Nicaragua is among the 16 countries producing and exporting certified organic cocoa in the world, 100 percent of exportations are the highest quality, Quality A. Given Nicaragua’s potential in the global cocoa market, private investors, international cooperation agencies and NGOs have invested time and resources in strengthening the cocoa value chain for more than a decade.

The chocolate value chain is evolving rapidly, with highly differentiated markets in terms of price, quality, type of production, and management of social and environmental issues, among others. Moreover, consumers are increasingly prepared to pay a premium for high quality or ethically produced cocoa. These trends are creating pressure to value chain stakeholders, including wholesalers, retailers and manufacturers, to adopt standard certification and ensure traceability in the value chain in order to guarantee product quality.

Cocoa becomes a lucrative investment at the post-harvest stage of the production process, after the products have left the farm. However, the quality and productivity of production relies on farm-level production. As the profitability of the sector is directly linked with production success, the entire value chain is vulnerable to climate variability and weather events. It is crucial to reduce the vulnerability of producers.

**Resilience Solutions in the Coffee sector in Colombia**

For the past two centuries, coffee has been one of the most important crops in Colombia. It represents a significant staple of the country’s diet and economy, and it is among the most exported products. Coffee is a low risk agricultural commodity and a safe crop for many farmers, as all production can be sold to the National Federation of Coffee Growers (FNC). A growing trend in the sector is driven by the increasing popularity of specialty coffees. Specialty coffees (often certified and organic) provide value-add to growers, as products are sold under proprietary brands and at higher prices to customers looking for products that differ from most retail brands. Higher margins allows specialty coffee producers to invest in climate-resilient production and services.
Sector facts

- Annual coffee exports value reached USD 2.6 billion.
- The main export destinations are the United States (42%), Europe (32%) and Japan (11%).
- Coffee plays a significant role in the generation of employment; more than 785,000 people are directly involved in the activity, representing 28% of the total employment in the agriculture sector.

Value chain of the coffee sector in Colombia

The value chain builds on five main processes from input selection to transportation and distribution. Each process involves specific activities, which are conducted by direct actors and engage identified indirect actors.

Normal environmental conditions for production

- Production is viable at altitudes over 2,000 meters above sea level.
- There are different harvest seasons depending on the rainfall regime of the crop areas. In areas with two rainy seasons (Apr-May and Oct-Nov), there is a main harvest.
- The level of production depends on weather conditions in the flowering periods.
- Coffee production soils vary from sandy, stony to clayey. In flat or slightly wavy to abrupt reliefs, with marked differences compared to the soils of other coffee-producing countries.

Changes in the weather that could affect production and operations and related impacts

- More acidic and the ability to retain nutrients is reduced. Erosion is an issue in most coffee areas, representing increasing fertilization costs, and 30% of production areas consist of varieties that are susceptible and exposed to rust attack.
- As the profitability of the sector is directly linked with production success, the coffee value chain is vulnerable to climate variability and weather events.
- It is crucial to reduce the vulnerability of producers. Producers must apply crop adaptation and management practices that lead to resilient production, improving yields and producers' returns.

Environmental conditions. The quality of products are vulnerable to excessive humidity during storage or transportation to collection centres. Plus, the transportation of products to markets can be affected by landslides and disruptions in rural roads, leading to increasing transport costs.
### Resilience Solutions

#### Leading resilience solutions:
Knowledge services, crop protection expertise and water infrastructure.

#### Description:
The two highest-ranking resilience solutions include knowledge services and crop protection expertise against extreme events, diseases and plagues. Knowledge services are key in supporting the growing trend of larger coffee growers moving towards specialized, organic and certified coffee production. It is estimated that potential customers of specialized knowledge services would amount to over 50% of total growers, assuming that larger producers are in the financial position to pay for these services and that small producers receive some of these services through the FNC.

The third highest-ranking resilience solution is water infrastructure, as appropriate water management is key for the sustainability of the coffee sector. At the farm level, water management infrastructure includes irrigation systems, storage facilities, preservation of water sources, water extraction, transportation, distribution, preservation and adequate management of water. Water management is identified as a key resilience solution, particularly in areas prone to droughts. Irrigation and water infrastructure technologies during crop management and post-harvest processes are facilitating reduced costs and increased productivity. Water management infrastructure enables the efficient use of water, energy and labor resources in coffee processes at the farms, allowing improved management of resources and product quality. In the context of the value chain of coffee, adequate water management is critical during post-harvesting processes.

#### Resilience contribution:
Knowledge services and crop protection expertise contribute to climate adaptation by enhancing capacity within local producers and agricultural institutions (universities, technological institutes, producers associations and local government), and by providing software and information systems, and technical capacity for farm management, sector policy development, (e.g. financial structuration, crops and formalization).

#### Water management infrastructure

contributes to climate adaptation by securing water availability and regularity during relevant processes in the coffee value chain. Distribution and access to fresh water are expected to be a critical issue in the medium term, as the effects of climate change on water flows are exacerbated by deforestation, changes in land use and alterations affecting the natural drainage of rivers and streams. Particularly, regions experiencing seasonal scarcity and, for example, affected by El Niño events, efficient water management can have a significant positive impact.

#### Market opportunities:
The increasing popularity of specialized coffee varieties, including organic and certified coffee, are driving market demand and opportunities for the identified resilience solutions.

#### Example of Resilience Solution

**Ecomill – Post harvest equipment improving efficiency and improving sustainability of coffee production**

The Ecomill is helping to improve efficiencies in the processing stage of coffee production. The equipment pulps, ferments and wash the coffee, thus reducing the consumption of water and energy. The Ecomill technology has been developed by CENICAFe and the machinery is produced and sold to coffee producers by local companies. Target consumers of the Ecomill are most coffee producers of all sizes. While the standard machines are appropriate for large producers, tailored adjustments can be made for small and medium size producers. New more affordable versions for small producers of the Ecomill are being developed. Moreover, as the Ecomill is equipment, it can be insured and is bought with traditional financial products.

#### Resilience contribution:
The Ecomill allows a more water & energy efficient post-harvest management of coffee beans, particularly benefiting production in areas prone to droughts and water scarcity.

#### Advantages of the resilience solution:
- Quality of the bean greatly influences coffee prices. Ecomill contributes to high quality coffee by reduce water use, reducing significantly contamination generated by discharges during washing, and consequently protecting bean quality.
- Efficiency of the Ecomill in reducing water consumption is higher than alternative technologies, such as tank wash with manual agitation.
- The Ecomill contributes to producing coffee in a sustainable manner and reducing significantly the ecological footprint of the coffee process.

#### Main challenges related to resilience solutions:
Financial constraints of small-scale farmers and limited access to credit.

### Business examples

**Café Mogambo** is a 20-hectare farm producing single-origin coffee in Biota, Cundinamarca, three hours from Bogota. Mogambo’s coffee production is 100% organic. Mogambo is a multi-strata productive farm, and a botanical garden of 2,000+ species; it is a destination for research tourism, a living laboratory of ethnobotany, biodiversity and coffee. Currently, Mogambo has partnerships with high-end restaurants, laboratories and universities in Colombia, for the research and inclusion of new species and or varieties in different businesses. While monoculture could increase production by an estimated 15%, the quality of coffee would be affected, leading to a deterioration in the competitive advantage of Mogambo coffee in relation to other products in the market.

Although Mogambo is not promoted as a climate resilient coffee farm, by implementing good practices and on-site research, production and product quality have remained stable, despite of the climatic variability affecting several regions of Colombia. In practice, crop arrangement in a biodiverse polyculture and the use of organic fertilizers have been utilized to ensure the protection of soil, water, air, and fauna (birds, reptiles, mammals, others). Plus, the highly diverse canopy allows the natural regulation of temperature, and as soils are not affected by erosion or landslides. Crops and production are resilient during drought and heavy rainfall. Moreover, coffee crops have not been affected by extreme weather (e.g. hear and frost) or El Niño or La Niña conditions.

### Quotes

“It’s not about growing coffee in a sustainable manner, it’s about being sustainable in growing coffee. We are forestry engineers and used to provide technical assistance to the agriculture sector on behalf of national and international organizations. Not all coffee growers (and farmers) want to put the effort to have and maintain sustainable farms in which productivity is high based on good practices. It is easy to sell products of lower quality, with pesticides, or even transform the farm into recreation houses, than putting the time and effort to create what we have created.”

- Leonor Rodriguez, Mogambo Biodiversity Coffee