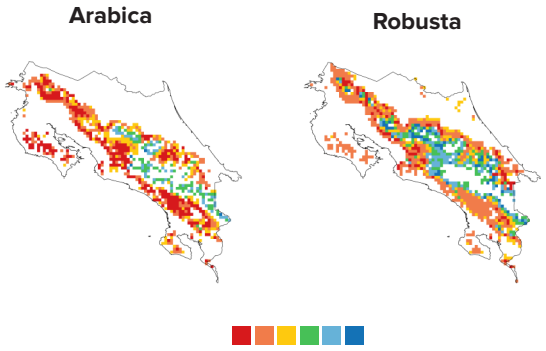
COFFEE PRODUCTION IN THE FACE OF CLIMATE CHANGE: **COSTA RICA**

KEY PRODUCTION AREAS IN COSTA RICA[20]

The main coffee producing areas are in the highlands of central Costa Rica, in the provinces Cartago, San José and the south of Alajuela.



Changes in suitability between today and 2050 [24]

OBSERVED AND PREDICTED EFFECTS OF CLIMATE CHANGE IN COFFEE PRODUCING AREAS [5,13,15,16]

Rising Temperatures

- Estimated average temperature rise of 2-2.25°C.

Changing Seasonality

- Earlier onset of the rainy season.
- More erratic and unpredictable rainfall expected.

Changing Rainfall

- 0-5% decrease in precipitation
- Rainfall is expected to be lower in the rainy season.

Extreme Weather Events

- Higher possibility of hurricane occurrence in Costa Rica.

LIKELY IMPACTS OF CLIMATE CHANGE ON COFFEE PRODUCTION

Predicted changes in coffee producing areas:

- Overall climatic suitability for coffee is expected to decline by 40% or more for 55% of the land currently suitable for Arabica coffee.
- While 40% of the currently suitable land is likely to experience some reduction of suitability for Arabica[35]; another 30% of the land is expected to become unsuitable by 2050.[2]
- Land with optimal coffee growing conditions will shift from currently around 1,200 meters to 1,600 meters.[13] Areas up to 2,500 meters are expected to become suitable for coffee.[2]
- If the country invests into adaptive measures and is able to shift coffee farming to higher altitudes, Costa Rica could compensate for the declining production expected for Nicaragua and El Salvador.[2]
- At lower altitudes, a shift from Arabica to Robusta would be an alternative, especially in combination with best practice management.

THE IMPORTANCE OF COFFEE IN THE COSTA RICAN AGRICULTURAL SECTOR[1,6,7,8,10,16,17,19,23]

Coffee production and export in 2017/2018

- Arabica: 90,000 tons
- Robusta production was legally banned between 1989 and 2018
- 73% of coffee is exported.

Area under coffee production

Arabica
84,000 ha

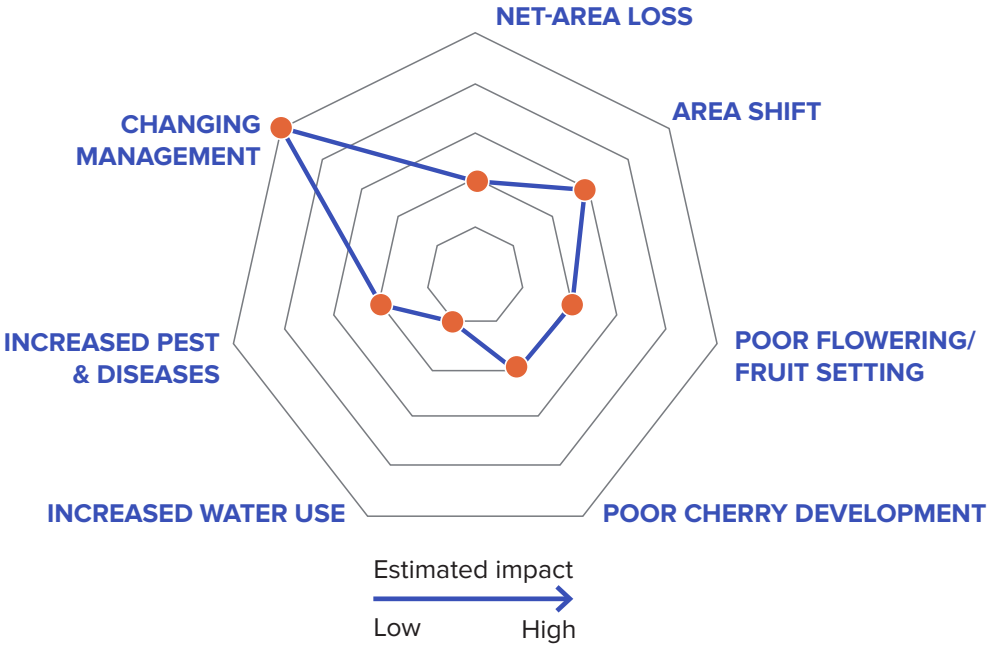
Farms

- 41,000 smallholders (~ 3 ha) produce 60% of the coffee on 97% of the coffee production area

Importance in the national economy Coffee generates:

- 2.7% of export revenues and
- 2.5% of gross domestic product
- Is the 3rd biggest agricultural export commodity

LIKELY IMPACTS OF CLIMATE CHANGE ON COFFEE PRODUCTION



- Higher incidences of pest and disease outbreaks are expected in the future.[2]
- Higher temperatures cause faster ripening of berries, leading to lower quality.[13]
- Erratic rain could lead to irregular flowering and cherry development.[13]

PRODUCTION STANDARDS AND PRACTICES

CERTIFIED PRODUCTION

- Ca. 32% of the coffee production is certified, mostly with Fair Trade and Rainforest Alliance standards.[4]
- 80% of the production enters the specialty market. Costa Rica is the 4th largest specialty coffee producer worldwide.[11]

FARM PRACTICES

- 75% of coffee trees are past peak productivity and between 40-60% of the coffee trees are affected by Coffee Leaf Rust.[1,22]
- Farmers rely heavily on agrochemicals. Usage rates in Costa Rica are among the highest in the world.[16]
- Coffee is mostly cultivated in monoculture. Sometimes lights shade from smaller, nitrogen fixing species is available.[14]
- Coffee cherries are washed by cooperatives, independent processors and multi-national companies. Cooperatives process about 10% of the total volume.[1]

FARM ECONOMY

- Average yield is 1.1 ton/ha.[10]
- Hired labor earns a relatively high minimum wage of about USD 18/day.[1]
- Coffee prices for farmers are regulated by government.
- High production costs (about 3,000 USD/ha*year) in combination with revenues of about 2,000 USD/ha make coffee farming unattractive.[9]

CLIMATE CHANGE ADAPTATION:

STRENGTHS

Technical aspects

Climate-smart strategies like agroforestry, optimizing fertilizer use and reducing the water footprint of coffee processing are already institutionalized in the coffee NAMA and piloted in the framework of the NAMA support project.[16]

The Coffee Institute of Costa Rica (Icafe) conducts research on Coffee Leaf Rust resistant varieties as well as farm practices and processing.[1]

Economic aspects

Farmers receive a minimum price for the coffee, regulated by law.[1,21]

Public banks offer a favorable credit line for rejuvenation of coffee plots. The National Coffee Institute, Icafe, has to confirm the technical feasibility before farmers can access the loan.

Costa Rica focusses on specialty coffee to compete with bigger producer countries.[3,11]

Organizational aspects

About 45% of farmers are connected to cooperatives with micro-mills.[1]

Political aspects

The coffee sector is highly regulated and considered transparent. For example, the Coffee Law (1961) stipulates relationships between producers, processors, and exporters, and includes mechanisms for coffee price setting and credit provision. Laws include also Geographical Indications and Denomination of Origin.[4,9,21]

The country is committed to achieving carbon neutrality by 2021. This has implications for coffee production and processing and is reflected in the coffee NAMA. Key action points for mitigation in the coffee sector are the adoption of agroforestry and reducing emissions on-farm and coffee processing.[12,16]

OPPORTUNITIES

Technical aspects

The Monitoring, Reporting and Verification (MRV) system of the NAMA project includes the improvement of weather forecasts and monitoring of disease outbreaks. The information can help to improve the responsiveness of stakeholders.

Economic Aspects

The introduction of Climate Smart Agriculture as per NAMA and implemented in the framework of the NAMA Support Project is expected to reduce emissions and sequester carbon while improving the financial performance of coffee farmers and processors.

Shade trees planted for climate change mitigation and adaptation can also diversify farm income. Coffee farmers participating in the NAMA are eligible to a Payment for Ecosystem Services of USD 2/tree.

Smallholders could double their yields through rejuvenation and implementation of good agricultural practices.

Organizational aspects

45% of smallholders are already organized in cooperatives. The political empowerment of coffee farmers could be enhanced if more farmers become organized in cooperatives, e.g. for the reformulation and restructuring of the national coffee fund.

Political aspects

In June 2018 the government issued a decree authorizing the cultivation of Robusta coffee at low altitude areas, offering farmers an alternative adaptation option.(18) The financial and technical viability of Robusta has to be explored in detail before investments are made.

WEAKNESSES

Technical aspects

75% of coffee is well beyond peak productivity and in need of rejuvenation.

An estimated 40-60% of coffee is affected by the Coffee Leaf Rust, causing yield losses. Susceptible varieties must be replaced with resistant breeds.

Most coffee is grown in full-sun mono-culture. In particular plantations at lower elevations are prone to damage by the increasing temperatures and other effects of climate change.

Economic aspects

Production costs in Costa Rica are high, reducing the country's competitiveness in the global market.

Low-profit margins provide little incentive to invest in coffee farms. High cost for rejuvenation (estimated to be USD 6,000 per ha) in combination with the subsequent income gap makes such investments very unlikely unless financial support in form of subsidies and soft loans is provided.

Apart from the difficulty to finance investments, the biggest constraint for smallholders is affordable access to extension services/agronomists.

Political aspects

The production of Robusta coffee was prohibited since 1989. While the ban was lifted in 2018, farmers and technical advisory services have little know-how in Robusta cultivation. Additional efforts to bridge this knowledge gap are needed if the re-introduction is to be successful.

THREATS

Technical aspects

The high production costs make farmers in Costa Rica in particular vulnerable to world market fluctuations.

Low profits make the coffee sector unattractive for young farmers. Poor profit margins, high opportunity costs, and losses caused by the Coffee Leaf Rust lead to farmers giving up coffee production. In particular, farms situated at the fringes of urban centers are increasingly converted to other land uses (e.g. in the Valle Central, a key coffee growing region).

Political aspects

The National Coffee Fund is insufficiently monetarized. Stakeholders foresee investment needs in the range of USD 100 million versus the currently available USD 30 million. Furthermore, its structure does not adequately reflect the current situation of the coffee sector.

The cultivation of Robusta coffee is an alternative land use at lower altitudes. However, farm-level investments in Robusta coffee should not take place before the financial and technical viability has been confirmed.

THE COFFEE NAMA OF COSTA RICA

Costa Rica's Coffee NAMA is one of the first "National Appropriate Mitigation Actions" in the agricultural sector globally, and is part of Costa Rica's strategy to become a carbon neutral country by 2021.[17] The coffee sector causes approximately 1.15 million tons of carbon dioxide, or 9% of Costa Rica's greenhouse gas emissions annually.

The Coffee NAMA, implemented through the NAMA Support Project with funding from Germany and the United Kingdom has five objectives, which are implemented on-farm and in coffee processing:

- The reduction of nitrous oxide emissions through the adoption of efficient fertilizer and lime application practices.
- The reduction of methane emissions through improved water management and the introduction of wastewater treatment technologies in coffee washing stations.
- The reduction of methane and carbon dioxide emissions through aerobic treatment and use of the pulp for energy.
- Reduction of carbon dioxide by using improved combustion systems in furnaces and boilers, and greater use of solar drying.
- Increased carbon sequestration through expansion of coffee agroforestry systems.

The agricultural good practices promoted are the replacement of conventional fertilizers with slow-release fertilizer, correct application of agrochemicals, and the establishment of 70 shade trees per hectare coffee.

The NAMA Support Project enables investments by farmers and millers by providing incentives, grants, loans, and guarantees. Participating farmers can receive USD 2 per tree planted in their coffee farm. Businesses are eligible for grant funding of up to USD 10,000 or 10% of the investment volume.

The achievement of the objectives would result in a combined greenhouse gas reduction and sequestration estimated to be 1.85 million tons of carbon dioxide per year.[22]

Putting the NAMA into practice is anticipated to cost USD 30 million in technical and financial assistance. The first phase of NAMA implementation focused on developing and piloting mitigation interventions. The targets of the current, second phase (until 2019) are to enable 6,000 farmers in good agricultural practices and to reduce the water and carbon footprint of 50 coffee mills. The third phase of implementation will place a stronger focus on the private sector and the full implementation of the monitoring and verification system.

Challenges experienced in the implementation if the NAMA are:

- The urgent need to rejuvenate coffee farms/replace coffee trees with disease-resistant varieties. Rejuvenation is capital intensive and results in a temporary loss of income until trees start bearing fruit. The need for expensive rejuvenation in combination with the low profitability of farms may prevent farmers from participation in the NAMA, despite the comparatively low cost of the promoted mitigation practices.
- The provision of farm and processing level data and information to producers as a tool to optimize production is still at an early stage. The piloting farmers and processors are slow to integrate this tool into their management.

More information is available at http://www.namacafe.org and https://www.nama-facility.org/projects/costa-rica-low-carbon-coffee-nama/.

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