Food and Agriculture Organization of the United Nations

FUNDING PROPOSAL TO THE GREEN CLIMATE FUND

-IRES-CUBA-
INCREASED CLIMATE RESILIENCE OF RURAL HOUSEHOLDS AND COMMUNITIES THROUGH THE REHABILITATION OF PRODUCTIVE AGROFORESTRY LANDSCAPES IN SELECTED LOCALITIES OF THE REPUBLIC OF CUBA

ANNEX 20 Operations and Maintenance Plan (O&M)

October 2019

Republic of Cuba

Contents

Section 1: Operations and Maintenance Plan (O&M) for a 20-year period

Overview: Restored and resilient productive agro-forestry landscapes, to guarantee food security for the vulnerable population; Timely availability of the necessary equipment and implements for the development of the operations under the administrative and operational responsibility of the Integral Base Technical Services Business Units, UEBIST, located in the Project Implementation Area, AIP.

Details of the Operations and Maintenance Plan (O&M), for the 20-year period are described in the following tables

Work Plan to implement O&M on the equipment and implements used to provide mechanical services to machinery.

Table 1. Summary of O&M costs and sources of financing during and after project implementation.

Products	Activities for which O&M is necessary	Description of O&M Activities	Cost Structure and Financing Sources	O&M During Project Implementation (USD)	O&M Post-project implementation to guarantee lifespan of equipment (USD)
1. Restore 15,544 hectares of land infested with marabou, and increase resilience to climate change through sustainable agroforestry and assisted natural regeneration. 2. Restore 20,189 ha of grasslands with compacted soils and increase the resilience of the effects of climate change through the establishment	1. Provide agricultural mechanization services to establish agroforestry and silvopastoral systems, resistant to climate change; as well as the establishment of planted forests close to nature, as well as assisted natural regeneration to improve ecosystem services through practices focused on the management of soil and water resources, increasing carbon storage. 2. Provide services for the transport of inputs and	**1. Develop O&M Implementation Work Plan** that will be provided to the equipment, including implements required to provide machinery services. This plan considers the characterization of the aspects that involve the installed capacity to deliver services to machinery, the organizational structure, as well as human resources, occupational safety, the facilities and basic services required, the means of work (equipment and tools) to perform such maintenance. **2. Services provided by UEBIST:** - Mechanization services to the production units. - Technical assistance and repair services to the fleet of tractors, machines and agricultural implements, irrigation equipment, as well as means of transport. **Components of the O&M Plan** **OPERATIONS** **Agroforestry Systems (SAF)** *I. Land Preparation* - Rehabilitation of lands invaded by Marabou; For this, the equipment and implements to be	1. **O&M Plan Cost Structure** ***i. Operational Costs (O)*** - Variable Costs (Lubricants, filters, labor, unforeseen. Fuel is not included, since it is paid by the producer, a cost that has been included in the budget of each module. - Fixed Costs (Equipment and implements replacement fund, Insurance, Backup and administration). These costs are entirely financed by the Government of Cuba. ***ii. Maintenance Costs (M)*** - Includes the purchase of spare parts of mechanical, electrical and measurement systems. - These costs are fully covered with resources from the Green Climate Fund for the period of project implementation; which is seven (7) years old. From year 8 to 20, the post project period is covered by the Government of Cuba in its entirety.	**Operational (O) and Maintenance (M) Costs: US$9,189,682.92** Of which: - **US$7,972,374**, of Operational Costs (O); financed entirely by the Government of Cuba. - **US$1,217,308.68,** of Maintenance Costs (M), of which FVC, finances US$1,095,102, and the Government of Cuba finances US$122,206. **During the project implementation phase (7 years) FVC contributes with 13% and the Government of Cuba with 87% of O&M total cost.**	**Operational (O) and Maintenance (M) Costs: US$12,690,334** Of which: - **US$11,040,590**, Operational Costs (O); financed entirely by the Government of Cuba. - **US$1,649,744** de Maintenance costs (M), 100% entirely financed by the Government of Cuba. **During the post Project phase (13 years) the Government of Cuba finances 100% of O&M total cost.**

of silvopastoral systems.	necessary tools for the establishment of systems to be implemented; provide also support in the collection and transport of agricultural crops from site	used are determined considering the work of clearing, crushing and incorporating marabou plant material, elimination and transfer of material not suitable for incorporation. (This last work is according to need). - Soil preparation, an operation that includes subsoiling, shattering and enlistment tasks; for which the equipment and implements that will be necessary to use are established. *II. Establishment of agroforestry systems. (forest species, fruit species and annual crops):* - Plantation, for which the equipment and implements for the development of the tasks such as furrowing and hole digging are assigned. These tasks are complemented with those supporting the transfer of tools, supplies and materials that are used for the establishment of agroforestry systems. *III. Maintenance* - Define construction and maintenance of short fire trails, for this purpose the tasks of choking and creation of clean strips (vegetation control) are carried out, and thus be able to determine the need for equipment and implements to be used. - Realization of cultural practices related to planting, fertilization, control of pests and diseases, and weed control; establishing the appropriate equipment and implement for each job. *IV. Harvest and transportation* - The mechanized work in these operations is concentrated in the harvesting and transportation services of the crops; using	- Labor cost of the mechanics who perform maintenance. From year one (1) to year twenty (20), these costs will be entirely covered with resources of the Government of Cuba). The implementation of the Preventive Maintenance Plan requires the allocation of financial resources and the identification of sources of financing; resources that must be quantified and ensure that they are available for use. These resources must be used for preventive maintenance, considering any corrective maintenance that may arise. The components of the plan financing budgets are: i. Technical, mechanical, operative and administrative personnel. ii. Maintenance of equipment necessary for carrying out activities. iii. Materials and spare parts, according to manufacturer specifications. iv. Payment of basic services necessary for the operation of the service center. v. Contingency		

		the required equipment and accessories for this purpose, focused on agricultural products. **OPERATIONS** **Silvopastoral Systems (SSP)**. V. *Land Preparation* - For SSPs, the rehabilitation operations of land invaded by marabou are not considered; so only the soil preparation work, operation related to subsoiling, establishing the equipment and implement to be used are included in the plan. *VI. Establishment of agroforestry systems (forest species and forage grasses).* *VII. Maintenance and transportation of milk* - - The mechanized tasks in these operations have very similar characteristics; So, the attention to provide the different services is focused on identifying the type of equipment and implements to be used. The summary of the use of agricultural machinery and the necessary implements according to the work to be done in the different operations is presented in Table A.1 of this document; Source: Institute of Agricultural Engineering, IAgric, of the Ministry of Agriculture, MINAG, Cuba, 2019. Table A.2. provides details of the equipment and implements to be acquired for the O&M plan. **3. O&M Components /**			

		PREVENTIVE MAINTENANCE **Equipment and implements** Preventive maintenance can be defined as a complete list of activities that complies with manufacturer's recommendations; all performed by users, operators, and maintenance personnel; hence it is necessary to outline a Preventive Maintenance Plan, including the activities detailed below: *i. Keep an updated inventory of agricultural equipment and implements* It enables to determine with certainty the quantity and conditions of the assets, which is necessary for providing services as well as maintenance *ii. Create a Registration Sheet for equipment and implements* A record must be kept for each machine, tool or implement, based on the technical and operational specifications established by the manufacturer. *iii. Establish a maintenance log for each equipment and implement* Keeps a record history of scheduled maintenance activities performed on each equipment involved; as well as the corrective maintenance activities carried out. *v. General maintenance record* It allows to know in a general way the compliance of the preventive maintenance plan of the equipment and implements;			

		through a schedule of planned and executed activities. The preventive maintenance plan should consider element inspections and routine activities, according to the manufacturer's technical specifications, such as: • Lubrication and review of levels. • Revision of the electrical system. • Review of mechanical aspects In general terms this maintenance can be organized by type of maintenance: • First Maintenance • Second Maintenance • Third Maintenance • Repairs of equipment and implements due to breakage or technical damage. • Capital Repair • General The detail of the equipment and implement maintenance activities is presented in Table A3, indicating the equipment or implement, maintenance activity and the entity responsible for the activity.			

Fuente: IAgric-MINAG, Cuba 2019

Table 1.1: ***Use of agricultural machinery in the implementation and development of agroforestry modules***

Phase	Activity	Task	Objective	Equipment	Implements	Modules					
						1	2	3	4	5	6
Preparation of the Fields	Site Clearing	Land Clearing	Clean and recover land with productive potential invaded by Marabou; using mechanical methods.	Biomass harvester (marabou) BMH - 480	n/a						
		Crushing and incorporation of stubble	Incorporate organic matter into the soil, through the removal and chopping of marabou remains.	n/a	Rotavator TR - 400						
		Transfer of removed material	Remove material that is not incorporated into the ground because of its texture and size.	Tractor of 90 hp	Trailer 14t.						
	Soil Preparation	Subsoiled	Oxygenate the soil while allowing better water circulation in the deep layers of the earth.	Tractor of 120 hp	Subsoiler of 3 b.						
		Tillage	Develop different forms of tillage to improve water storage and soil aeration.	Tractor of 120 hp	Multi-plough						
		Layout	Sponge and air the soil; as well as preparation of the planting bed.	Tractor of 90 hp	Harvester						

……Continuation Table 1.1

Phase	Activity	Task	Objective	Equipment	Implements	Modules					
						1	2	3	4	5	6
ESTABLISHMENT	Plantation	Plough	Draw parallel grooves within a batch spaced at the same distance where the seed or vegetative material is sown.	Tractor 90 hp	Three anchor furrow opener						
		Hole Digging	Opening of cylindrical holes, intended for planting trees and posts.	Tractor 90 hp	Drilling machine						
				n/a	Manual drilling gasoline motor						
		Transfer of supplies and materials	Move the supplies and materials necessary for the establishment of the modules to the growing area.	Tractor 90 hp	Trailer 7t.						
MAINTENANCE	Cultural work development	Construction and maintenance of fire trails	Protection against forest fires; through the control and management of vegetation that promotes conditions for the spread of fire	n/a Tractor 90 hp	Rotovator Multiplow 6 in 1						
		Sowing, fertilization, control of pests and weeds.	Perform mechanized or manual planting, fertilization, pest control; weed control, humanizing work and increasing productivity.	Tractor 90 hp	Seeder, Sprinkler, Fertilizer						
				Seeder - fertilizer, sprinkler, manual brushcutter.							
		Thinning and pruning	Tree formation and mechanical sanitary control.	Chainsaw for thinning and pruning							
HARVEST MANAGEMENT	Harvest	Harvest	Collection of grains, food and fruits, Non-Wood Forest Products (M2)	n / a	n/a						
		Felling	Definitive logging of forest species	Chainsaw with extension	n/a						
	Agricultural harvest transportation	Transport	Facilitate the availability of inputs in the production areas and the collection of agricultural and livestock products.	Tractor 120 hp	Trailer						

Source: IAgric-MINAG, Cuba 2019.

The table below describes the value assigned to O&M for each equipment and implement.

In the case of Cuba, an additional 15% is added to the price of the equipment, as a repair and maintenance kit, as part of the process of acquiring tractors, equipment and implements. These resources are necessary for maintenance and are contracted to the supplier.

Values in table correspond to 7 years of exploitation. For tractors and equipment, the useful life is considered 12 years if the planned O&M activities are guaranteed, while in the case of implements they are being assumed as an average useful life of 7 years.

Table 1.2: Details of the equipment and implements to be acquired through the O&M Plan. IRES-Cuba Project

Equipment and Implements	Quantity to be procured by the project	Unit Cost	Total Cost	Equivalent acquisition value (85% of the total price)	Value allocated to O&M (15% of the total price)
BMH 480 Brushcutter	4	700,000.00	2800,000.00	2380,000.00	420,000.00
120 hp rim tractor	14	28,500.00	399,000.00	339,150.00	59,850.00
Tractor with 90 hp rim	14	24,500.00	343,000.00	291,550.00	51,450.00
45 hp rim tractor	7	10,000.00	70,000.00	59,500.00	10,500.00
Excavator	4	189,700.00	758,800.00	644,980.00	113,820.00
Rotovator	2	341,387	682,774	580,358	102,416
3 organ subsoiler	8	6,700	53,600	45,560	8,040
Multiplow	7	2,500	17,500	14,875	2,625
Cultivator	6	1,350	8,100	6,885	1,215
3 organ furrower	8	2,700	21,600	18,360	3,240
Trailer tribasculant 14t	13	12,000	156,000	132,600	23,400
7t trailer	9	6,000	54,000	45,900	8,100
Choking - Borer	7	1,650	11,550	9,818	1,733
Precision sowing machine with coarse grains / 4 rows	6	9,840	59,040	50,184	8,856
Multiplow 6 in 1	8	2,500	20,000	17,000	3,000
400 L integral sprayer	7	800	5,600	4,760	840
Forage Machine by cardan	5	6,150.00	30750	26,138	4,613
Harvester	5	21,050.00	105,250.00	89,463	15,788

Table 1.2 (Continuation): ***Details of the equipment and implements to be acquired subject to the O&M Plan. IRES-Cuba Project***

Equipment and Implements	Quantity to be procured by the project	Unit Cost	Total Cost	Equivalent acquisition value (85% of the total price)	Value allocated to O&M (15% of the total price)
Grass mower	5	8,500.00	42,500.00	36,125	6,375
Hay Baler	5	21,900.00	109,500.00	93,075	16,425
Windrower	5	8,090.00	40,450.00	34,383	6,068
Toyota Hilux 3.0 D-4D truck 171 Double cabin VXL-4p. 5 seats	11	$25,000	$275,000	23,3750.00	41,250.00
Light car 5 seats	1	$16,000	$16,000	13,600.00	2,400.00
Motorcycle sidecar	25	$6,000	$150,000	127,500.00	22,500.00
Manual tillage equipment	100	150.00	15,000.00	12,750.00	2,250.00
Manual crusher with set of cutting discs.	300	485.00	145,500.00	123,675.00	21,825.00
Manual grain seeder	300	200.00	60,000.00	51,000.00	9,000.00
Manual borer - gasoline engine	400	300.00	120,000.00	102,000.00	18,000.00
Granular fertilizer manual applicator	300	286.00	85,800.00	72,930.00	12,870.00
Backpack sprayer with 20-25-liter gasoline engine	150	406.00	60,900.00	51,765.00	9,135.00
20-25-liter backpack sprinkler	150	75.00	11,250.00	9,562.50	1,687.50
Brushcutter - Manual Motoguadaña	200	515.00	103,000.00	87,550.00	15,450.00
Chainsaw for thinning, pruning and felling	400	290.00	116,000.00	98,600.00	17,400.00
Battery telescopic chainsaw	300	225.00	67,500.00	57,375.00	10,125.00
Equipos de oredeño mecanico alimentado con paneles solares	20	10,000.00	200,000.00	170,000.00	30,000.00
Termos para enfriamiento de leche con capacidad de 1000 L. Energia convencional	20	10,000.00	200,000.00	170,000.00	30,000.00
GRAND TOTAL			**$7014,964.00**	**$5962,719.40**	**$1052,244.60**

The O&M activities for each equipment acquired during the project and in the subsequent implementation, as well as the entities responsible for executing them, are detailed in Table A3.

Table 1.3. O&M for each type of equipment.

O&M of the equipment acquired during the project and in the post-project implementation (20 years)	O&M Activities	Entities responsible for carrying out O&M activities
BMH 480 Brushcutter	Technical maintenance of the engine (filter and oil change), shingle changes for the mats, bearings, blades of the cutting system, cabin maintenance and computerized systems, digital loader balance, lighting system, electrical and hydraulic system.	Integral Base Business Units of Technical Services, WEBIST
120 hp rim tractor	Technical maintenance of the engine (filter and oil change), belts, bearings, tire replacement, repair of the hydraulic system, electrical and lighting system, hitch system, transmission repair, engine and cabin repair, system of air conditioning, gas replacement and compressor.	Integral Base Business Units of Technical Services, WEBIST
Tractor with 90 hp rim	Technical maintenance of the engine (filter and oil change), belts, bearings, tire replacement, repair of the hydraulic system, electrical and lighting system, hitch system, transmission repair, engine repair, cabin, system of air conditioning, gas replacement and compressor.	Integral Base Business Units of Technical Services, WEBIST
45 hp rim tractor	Technical maintenance of the engine (filter and oil change), belts, bearings, tire replacement, repair of the hydraulic system, electrical and lighting system, hitch system, transmission repair, engine repair and cab.	Integral Base Business Units of Technical Services, WEBIST
Excavator	Technical maintenance of the engine (filter and oil change), repair of the hydraulic system, bearings, electrical and lighting system, belts, pulleys, replacement of accessories (loader, blades).	Integral Base Business Units of Technical Services, WEBIST
Rotovator	Maintenance and replacement of worn parts and components in a year of operation such as sets of blades, bearings, gimbal every two years, screws, some metal structures that are damaged such as skates and the back cover.	Integral Base Business Units of Technical Services, WEBIST
3 anchor subsoiler	Maintenance and replacement of worn parts and components in two years of operation as work organs, tinsels and depth wheel.	Integral Base Business Units of Technical Services, WEBIST

Table 1.3 (Continuation). O&M for each type of equipment

O&M of the equipment acquired during the project and in the post-project implementation (20 years)	O&M Activities	Entities responsible for carrying out O&M activities
Multi plow	Maintenance and replacement of worn parts and components in a year of operation such as chisels, shoes, fuses, screws, depth wheel and worm.	Integral Base Business Units of Technical Services, WEBIST
Cultivator	Replacement of the work organs due to wear such as chisels, springs and screws.	Integral Base Business Units of Technical Services, WEBIST
3-anchor furrower	Replacement of working organs due to wear such as fins, chisels and screws.	Integral Base Business Units of Technical Services, WEBIST
14t tribasculant trailer	Maintenance and replacement of worn parts and components, tires, hydraulic system, electrical system, racks, bearings, screws and railings.	Integral Base Business Units of Technical Services, WEBIST
7t trailer	Maintenance and replacement of worn parts and components, tires, hydraulic system, electrical system, racks, bearings, screws and railings.	Integral Base Business Units of Technical Services, WEBIST
Choking - Borer	Maintenance and replacement of worn parts and components such as sets of augers, clochet, hydraulic system and screws.	Integral Base Business Units of Technical Services, WEBIST
Precision sowing machine with coarse grains / 4 rows	Replacement of the sowing discs, suction hoses, pressure gauge, vacuum pump, main gimbal and intermediate gimbals, hoppers, capping wheels, pinions, distribution box, screws.	Integral Base Business Units of Technical Services, WEBIST
Multi plow 6 in 1	Replacement of blades and screws.	Integral Base Business Units of Technical Services, WEBIST

Table 1.3 (Continuation). O&M for each type of equipment

O&M of the equipment acquired during the project and in the post-project implementation (20 years)	O&M Activities	Entities responsible for carrying out O&M activities
400 L integral sprayer	Maintenance and replacement of parts and components such as diaphragm kits, filter kits, nozzle sets, application bar, gimbal, nozzle holders, hydraulic cylinders, distribution command, hoses and screws.	Integral Base Business Units of Technical Services, WEBIST
Gimbal Forage Machine	Repair of electric motor, set of cutting blades, belt, pulley, gimbal and screws.	Integral Base Business Units of Technical Services, WEBIST
Harvester	Change of blades, bearings, transmission case, chains, pinions, cardan, pinions, skates and metal structure. Tire replacement	Integral Base Business Units of Technical Services, WEBIST
Hay Baler	Acquisition of needles, thread cones, pinion replacement, chains, sewing and mooring system, rocker arms. Tire replacement	Integral Base Business Units of Technical Services, WEBIST
Windrower	Replacement of hooks, cardans, rotors, road and tires.	Integral Base Business Units of Technical Services, WEBIST
Grass mower	Replacement of drums and blades, bearings, transmission case, sprocket and chain, transmission axles or cardan, hydraulic system and metal structures.	Integral Base Business Units of Technical Services, WEBIST
Toyota Hilux 3.0 D-4D truck 171 Double cabin VXL-4p. 5 seats	Technical maintenance of the engine (change of filters and oil), maintenance of the electrical system, replacement of tires and accessories, sheet and paint, belts, transmission chain, brake system, steering, air conditioning system, lighting system	Automotive mechanic workshops belonging to the Ministry of Agriculture (companies, provincial and national).

Table 1.3 (Continuation). O&M for each type of equipment

O&M of the equipment acquired during the project and in the post-project implementation (20 years)	O&M Activities	Entities responsible for carrying out O&M activities
Light car 5 seats	Technical maintenance of the engine (change of filters and oil), maintenance of the electrical system, replacement of tires and accessories, sheet and paint.	Automotive mechanic workshops belonging to the Ministry of Agriculture (companies, provincial and national).
Sidecar motorcycle	Technical maintenance of the engine (change of filters and oil), maintenance of the electrical system, replacement of tires and accessories, sheet and paint, brakes, clochet	Automotive mechanic workshops belonging to the Ministry of Agriculture (companies, provincial and national).
Manual tillage equipment	Minor repairs and replacement in case of serious breakage.	Productive Forms Beneficiaries
Manual crusher with set of cutting discs.	Replacement of cutting bodies and bearings.	Productive Forms Beneficiaries
Manual grain seeder	Replacement of distribution organ and metal parts that are damaged.	Productive Forms Beneficiaries
Manual borer - gasoline engine	Engine repair and auger replacement.	Productive Forms Beneficiaries
Granular fertilizer manual applicator	Minor repairs and replacement of the deposit	Productive Forms Beneficiaries
Backpack sprayer with 20-25-liter gasoline engine	Engine repair, replacement of nozzle and plastic parts.	Productive Forms Beneficiaries
20-25-liter backpack sprinkler	Repairs according to Backpack repair kit, lance replacement and plastic parts x breakage.	Productive Forms Beneficiaries
Brushcutter - Manual Motoguadaña	Repair of the engine and cutting elements, transmission bar and safety system (belts)	Productive Forms Beneficiaries
Chainsaw for thinning, pruning and felling	Repair and / or replacement of the engine, filter and oil changes, carburetor, greasing, chain and bar or sword changes, cloche, hand starter, gear, plastic parts,	Productive Forms Beneficiaries
Telescopic battery chainsaw	Permanent revision and charging of main and spare batteries.	Productive Forms Beneficiaries
Equipos de ordeño mecanico alimentado con paneles solares	Revision y/o cambio, según la situación de selladores, tubo, mangueras, pezoneras. Cambior de filtros y aceite para bombas de vacío.	Productive Forms Beneficiaries
Termos para enfriamiento de leche con capacidad de 1000 L. Energia convencional	Revision de gas refrigerante y tberias para evitar fugas.	Productive Forms Beneficiaries

The operational mechanism for the implementation of agricultural mechanization in the project provides for the allocation and distribution of goods acquired, to the UEBIST and to the Productive Forms benefiting from the project (production units); according to its role in the execution of the activities for the implementation of mechanization.

The Integral Units of Technical Services (UEBIST) are Municipal-Based Business Units (one in each municipality), responsible for providing agricultural mechanization services and technical assistance to the producers in their area of action. The Unit is subordinated to a Business Group of the Municipal Agricultural Company. It manages its resources and enforces the established policies of agricultural machinery, irrigation and transport, as well as technical assistance on the productive basis.

The UEBIST provide the mechanization services in accordance with the Machinery and Irrigation Balances, prepared in the Productive Forms from the sowing plans, as well as the technical assistance to the agricultural machinery, irrigation equipment and means of transport, both formalizing services through a service contract signed between the production units and the Municipal Agricultural Company.

On the other hand, the Productive Forms will assign the goods they receive as loans (small implements oriented to promote conservation agriculture), according to the demand established in the planning of the production systems developed by each of the producers.

Additionally, the project will provide a tool kit that will be necessary for the development of complementary activities in the implementation of the modules; which will be administered by the Productive Forms. These tools will be delivered as a loan to the producers, according to the planning of crops and activities.

The technical assistance and training services for mechanization will be carried out by the IAgric of MINAG, with the objective of strengthening and guaranteeing the implementation of the agricultural mechanization approach and sustainability and replication of the expected results in the project related to conservation agriculture and sustainable development.

The proposal aims to implement the mechanization of the activities carried out during the previous stage and the phenological development of the plantations; defining four phases in the implementation of agroforestry systems; that is to say: i) Land adaptation, ii) Establishment, iii) Maintenance and iv) Harvest; under a conservation agriculture approach.

The machinery and equipment to be acquired with the co-financing of the Green Climate Fund, FVC, will be distributed and managed by the Integrated Basic Technical Services Business Units (UEBIST), located in each of the seven municipalities of the Project Intervention Area (AIP); who will define the fee to be charged for the service provided, according to the existing cost sheets. The work to be performed will be programmed and budgeted under the figure of provision of machinery services.

Each UEBIST must have an Operation and Maintenance Plan to ensure the provision of services efficiently; with a focus on sustainability.

Section 2: Operation and maintenance costs for the post-Project period

The project is designed to guarantee the operation and maintenance of the project results beyond 7 years; for the amount indicated in Section 1, identifying the destination according to the Operation and Maintenance Plan, resources that will be covered by the Government of Cuba in its entirety, including all the equipment and implements described in Tables A2 and A3.

Products and activities that will require O&M in the post project stage are the following:

Product	Activities for which O&M will be required
Restored production landscapes (ha) with improved resistance capacity and climate production to guarantee food security for vulnerable populations.	Establish weather-resistant agroforestry, silvopastoral systems, planted forests close to nature and assisted natural regeneration to improve ecosystem services and water safety and regulation; as well as increase carbon storage.

Specifically, the areas that have already been cleared of marabou will have to be maintained, and in those AIP modules 1 to 4 will be established. Silvopastoral Systems modules (5 and 6) will also be established. Maintenance, harvesting, replacement and planting, cultural work, fertilization, pest control, pasture renewal, as well as implementing environmental measures and safeguards for sustainable development and strengthening of climate resilience and livelihoods will be carried out. .

Some equipment such as the marabou brushcutter, rotavator and trailers will be providing services to other areas through the escalation of the project, which is also an interest in terms of replicability and sustainability in degraded agroproductive landscapes in vulnerable areas of the territory.

CONSULTED BIBLIOGRAPHY

Carrasco J, Abarca P, and Catalán A. (2018). Methodology for calculating the costs of using agricultural machinery for the cultivation of corn. Informational No. 64. Pp 4. Institute of Agricultural Research, INIA. Department of agriculture. O'Higgins Region, Chile

Gasca R, and Vargas M. (2014). Design of a preventive maintenance plan for the agroangel company. (undergraduate thesis). Technological University of Pereira, Faculty of Mechanical Engineering, Pereira, Colombia.

Garbers R, and Chen Y. (August, 2013). Operating costs of agricultural machinery (Basic synthesis for its calculation), Agricultural Machinery Magazine, pp. 25. National Directorate of Rural Contractors Agricultural Inputs. Under Secretary of Agriculture, Ministry of Agriculture, Livestock and Fisheries, Argentina.