Mario Guevara Bonilla									
2.4. Launch a genetic improvement program for priority species that need it	Dr. Olman Murillo Gamboa									
Output 3: High value-added timber products developed										
3.1. Identify alternative high value-added products to be produced with plantation timber, profitability and markets	Dr. Freddy Muñoz Acosta/Ing. Marta Saenz Muñoz									
3.2. Assess alternative products to select the most promising	Dr. Freddy Muñoz Acosta/Ing. Marta Saenz Muñoz									
3.3. Prepare prototypes for selected products	Dr. Freddy Muñoz Acosta/Ing. Marta Saenz Muñoz									
3.4. Determine the characteristics and applicability of designed products	Dr. Freddy Muñoz Acosta/Ing. Marta Saenz Muñoz									
3.5. Identify companies or investors to introduce developed prototypes into the market	Dr. Freddy Muñoz Acosta/Ing. Marta Saenz Muñoz/Ing. Diego Camacho									

3.4 Budget

3.4.1 Master Budget Schedule (in US\$)

Outputs	Activities	Description	Budget component	Quantity			Unit	Unit cost \$	Total cost \$	ITTO			Executing agency
				Year 1	Year 2	Year 3				Year 1	Year 2	Year 3	
1.1. Compile existing proposals for finance mechanisms	Five proposals for commercial reforestation finance systems compiled by the 3rd month of the project	Coordination staff for Component 1 activities during the project	11.1	1.2	1.2	1.2	Person-month	8000	28800				28800
1.1. Compile existing proposals for finance mechanisms		Three work meetings in FONAFIFO and ONF	31.0	9	0	0	Participant-day-per diem	60	270	270			
1.2. Assess the value of identified proposals	100% of finance proposals are assessed based on a valuation matrix by the 4th month of the project	To be carried out by project staff. Cost included in 1.1	11.1										
1.3. Select the most suitable proposals	At least one finance system selected by the 4th month of the project	Hiring of workshop services including meals and moderator	21.1	2	0	0	Dissemination workshop	1500	3000	3000	0	0	
1.3. Select the most suitable proposals		2 work meetings with the participation of 5 people	31.0	10	0	0	Participant-day-per diem	60	600	600	0	0	
1.4. Experimentally validate selected proposals	At least one finance proposal validated in an experimental economics laboratory by the end of the 1st year	Sub-contract – Validation at experimental economics laboratory	22.0	1	0	0	Simulation event	5000	5000	5000	0	0	

1.5. Implement the best validated system to a pilot area or "forest production cluster" (includes validation system)	At least four forest producers organizations have information available on commercial reforestation financing mechanisms by the end of the 2nd year	Promotion, monitoring and evaluation of proposed finance system in one pilot area	11.2			12	Person - month	700	8400			8400	
1.5. Implement the best validated system to a pilot area or "forest production cluster" (includes validation system)		DSA for project staff	31.0	0	36	36	DSA/day	60	4320	0	2160	2160	
1.5. Implement the best validated system to a pilot area or "forest production cluster" (includes validation system)		Vehicle fuel and lubricants	51.0	1	1	1	Yearly	2000	6000	2000	2000	2000	
1.5. Implement the best validated system to a pilot area or "forest production cluster" (includes validation system)		Four system promotion workshops	21.2	0	4	0	Dissemination workshop	750	3000	0	1500	1500	
1.6. Make information on reforestation financing options available to producers	Workshop for the publication of results, and printed technical fact-sheets on financing system and its operation	Workshop for the presentation of final results	21.3	0	0	1	Dissemination workshop	1500	2500			2500	
<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>	Mapping and inventory of commercial forest plantations by the end of the 2nd year	Coordination staff for Component 2 activities during the project	11.3	1.2	1.2	1.2	Person-month	8000	28800				28800

<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>		2 field technicians for mapping and inventory of commercial plantations	11.4	16	12		Person-month	2300	64400	36800	27600		
<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>		Fuel and lubricants	51.0	1	1	1	Yearly	4500	13500	4500	4500	4500	
<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>		Vehicle maintenance	53.0	1	1	1	Yearly	1500	4500	1500	1500	1500	
<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>		Forestry measurement equipment (tapes, hypsometers, GPS)	44.2	2			Forestry measurement equipment set	900	1800	1800	0	0	
<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>		Tyre change	52.0		2		Set of tyres	1200	2400		2400		
<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>		2 vehicles	43.0	2			vehicle	26000	52000	52000	0	0	
<u>2.1. Determine the quantity, quality and location of existing forest plantations</u>		Soil analysis in specialized laboratory	23.0	70	70		Analysis	50	7000	3500	3500	0	
<u>2.2. Develop forest production systems with high-value species by region, soil type and product</u>	Species productivity ratio matrix (in m3/ha) per region	Sub-contract – Soil expert for inventory data analysis and soil analysis	24.0		2		man-month	2000	4000		4000		
<u>2.2. Develop forest production systems with high-value species by region, soil type and product</u>		Workshop for the presentation of productivity results by region and by soil type	21.4	0	2	0	Dissemination workshop	1500	3000	0	3000	0	

<u>2.2. Develop forest production systems with high-value species by region, soil type and product</u>	At least 5 species of commercial value defined for regions ZHC, ZHN and ZB by the end of the 3rd year	2 work meetings with the participation of 5 people per region	31.0	10	0	0	Participant-day	60	600		600	0	
<u>2.2. Develop forest production systems with high-value species by region, soil type and product</u>	Pest and disease management options for plantations of other identified species	At least 15 people in the work areas trained by a hired consultant	25.2		1	1	Person-month	3000	6000	0	3000	3000	
<u>2.2. Develop forest production systems with high-value species by region, soil type and product</u>		Meals, refreshments and venue rental	26.1	1	1		Training event	750	1500	750	750		
<u>2.2. Develop forest production systems with high-value species by region, soil type and product</u>	Productivity baseline defined (in m3/ha for 5 – 10 yrs) for each species and region by the end of the 2nd year	2 work meetings with the participation of 5 people per region	31.0	10	0	0	Participant-day	60	600		600	0	
<u>2.2. Develop forest production systems with high-value species by region, soil type and product</u>	A technological package by product type, including species, genetic aspects, densities, soil, fertility, undergrowth management, overall management, production quality, and profitability, by the end of the 3rd year	Hiring of forester and timber engineer for the development of cultivation guides	27.0			6	Man-month	3000	18000	0	0	18000	

<u>2.3 Inform the national forest sector about high-productivity plantation establishment and management options by region, soil type and product</u>	At least one training course on teca and melina pest management per region	2 training courses with at least 15 participants in the work areas given by a hired consultant	25.1	0.5	0.5		Person-month	3000	3000	1500	1500	0	
<u>2.3 Inform the national forest sector about high-productivity plantation establishment and management options by region, soil type and product</u>		Meals, refreshments and venue rental	26.0	1	1		Training event	750	1500	750	750		
<u>2.3 Inform the national forest sector about high-productivity plantation establishment and management options by region, soil type and product</u>	Guide on species management in plantations established by soil type and product by the end of the 2nd year	Production of forest management guides for small forest producers	27.1	1	2	2	Management guides	2000	10000	2000	4000	4000	
<u>2.4. Launch a genetic improvement program for high-value native species that need it</u>	Genetic improvement tests (for laurel, cedar, guanacaste and cenízaro) in the field by the end of the 3rd year	Genetic improvement tests (for laurel, cedar, guanacaste and cenízaro) in the field by the end of the 3rd year	28.0	1	1	1	Expert/year	5000	15000	5000	5000	5000	
<u>3.1. Identify alternative high value-added products to be produced with plantation timber, profitability and markets</u>	At least 15 production alternatives identified within 3 months	Coordination staff for Component 3 activities during the project	11.5	1.2	1.2	1.2	Person-month	8000	28800				28800

3.1. Identify alternative high value-added products to be produced with plantation timber, profitability and markets		2 work meetings with the participation of 5 people per region, Steering Committee and Consultative Committee	31.0	15	0	0	Participant-day	60	900	900		0	
3.1. Identify alternative high value-added products to be produced with plantation timber, profitability and markets	100% of identified alternatives are assessed through a prioritization matrix	Workshops in ITCR facilities with support from project staff and FONAFIFO	11.1										
3.2. Prepare prototypes for selected products	Preparation of prototypes of at least 10 identified products	Preparation of prototypes of at least 10 identified products	29.0	3	4	3	Sub-contract per product	2000	20000	6000	8000	6000	
3.3. Determine the characteristics and applicability of designed products	Characterization of prototypes for at least 5 products	Coordination staff for Component 3 activities during the project in ITCR laboratories. Cost included in 3.1	11.1										
3.4. Identify companies or investors to introduce developed prototypes into the market	Identification of at least 5 companies or investors interested in introducing products into the market by the end of year 3	Presentation of prototypes to identified companies	21.5		1	3	Dissemination workshop	1750	7000	0	1750	5250	
Total									356190	127870	78110	63810	86400

3.4.2 Consolidated budget by component (in US\$)

Category	Description	Total	Year 1	Year 2	Year 3
10	Personnel				
11.1	Coordination staff for Project Component 1	28800	9600	9600	9600
11.2	Promotion, monitoring and evaluation of proposed finance system in a pilot area	8400			8400
11.3	Coordination staff for Project Component 2	28800	9600	9600	9600
11.4	2 field technicians for mapping and forest inventory in plantations	64400	36800	27600	
11.5	Coordination staff for Project Component 3	28800	9600	9600	9600
20	Sub-contracts				
21.1	Hiring of workshop services including meals and moderator	3000	3000	0	0
21.2	Four workshops for system promotion	3000	0	1500	1500
21.3	Workshop for presentation of final results	2500			2500
21.4	Workshop for presentation of productivity results by region and soil type	3000	0	3000	0
21.5	Presentation of prototypes to identified companies	7000	0	1750	5250
22	Sub-contracting validation in experimental economics laboratory	5000	5000	0	0
23	Soil analysis in specialized laboratory	7000	3500	3500	0
24	Sub-contract – Soil/Inventory Expert	4000		4000	
25.1	2 Training courses – Pest management 1	3000	1500	1500	0
25.2	3 Training courses – Pest management 2	6000	0	3000	3000
26	Meals, refreshments and venue rental	1500	750	750	
26.1	Meals, refreshments and venue rental	1500	750	750	
27	Hiring of forester and timber engineer for the preparation of cultivation guides	18000	0	0	18000
27.1	Production of forest management guides for small forest producers	10000	2000	4000	4000
28	Genetic improvement tests for new species (Laurel, Cedar, Guanacaste and Cenízaro) in the field	15000	5000	5000	5000
29	Preparation of prototypes for at least 10 identified products	20000	6000	8000	6000
30	Travel/DSA				
31	2 work meetings with the participation of 5 people	600	600	0	0
31.1	2 work meetings with the participation of 5 people per region	1200		1200	0
31.2	2 work meetings with the participation of 5 people per region, Steering and Consultative Committees	900	900		0
31.3	DSA for project staff	4320	0	2160	2160
31.4	Three work meetings in FONAFIFO and ONF	270	270		

Category	Description	Total	Year 1	Year 2	Year 3
40	Capital items				
44.2	Forestry measurement equipment (tapes, hypsometers, GPS)	1800	1800	0	0
43	2 Vehicles	52000	52000	0	0
50	Consumable items				
51.1	Fuel and lubricants	13500	4500	4500	4500
51.2	Vehicle fuel and oil	6000	2000	2000	2000
52	Tyre change	2400		2400	
53	Vehicle maintenance	4500	1500	1500	1500
60	Miscellaneous	0	0	0	0
70	ITCR management costs	0	0	0	0
Sub-total		356190	156670	106910	92610
80	Project monitoring and administration				
81	ITTO monitoring and review	15000			
82	ITTO mid-term, final, ex-post evaluation	15000			
83	ITTO programme support costs (12% of items 10 - 82 above)	35975			
89	Sub-total	65975			
100	GRAND TOTAL	422165			

3.4.3 ITTO budget by component (US\$)

Category	Description	Total	Year 1	Year 2	Year 3
10	Personnel	72800	36800	27600	8400
11.2	Promotion, monitoring and evaluation of proposed finance system in a pilot area	8400			8400
11.4	2 field technicians for mapping and forest inventory in plantations	64400	36800	27600	
20	Sub-contracts	109500	27500	36750	45250
21.1	Hiring of workshop services including meals and moderator	3000	3000	0	0
21.2	Four workshops for system promotion	3000	0	1500	1500
21.3	Workshop for presentation of final results	2500			2500
21.4	Workshop for presentation of productivity results by region and soil type	3000	0	3000	0
21.5	Presentation of prototypes to identified companies	7000	0	1750	5250
22	Sub-contracting validation in experimental economics laboratory	5000	5000	0	0
23	Soil analysis in specialized laboratory	7000	3500	3500	0
24	Sub-contract – Soil/Inventory Expert	4000		4000	
25.1	2 Training courses – Pest management 1	3000	1500	1500	0
25.2	3 Training courses – Pest management 2	6000	0	3000	3000
26	Meals, refreshments and venue rental	1500	750	750	

Category	Description	Total	Year 1	Year 2	Year 3
26.1	Meals, refreshments and venue rental	1500	750	750	
27	Hiring of forester and timber engineer for the preparation of cultivation guides	18000	0	0	18000
27.1	Production of forest management guides for small forest producers	10000	2000	4000	4000
28	Genetic improvement test for new species (Laurel, Cedar, Guanacaste and Cenizaro) in the field	15000	5000	5000	5000
29	Preparation of prototypes for at least 10 identified products	20000	6000	8000	6000
30	Travel/DSA	7290	1770	3360	2160
31	2 work meetings with the participation of 5 people	600	600	0	0
31.1	2 work meetings with the participation of 5 people per region	1200		1200	0
31.2	2 work meetings with the participation of 5 people per region, Steering and Consultative Committees	900	900		0
31.3	DSA for project staff	4320	0	2160	2160
31.4	Three work meetings in FONAFIFO and ONF	270	270		
40	Capital items	53800	53800	0	0
44.2	Forestry measurement equipment (tapes, hypsometers, GPS)	1800	1800	0	0
43	2 Vehicles	52000	52000	0	0
50	Consumable items	26400	8000	10400	8000
51.1	Fuel and lubricants	13500	4500	4500	4500
51.2	Vehicle fuel and oil	6000	2000	2000	2000
52	Tyre change	2400		2400	
53	Vehicle maintenance	4500	1500	1500	1500
60	Miscellaneous	0	0	0	0
70	ITCR management costs	0	0	0	0
Sub-total		269790	127870	78110	63810
80	Project monitoring and administration				
81	ITTO monitoring and review	15000			
82	ITTO mid-term, final, ex-post evaluation	15000			
83	ITTO programme support costs (12% of items 10 - 82 above)	35975			
89	Sub-total	65975			
100	GRAND TOTAL	335765			

3.4.4 Executing agency budget by component (US\$)

Category	Description	Total	Year 1	Year 2	Year 3
10	Personnel				
11.1	Coordination staff for Project Component 1	28800	9600	9600	9600
11.3	Coordination staff for Project Component 2	28800	9600	9600	9600
11.5	Coordination staff for Project Component 3	28800	9600	9600	9600
100	Total	86400			

3.4.5 Budget by activity and component

		BUDGET COMPONENTS (in US\$)													
OUTPUTS / ACTIVITIES +		10. Project personnel		20. Sub-contracts		30. Duty travel		40. Capital items		50. Consumable items		60. Miscellaneous		Year	GRAND TOTAL
Output 1: An innovative financing system is developed for commercial reforestation with corresponding monitoring system															
1.1. Compile proposals for finance mechanisms	5760	IE	-		270	I								I	6030
1.2. Assess the value of proposals	5760	IE			0	I								I	5760
1.3. Select the most suitable proposals	5760	IE	3000	I	600	I								I	9360
1.4. Experimentally validate selected proposals	5760	IE	5000	I	0	I				I				I	10760
1.5. Apply the best financing system in pilot area (Cluster inc. validation system)	5760	IE	3000	I	4320	I				6000	I			I,II	19080
1.6. Make information on reforestation financing options available to producers	8400	I	2500	I		I								II,III	10900
Sub-total 1	37200	I+IE	13500	I	5190	I				6000	I				61890
Output 2: Commercial reforestation productivity is increased															
2.1. Determine the quantity, quality and location of existing commercial forest plantations	64400	I	7000	I		I	53800	I		20400	I			I,II	145600
2.2. Develop forest production systems with high-value species by region, soil type and product	18000	IE	32500	I	1200									II,III	51700
2.3. Inform the national forest sector about high-productivity plantation establishment and management options by region, soil type and product	7200	IE	14500	I										II,III	21700
2.4. Launch a genetic improvement programme for high-value native species that need it	3600	IE	15000	I		I								III	18600
Sub-total 2	93200	I+IE	69000	I	1200	I	53800	I		20400	I				237600
Output 3: High value-added timber products developed															
3.1. Identify alternative high added value products to be produced with plantation timber, profitability and markets	5760	IE			900	I								I	6660
3.2. Assess alternative products to select the most promising	5760	IE				I								I	5760
3.3. Prepare prototypes of selected products	5760	IE	20000	I		I								I,II	25760
3.4. Determine the characteristics and applicability of designed products	5760	IE		I		I								II	5760
3.5.. Identify companies or investors to introduce developed prototypes into the market	5760	IE	7000	I		I								II,III	12760
Sub-total 3	28800	IE	27000	I	900	I									56700
Sub-total (ITTO)	72800		109500	I	7290	I	53800	I		26400	I				269790
ITCR Sub-total	86400		0		0		0			0					86400
Sub-total (Other sources)	0		0		0		0			0					
TOTAL	159200		109500		7290		53800			26400					356190

3.5 Assumptions, risks, sustainability

3.5.1 Assumptions and risks

Project risks and assumptions were identified for each component and appear in the logical framework matrix in section 2.1.4. Furthermore, other risks and mitigation actions include:

<u>Specific Objective</u>	<u>Assumptions and risks</u>	<u>Mitigating actions for possible impacts</u>
<u>Development objective: Fulfil the needs of Costa Rican communities through commercial reforestation</u>	<u>Assumption: the use of timber products is promoted to mitigate climate change</u> <u>Risk: Economic activity in the country (GDP) falls.</u> <u>Risk: New wood substitute products are developed.</u>	<u>Promote timber product marketing and sales strategies.</u>
<u>OBJ. 1: Propose an efficient financing system for commercial reforestation</u>	<u>Assumption: the sector attracts external resources to invest in commercial reforestation</u> <u>Risk: FONAFIFO does not have the economic resources to implement the new financing system.</u> <u>Risk: Legislation and FONAFIFO's internal regulations do not allow field testing for the developed mechanism</u>	<u>Seek additional financing to test the system in an organization through the Development Bank system.</u> <u>Propose amendments to the legislation and FONAFIFO's regulations.</u>
<u>OBJ. 2: Increase the productivity of commercial forest plantations</u>	<u>Risk: Increased incidence of new pests and diseases in forest plantations due to climate change effects</u> <u>Risk: It is not possible to identify species of high commercial value that are suitable for the lands available for reforestation</u>	<u>Improve the integrated management of forest pests and diseases.</u> <u>Improve the physical-mechanical and chemical properties of low commercial value species adapted to the quality of available lands.</u>
<u>OBJ. 3: Develop high value-added plantation timber products</u>	<u>Assumption: New generations of consumers prefer to use products with a smaller ecological footprint.</u> <u>Risk: The raw materials needed for the development of high added value products are not available in the required quantity and quality.</u> <u>Risk: High value-added products have been identified, but it has not been possible to get potential users or forest companies to become interested in their production</u>	<u>Promote the use of non-traditional timber species and improve their physical-mechanical and chemical properties.</u> <u>Seek partnerships with international companies with the greatest capacity to respond</u>

3.5.2 Sustainability

The project will be implemented over 3 years, and at the end of this period, it is expected to continue operating for the next 5 to 10 years, particularly under Component 3, which offers the highest rate of sustainability. The following table gives an analysis of the sustainability of the proposal and shows that it was designed in accordance with PNDF guidelines with the aim of increasing the competitiveness of commercial reforestation, thus increasing the income of small and middle reforesters in Costa Rica.

<u>Type of sustainability</u>	<u>Sustainability analysis</u>
<u>Social</u>	<u>The project has a high social sustainability level as it was designed to increase the income levels of forest producers involved in commercial reforestation activities. The project is based on the participatory identification of their problems and needs and includes three major core areas: financing, product development and increased productivity. These three core areas will ensure the sustainability of commercial reforestation activities.</u>
<u>Technical</u>	<u>Project activities include training and technical assistance for the development of commercial reforestation projects. The project is technically sustainable as it is based on the premise that before undertaking reforestation activities it is important to identify the products to be produced and marketed instead of proceeding the other way around.</u>
<u>Institutional</u>	<u>The primary project stakeholders, ASIREA and CODEFORSA, have been developing technical and financial capacities for the past 30 years, so after project completion they will be able to adopt and implement project outputs and outcomes.</u>
<u>Financial and economic</u>	<u>The project is in fact aimed at ensuring the financial sustainability of commercial reforestation.</u>
<u>Political</u>	<u>Given that the project's objectives have been established within the PNDF framework and that this program is the political instrument by which the Government of Costa Rica promotes national forest development in the country, the proposed project has received full political support. In July 2017 a memorandum of understanding was signed between MINAE-FONAFIFO-TEC whereby the Ministry of Environment and Energy (MINAE) and FONAFIFO have committed themselves to supporting the project and procuring the required financing for its implementation.</u>

PART 4. IMPLEMENTATION ARRANGEMENTS

4.1 Organization structure and stakeholder involvement mechanisms

4.1.1. Executing agency and partners

The project plans to use operating funds mainly provided by ITTO, while the Costa Rican Institute of Technology (ITCR) will provide the human resources for implementation, and laboratory, offices, and computer and specialised equipment from the Research Centre for Forestry Innovation (CIF) of ITCR's School of Forestry. The Costa Rican Institute of Technology (ITCR) through the Research Centre for Forestry Innovation (CIF) will be the project executing agency.

Furthermore, it is proposed that ITTO funds be administered through ITCR, as this institution possesses the mechanisms to implement this kind of project, which will provide an administrative structure for recruitment and input purchase, and will provide accounting, auditing and financial reporting to ITTO.

To implement the project, ITCR will appoint a General Project Coordinator who will be recruited with ITCR funds; furthermore, specific coordinators will be appointed for each project output or component, who will be ITCR officials - see Table 6.

4.1.2 Project management team

The project management team appears in Table 6, section 2.1.1. This management team will consist of ITCR officials who are academics at the School of Forestry and are part of CIF.

4.1.3 Project steering committee

The project will have a steering committee made up of representatives of the National Forest Finance Fund (FONAFIFO), a representative of CODEFORSA, and a representative of ASIREA. These representatives will be appointed by the Boards of Directors of their respective organizations. All the members will be appointed for three years and may be replaced by agreement of the respective Boards of Directors of the aforementioned organizations. Furthermore, membership of the Steering Committee will also include the General Coordinator of the project, Dr. Edgar Ortiz-Malavasi, and the Officer in charge of the project budget, purchases and recruitment management, Ing. Francisco Monge Romero.

4.1.4 Stakeholder involvement mechanisms

The main project stakeholders/beneficiaries will be ASIREA and CODEFORSA members, who are small and medium reforesters of the Huetar Norte and Huetar Caribbean regions of Costa Rica. They will be directly represented in the proposed Project Steering Committee through the representatives appointed by both CODEFORSA and ASIREA. In addition, the organizational structures of both ASIREA and CODEFORSA provide for the establishment of working groups, committees and assemblies of members, which will allow the project to receive adequate feedback and ensure the appropriate dissemination and transfer of project results (see organizational chart in Figure 4).

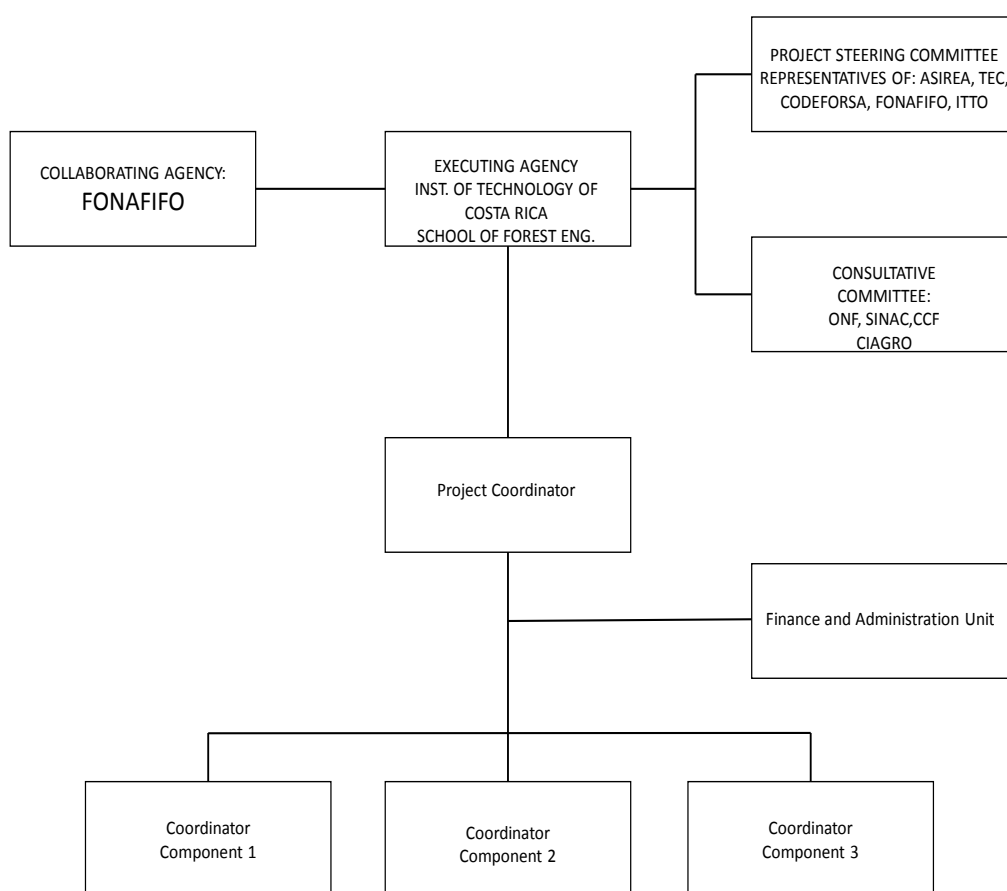


Figure 4. Project organizational structure

4.2 Reporting, review, monitoring and evaluation

The submission of project reports will be carried out in accordance with the provisions of the ITTO Manual for Project Monitoring, Review, Reporting and Evaluation, including frequency and formats. The following table shows the reports to be submitted, their contents and format, and the parties responsible for their preparation:

<u>Activity</u>	<u>Description</u>	<u>Date</u>	<u>Responsible party</u>	<u>Format</u>
<u>Inception report</u>	<u>Formal notification that the Project is about to commence. It comprises confirmation that all conditions are met, provisions are in place and formalities have been concluded for a smooth start of the project implementation</u>	<u>Upon signing the project agreement</u>	<u>Project Coordinator appointed by the EA</u>	<u>Annex A of the ITTO Manual. It will include the following annexes: a detailed work plan and MOUs required to start project implementation.</u>

<u>Yearly plan of operations</u>	<u>Plan of annual operations envisaged for the implementation of the project. The YPO will present the coming operational year in greater detail than in the project document.</u>	<u>Ten weeks before the beginning of the following year of project implementation.</u>	<u>Project Coordinator appointed by the EA</u>	<u>Use ITTO software (ProTool)</u>
<u>Project progress reports</u>	<u>Reports to be submitted every 6 months on implemented activities, expenditures and outputs achieved.</u>	<u>By 28 February and 31 August of each year of project implementation.</u>	<u>Project Coordinator appointed by the EA with inputs from the coordinators of the project components.</u>	<u>Annex C of the ITTO Manual. These reports will include a financial statement as shown in Appendix 1 of Annex C.</u>
<u>Technical report</u>	<u>Document to register and transfer the results of the work carried out under ITTO research, development and demonstration projects. Technical reports contain technical and scientific data, analysis of the data and project results.</u>	<u>A technical report by the end of each year of project implementation.</u>	<u>Project Coordinator appointed by the EA with inputs from the coordinators of the project components.</u>	<u>Annex C of the ITTO Manual.</u>
<u>Financial audit report</u>	<u>The financial audit report comprises a statement of the auditor accompanied by the following documents: opening balance; and expenditures incurred against each project budget component for the budgets of ITTO, the EA and other sources.</u>	<u>Annually, within three months after the end of the financial year.</u>	<u>Technical-administrative assistant of the project</u>	<u>Annex C of the ITTO Manual</u>

<u>Completion report</u>	<u>Final formal report summarising the implementation of all planned project elements, their impact and expected sustainability.</u>	<u>Within three months of project completion</u>	<u>Project Coordinator appointed by the EA with inputs from the coordinators of the project components.</u>	<u>Annex E of the ITTO Manual</u>
<u>ITTO's mid-term evaluation</u>	<u>Systematic and objective collection of information, on-the-spot assessments and analysis of the validity, design, appropriateness, performance, and impact of the project during its implementation stage. It is not always carried out.</u>	<u>As determined by the ITTO Secretariat</u>	<u>ITTO Secretariat</u>	<u>According to the terms of reference established by ITTO</u>
<u>ITTO's ex-post evaluation</u>	<u>Systematic and objective collection of information, on-the-spot assessment and analysis of the validity, design, appropriateness, performance and impact of the project after its completion.</u>	<u>As determined by the ITTO Secretariat.</u>	<u>ITTO Secretariat.</u>	<u>According to the terms of reference established by ITTO</u>

4.3 Dissemination and mainstreaming of project learning

4.3.1 Dissemination of project outputs

The project's communication and mainstreaming strategy will be based on the establishment of a direct relationship with forest producers, members of ASIREA and CODEFORSA. For this purpose, the project will establish a linked set of communication channels to facilitate adequate two-way communication of project outcomes. This set of communication channels will include: a) a field day, b) participatory workshops, c) guided field visits, and d) use of social media (Facebook and WhatsApp). Furthermore, user-friendly printed material will be prepared, using infographic materials.

All project components include dissemination and mainstreaming activities that are an integral part of the project. Also, the budget duly includes the funds required to implement dissemination workshops, transfer of outcomes and dissemination of the project. Outcome communication and dissemination activities appear in Table 8.

4.3.2 Mainstreaming of project learning

Project learning will be mainstreamed through workshops and publications of its outputs, according to the dissemination and activities plan of the project. In this respect, several activities have been included which appear in Table 8.

Table 8. Project activities for the dissemination and mainstreaming of outcomes.

Output	Activity - Dissemination and mainstreaming of outcomes
For Output 1:	Workshops to assess finance alternatives Workshops to provide producers with information on options for the finance of reforestation, assessed experimentally and in the field
For Output 2:	Training to transfer information on pest and disease management for teak and melina plantations to the forest sector Workshops to define the list of species recommended for commercial reforestation by region and product Publication of silvicultural guides for reforesters by soil and product type
For Output 3:	Workshops to identify high value added products from forest plantation timber Identify companies or investors to introduce developed prototypes into the market
Publications	Publication of outcomes in Revista Forestal Mesoamerica Kurú https://dialnet.unirioja.es/servlet/revista?codigo=23383

ANNEX 1. Profile of the executing agency

Profile of the Research Centre for Forestry Innovation (CIF)

Web page: <http://www.tec.ac.cr/sitios/Docencia/forestal/cif/Paginas/default.aspx>

Contact: Dr. Edgar Ortiz-Malavasi (email: eortiz@itcr.ac.cr)

Introduction:

The Research Centre for Forestry Innovation (CIF) is dedicated to the generation and transfer of science and technology in the field of forestry knowledge. The Centre is a specialist unit of the School of Forestry dedicated to research, outreach and specialised services in forest sciences, with an emphasis on forest plantation silviculture, forest product technology, natural tropical forest silviculture and management of environmental services derived from forests and forest plantations.

Mission

To contribute to national and international development through training at postgraduate level, of higher academic level human resources as well as through research and outreach on forest resources, achieving and maintaining academic excellence, scientific leadership and strict adherence to ethical, moral and environmental standards, in order to meet the needs of the national and tropical Mesoamerican region environmental sector.

Vision

It will be the main actor in the transformation of the relationship between society and forest resources in pursuit of a better quality of life through scientific research, development of appropriate technologies, and providing specialized services required by the forestry sector.

Areas of research and outreach

- **Productivity and quality of forest plantations:** identifying sources of germplasm, breeding, planting, protection, management and harvesting. Genetic improvement, product evaluation and assessment. Studies in forest genetics, cultivation of native and exotic forest species.
 - **Sustainable management of natural forests:** Research of all typical tropical ecosystems, population dynamics and interactions with other forms of life. In addition, development of natural forest management techniques for products, sustainably maintaining forest structure. Recovery of degraded areas, study of endangered populations, and others.
 - **Forest product technology, biomass and wood energy:** technological development and innovation in forest products required by industry and society, including the development of alternative uses of biomass as an energy source.
 - **Management of forest resource ecosystem services:** quantification and assessment of environmental services (non-tangible benefits) provided by forests as well as their integration into forest resource management and utilization models. Interdisciplinary research on climate change, watershed management, and use of geographic information systems, and others.
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ANNEX 2. Tasks and responsibilities of key experts provided by the executing agency

IMPLEMENTATION AND MONITORING MATRIX OF THE PROJECT TEAM						
Responsibility level code			Participant code			
E: Implement			EOM: Edgar Ortiz-Malavasi			
P: Participate			AMM: Alejandro Meza Montoya			
S: Supervise			FMR: Francisco Monge Romero			
			MS: Marta Sáenz Muñoz			
			FMA: Freddy Muñoz Acosta			
			RM: Dr Ronald Mora			
			OMG: Olman Murillo Gamboa			
			MG: Mario Guevara Bonilla			
			DCC: Diego Camacho Cornejo			
Participant/Responsibility code						
OBJECTIVE 1: To develop and test a financing system that promotes the establishment and appropriate management of forest plantations	AMM	FMR	RM	EOM	OMG	Outputs
Compile existing finance proposals	P	E	P	E	P	Five systems of finance for commercial reforestation have been compiled
Assess proposals - Select the most suitable proposals	E	E	P	E	P	All finance proposals assessed with a matrix
Experimentally validate selected proposals	P	P	E	S	P	At least one finance proposal has been validated in an experimental economics laboratory
Apply the best finance system in a pilot area (Cluster)	P	E	P	S	P	Finance system tested in at least one pilot area.
Make information on reforestation financing options available to producers by products	E	E	P	S	P	At least four forest producer organizations have information on finance mechanisms for commercial reforestation
OBJECTIVE 2: Increase the productivity of commercial forest plantations	FMR	MG	OMG	EOM		Outputs
Define quantity and quality of existing forest plantations	P	E	E	E		Mapping and inventory of commercial forest plantations
Generate information that links productivity of the species by region	P	E	E	S		Matrix of productivity links by species (in m³/hectare) by region
Transfer the management options for pests and diseases in teak and melina plantations	P	E	E	S		At least one training course in teak and melina pests by region

Define the list of recommended species for commercial reforestation by region	P	E	E	E		At least 5 commercially significant species defined for regions ZHC, ZHN, and ZB.
Generate management options for pests and diseases in plantations of the other identified species	P	E	E	S		At least three other significant species with pest management options
Define the productivity baseline by species or group of species, by region (define product and unit)	P	E	S	E		There is a defined productivity baseline (in m ³ /hectare) for each species and region
Develop technological packages by type of product by species for the defined species	P	E	E	P		A technological package by type of product including species, genetic aspects, densities, soil, fertility, weed management, general management, production quality, profitability.
Launch a genetic improvement programme for defined species that require it	P	P	E	S		A genetic improvement trial for (Laurel, cedar, Guanacaste and cenízaro) established in the field
OBJECTIVE 3: Develop high value added plantation timber products that increase forest producers' income	FMA	MS	FMR	EOM	DCC	Outputs
Identify successful product alternatives, according to forest species, availability of raw material, profitability and market	E	E	P	S	E	At least 25 product alternatives have been identified.
Assess alternative products to select the most promising	E	E	P	S	E	All alternatives assessed with a prioritization matrix by month 8
Preparation of prototypes of selected products	E	E	P	S	P	Prototypes of at least 15 products have been manufactured by the end of Year 2
Define characteristics and applicability of designed products	E	E	P	S	P	Prototypes defined for at least 15 products
Identify companies or investors to introduce developed prototypes into the market	E	E	E	S	E	At least 5 companies or investors have been identified that have an interest in introducing the products on the market

ANNEX 3. Terms of reference of personnel and consultants and sub-contracts funded by ITTO

Recruitment of Foresters	
Objective	Implement mapping and inventory activities in forest plantations
Academic studies	Forester with a Bachelor's degree in Forest sciences
Experience	Minimum two years' experience in the use of Geographic Information Systems, GPS devices or forest mapping using aerial images and photographs, and in-depth knowledge of Google Earth and other similar systems Minimum two years' experience in plot establishment for inventory and tree measurement purposes in natural forests or forest plantations
Languages	Spanish, and in-depth knowledge of English desirable
Software knowledge	In-depth knowledge of Excel (MS), as well as MS-Office resources In-depth knowledge of GIS platforms including ArcGis or QGIS
Other skills and requirements	Current driver's licence Excellent written and oral communication skills Ability to work with groups, and excellent ability to work with forest producers Ability to work to a deadline and under pressure Available to travel throughout the country

Experimental economics laboratory services	
Objective	Planning and development of economic experiments to test the operation of a finance system for commercial forest plantations, under laboratory conditions and with a diversity of stakeholders
Experience	Minimum 3 years proven experience in implementing experimental economics, to study the behaviour of various economic actors regarding income maximisation policies and decisions
Personnel availability	At least two professionals with proven experience and scientific publications in indexed journals that qualify them to develop econometric experiments regarding decision making on the use of natural resources or similar cases
Availability of physical space	Availability of a duly set up (equipment and software) experimental economics laboratory with additional space for work sessions with potential stakeholders regarding the use of the finance system for commercial reforestation

ANNEX 4. Recommendations of the 52nd ITTO Expert Panel

<u>Specific recommendations</u>	<u>Action taken/response</u>
1. Refine Section 1.4 (Expected outcomes at project completion) by describing the intended immediate effects of the project. Avoid describing the outputs and activities;	<u>Section 1.4 was amended as requested. The intended immediate effects were identified and included in the objectives tree. Expected outputs were drafted on the basis of the logical framework matrix and the indicators of the specific objective.</u>
2. Further elaborate the environmental aspects of the project as the current information is too general;	<u>The environmental aspects of the regions where the project will be implemented were expanded by adding a specific section on this issue. The general description of the diversity of the regions, landscape, life zones, habitats, etc. was maintained.</u>
3. Further elaborate the institutional set-up issues by identifying appropriate partners for project implementation and the degree of cooperation between them;	<u>The analysis of the institutional framework was improved. The stakeholders involved in the implementation of the project were redefined.</u>
4. Improve the stakeholder analysis by providing a stakeholder analysis table based on the guide of the ITTO Manual for Project Formulation;	<u>The analysis and roles of the different stakeholders was improved and a table based on the ITTO Manual for Project Formulation was included.</u>
5. Refine the presentation of the problem tree in a tree form (key problem – trunk of a tree, causes and sub-causes – roots of a tree) in line with general guide provided in the ITTO Manual for Project Formulation. In a similar way, refine the presentation of the objective tree;	<u>The presentation of the problem tree and objectives tree was amended in line with the general guidelines of the ITTO Manual for Project Formulation.</u>
6. Further elaborate Section 3.2 (Implementation approaches and methods) by incorporating scientifically sound and socially inclusive approaches in addition to financial instruments;	<u>The requested information was incorporated into section 3.2, including information on social aspects and new techniques available to find appropriate solutions.</u>

7. Refine the works plan presentation in a quarterly base as the current monthly based presentation is hard to catch each project implementation duration;	<u>The work plan was re-structured in a quarterly base as requested.</u>
8. Refine Section 3.4 (Budget) based on the guide of the ITTO Manual for Project Formulation. A master budget schedule should be provided in the beginning of the budget presentation;	<u>A master budget table was included. Calculation errors were corrected and the budget contribution requested from the ITTO was reduced by amending the recommended budget items. The overall budget was also reduced. The amounts for evaluations (item 81) and ex-post evaluations (item 82) were duly adjusted. The ITTO program support costs were recalculated at 12%.</u>
9. Justify the budget provision (US\$54,000) allocated for Assistant 1. Make sure the inclusion of a budget to conduct an annual financial auditing in accordance with the relevant ITTO guidelines;	<u>The hiring of 2 assistants was justified. Technical personnel at a baccalaureate level of education to carry out forest inventory tasks cannot be hired with research funds from ITCR, as the Institute's funding can only cover staff with a master's or doctorate degree. The hiring of personnel at a master's or doctorate level to carry out these activities cannot be justified and therefore ITTO funding is being requested for the technical staff members to be hired.</u>
10. Recalculate the ITTO Programmed Support Costs (sub-item 83) so as to confirm with standard rate of 12% of the total ITTO project costs (on the budget items 10 to 82);	<u>Cost recalculated. This sub-item was recalculated at a rate of 12% of the sum of items 10 to 82.</u>
11. Review the risk assessment (Section 3.5.1) in a consistent way with the risks of the logistical framework matrix;	<u>The section was reviewed and an analysis was carried out to ensure consistency with the project's logical framework.</u>
12. Improve the sustainability (Section 3.5.2) by addressing the issues of social sustainability, technical sustainability and economic sustainability;	<u>Section 3.5.2 was improved by providing information on each of the sustainability issues: social, technical, institutional, etc.</u>

13. Include Section 4.1.4 (Stakeholder involvement mechanisms) to ensure the effective involvement of stakeholders in project implementation in a transparent manner;	<u>Section 4.1.4 was included as requested.</u>
14. Further elaborate Section 4.3 (Dissemination and mainstreaming of project learning) by describing communication strategy and methods of the project team; and	<u>Section 4.3 was improved as requested, providing information on the use of social networks as mechanisms for the dissemination of project results.</u>
15. Include an annex that shows the recommendations of the 52nd Expert Panel and the respective modifications in tabular form. Modifications should also be highlighted (bold and underline) in the text.	<u>The recommendations in this annex were duly incorporated and this table explains how each recommendation was dealt with. Modifications were highlighted in bold and underlined in the text.</u>

ANNEX 5. Recommendations of the 53rd ITTO Expert Panel

<u>Specific recommendations</u>	<u>Action taken/response</u>
1. Improve the problem analysis by further describing the causes of the key problem. Improve the consistency between the numbers of sub-causes in the problem tree and those of activities under three Outputs. Three sub-causes for the second causes are listed but there are eight activities listed under Output 2;	<u>The Problem Tree, Objectives Tree and activities related to Output 2 have been modified. There is now consistency between these three elements of the proposal. In addition, the work plan and the activities in the budget have also been modified accordingly.</u>
2. Improve the indicators of the logical framework matrix. Expected outcomes of some individual activities under each output would be used as indicators of output delivery;	<u>The indicators in the logical framework matrix have been improved. The expected outputs of some individual activities are used as indicators.</u>
3. Refine the statement of the development objective on Figure 3 (3 top rows of boxes) by taking the form of active sentence like "to increase...". Formulate the indicators more specifically;	<u>The development and specific objectives were redefined in Figure 3 as well as in other sections.</u>
4. Justify the origin of listed activities or revisit the problem analysis as many activities had been defined inconsistently. Clarify Activity 3.1 (identify alternative high value-added products...) as the markets would work with existing high value-added products for plantation timber;	<u>The activities related to each output have been revised and the number of activities has been reduced in accordance with the problem and objectives trees. Response: Activity 3.1 is aimed at developing new high-value production alternatives that may be produced using the material obtained from forest plantations, whose dimensions and properties are different from those of the timber produced in natural forests.</u>
5. Further refine Section 3.5.1 by identifying the assumptions, potential risks and feasible mitigating measures;	<u>Section 3.5.1 has been modified as requested. Assumptions and risks have been identified, and mitigating measures have been revised.</u>
6. Improve Section 4.2 (Reporting, review, monitoring and evaluation) by specifying the delivery of required reports and monitoring process in line with the guidance of the ITTO Manual for Standard Operating Procedures for Project Cycle;	<u>A table has been included in section 4.2 showing a detailed description of reports to be submitted and the monitoring actions to be implemented during project implementation in accordance with the ITTO Manual for Standard Operating Procedures for the Project Cycle.</u>

7. Correctly calculate the ITTO Programme Support Costs (sub-item 83) so as to conform with standard rate of 12% of the total ITTO project costs (on budget items 10 to 82), and adjust the total ITTO budget accordingly; and	<u>Response: the project administration costs have been revised to US\$65975 using the standard rate of 12% of the total sum of items 10 to 82 (US\$35975) plus US\$30000 for ITTO monitoring and review costs, amounting to a total of US\$335765.</u>
8. Include an Annex that shows the overall assessment and specific recommendations of the 53rd Expert Panel and respective modifications in tabular form. Modifications should also be highlighted (bold and underline) in the text	<u>The requested annex has been included in the project document (Annex 5).</u>