

# HYDRO-PROGRAM FOR THE REFORESTATION OF THE COLOMBIAN AMAZON BASIN

## RESUMEN

This program aims to restore 14,400 hectares of forests in the Caquetá River basin, which flows into the Amazon River, in Colombia. The Caquetá River valley is inhabited by 4 cities of the Kamsá indigenous community, in the Amazon forests. There are 4 threats to the forests of the basin: 1. Deforestation for agricultural activities and illegal mining. 2. Contamination by heavy metals (mercury and lead) of wetlands underlying the basin (lagoons, streams). 3. Climate change: high temperatures are generating massive migration of native and endemic biodiversity to higher altitude forests (moorlands); animals die of starvation because food is scarce in these ecosystems. 4. Forest fires: induced (Kamsá indigenous people set fire to the forests to carry out agricultural activities) and natural (high temperatures generate forest fires). This program proposes strategies to restore and protect 14,400 hectares with conservation activities (reforestation of 50,000 trees); education (training of 300 young indigenous environmental leaders); sustainability (creation of a regional office for forest conservation in the Colombian Amazon basin); and communication (sensitize 50,000 people about conservation in the Colombian Amazon).

**Keywords:** Reforestation, Kamsá indigenous people, Colombian Amazon, pollution, forest fires.



#### 4.1. PLAN FUNDAMENTALS

The actions of the Plan are aimed at controlling and recovering degraded soils, prioritizing those that are in an advanced state of deterioration, those included in the categories of moderate to severe, high and very high and extremely high levels of erosion, specifically, those associated with the advance of the extension of the agricultural frontier towards marginal areas and by agro-productive activities, to which must be added an unplanned urban and industrial development, the construction of communication routes without Environmental Impact Studies and the lack of treatment of effluents and liquid and solid waste from factories and urban areas.

The above, allows orienting the Plan to the recovery of the ecological balance and ecosystems; the protection of the development infrastructures installed and planned for the area, the conservation of renewable natural resources and the increase of productive resources for the development of the region.

#### 4.2. VISION

The Forestry vision for 2024 is “Kamsá indigenous community maintains and manages its natural forests, increases its forest plantations and conserves ecosystems that generate goods and services, wealth and well-being with equity in a permanent way and in harmony with the environment, as a result of an awareness and forest culture”.

#### 4.3. OBJECTIVE

Appropriate use and conservation of renewable natural resources and protection of development infrastructures and investment projects, within a comprehensive approach to regional development, considering socioeconomic, technical, institutional and

environmental aspects, with emphasis on erosion control, sedimentation and causes of alteration of ecosystems and natural resources as axes for the development of plantations for highly competitive industrial purposes.

Prepared jointly with the population, through participatory workshops held in each of the Caquetá River basin.



#### 4.4. STRATEGIC GUIDELINES

Strategic Guideline 1 “Systems for the Protection, Conservation and Installation of Forest and Agroforestry Systems”.

- Program "Reforestation and Environmental Conservation of Watersheds".

- Project: "Reforestation with Massif Systems and Agroforestry in Slope Areas".

- Project: "Installation of Agroforestry Systems in Valley Areas".

- Project: “Reforestation with Massif Systems in Desert Zones, in FEN Periods”.

- Project: "Protection and Conservation of Wet and Dry Forests".

- Program "Protection of Natural Conservation Areas".

- Project "Inventory of Regional and Local Conservation Areas".

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- Project "Legal Physical Sanitation of Regional and Local Conservation Zones".
- Project "Establishment of Regional and Local Conservation Areas".
- Project "Determination of Biological Species and Environmental Characteristics of Local Conservation Areas".



- Result 1.1: Public and private investments have been developed in plantations in competitive forest massifs.
- Result 1.2: Agroforestry plantations integrated into sustainable and competitive systems for the recovery and conservation of soils.
- Result 1.3: Added value has been added to non-timber products from forestry and agroforestry plantations.

### **Strategic Guideline 2 "Promotion and Investigation of the Environmental Assessment of Forest Resources and Soils".**

- Program "Scientific Research and Environmental Assessment of Forest Resources and Soils".
  - Project "Incorporation in Universities

- Project "Determination of the Genetic Potential of the Biodiversity of Andean and Coastal Forest Species".
- Project "Environmental Assessment of Forest Resources and Basin Soils".
- Project "Identification and Determination of the Type of Environmental Service of Wet and Dry Forest Ecosystems, with Emphasis on Water and Carbon".

- Result 2.1: There are forest and agroforestry plantations that conserve soils and generate environmental services in the lower, middle and upper parts of the Caquetá River basin.
- Result 2.2: Payment for environmental services has been institutionalized

### Strategic Guideline 3 "Management and Sustainable Use of Soils on Slopes and Plains".

- Program "Protection and Management of Slopes and Plains Soils".
  - Project "Implementation of Soil Conservation Practices in Slope Areas".
  - Project "Control of Gullies in Slope Areas".
  - Project "Installation of Living Forest Barriers in River Channels and Streams".
  - Project "Use of Modern Technologies for Parcel Irrigation in Andean Watershed Areas".
  - Projects "Zoning of the Potential Use Capacity of Slopes and Plains Soils".
- Program "Use of Practices and Technologies for the Management of Slopes and Plains Soils".

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- Project "Production and Use of Organic Fertilizers for the Improvement of the Structure of Agricultural Soils".
  - Project "Production and Adequate Management of Silvo pastures on the slopes".
  - Project "Management and Preparation of Soils for the Installation of Crops".
  - Project "Implementation of Technified Irrigation Systems and Methods, Using Rustic Materials".
  - Project "Maintenance and Rehabilitation of Irrigation and Drainage Infrastructure in the Valles de Costa".
  - Project "Establishment of Regional and Local Environmental Law Policies".
  - Project "Formulation and Implementation of a Compensation Model for Hydrological Environmental Services".
  - Project "Formulation of a Technical Normative Proposal to Adapt the SNIP and Promote Public Investment in the Installation of Agroforestry Systems".
- Strategic Guideline 5 "Institutional Strengthening in Environmental Issues".



- Result 3.1: Permanent employment has been generated that fundamentally benefits the rural population, considering a gender perspective.
- Result 3.2: Associativity in productive chains and value networks operating efficiently.
- Result 3.3: Public sector encourages and the private sector generates business opportunities with social and environmental responsibility.

Strategic Guideline 4 "Policies and Prioritization of Watershed Management Investments".

- Program "Design and Implementation of Regional Forest - Environmental Policies".

Strategic Guideline 5 "Institutional Strengthening in Environmental Issues".

- Program "Strengthening Institutional Capacities in Environmental Issues".

□ Project "Training of Technical Teams of Regional and Local Institutions, on the Issue of Natural Resources and Environment".

□ Project "Awareness of the Local Population in the Sustainable Use and Management of Natural Resources and the Environment".

□ Project "Professional Training in Formulation, Evaluation, Execution and Monitoring of Forestry Projects".

□ Project "Organization and Operation of a Regional Platform - Local Forestry".

□ Project "Implementation of a Regional Technical Team of Experts on Forestry Issues".

□ Result 5.1: Efficient, developed, integrated, stable and decentralized institutionality within the Region.

□ Result 5.2: PRRCS is articulated to the BOSQUE COLOMBIANO ORG and National Soil Conservation Programs, and is included in the national, regional and local development agendas.

□ Result 5.3: Science and technology developed and applied to the production of forest plantation goods and services and soil conservation.

□ Result 5.4: There is specialized and competent human resources in the public and private sectors.

□ Outcome 5.5: Trained beneficiary populations efficiently manage their forest and soil resources.

#### 4.5. BIG GOALS

The actions of the Plan are aimed at obtaining the following results:

##### a. River basin management

- Carry out proper administration and management of the Caquetá River basin.

##### b. Agroproductive

- Make a re-identification at the sub-basin or micro-basin level of the lands suitable for agricultural activity, fruit products, pastures, forestry and agroforestry, at 1:50 000, 1:25 000 and 1:10 000 scales.

- Adoption of conservationist agricultural, forestry and agroforestry practices in areas suitable for these activities.

- Prepare specific management plans for areas with intensive use pastures, and those with improved pastures that are in accordance with the Plan.

- Establish, manage and protect 3 000 ha. of commercial forest plantations.

- Maintain, protect and reforest - where the case warrants - protective forests and mist collectors in an area of 6,000 ha.

- Recover and protect the vegetation cover of moors.

- Establish agroforestry systems on 3,000 ha.

##### c. Soil conservation



- Design and location of erosion control works on slopes, gullies, streams and alluvial fans, to serve the areas with the most degraded soils.

- Establishment of erosion control works in rivers and sediment retention dams upstream that are potential sources of water erosion.

- Use of cultural and mechanical soil conservation practices in intensive agriculture and silvopastoral areas with afforestation and reforestation activities.

##### d. Development of human capacities and institutional strengthening

MAP OF THE PROJECT'S AREA OF INFLUENCE



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CONVENTIONS

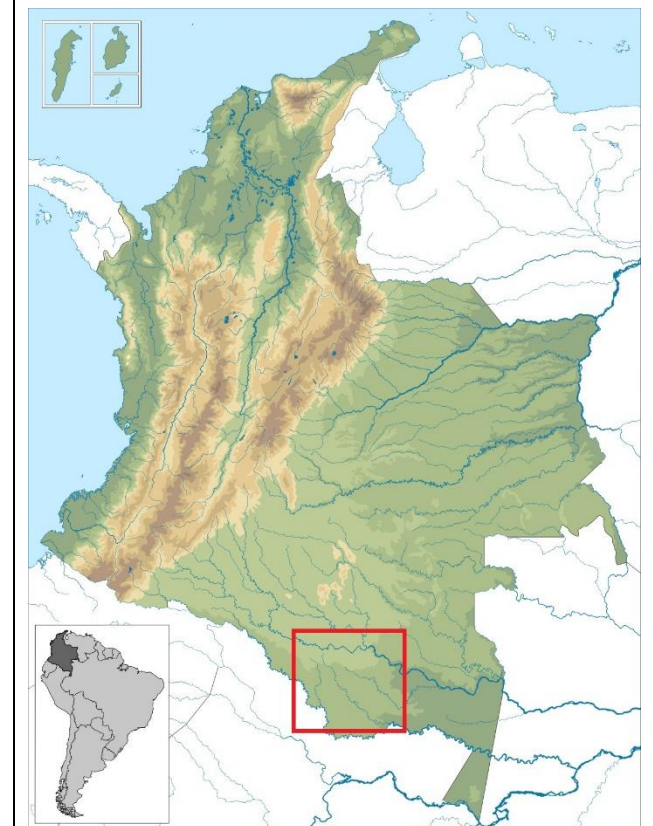
	Program area
	Kamsá indigenous cities
	Deforestation hotspots
	Frequent wildfire areas

SCALE



LOCATION

- Country:** Colombia; **Departments:** Putumayo and Amazonas, Kamsá indigenous territory.
- Geographical coordinates:**  
From 0° 14'13.6 "S and 74° 17'22.9"W to 0° 29'33.2 "S to 73° 24'27.7"W



- Establishment of programs and projects for the sensitization and training of the rural population in the matter of conservation and management of renewable natural resources.
  - Establishment of demonstration plots to carry out research studies on soil losses, control practices and productive systems on slopes with conservation works.
  - Organization and operation of the Public Administrative Unit that promotes and executes the works that support the Plan.
- Program 5: Capacity development, are related to forestry activities, soil conservation, civil works, capacity building and institutional strengthening.

Within each program, projects have been identified, the implementation and execution of which would contribute to the achievement of the Plan's results and goals. In Annex II, the files of these projects are detailed.

Plantations for commercial and industrial purposes, to the extent that technical, legal and business management conditions are ensured, must generate direct income from the use, transformation and marketing of their products, being highly profitable and competitive.

The products of the watershed protection plantations will translate into the recovery of the essential functions of the ecosystems and the agricultural productivity of the land, generating direct and indirect income for environmental services and goods to satisfy the needs of local communities, making the different activities that occur in the basin profitable

The plantation systems of the corresponding programs will be adapted to the biophysical conditions of each site, to the social and cultural aspects of land tenure and usufruct, and may vary from industrial plantations with state-of-the-art technology, through agroforestry plantations of different intensities of use of trees, up to low-use protective plantations. The species to be planted may also be timber, non-timber, or a combination of both.

The effective management of the tangible and intangible resources involved in the plan is a condition that will permanently support the activities of the other four programs. This will include, above all, the modern management of human resources at all levels, the management of information and knowledge as well as the physical and economic means at their disposal.

### 4.6. PROGRAMS

The Reforestation and Soil Conservation Plan of the Kamsá indigenous community Region Caquetá River basin considers five Programs that are aimed at developing forest plantations for timber and non-timber purposes that together enable the recovery of soils, the ecosystem and biodiversity; these are:



- Program 1: Soil conservation program.
- Program 2: Afforestation and reforestation program.
- Program 3: Watershed protection program and water suppliers for human consumption and provision of environmental services.
- Program 4: Civil works program.

In this perspective, the five programs that are proposed are of singular importance for the investor, the local communities and the Peruvian State; Consequently, they must always be assumed in the context of profitability, be it economic, social or environmental, permanently demanding efficiency and quality, that is, competitiveness, in the State, entrepreneurs and producers, so that the money invested, not only return, but truly increase the economies of the Peruvian investor and producer.



### 4.6.1. SOIL CONSERVATION PROGRAM

This program is aimed at the conservation of productive lands, the recovery of the vegetation cover, and the management of the soils to stabilize them and increase the uptake and retention of moisture in the areas that naturally performed this function in association with shrub and shrub tree species. that are currently being degraded.

"Soil recovery are those activities s that consider the application of techniques and practices of a biological, mechanical type or integral treatments of micro-watersheds at the property level, for the conservationist use of soil and water. And soil conservation is defined as the use and management of the soil resource in order to maintain and / or manage its capacity.

productive according to their aptitudes, limitations and potentialities in order to avoid their loss and / or degradation "49.

Productivity is a good indicator of the conditions of the land, since it directly reflects changes in quality and limitations of the same. The evaluation of the productivity of certain specific areas and the comparison with neighboring similar areas that are already applying adequate crop management practices allows the identification of the need to introduce specific soil improvement practices.

The main objective of sustainable agriculture is to obtain high productivity without degrading the soils. Productivity shows a positive response to all the factors that control the growth, development and production of crops. Sustained good productivity is synonymous with good soil conditions and good management practices, which at the same time maintain or improve the quality of the soil, the correct use of tillage practices and auxiliary soil management and conservation practices is which will give success to future proposals that are presented specifically for each of the cases that need to be addressed.

#### 4.6.1.1 GENERAL GUIDELINES FOR THE PROPOSAL OF THE SOIL CONSERVATION PLAN

The management of the basin must be oriented around the main objective that is conservation, for which the soil conservation practices described below must be carried out, which will reduce the process of soil erosion in the basin and, consequently, the sedimentation of the Poechos reservoir.

#### Selection of Conservation Practice

The criteria for the control of water erosion at the basin level and the efficiency of the systems to be used are given by the study of the potential erosion risk and the use of thematic maps, cartography in the terrain itself, since it is required knowledge of classification systems and practice in distinguishing the different soils, classes of slopes and class of degree of



erosion, taking into account maintaining the balance of natural processes.

### a) Forestry

Afforestation and reforestation constitute a fundamental activity in the erosion and rational use of soil and water resources, mainly in the Andean region. The fixation and use of native and adapted species will be in function of the Strategic Hierarchies indicated in the Logical Framework, with competitive and sustainable forest and agroforestry plantations.

Due to the degradation conditions in which the resources are found, and especially the forest resources, it is imperative to initiate a set of programs, aimed at halting and improving the ecological and environmental conditions of the basins of the study area.

- Carry out a reforestation program especially aimed at protecting the headwaters of the watersheds; the stabilization of gullies, slopes, banks, streams and channels; using especially native species.
- Promote the rational use of energy resources or firewood, encouraging the use of so-called "improved stoves", since these allow better use of energy and are aimed at reducing the pressure on forests due to the demand for firewood.
- Protect and silviculturally manage natural regeneration by promoting projects that enable economic and social development based on the conservation of forests and rational use of resources.
- Agroforestry will be carried out seeking to extend as much as possible the tree and shrub species existing in the region, as well as to regenerate or implant herbaceous vegetation.
- Use all legal instruments, as well as carry out coordination with the institutions committed to natural resources, in order to fulfill a more

leading role as a guarantee to stop the degradation of forests and achieve the presentation of the biodiversity of the region.

- Carry out detailed studies to evaluate the quantity and quality of the existing forest resource, as well as study the native forest species, and the fauna diversity that the region has.



### b) Agronomic Cultural

Contour furrows and strip crops, these are widely used practices. It is important to note that these practices are good to control erosion when the crop foliage protects a large part of the soil.

Pasture Management, the following actions should be taken:

- Determination of the carrying capacity of grasslands.
- Rotation of grazing areas.
- Reseeding of natural pastures and sowing of exotic pastures.
- In the higher areas, the repopulation with pastures and / or shrubs in the area.

In the case of pastures, the Rye Grass associated with clover is recommended in the area surrounding Ayabaca and the like, for

sheep. In the case of cattle (*Dactylis glomerata*), associated with alfalfa.

The legume shrubby species known by the name of Pachte would be a good alternative for the area. In the Montero area and warm areas of the lower basins, the gramalote (*Brachiaria* sp) and the elephant grass (*Pennisetum purpureum*) are alternatives that are currently used, but that could be increased extensively. Another possibility is the pangola grass (*Digitaria decumbens*). King grass is another species (it belongs to the elephant grass group) that has great potential for the area.

In the areas adjacent to the Poechos reservoir, right and left banks, the alternative for the doubling of pastures is given by the species (*Cenchrus ciliaris*) or bufel grass, which is adapted to arid conditions and poor soils; the time in which it could be established would be in the rainy season.



### Crop management

Use of polycultures, in such a way that they cover a large part of the soil and make better use of water, soil and nutrient resources.

Crop Rotation is a practice that should be used in the study area.

Permanent crops should be prioritized in the study area, as in the Montero and Jililí area due to the favorable agroclimatic conditions it has. A

crop that has a good price in the market is Lucuma, from which flour can be obtained.

Cultivation of permanent species such as zarandaja (*Cajanus cajan*), in warmer areas as a food crop, soil stabilizer and restoring natural fertility.

Given the favorable characteristics for the cultivation of coffee in these areas, technical advice must be established to conduct the cultivation efficiently, promoting the use of techniques aimed at the conservation and improvement of the soil resource.

### c) Slope stabilization

Sowing of pastures, afforestation and reforestation, for which the aforementioned forest species and pastures can be used. The use Pacae, foxtail, and / or species that are not palatable to goats, such as thorny species such as blackberry, is recommended for this conservation practice.

### d) Structural Mechanical

Slow and Absorption Formation Terraces, the construction of terraces is one of the most effective practices to combat soil erosion; however, it is the most expensive and should be applied when other soil conservation alternatives, such as contour furrowing and strip crops or other cultural agronomic practice cannot be carried out, because its construction and maintenance cost is high.

Control of gullies and channels, these practices should be carried out in the upper and middle part of the basin, with staggered containment dikes; which can be built of cyclopean concrete for the channels. In the control and stabilization of gullies it is convenient to use live fences with species such as blackberry and agaves.

Terraces are the most efficient means to correct small gullies that are not so deep

The terraces that constitute the top of a gully too deep to be crossed by common terraces, divert the water from the head, being able to give the additional treatment that was necessary.

Canal terraces, ridges of steps or benches should be used, depending on the circumstances.

To effectively stop the advance of the gullies, it is necessary that the permanent corrective works are built close enough to their source so that the slope from the upper edge of the spillway to the lower edge of the gully does not exceed the slope of sedimentation that is to be expected for the particular type of soil and vegetation cover.

Infiltration ditches, this practice is recommended in afforestation and reforestation areas, rather than in areas of pasture and crops, generally these works are associated with the control of gullies.



### 4.6.1.2 OBJECTIVE

Reforestation in order to increase the uptake of the water resource in foggy areas and springs of the slopes in the middle and upper parts of the basin, mainly fulfilling a role of stabilization and soil conservation.

### 4.6.1.3. STRATEGY

This program will be developed through massif plantations, prioritizing native species, for the purpose of conservation, stabilization of soils and increase the uptake of water in the middle and upper areas of the basins.

Taking into account that it is a Regional Plan, the soil conservation program conceived here is of a guiding nature, without defining the physical limits of the area where it will be carried out; In this way, all those productive land conservation practices and activities leading to the rehabilitation of degraded soils are defined.

Within the productive land conservation practices, criteria for the design, construction and general use of the following practices must be taken into account.

- a) Cultural practices: windbreaks, agricultural cover, crop rotation, green manures, contour planting, live barriers, block crops.
- b) Agronomic practices: use of improved seeds, use of organic fertilizers and biocontrollers.
- c) Mechanical practices: slope ditches (absorption), water diversion ditches, bank and individual terraces.

Other techniques are also available, such as Blind Tubs, Trench Ditches, Surface Runoff Management, Contour Furrowing, Windbreak Curtains, Derivative Ditches, Control of gullies and silt control dams, Terraces<sup>50</sup>.

On the subject of soil degradation<sup>51</sup>, on the one hand there is the physical degradation of the soil, that is, its structure, but there is also chemical degradation, mainly affected by salinization, loss of organic matter and absence or loss of nutrients. Another type of soil degradation is the loss of it, the decrease in weight and volume due to erosive processes, both water and wind.

#### 4.6.1.4. CRITERIA FOR IDENTIFICATION AND FORMULATION OF PROJECTS

Within this program, the need to formulate and implement projects that promote:

- The use of soils according to their capacity for greater use.
- The adoption of agronomic practices to reduce soil erosion and degradation.
- The recovery of degraded areas with very poor soils to replace the shrub and tree component in the ecosystem and areas in a frank process of erosion, contributing to the environmental, economic and social benefit of the intervention area.
- The construction of individual forest terraces and containment dikes to control gullies.
- The recovery of the vegetation cover and its ecological functions, stabilization of slopes in rural roads of the region and riparian defenses in river beds.

#### 4.6.2. FORESTATION AND REFORESTATION PROGRAM

According to the secondary information available, there are 50,000 hectares for reforestation in the region; of which about 3 000 has. 3 000 ha will be used for commercial plantations. for agroforestry plantations and 6,000 ha. for mist catchment forests and protection that includes the natural cover of the Andean moorlands and scrublands.

##### 4.6.2.1. OBJECTIVE

Reforestation for production and protection purposes with a tendency to increase production and productivity, the conservation of soil, water and biotic resources and the provision of other environmental services.

##### 4.6.2.2. STRATEGY

The forestry program will be developed through plantations for production and protection purposes associated with pastures and crops. These plantations would be carried out, within a limited space, according to the distribution of the land and through two plantation systems: in compact masses and in lines.



The areas suitable for plantations in compact masses are located in the plots of size greater than 5 hectares. Line plantations are designed, in the case of small farms whose size is less than 5 hectares, for the purposes of protection and diverse production, which are the sizes of plots that most predominate in the area.

In order to achieve the proposed goals, and in accordance with the National Reforestation Plan, the following activities must be developed:

- Establish a Technological Innovation Program Various technological packages will be formulated with advanced technologies for each of the processes of the production chain leading to the achievement of maximum efficiency in the use of natural, human and financial resources, so that the goods and services produced reach a high level of competitiveness.

This program will be coordinated with investors, industrialists and producers, and a strategy for

updating and permanent incorporation of new technologies will be established.

### - Development of Forest Associativity Models<sup>53</sup>

The association of small land-owning producers with investors or industrialists is a mutually beneficial business, through which the establishment and commercial management of a plantation and the supply of wood to forest companies are guaranteed, the benefits of which are shared. by both contracting parties.

The commitments acquired in the contracts signed between the company and the producer may include the following commitments:

- Payment of an annual usufruct right to the owner of the land



- The entrepreneur or investor assumes all the costs of planting and management and owns a greater percentage of the forest area.

- Percentage share of producers in the final harvest

- Replanting the land at the end of the final harvest.

- The small producer continues to own the land

### - Creation of the investment fund in forest plantations<sup>54</sup>

A proposal must be designed together with the investors to create the Forest Plantations Investment Fund, which must be framed in the commitments of the internal agendas and which

will have the participation of various actors. It is an innovative investment and financing model in a portfolio of profitable and competitive projects, based on having a company specialized in the administration of the Fund and operating companies that require investment partners to grow and consolidate the size of the business. , that makes it competitive at the international level.

### - Design and implementation of a Voluntary Forest Certification System

Given the ecological, economic and social particularity of the areas to be reforested in the region, criteria for voluntary forest certification should be developed based on international standards that allow the incorporation of measures that guarantee the achievement of their sustainability and competitiveness.

### - Conglomerates of Industrial Plantations<sup>55</sup>

Planning jointly with the regions, investors and the population involved, for the establishment of industrial plantations in conglomerates integrated into forestry development poles. The identification and formation of these clusters will be due to efficiency reasons in terms of costs and economic benefits, to rule out scattered plantations in inaccessible places or very distant from the transformation centers. If the profitability projections so advise, the respective infrastructure development forecasts may be made.

### - Application of the incentive policy and financial mechanisms<sup>56</sup>.

The program will administer the granting of incentives to private investors who wish to avail themselves of said benefits in the establishment of industrial forest plantations. For this purpose, it will establish expeditious technical and administrative procedures, with a view to ensuring maximum efficiency, in accordance with the regulations governing its granting; also

proposing the measures that it considers pertinent for its improvement, monitoring and control.

It is expected that this policy of incentives and financial mechanisms is working or in the process of being implemented in the shortest possible time, since it is one of the assumptions that will allow the promotion of forest plantations.

- Potential forest species<sup>57</sup>.

Through the analysis of environmental variables, such as ecology, life zones, climate and altitude, as well as other variables related to the forest species themselves, the most promising native forest species for production, protection and agroforestry plantations will be identified prioritizing. .

### 4.6.2.3. CRITERIA FOR IDENTIFICATION AND FORMULATION OF PROJECTS

- Oriented to timber forest production, either in massifs or small groves of family production.
- That they promote agroforestry systems to protect the areas of crops and plantations associated with pastures.
- Oriented to the use of non-timber forest products.
- That it contemplates the reforestation of areas with degraded soils to replace the shrub and tree component in the ecosystem and areas in a frank process of erosion.
- Prioritize areas with high vulnerability within each basin, in order to conserve and manage natural resources with an eco-systemic approach.
- That their purpose is to recover the vegetation cover of the headwaters of the basins, and that they contemplate activities aimed at the recovery, management and improvement of native pastures, incorporating the most

recommended shrub or tree component according to the environmental offer.

- In cases where circumstances make it advisable, projects should be developed that contemplate combined actions of reforestation and management of natural regeneration to ensure the persistence of the vegetation cover, especially in areas threatened by the advance of desertification, such as the ecosystems of dry forests, coordinating and coordinating efforts with the entities responsible for the management of natural forests.

### 4.6.3. PROGRAM FOR THE PROTECTION OF BASINS SUPPLYING WATER FOR HUMAN CONSUMPTION

The migration of peasants and their families increases the urban population in the main cities and populated centers of the basin and pressure for the development and expansion of the infrastructure of the water and sewage network, which brings about the scarcity of water for consumption human.

#### 4.6.3.1. OBJECTIVE



The main objective of the Program to counteract this problem is to protect and safeguard the quantity and quality of water for human consumption, avoiding its contamination at sources due to inappropriate activities and the proximity or entry of solid or liquid waste.

Consequently, the administration of the catchment areas must obey an inventory and distribution of this resource according to the needs of the most important centers at the level of the main sub-basins. Once the catchment areas or basins have been identified, it will be necessary to carry out detailed studies on their current state and the need to initiate actions aimed at achieving their control and conservation.



### 4.6.3.2. STRATEGY

Identification and selection of priority micro-watersheds that should be addressed through detailed programs and / or specific projects that solve the most critical problems of water scarcity and, where necessary, the conservation and / or protection of existing forests and those that are established. in the future.

### 4.6.3.3. CRITERIA FOR IDENTIFICATION AND FORMULATION OF PROJECTS

- That they promote the establishment of forest plantations whose foliage provides a high interception surface for raindrops for condensation in foggy areas.
- That they promote the performance of soil conservation and optimization practices in the capture of water (construction of infiltration ditches and diversion channels), aimed at reducing or counteracting surface water runoff and that rather favor or facilitate its infiltration .

- That they promote payment for environmental services.

### 4.6.4. CIVIL WORKS PROGRAM

Civil works are a complement to reforestation activities and cultural practices of the soil for its conservation, their application is not in current use, since they are very expensive activities and use must be adequately planned, depending on the magnitude of the loss of soil, they are more appropriate to solve the problems of torrentiality, gully control, landslides and landslides are sediment retention and consolidation dikes, infiltration ditches and diversion channels and longitudinal walls that will complement the successful use of tillage practices and auxiliary soil management and conservation practices.

#### 4.6.4.1. OBJECTIVE

Erosion control and sediment retention in areas of high torrentiality, gullies, landslides and landslides that constitute high-risk areas, through civil works that are complemented with soil conservation and reforestation practices.

#### 4.6.4.2. STRATEGY

Due to the high costs involved in developing civil works, the actions taken into account will have to be selective and must be the result of prioritizing affected and high-risk areas.

### 4.6.4.3. CRITERIA FOR IDENTIFICATION AND FORMULATION OF PROJECTS

- That they promote the execution of civil works to protect the road, irrigation and sanitation infrastructure, to reduce landslides through the recovery of gullies and stabilization of slopes.
- Oriented to the protection of riverbanks and areas adjacent to them, through retaining walls, trestles, gabions, etc.
- That they promote the recovery of saline soils, through civil works (irrigation or drainage) or by

planting and cultivating species resistant to the high salt content of these soils.

- That they contemplate the construction of infiltration ditches and diversion channels, establishing vegetation cover at the edges, to counteract surface water runoff and facilitate their infiltration into the ground.

### 4.6.5. CAPACITY DEVELOPMENT PROGRAM



As a result of the workshops carried out, it has been necessary to prioritize the development of human capacities that are oriented to the training of the beneficiary population and of the technical personnel of the public and private sector that work in the field, which should be complemented with educational or training activities. training in schools in the region, which will also contribute to institutional strengthening.

Once the plan is disseminated and known, the activities that are being developed should be promoted, in such a way that the beneficiaries can publicize their progress related to forest plantations. In this sense, it will be necessary to have national and international business rounds, which will take place after the formation of companies and production chains.

Reforestation as a development option must have a broad and aggressive diffusion that guarantees its position in society, especially in the political scenario in which major decisions

are made, in the perspective of a national agreement. The fundamental basis of the dissemination system should be a detailed analysis of the economic advantages of tree cultivation for the country and the regions, without demagoguery, taking as an example the experiences of neighboring countries. Likewise, special attention will be given to strengthening the capacities of local actors based on continuous education, training and information programs; It will seek to raise the technological and management level, mainly of peasant and indigenous communities, union organizations, local communities, interest groups, etc., in order to achieve plantations with international standards. These should follow a plan developed by the different programs, depending on the target audience.

Technical assistance and training will be permanent, involving the entire production chain, being important to have highly trained and qualified professionals who know how to reach the target audience and who accompany them throughout the process, putting into practice in the field what they have learned in training and making early warning of any possible problem.

On the other hand, having the appropriate scientific and technological information available at the necessary time with appropriate means and methods of dissemination will increase the competitive advantage of the plantations.

Another important aspect to address in this subject is the specialization of students interested in the subject of soil conservation and reforestation, through strategic alliances between technical and higher education centers and private companies that use these services. In this sense, not only private companies benefit, but also the student's business training



is affected, so that they are able to form their own company and be generators of employment.

The national market is increasingly demanding quality products and the international market accuses even greater demands. To be inserted in both markets, competitiveness will be the starting point and the one that accompanies the producer throughout the process. Likewise, voluntary forest certification, under the plantation standards that must be established for Peru, will make the product more competitive in the market, so the issue of certification takes a lot of force within the issue of competitiveness<sup>61</sup>.

### 4.6.5.1 OBJECTIVE

Development and transfer of appropriate technologies for soil conservation and obtaining forest plantations of high productive and competitive value in the national and international market.



### 4.6.5.2 STRATEGY

To improve the effectiveness and efficiency of public and private efforts towards competitiveness, like the BOSQUE COLOMBIANO ORG, the Regional Plan can be implemented through an institution with broad autonomy and management capacity. This institutional framework that will lead the Plan will have a corporate profile where the most

important actors of the Region and basins where the State shares with civil society the exercise of its authority. Institutional strengthening must allow or result in the operationalization and implementation of complementary actions necessary to achieve the objectives set, as well as the creation or refloating of key institutions and mechanisms, such as the implementation of:

#### - Land registry and forest plantations

The plan is framed within the concept of territorial ordering, where forestry investments are placed in economic axes and forest production units linked to the market. To this end, the cadastre of forest lands and plantations, of industrial aptitude or protection, or by type of property, must maintain an updated record of each unit of forest land. The organization and implementation of this system will be carried out in close coordination with COFOPRI and the Public Registries.

#### - Centers for Research and Development of Forest Plantations (CIDEFOR)

It is convenient to generate a CIDEFOR, as part of the institutional framework of the BOSQUE COLOMBIANO ORG and the Regional Plan that has a forest seed bank, forest nurseries, training center and technical assistance, as well as investment promotion at the service of producers, including the development of forest technology packages, adapted to the agroecological conditions of the region, and which respond to the demand of the industry and the market.

It will make it possible to convert the ecological and cultural characteristics of the country and the region into competitive advantages, since greater knowledge of forest ecosystems, ancestral knowledge, better silvicultural management of species, among other aspects, will result in diversification, quality, increases in productivity, possibilities of using and improving

the forest resource; in short, it gains in competitiveness.

In economic terms, those who decide to undertake the development of plantations would not have to assume additional and unnecessary risks due to lack of information, deficiency of vegetative material of high genetic value or uncertainty in the expected yields; In addition, it will mean security and reliability when investing in reforestation processes, entering an economically and environmentally profitable business that additionally generates employment. Research plans should consider, among others, the following topics:



It should be coordinated with universities and research centers, in order to avoid duplication of work, take advantage of possible synergies and influence priority lines of research. In addition, it will contribute to the sharing of information, technical knowledge or resources, reducing costs, minimizing duplication of efforts, increasing efficiency and promoting national self-sufficiency, in terms of research or management capacity.

The creation of networks and the bilateral and multiple association, offer the means to accelerate the transfer of technology, favor the training of personnel and provide research material and guidelines that are difficult to obtain to all possible beneficiaries. This makes the results of the investigations more

comprehensive and interesting than the sum of the individual activities of the components of the network.

### - Regional Forest Seed Bank (BRSF)

Although the refloating of the National Forest Seed Bank (BNSF) is imperative, it is necessary to carry out regional reforestation plans to have a Regional Forest Seed Bank. Forest seed production is complex, so it requires continuous research in terms of the physiology of the reproductive states of the tree, which differ according to species and ecological sites. Consequently, research should be done on the topics of: reproductive states of forest species in different ecosystems, fruit processing, seed physiology, multiplication of reproductive material, seed sources, as well as provenance and progeny tests. The country and the region must have forest seed orchards.

If the National Plan for Research and Transfer of Forest Technology is implemented, as part of the institutional framework that the BOSQUE COLOMBIANO ORG will be in charge of, synergies should be established with it.

### - National Forest Fire Prevention and Control System

The institution responsible for the BOSQUE COLOMBIANO ORG and the Regional Plans will organize and lead a National Forest Fire Prevention and Control System, with the direct participation of regional and local authorities, as well as the general population, using methodologies and techniques that favor the creation of a culture of caring for forests, and of mitigating the negative impacts caused by forest fires.

In this sense, it is necessary to raise regional awareness of the need to be part of the National System, since after the occurrence of the El Niño phenomenon, abundant combustible material is generated that is also constituted in

the pasture for the livestock of the years after the occurrence of the “El Niño” phenomenon, and the fires have a double negative effect on these resources, on the one hand they are lost as fodder biomass and on the other hand, there is the negative effect of the forest fire itself.

### **4.6.5.3. CRITERIA FOR IDENTIFICATION AND FORMULATION OF PROJECTS**

The development of capacities will be mainly oriented to aspects related to forestry and soil activities, without neglecting the environment in which they are developed, such as conservation and non-pollution of the environment, reduction of CO2 emissions, capture of water resources and sustainable use. of water, in addition to addressing issues related to efficient business management of the resources of the basin. In this program the projects must be oriented to:

- Sensitize and train the rural population, highlighting family participation with equity and a gender focus.
- Develop training and updating programs for professionals to strengthen the institutions that operate in the different areas of the basins.
- Encourage the holding of workshops and participatory meetings to discuss institutional plans and programs for the conservation of forest and soil resources.
- Promote the implementation of the Land Registry and Forest Plantations, the Center for Research and Development of Forest Plantations (CIDEFOR), the Regional and National Bank of Forest Seeds (BRSF and BNSF) and the creation of the National Fire Prevention and Control System Forestry.

### **4.7. ORGANIZATION FOR THE EXECUTION OF THE PLAN**

The execution of the Plan is framed in the National Reforestation Plan, which

contemplates the creation of Watershed Management Committees, which must be representative of all the organizations in these areas, so that they actively and responsibly participate in decision-making in the programs proposed for this area. In this sense, the Plan contemplates the creation of 01 Regional Committee for the management of the three basins and 01 Management Committee in each of the 03 basins, these Committees in conjunction with the organized population and institutions present in the area, They will carry out the diagnosis and planning of the activities that will be developed in the basins, considering their limitations and potential, especially those related to forest resources.

### **4.8. INSTITUTIONAL STRATEGY FOR THE EXECUTION OF THE PLAN**

Permanent coordination between the public institutions that have the mandate to watch over natural resources and those that have direct responsibility for implementing the regional reforestation and soil conservation plans is the key to efficient management of the Plan.

The activities of the BOSQUE COLOMBIANO ORG and the Regional Plan will be carried out in a strategic context to achieve competitiveness. To this end, permanent studies and evaluations will be developed aimed at learning about world trends in the forest products market, sources of financing, the development of markets for environmental services, technological innovations, competitors, investment and financing policies, and other factors. that influence the efficiency of the production of goods and services, from forest plantations. The incorporation of the forestry issue in the agenda of the regional government, organizations and political parties will also be addressed, with a view to cultivating a regional and national forestry agreement that will help ensure the continuity of the plan in the long term<sup>66</sup>.

On the other hand, the need to regulate the legal instruments issued by the State through the competent government bodies is highlighted, to encourage and promote forest plantations, as well as to incorporate substantive changes in the Forestry Law and other regulations related to the promotion investment, tending to improve its effectiveness, in light of the results obtained during its application, constituting this in a requirement for the efficient management of the Plan.

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