

**Ministry of Agriculture and Livestock**

**Climate Smart Agriculture (Draft version V01)**

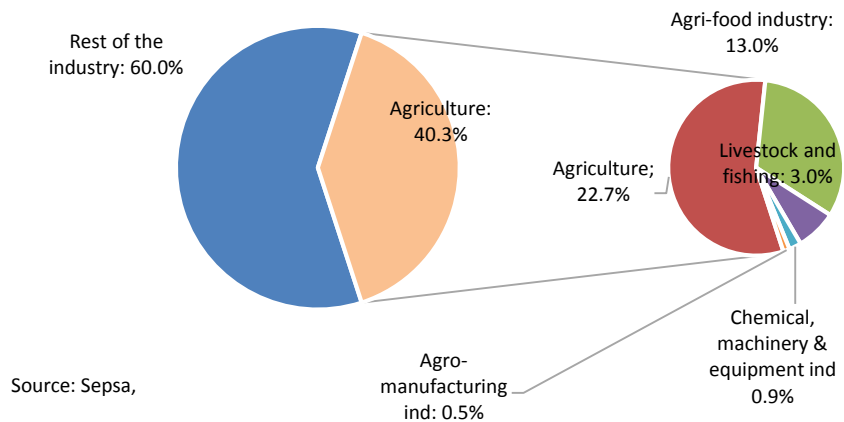
**1. Overview: Agriculture and Climate in the Context of the National Economy**

The Costa Rican agriculture and livestock sector plays an important role in the country's development. According to the 2014 agricultural census, the area used by the 93 thousand existing farms covers approximately 2.4 million hectares, representing close to 47% of the national territory.

According to the 2012-2015 Continuous Employment Survey (CES), the annual average Economically Active Population (EAP) was 2,062,517 nationwide, with a mean rate of change of 0.2%. The agricultural sector employs on average 10.9% of the national EAP and ranks second as a source of employment. Agricultural activities in 2012 employed 239,799 people (INEC 2014) and contributed 8.0% to the GDP in 2015.

Agricultural exports accounted for 40.3% of the country's exported goods in the 2012-2015 period. By subsector, agriculture contributed 22.7% to the country's total exports; the agribusiness industry added 13.0%, and the livestock and fishing sectors accounted for 3.0%. Thus, the agricultural sector is the most important in terms of the export mix.

Costa Rica. Exports per sector, 2012-2015



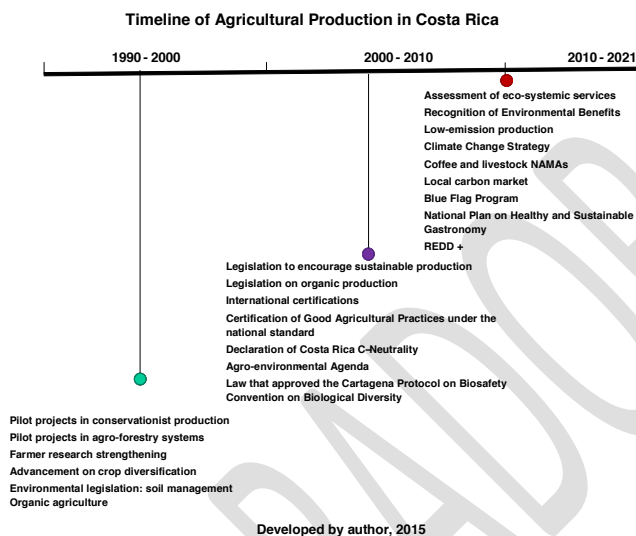
Source: Sepsa,

In the current climate change context, the national agricultural sector is being affected by a water deficit in a large portion of the country's Pacific and Northern basins, an excess of rainfall in the Caribbean basin, and temperature increases and irregular rains in other areas.

According to a survey of producers who participated in the workshops held in November 2015 in Guanacaste and San Jose, climate change effects on agricultural production are noticeable, particularly with respect to changes in planting areas and seasons, species migration, plant and animal stress conditions, an increase of pest attacks and diseases, an increase in production costs, lower crop yields, difficulty to plan farm activities, slippage in flowering and fruiting, suspension of productive projects, higher livestock mortality, a decrease in the availability of water resources, rural to urban migration, higher forage consumption, loss of crops, new plagues, loss of soil due to hydric erosion, production cost increasing, food insecurity, a cultural distancing from agriculture, low-crop quality, and more damages to transportation infrastructure, such as roads.

## 2. Enabling Environment for CSA

For more than two decades, the Costa Rican agricultural sector has been implementing initiatives aimed at aligning conservation and production objectives. At the beginning of the 1990s, projects based on technical principles were established to boost production system productivity, spread vegetation cover, protect the soil, and improve soil conditions to foster the water and carbon cycles. Within the framework of projects intended to advance agro-forestry systems, promote soil and water management and conservation, and build the capacity of small and medium producers, institutions such as the Ministry of Environment and Energy, the Ministry of Agriculture and Livestock, and the Institute for Agricultural Development (currently, Institute for Rural Development) reported positive results with respect to productivity, agro-ecologically based production systems, food and nutritional security, vegetation cover expansion, degraded land recovery, and others. These experiences laid the ground to pass laws and regulations for the sustainable management of the country's natural resources.



In the first decade of the 21st century, Costa Rica experienced an important change through innovative proposals such as the Agro-Environmental Agenda under the responsibility of the Ministry of Agriculture, the Ministry of the Environment, and the Tropical Agricultural Research and Higher Education Center (CATIE), which generated the enabling conditions that

prompted the development of productive initiatives for production and conservation principles.

An important milestone in the field of climate-smart agriculture is the Development Program on Sustainable Agricultural Production, which has the goal of increasing the income and improving the quality of life of the families of small and medium producers by fostering agricultural production system competitiveness in an environmentally and socially sustainable manner. This Program established the recognition of environmental benefits for environmentally positive investments as an incentive to promote technological changes to reduce negative externalities, improve productive process efficiencies, and strengthen their adaptation to the climate change. So far, important economic, environmental, and social results have been achieved mainly in sectors such as coffee, livestock, and vegetables.

During this decade, efforts both in the public and private sectors have been geared toward the development of low emissions and resiliency to the climate change. The proposals incorporate prior experiences and results and add a new element – carbon balance – in production systems. The agricultural sector will face big challenges under conditions where information and knowledge of variables such as the climate will determine its short-, medium-, and long-term success and stability.

Coordination among public sector institutions and between this sector and the private sector has been fundamental to the progress achieved, in particular the success of low emissions and green and inclusive developments.

### 3. Investment Climate

The private sector continuously invests resources to be more productive and competitive. Sometimes, within its legal duty framework, new investments must be made to reduce externalities in the agricultural production process. Often, new investments are required to better the efficiency, productivity and competitiveness of agri-food systems. Within the framework of the national goal to become a carbon neutral country, a considerable number of enterprises are executing interesting initiatives in the field of CSA. Some of them are partially supported by the government either through technical assistance or funding.

Common private investments in CSA include:

- Equipment and technological systems to improve efficiency in water and energy use in post harvesting processes (coffee, rice, oil palm, sugarcane, livestock)
- Machinery, equipment and soil management to improve productivity in farming/livestock systems (rice, sugarcane, banana, pineapple, livestock)
- Technology to reduce GHG emissions (poultry, livestock, coffee,)
- Water source protection (livestock, coffee, banana, rice)
- Protecting ecosystem services (livestock, coffee, rice, sugarcane, pineapple, vegetables)
- Adopting practices for adaptation and resilience (vegetables, livestock, sugarcane, coffee)
- Increasing productivity (coffee, livestock, rice, vegetables)
- Bolstering research and extension (banana, sugarcane, oil palm, coffee, dairy)

Common public investments in CSA include:

- Expanding research and extension (annual crops, vegetables, cattle, coffee, organic agriculture, pineapple, fruits)
- Improving efficiency in post harvesting processes (coffee, livestock, vegetables)
- Reducing GHG emissions (poultry, livestock, coffee,)
- Improving efficiency in farming/livestock systems (rice, vegetables, annual crops, livestock)
- Protecting water sources and soil (all agricultural and livestock activities)
- Protecting ecosystem services (all agricultural and livestock activities)
- Adopting practices for adaptation and resilience (all agricultural and livestock activities)
- productivity (all agricultural and livestock activities)

Annually, the Costa Rican Government provides about 0.8 US\$, to help small farmers organization efforts in the areas mentioned above. In the case of the Ministry of Agriculture and Livestock, there are two important programs to support small and medium farmer organizations to put in practice investments in the fields of productivity, competitiveness, sustainability, energy and water efficiency, GHG mitigation, adaptation, resilience and food security: i- the program for Environmental Services Recognition, and ii- the Program for Investment and Technological Development and Competitiveness of Small and Medium Agricultural Producers.

### 4. CSA Technologies, Practices, and Services

These are some of the most relevant actions related to: productivity, competitiveness, mitigation, adaptation, resilience and nutritional and food security.

4.1 Development Program on Sustainable Agricultural Production. This Program is executed nationwide through the National Extension Program. It is aimed at fostering good agricultural

practices to reduce negative externalities in the production process and improving the sustainability of farm systems and agricultural enterprise competitiveness.

- 4.2 National Program on Organic Agriculture. This Program focuses on fostering organic production at the national level. It is based on applied research, farmer training, and tax and non-tax incentives.
- 4.3 Ecological Blue Flag Program. It is a voluntary standard promoted through the National Extension Program throughout the country. It is based on better practices on water and soil management, agrochemical input use, residue management, adaptation and mitigation practices, animal welfare, and social responsibility. It is focused on competitiveness and sustainability.
- 4.4 National Plan on Sustainable and Healthy Gastronomy. This Plan promotes enabling conditions for organic and sustainable family farming through several initiatives to contribute to the national goals of competitiveness and low carbon emissions. The Plan is a public-private initiative that simultaneously combines the strengthening of gastronomy as a value in the national tourism proposal with the objectives of sustainable food production, biodiversity conservation, and environmental protection. Its main objectives are: (i) support the conservation of wild and cultivated biodiversity species relevant to Costa Rican food habits and their sustainable use for the benefit of the sovereignty and food and nutrition security; (ii) foster productive practices based on sustainable farming techniques that contribute to the maintenance of agro-ecological cycles; (iii) strengthen the development of the domestic market for products with social and environmental added value; (iv) promote family-based agriculture participation in the value chain in agri-food systems; and (v) stimulate better practices in agri-food consumption systems.
- 4.5 Low Carbon Livestock Program. National initiative aligned with Costa Rica's goal of becoming a carbon-neutral country by 2021. Costa Rica has bet on a national strategy for low-carbon livestock, so that in the medium term (10-15 years) the country can impact the least 70% of the national herd in 60% of the territory, thus managing to capture about 4 million tons of CO<sub>2</sub> and mitigate 6 million tons of CO<sub>2</sub>e. This will result in a livestock sector which through good practices will be able to improve its competitiveness and production efficiency and stability, and develop a system that is environmentally sustainable.
- 4.6 Adaptation Fund Program. Public-private initiative sponsored by Fundecooperación para el Desarrollo Sostenible and the Ministry of Agriculture and Livestock to foster programs and projects in agri-food system adaptation.
- 4.7 Nationally Appropriate Mitigation Action Programs. Regarding mitigation actions to reduce the CO<sub>2</sub> emissions in the agricultural sector as well as to improve its efficiency, Costa Rica has advanced three NAMAs: coffee, livestock and Waste Agricultural Biomass for Energy (WAB2E). Coffee NAMA is the most advanced; livestock is second; and WAB2E is in a very early phase.
- 4.8 Watershed Management Projects. Framed on law on use, management and soil conservation of 1997, Costa Rica established the legal basis for watershed management initiatives which focus on ecological and economic objectives in the use of the natural resources with a short-, medium-, and long-term perspective.
- 4.9 Research and Technical Assistance Program on Banana. It is a public-private initiative which focuses on productivity, competitiveness, and sustainability in the banana production sector. The BANACLIMA Program is an agile and efficient weather forecasting and warning tool of extreme weather events. Its data allows for a better understanding and assessment of the impact of climate on banana cultivation by constantly monitoring weather conditions in the country's major banana production areas. Its main objective is to make detailed information available to banana

producers in real time to optimize plantation management, reduce costs, and increase production, thus bringing great benefits to the industry. By checking the information in real time, banana growers and agronomists in charge of farm management can optimize the use of inputs (such as fertilizers, nematicides, fungicides, and other products), obtaining greater economic and environmental benefits.

4.10 Sugarcane Research and Extension Program. This is a public-private initiative that focuses on productivity and sustainability in the sugarcane production sector and food security at the country level.

4.11 Coffee Research and Extension Program. It is a public-private initiative that focuses on productivity and sustainability in the coffee production sector, as well as on the competitiveness of Costa Rican high-quality coffee.

4.12 Rice Research and Extension Program. It is a public-private initiative that focuses on productivity and competitiveness in the rice production sector and food security at the country level.

## 5. Extension Services

Public agricultural extension services operate in Costa Rica under the responsibility of the Ministry of Agriculture and Livestock through nine regional offices and 90 local offices, called Extension Agencies, located throughout the country. A total of 230 employees serve about 13,500 micro, small, and medium producers in several agricultural subsectors. This Program coordinates its actions with associations of producers and public institutions and other governmental entities of the agricultural sector.

Of the several extension and technical assistance programs working in the country, some specialize in certain crops or sectors, such as banana, sugarcane, coffee, dairy, and rice, while others are associated to research programs or are supported by the research done by the Ministry of Agriculture and Livestock through the National Institute of Technological Agricultural Innovation and Transfer.

Sector	Extension Services
Banana	The Board of Directors of Corporación Bananera Nacional, a public non-state entity created by law, has three members representing its stakeholders: the Government, the national banking system, and the producers. It promotes research and technological transfer programs to foster productivity and competitiveness in the national banana sector. <a href="http://www.corbana.co.cr">www.corbana.co.cr</a>
Sugarcane	The Board of Directors of Liga Agrícola Industrial de la Caña de Azúcar, a public non-state entity created by law, has three members that represent the sector: the Government, the industrialists, and the producers. It promotes research and extension programs to foster productivity and competitiveness of the national sugarcane production. <a href="http://www.laica.co.cr">www.laica.co.cr</a>
Coffee	The Instituto del Café de Costa Rica is the public non-state entity that regulates Costa Rican coffee cultivation. It promotes research and technology transfer programs for the production, industrialization, and merchandising of coffee. <a href="http://www.icafe.cr">www.icafe.cr</a>
Dairy	Cooperativa Dos Pinos develops technical assistance programs to aid producers improve the production and quality of dairy products and enhance environmental management and protection. <a href="http://www.dospinos.com">www.dospinos.com</a>
Rice	Corporación Arrocería Nacional is a public non-state entity created by law that organizes technical and scientific analysis and discussion forums on national rice activities and that conducts research, technical assistance, and technical, economic, social, and organizational studies aimed at increasing the production, productivity, and efficiency of rice industrialization processes. <a href="http://www.conarroz.com">www.conarroz.com</a>

## 6. Metrics and Methodologies for Measuring Success

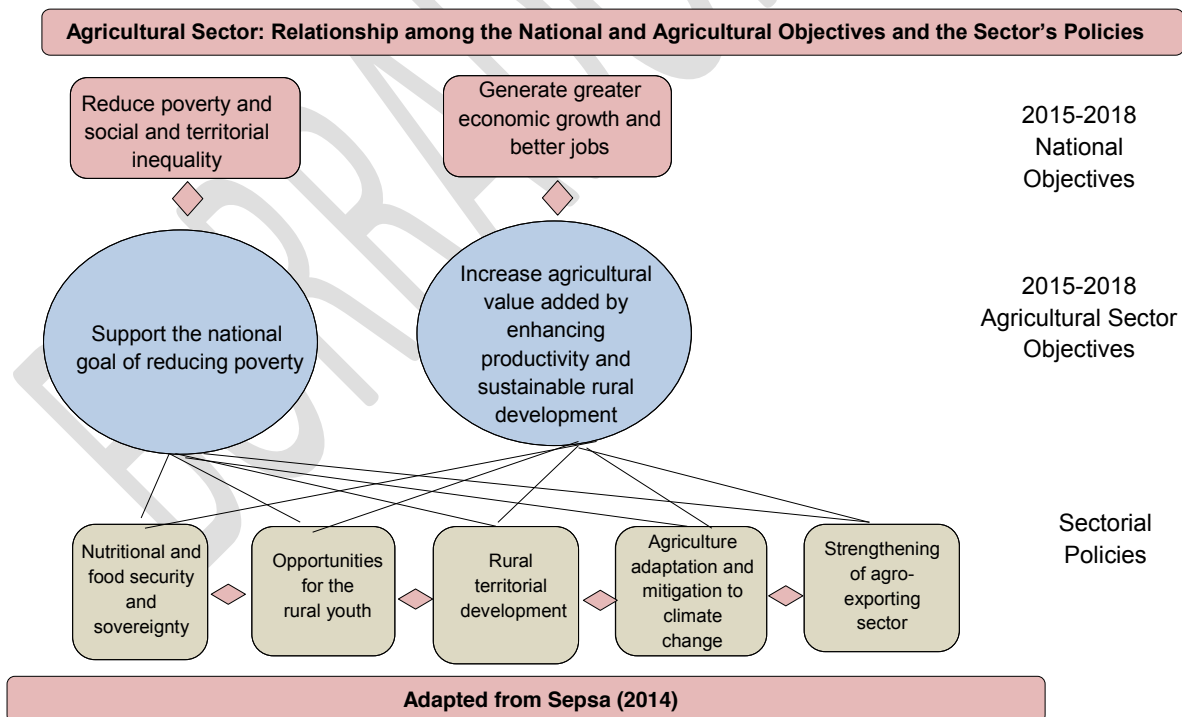
To be able to assess the results of the programs promoted by agricultural institutions, it is necessary to define simple, practical indicators whose data-gathering methodology and calculation should be accessible and cost effective.

Several studies and sustainable agricultural development projects have invested in measuring economic and biological indicators; however, this is not a common or widespread practice as climate-smart agriculture metrics require. This is one of the aspects requiring strengthening in the country to be able to turn it into a common practice that allows learning about the impact of public policies on sustainable development.

Within the framework of the NAMAs being developed in the country in the coffee and livestock sectors, biological and economic indicators have been defined and efforts are under way to validate methodologies that would allow measuring the results of the nationally appropriate mitigation measures that each of the NAMAs includes. These initiatives will be important benchmarks for future developments in other agricultural sectors.

## 7. Planning and Priority-setting for Strengthening Climate-smart Food Production Systems

According to the 2015-2018 Policy for the Agricultural Sector and Development of Rural Territories, the main challenge for national agriculture is to significantly increase yields with higher value-added and more favorable commercialization margins in most of the agri-food chains by improving the efficiency of natural resource consumption. Figure 3 shows the relationships among the country's objectives set out in the National Development Plan, the agricultural sector objectives included in the agricultural policy, and the policies of the Ministry of Agriculture and Livestock.



In this context, climate-smart agriculture is part of the strategic actions for the policies on agriculture adaptation and mitigation to climate change and food and nutritional security and sovereignty. The incorporation of the climate variable to the management of institutional services is a fundamental part of the response required for the Costa Rican agricultural sector to become more resilient, to continue being competitive and sustainable, and to strengthen its participation in the national economy.

## **8. Examples of Ongoing CSA Actions by Civil Society Organizations and the Private Sector**

Several climate-smart agriculture experiences led by agricultural producer organizations and public-private initiatives that promote the implementation of good practices in agro-environmental management to achieve the sustainability of eco-systemic production service competitiveness are being developed in the country. The technological paths used vary by experience; however, all of them are characterized by the fact that their development approach combines economic, environmental, and social objectives.

As reference, four experiences developed by organizations are described below; they are just a small sample of the cases being promoted in the country.

### **8.1 Development of Integral and Sustainable Productive Units**

The canton of Hojancha located in the southern part of the Nicoya Peninsula is a national referent in terms of sustainable development dating from the 1970s. At that time, the canton's critical social, environmental, and economic conditions prompted public and private entities to join efforts to implement programs aimed at restoring the landscape and diversifying technology-based production that would allow the convergence of natural resource conservation objectives and agricultural sustainable production.

The Centro Agrícola Cantonal de Hojancha is an organization that promotes sustainable development through agricultural diversification projects, industrialization, product commercialization and business capacity building among small and medium producers. Through this Organization, the canton has experienced a favorable change based on production options such as commercial reforestation, horticulture, sustainable cattle breeding, apiculture, and pig farming.

The reconversion process of the agricultural and forestry activities in the canton, which has encouraged the participation of other local organizations of farmers and cattle breeders, has prompted the validation of new technical options to improve farm productivity and families' income through a development model based on production diversification.

The project for the development of sustainable production units, which gathers 81 producers, consists of a private initiative supported by the Ministry of Agriculture and Livestock to strengthen diversified integral production through investments in cattle nutrition through better pasture, organic waste integrated management, farm replanting, soil erosion and degradation prevention practices, infrastructure to manage semi-confined cattle, protection of water recharge areas, forage bank cultivation, and others.

### **8.2 Promotion of the Climate Change Adaptation Processes in the Districts of Lepanto, Paquera, and Cóbano in the Province of Puntarenas**

The south of the Nicoya Peninsula comprises the districts of Cóbano, Paquera, and Lepanto that belong to the province of Puntarenas. They cover an area of 1,138 Km<sup>2</sup> including the islands in the Gulf of Nicoya and have a population of 25,258 inhabitants, whose local economy is based on family-based

agricultural and livestock production, tourism, and fishing. This is an area that is characterized by sloped lands with flat areas rolling near the coasts and a dry season that usually lasts six months, but that has been lasting longer in the last few years due to the climate change.

Because of inadequate practices, such as extensive cattle farming in areas with steep slopes, illegal hunting, and forest fires, over the last two decades of the XX century, the area's natural resources became seriously degraded with a resulting loss in productivity and vegetation cover, which, in turn, reduced water availability. This problem was further exacerbated by for-export melon and watermelon plantations which use large amounts of water.

Faced with this challenge, the Centro Agrícola Cantonal de Jicaral, a local non-profit social organization, has taken up the leadership in participatory resource planning and management to promote sustainable development through diversification practices and reforestation and improvement of productivity and food security for their families.

For more than two decades, the Organization has promoted the incorporation of investments with positive environmental effects in agricultural production to improve farm productivity. More recently, given the negative effects of the climate change, the Organization has started implementing a 2.5-year project with an investment of 0.5 million dollars. The Fondo de Adaptación and the CRUSA Foundation have contributed 36%, while producers and other cooperative members have contributed 64% to this project. The project's objective is to foster adaptation to the climate change based on practices to increase the vegetation cover, a diversification of food biodiversity, organic production, water resource protection, soil protection, and production value added.

### **8.3 National Pilot Program in Cattle Farming with Low Greenhouse Effect Gas Emissions**

Cattle farming is widely distributed in the country; it generates employment, provides eco-systemic services (bio-diversity protection, water source protection, for example), and offers development opportunities for rural areas. It also assures the national self-consumption of meat and dairy products. From the country's total area, 20.4% is pastureland, of which 53.3% are improved pastures, and 5% are reported as areas for forest grazing. Twenty-four percent of cattle farming area is devoted to forest conservation.

Corporación Ganadera promotes the National Pilot Program in Cattle Farming with Low Greenhouse Gas Emissions with the twofold objective of increasing the productivity of the breeding heard and improving the sector's profitability.

The Ministry of Agriculture and Livestock has joined efforts to this initiative and has included this Program as part of the cattle farming NAMA pilot project, since the technologies proposed allow cattle farmers to mitigate the effects of climate change and become less vulnerable.

The Program is grounded on a set of comprehensive interconnected measures that allow setting the foundations for sustainable growth. It has been organized by a project executor subordinated to the organization structure of Corporación Ganadera, namely its Board of Directors, its Executive Director, and Project Unit Coordinator. The Program executor is responsible for the technical coordination and the design, follow-up, and evaluation of the plans and agreements.

Among the specific actions to be carried out by the program are a diagnostic of the sector and the incorporation of technical consultants who will work in improving the administration, sanitation, reproduction and nutritional practices of the participating farms as well as their infrastructure, within the framework of environmentally friendly cattle farming principles.

This Program is articulated through the Regional Commissions which interact with several entities, such as the Ministry of Agriculture and Livestock, the National Institute of Agricultural Technology Research



and Transfer, the National Animal Health Service, and associations and Chambers of Cattle Breeders. Furthermore, other entities, including the Banco Nacional de Costa Rica and the United Nations Development Program (UNDP), have joined the initiative to provide economic support to the various project components.

#### **8.4 Coopetarrazu: Climate-Smart Agriculture Initiatives to Improve Coffee Industry Efficiency**

Coopetarrazú is a grassroots organization of 4 000 smallholder coffee producers that a decade ago decided to seek the means to fight the challenges of productivity, quality and, in particular, low environmental impact through sustainable production. The sustainability policy adopted by the administration and the producers is based on good practices that allow improving farm productivity and higher coffee industrialization efficiency; protecting soil, water, and biodiversity resources; mitigating greenhouse effect gases; and adapting to the climate change.

The following are some of the climate-smart actions implemented by this Cooperative:

- Good agricultural practices to reduce the use of synthetic products, improve the environmental conditions by shading coffee plantations, and promote the utilization of organic bio inputs.
- A network of coffee receiving stations throughout the region with an impact on the reduction of individual fuel consumption.
- Use of husks and organic wastes as an energy source, which reduces the consumption of firewood and eliminated the use of diesel burners.
- Reduction of the amount of water for processing coffee, which went from 1200 liters to 180 liters of water per bushel of coffee.
- Processing water management through an aspersion system that replaced the highly inefficient methane producing ponds and eliminated bad odors and plagues with zero emissions.
- Installation of solar panels to buffer the use of thermal energy generation.
- Pulp solar drying which prevents methane emissions and may be a source of heat that reduces the amount of firewood used.
- Pulp treatment with microorganisms, thus reducing the decomposing time and its emissions.
- Distillation project using pulp juice to transform it into ethanol, treated water, and biogas.
- Wood fuel project which reduced the use of firewood and turned into a carbon sink.

**This case study has been prepared thanks to the following people's contributions.**

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