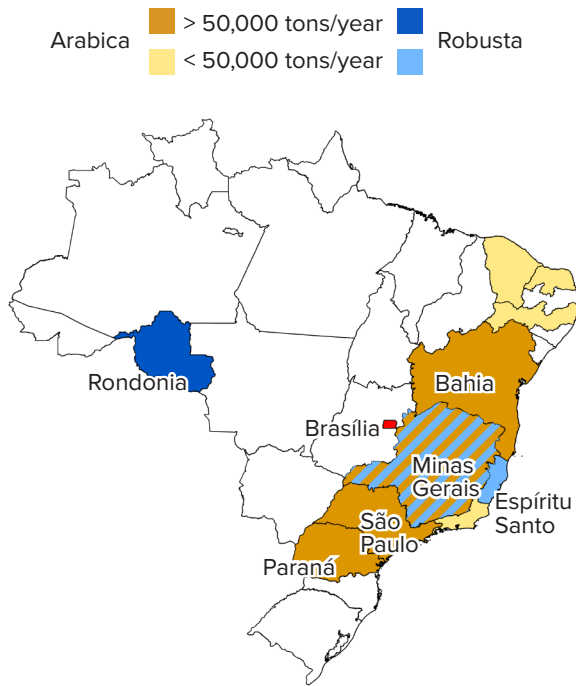
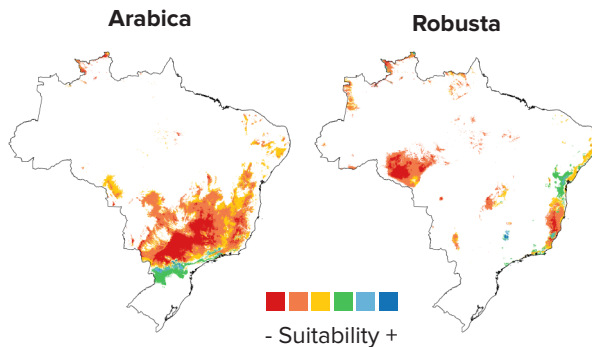


COFFEE PRODUCTION IN THE FACE OF CLIMATE CHANGE: BRAZIL

KEY PRODUCTION AREAS IN BRAZIL



The state of Minas Gerais accounts for 53% of overall and 70% of Arabica coffee production. About 30% of Brazil's small coffee producers are located in the state.



Changes in suitability between today and 2050 ⁽²⁰⁾

OBSERVED AND PREDICTED EFFECTS OF CLIMATE CHANGE IN COFFEE PRODUCING AREAS ^(8,9,10,27)



Rising Temperatures

- Temperature projections vary widely
- The average of 21 models projects increases of up to 3.5°C over most of the country by 2100



Changing Seasonality

- The dry season in the Amazon will likely get longer and precipitation decrease, especially in the dry season



Changing Rainfall

- 5% increase in rainfall in the west Brazil
- Rainfall decreases of up to 5% in central, north and southeast Brazil



Extreme Weather Events

- Increased drought and increased length of dry period are expected due to stronger and frequent El Niño events

LIKELY IMPACTS OF CLIMATE CHANGE ON COFFEE PRODUCTION

Predicted changes in coffee producing areas:

- Land suitable for coffee production is estimated to be reduced by 18% by 2050 and by 27% by 2070. ⁽¹⁰⁾
- Other sources estimate loss of suitability for 25% ⁽¹⁸⁾ and 84% ⁽¹⁹⁾ of areas where Arabica coffee is cultivated currently.
- The Robusta producing states Rondonia and Espírito Santo may face losses of suitable areas of about 60%. ⁽²⁰⁾
- The potential of shifting coffee production to higher elevations is very limited. Southward latitudinal migration may be a possibility but is limited by high temperature variability (including frost) in sub-tropical regions. ^(21,21)

THE IMPORTANCE OF COFFEE IN THE BRAZILIAN AGRICULTURAL SECTOR ^(1,2,3,4,5,6,7,14,25)

Coffee production and export in 2017/2018

- Arabica: 2.3 million tons
- Robusta: 750,000 tons
- 1.9 million tons (> 60% of production) were exported
- 10% of exports in form of soluble coffee

Area under coffee production

Arabica
1.7 million ha

Robusta
410,000 ha

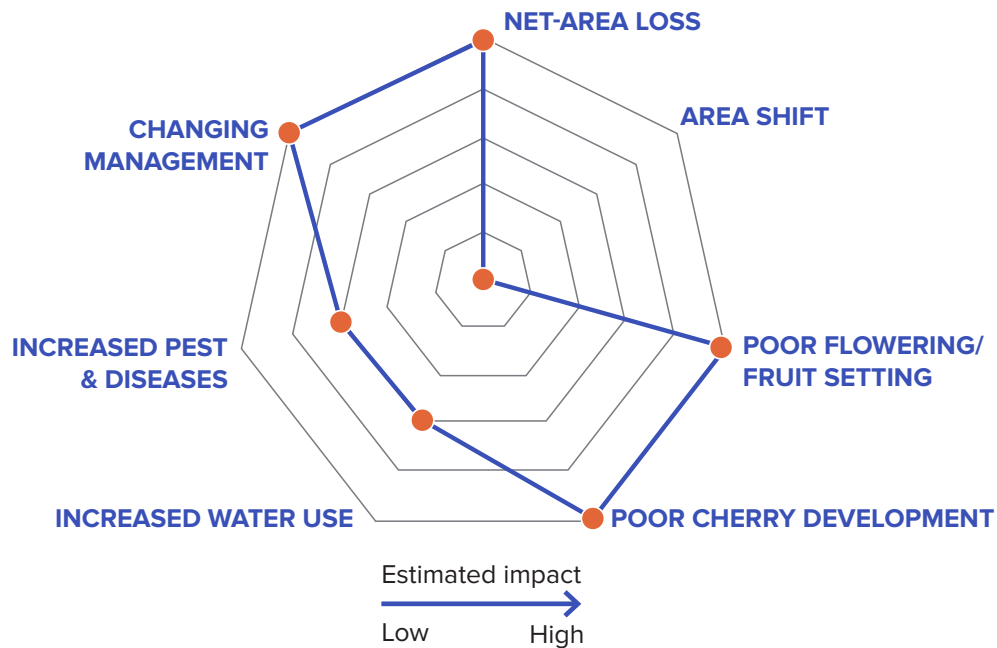
Farms

- 300,000 smallholders (~ 5 ha) represent 75% of coffee growers
- Medium-sized (≥ 10 ha) and large (> 100 ha) producers account for 62% of total production.

Importance in the national economy Coffee generates:

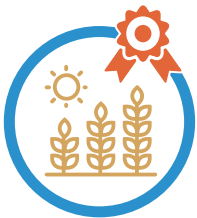
- 3% of export revenues
- 0.3% of gross domestic product

LIKELY IMPACTS OF CLIMATE CHANGE ON COFFEE PRODUCTION



- Stress caused by heat and drought increases the susceptibility of coffee trees to pests and diseases.
 - Large areas will require investments into shade trees and irrigation to cope with the higher evapotranspiration and decreasing rainfall.
 - Lack of rainfall during the cherry development period will result in smaller bean sizes, i.e. lower quantity and quality.
- With higher temperatures, cherries ripen very fast. Farmers may experience difficulties to harvest and process the entire crop in a shorter time period and may need to invest in additional labor or mechanization.

PRODUCTION STANDARDS AND PRACTICES



CERTIFIED PRODUCTION

- Brazil is the largest supplier of UTZ and of Rainforest Alliance coffee worldwide.
 - The certificate holders are mainly medium and large scale coffee producers.
- Approximately 12% of the total export is sold as certified.



FARM PRACTICES

- Productivity and levels of technology vary from region to region and with farm size. Only larger farms are mechanized.
- In most parts of Brazil (especially Minas Gerais), coffee is grown in an intensive, high input system and under full sun.
 - On about 25% to 30% of the area, modern irrigation methods are used.
- Cooperatives are the main distribution channel for lime, fertilizers, agro-chemicals, and seed.



FARM ECONOMY

- Productivity is high, with 1.6 tons/ha for non-mechanized Arabica farmers.⁽³⁾
- Production costs have increased over the past years due to rising input and labor costs, affecting the competitiveness of small and medium sized farms especially.
- Farmers receive 85% of export price.⁽³⁾

CLIMATE CHANGE ADAPTATION:

STRENGTHS

Technical aspects

New varieties and clones have been developed by Café EMBRAPA Research, partly in partnership with private companies. The new varieties are resistant to Coffee Leaf Rust and highly productive.^(11,15) Varieties are multiplied by private nurseries.

Positive experiences using cover crops in coffee production have been made, e.g. with Signal Grass (*Brachiaria decumbens*). The cover crops improve water infiltration, nutrient availability, and soil carbon sequestration.^(12,13)

Economic aspects

Coffee producers have access to crop insurance and finance in the form of subsidies and loans. The National Fund for the Defense of the Coffee Economy (FUNCAFE) offers a special credit line for coffee growers, to finance harvesting, warehousing and trade.

Around 10% of smallholder producers are members of the circa 90 coffee cooperatives. The cooperatives provide access to market and technology.⁽¹⁵⁾

Political and organizational aspects

Brazil's coffee sector is well organized: the Brazil Global Coffee Platform is governed by the National Advisory Board (public and private sector institutions) and Brazil Working Group (state extension services, standards and roasters). The platform performs advisory functions and seeks to improve sustainability of the coffee sector.⁽²⁾

WEAKNESSES

Technical aspects

Many coffee farms are located in mountainous areas that cannot be mechanized easily and are not suitable for other cost-saving technologies.⁽⁴⁾

The often excessive use of fertilizers by coffee growers can result in accelerated land degradation and soil fertility decline.^(14,15) Getting farmers to optimize fertilizer use in combination with other soil management options will be crucial for continued production.

An estimated 70% of land cultivated with coffee is managed by smallholders. Yet, these farmers produce only between 40 and 50% of coffee.^(3,15) Lower production of smallholders is partly linked to lower degree of mechanization.⁽¹⁴⁾

Economic aspects

Labor costs have risen due to social policies introducing minimum wage. The labor costs have risen two to three times faster than inflation. In conjunction with rising input costs, many of the smaller producers struggle to remain profitable.^(4,15)

The already high production costs and low coffee prices (especially for Arabica coffee and Brazilian Special) leave little room for additional investments in sustainable practices.

OPPORTUNITIES

Technical aspects

The promotion of good agricultural practices for weed management, soil management and erosion control have clear adaptation co-benefits. These measures will also improve water infiltration and retention and reduce soil temperature, thereby helping to reduce water stress and the need for irrigation.

Economic aspects

Brazil has a very dynamic internal market for coffee, in particular for Robusta coffee. Internal consumption represents around 40% of Brazil's total sales. In combination with the narrow export price differential between Arabica and Robusta, and rising production costs for Arabica shifting production from Arabica to Robusta is an economically viable alternative.⁽⁴⁾

Coffee projects can be funded in the framework of the Low Carbon Agriculture Plan of Brazil (ABC, created in 2010). The ABC plan finances agricultural practices with high productivity and low greenhouse gas emissions.

Organizational aspects

Certifica Minas Gerais, an initiative of the Minas Gerais Government (SEAPA-IMA-EMATER), is a local certification scheme focusing on good agricultural practices and socio-environmental responsibility in coffee production. It offers certification at lower cost in comparison to international standards. It is implemented in partnership with UTZ, ensuring international recognition. Sustainable coffee production and climate change adaptation practices can be further promoted with Certifica Minas Gerais.

THREATS

Technical aspects

Coffee Leaf Rust continues to threaten coffee production with losses in the range from 30 to 50%. Coffee Leaf Rust is most severe at elevations below 1,200 meter and for Arabica coffee.⁽¹⁶⁾

Coffee producers mistrust promises of increased performance of new varieties. In the past new varieties performed well initially, but production declined rapidly. In combination with the high cost for replanting, this mistrust might slow down rejuvenation with adapted varieties. Delays in establishing varieties suited to the changing climate, pests, and diseases could be disastrous for farmers.

Economic and political aspects

Policies and finance for the sustainable development of the agricultural sector (e.g. the FUNCAFE credit line) are driven by factors such as Brazil's 2015 economic crisis or disasters like the severe droughts in southern Minas Gerais and Espírito Santo in 2014/15 and 2015/16 respectively. Proactive and reliable policies and funding are needed adequately address climate change adaptation.

The frequent changes of leadership on national and state level is a challenge for promoting sustainability in the Brazilian coffee sector.



RURAL CREDIT FOR COFFEE PRODUCERS AND CLIMATE CHANGE ADAPTATION IN BRAZIL ^(17,23,24,28,29)

The Brazilian government has supported the agriculture sector through rural credit programs since the 1960s. These programs are part of Brazil's enabling environment for climate change adaptation.

Two key programs are the Agricultural Plan (Plano Agrícola e Pecuário - PAP) and the National Plan for Family Farming (Programa Nacional de Fortalecimento da Agricultura Familiar - PRONAF). The annual funding available to farmers through these two plans is in the range of USD 60 billion and USD 9 billion respectively.*

A financing program specifically for the coffee sector is the Fund for the Defense of the Coffee Industry (FUNCAFE), amounting to 1.6% of rural credit programs in 2016/17. Financing under FUNCAFE is limited to activities related to harvesting, storage, and coffee trade. Lending rates are between 8.5%-11.25%. Additionally, the program supports coffee farms damaged by e.g. hail, frost and wind, where at least 10% of the farm area was affected.

Medium sized farm businesses can also apply to the National Program to Support Medium Producers (PRONAP). The program has different credit lines for investments into green technologies (e.g. renewables, recycling, soil, and water conservation), establishment of organic production, and related to forestry (including set-aside areas, forest restoration, and agroforestry). Interest varies between 2.5%-5.5%.

Since 2006, Brazil has the Crop Insurance Program (PSR). The program provides subsidies to farmers for agricultural insurance policies. The subsidies range between 35% and 40% of the insurance cost. About 4% of the insurance subsidies for crop insurance paid between 2006 and 20015 was applicable to coffee.

While various financing options are available for the coffee sector in Brazil, in practice access is complicated. The many different and partially overlapping credit lines make it hard for producers and local credit institutes to identify the best option for a given investment and region. Access to credit and conditions vary with credit purpose, location, farm size, and farm revenues. The difficulty in identifying and accessing the most suitable financial product poses a challenge for investments into adaptation and risk management.

An extended overview of financing sources for coffee producers are available in two practical guides in Portuguese by the Global Coffee Platform⁽²⁴⁾ and the Coffee and Climate Initiative⁽²⁸⁾.

*Values for the financial year 2017/2018

REFERENCES

1. USDA, 2017: Brazil Coffee Semi-annual. USDA Foreign Agricultural Service. Retrieved from [https://gain.fas.usda.gov/Recent GAIN Publications/Coffee Semi-annual_Sao Paulo ATO_Brazil_11-14-2017.pdf](https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Coffee%20Semi-annual_Sao%20Paulo%20ATO_Brazil_11-14-2017.pdf). Accessed on 26.09.2018
2. GCP, 2016: National Coffee Platforms: Public/Private Alignment for a Sustainable Coffee Sector. Global Coffee Platform.
3. GCP, 2018: Brazil – A Quick Scan on Improving the Economic Viability of Coffee Farming. Presentation prepared by Technoserve for the Global Coffee Platform. Retrieved from http://www.globalcoffeeplatform.org/assets/files/Resources/Vietnam-Deliverable_vSent.pdf
4. Technoserve, 2013: Brazil: A Business Case For Sustainable Coffee Production. Study for the Sustainable Coffee Program, IDH.
5. CONAB, 2018: Acompanhamento da safra brasileira. Companhia Nacional de Abastecimento. Retrieved from [https://doi.org/ISSN 2318-6852](https://doi.org/ISSN%202318-6852)
6. UTZ Certified, 2015: UTZ Certified Response “Effects of UTZ certification according to coffee farmers in Brazil”.
7. De Almeida L, Zylbersztajn D, 2016: Key Success Factors in the Brazilian Coffee Agrichain: Present and Future Challenges. International Journal on Food System Dynamics, 217-222. Retrieved from <https://doi.org/10.18461/pfsd.2016.1625>
8. USAID, 2018: Climate Risk Profile: Brazil. Report prepared under the Climate Integration Support Facility for USAID. Retrieved from https://www.climate-links.org/sites/default/files/asset/document/2018-April-30_USAID_CadmusCISF_Climate-Risk-Profile-Brazil.pdf
9. UK MetOffice, 2011: Climate: Observations, projections and impacts. Retrieved from <https://doi.org/10.1111/j.1749-6632.2009.05314.x>
10. Haggag J, Schepp K, 2012: Coffee and climate change: Impacts and options for adaption in Brazil, Guatemala, Tanzania and Vietnam. NRI Working Paper Series : 4(4), 50.
11. P&A, 2018: Coffee newsletter Confidential. Issues 123-135. P&A.
12. UNIQUE forestry and land use, 2015: coffee & climate initiative: Project evaluation.
13. Conselho Nacional do Café, 2017: Brazilian coffee production: overcoming the challenges of sustainability.
14. ICP, 2014: Empowering small scale coffee farmers for global markets and climate resilience in Minas Gerais, Brazil: Annual Progress Report for International Coffee Partners. Lavras, Brazil.
15. USAID, 2017: Data Sheets for Coffee Renovation and Rehabilitation. USAID Bureau for Food Security.
16. Zambolim L, 2016: Current status and management of coffee leaf rust in Brazil. Tropical Plant Pathology, 41(1), 1-8. <https://doi.org/10.1007/s40858-016-0065-9>
17. Lopes D, Lowery, 2015: Rural Credit in Brazil: Challenges and Opportunities for Sustainable in Agriculture.
18. Ovalle-Rivera O, Läderach P, Bunn C, Obersteiner M, Schroth G, 2015: Projected Shifts in Coffee Arabica Suitability Among Major Global Producing Regions Due to Climate Change. PLoS ONE 10(4).
19. Magrach A, Ghazoul J, 2015: Climate and Pest-Driven Geographic Shifts in Global Coffee Production: Implications for Forest Cover, Biodiversity and Carbon Storage. PLoS ONE 10(7): e0133071. doi:10.1371/journal.pone.0133071
20. Bunn C, Läderach P, Ovalle-Rivera O, Kirschke D, 2015: A bitter cup: climate change profile of global production of Arabica and Robusta coffee. Climatic Change (2015) 129:89–101
21. Bunn C, 2015: Modeling the climate change impacts on global coffee production. Dissertation at the Faculty of Life Sciences, Humboldt-University, Berlin.
22. Bunn C, Läderach P, Pérez Jimenez JG, Montagnon C, Schilling T, 2015: Multiclass Classification of Agro-Ecological Zones for Arabica Coffee: An Improved Understanding of the Impacts of Climate Change. PLoS ONE 10(10): e0140490. doi:10.1371/journal.pone.0140490
23. INPUT & Climate Policy Initiative, 2018: The fragmented rules of Brazilian rural credit: how policy design creates artificial obstacles in credit access and loan conditions for rural producers. Climate Policy Initiative.
24. SGP, 2015: Guia Prático de acesso a Linhas de Crédito para promoção da Sustentabilidade dos Cafeicultores. SGP Programa Cafe Sustentavel.
25. Ministry of Agriculture Livestock and Food Supply Brazil, 2016: Agricultural Risk Management in Brazil.
26. ICO, 2018: Trade Statistics Tables. International Coffee Organization. http://www.ico.org/trade_statistics.asp. Accessed 20.07.2018.
27. Ruiz-Cárdenas R, 2015: A cafeicultura e sua relação com o clima. Study for the program: Melhoria do Acesso a Financiamento Climático para Pequenos Produtores de Café no Brasil implemented by the Initiative for coffee&climate, HRNS.
28. Ruiz-Cárdenas R, 2015: O programa nacional de fortalecimento da agricultura familiar – PRONAF. Study for the program: Melhoria do Acesso a Financiamento Climático para Pequenos Produtores de Café no Brasil implemented by the Initiative for coffee&climate, HRNS.
29. CCI, 2014: Mecanismos de seguro rural contra eventos climáticos adversos em Perdões e Lambari. Factsheet produced by the Initiative for coffee&climate. Available from <http://toolbox.coffeeandclimate.org/>

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