The Paradoxes of Climate-Smart Coffee: A Teaching Case on Climate Change Mitigation and Adaptation Actions in Tanzanian and Ethiopian Coffee Value Chains

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PACSMAC

This case was prepared as part of the PACSMAC research project for educational purposes. Visit https://pacsmac.com/home/ for more information about the research project and its outputs.

Introduction

Global Coffee Production and Consumption

Coffee is one of the world's most traded agricultural commodities, cultivated in over 50 countries across the tropics and consumed by billions daily. The sector supports an estimated 12.5 million smallholder farms worldwide (Rushton, 2019), with production predominantly concentrated in the Global South. Three origins alone — Brazil, Vietnam, and Colombia — account for over 60 per cent of total volumes (ICO, 2023). Ethiopia, the world's fifth-largest producer and the top African producer, contributes approximately 4.5 per cent of global production, while Tanzania ranks as Africa's fourth-largest producer (Grabs et al., 2026a). Global demand continues to grow, with the European Union importing nearly half of the world's coffee (Gallemore et al., 2025).

Coffee Global Value Chains

The coffee value chain is characterised by stark power asymmetries between actors in importing and producing countries (Ponte et al., 2026). The chain extends from smallholder farmers and cooperatives in the Global South, through domestic traders and processors, to international trading companies (midstream actors) and large roasters in the Global North. Since the collapse of the International Coffee Agreement (ICA) in 1989, the sector has undergone successive phases of liberalisation and reconsolidation, leaving roasters as the most powerful actors in the chain (Ponte et al., 2026). International trading companies have vertically integrated into domestic sourcing and processing, while simultaneously positioning themselves as providers of sustainability assurance services, a role that has become increasingly profitable (Grabs et al., 2026b). Sustainability certifications (e.g. Fairtrade, Rainforest Alliance) and, more recently, in-house verification schemes led by roasters and traders, shape market access and set compliance costs which are disproportionately borne by producers (Grabs et al., 2026b). The EU Deforestation Regulation (EUDR), which requires importers to verify that coffee was not sourced from recently deforested land, represents a new and significant regulatory layer, with substantial implications for smallholders' continued market access (Gallemore et al., 2025).

Coffee Cultivation

Two primary species make up the bulk of commercial coffee cultivation: *Coffea arabica* (Arabica) and *Coffea canephora* (Robusta). Arabica accounts for approximately 60 per cent of global production and is prized for its nuanced flavour profiles, mild acidity, and aromatic complexity. It is grown predominantly at higher altitudes (600–2,000 metres above sea level), requires specific temperature ranges of 18–24°C, and is notably sensitive to heat and climate variability. Robusta (approximately 40 per cent of global production) tolerates warmer temperatures and lower altitudes, has a stronger, more bitter flavour, and higher caffeine content. It is widely cultivated in Vietnam, Uganda, and parts of West Africa.

Coffee is typically grown as a perennial shrub or small tree, often under the shade of larger canopy trees. This practice is known as agroforestry or shade-grown production. Shade trees moderate temperatures, conserve soil moisture, provide habitat for biodiversity, and can significantly enhance on-farm carbon sequestration, as both the coffee plants and shade trees bind atmospheric carbon. This makes well-managed coffee agroforestry systems relevant not only for climate adaptation but also for climate mitigation. The crop's cultivation cycle spans several years: seedlings take three to four years to reach their first harvest. Productive lifespans can extend to several decades, which means that climate-related shifts in suitability can have long-lasting consequences for farming households.

Climate Change and Coffee

Climate change poses an existential threat to the coffee sector. Some studies estimate that up to 50 per cent of current growing areas could become unsuitable for coffee production by 2050, owing to rising temperatures and changing rainfall patterns (Bunn et al., 2015; Pham et al., 2019). Increasingly frequent climate shocks like droughts, extreme rainfall events, and shifts in seasonal patterns are contributing to production shortfalls and volatile global prices (Grabs et al., 2026b). Coffee-producing communities report declining yields, increased pest and disease pressure, and the disruption of traditional cultivation cycles (Ponte et al., 2026). In 2025, international coffee prices spiked dramatically due to climate-related production failures in Brazil and Vietnam, underscoring the sector's vulnerability (Grabs et al., 2026b). Arabica coffee is particularly sensitive to temperature change, while Robusta, though more heat-tolerant, is also affected by increasing thermal stress (Kath et al., 2020). This vulnerability is compounded by the fact that optimal growing conditions, such as stable temperatures and well-distributed rainfall are being disrupted by climate change.

Mitigation and Adaptation Actions

Climate change responses are conventionally divided into two complementary strategies: mitigation and adaptation. The United Nations Framework Convention on Climate Change (UNFCCC) defines mitigation as human interventions that reduce the sources, or enhance the sinks, of greenhouse gases. Examples in the coffee sector include carbon footprinting of supply chains, carbon insetting (funding emissions reductions within one's own value chain), reducing deforestation, and investing in shade-tree systems that sequester carbon.

Adaptation, by contrast, refers to adjustments in natural or human systems in response to actual or expected climatic changes and their effects, with the aim of moderating harm or seizing beneficial opportunities (UNFCCC). In agriculture, adaptation means changing practices, crop varieties, or farming systems to cope with shifting temperatures, erratic rainfall, or new pest pressures. Common on-farm adaptation measures include shade tree planting, soil management, water conservation, and adopting disease-resistant varieties (Grabs et al., 2026a; Ponte et al., 2026).

Intervention in the Coffee Sector

Responses to climate change in coffee span mitigation and adaptation, but they are unevenly distributed and often misaligned with producer needs. A novel database of 160 climate-focused interventions in the global coffee sector found that the overwhelming majority (149 out of 160) include an adaptation component, while only 11 are purely mitigation-focused (Grabs et al., 2026a). However, corporate actors, particularly trading companies and roasters, are disproportionately investing in mitigation activities such as carbon footprinting, carbon insetting, and net-zero target reporting, driven more by financial incentives and client demands than by risk mitigation (Grabs et al., 2026b). Farmers themselves, on the other hand, overwhelmingly prioritise livelihood resilience over sectoral resilience: they value diversification, alternative income sources, and pragmatic adjustments more than interventions focused solely on maintaining coffee production (Grabs et al., 2026a). There is a fundamental tension between interventions designed to ensure the continued supply of coffee for global markets and those that genuinely strengthen farmers' capacity to navigate an uncertain future (Grabs et al., 2026a). Figure 1 illustrates how resilience can be understood at different scales, from global commodity flows down to individual households.

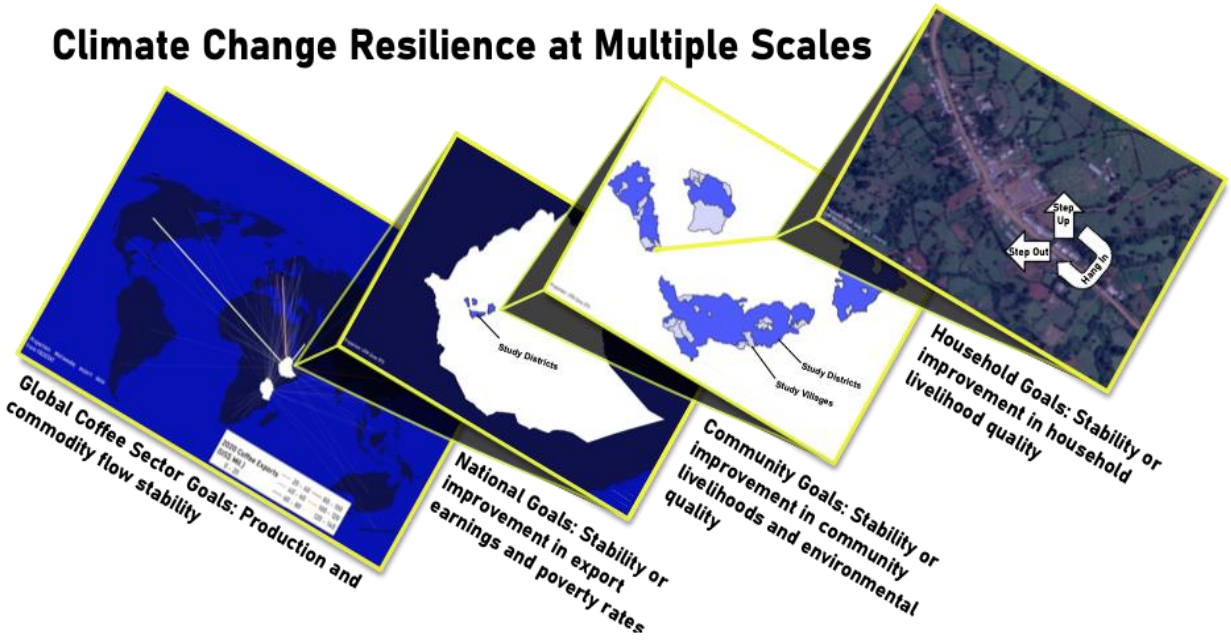


Figure 1: Climate change resilience can have different goals at multiple analytical scales

Source: *Grabs et al. (2026a)*

Country Background: Tanzania

National Sector Organisation

Tanzania produces both Arabica and Robusta coffee on an estimated 265,000 hectares, supporting over 450,000 smallholder farming households who account for roughly 90 per cent of production (TCB, 2017). Coffee plot sizes average 0.5–1.0 hectares in the northern zone and 2–3 hectares in the southern zone. An additional 2.4 million people are indirectly employed in the sector, which generates approximately US$100 million in annual export revenue, around 5% of total exports (Grabs et al., 2026a). Robusta production is concentrated in the northwest Kagera region, while Arabica is more widely distributed, with key production districts including Mbozi (Songwe region), Mbinga (Ruvuma region), and Rombo (Kilimanjaro region). Japan is the leading export destination by volume, followed by Italy and Germany (Ponte et al., 2026).

Country-Level Policy and Market Governance

Tanzania's coffee sector has undergone sweeping regulatory changes over three decades. Before 1993, all coffee passed through cooperative unions to an auction in Moshi, providing price stability at the expense of high overhead costs and delayed payments to farmers (Ponte et al., 2026). The 1993 Crop Boards Act opened the market to private traders, and the Tanzania Coffee Board (TCB) retained licensing and quality control functions. Market liberalisation led to faster cash payments to farmers but also to the collapse of input-credit schemes and the dramatic dominance of foreign companies across the value chain (Ponte et al., 2026). By the early 2000s, large exporters had vertically integrated into domestic trade, processing, and estate production. A mandatory auction was maintained, but most coffee was "captive" — re-acquired by the same company that purchased it domestically.

From 2018/19 onwards, a key reform allowed only Agricultural Marketing Cooperatives (AMCOs) to purchase coffee from farmers, aiming to improve smallholder bargaining power. In practice, however, many AMCOs lack the financial capacity to buy independently and must rely on credit from the same traders the reform was intended to counterbalance. Meanwhile, the export channel has shifted toward direct exports, with only 30% of exports going via auction by 2022/23 (Ponte et al., 2026). The Coffee Industry Development Strategy (CIDS 2021–2025) set ambitious targets to increase production from 68,000 MT to 300,000 MT and raise the share of high-quality coffee from 40% to 70%, but these targets are widely seen as unrealistic (Grabs et al., 2026a).

Regional Climate Change Trends and Experiences

Climate change is profoundly reshaping the geography of coffee production in Tanzania. Arabica production in the traditional northern heartlands, Kilimanjaro and Arusha, has significantly declined due to lower and more erratic rainfall, rising temperatures, and reduced water availability for traditional furrow irrigation (Ponte et al., 2026). Farmers in these areas report switching from coffee to more profitable crops such as bananas, avocados, and vegetables, or

leaving agriculture entirely. Young people increasingly prefer alternative livelihoods like motorbike transport or small businesses. Meanwhile, coffee production has expanded in the Southern Highlands and Western Tanzania, where land availability is greater, competition from alternative crops is lower, and rainfall change has been less pronounced (Ponte et al., 2026).

Detailed climate analyses of Tanzania's emerging production areas reveal concerning trajectories. A study of the Mbinga district (Figure 2), which is now one of Tanzania's leading Arabica-producing areas and central to hopes for expanded production, found that both minimum and maximum temperatures and vapour pressure deficit (VPD) during critical flowering and growing seasons are projected to increase significantly across all elevation zones over the coming decades under both moderate and high emission scenarios (Kasongi et al., 2024). Mean annual temperatures across elevation zones in Mbinga are projected to surpass the optimal temperature envelope for quality Arabica production (23°C), challenging the common assumption that highland areas can serve as a long-term refuge for coffee production. VPD levels in the lowlands are projected to exceed optimal thresholds for Arabica productivity from the mid-2020s, with midland areas following from the 2040s onward; only the highlands are projected to remain within optimal VPD bounds through the 2060s, though rising temperatures make even this prospect uncertain in the longer term (Kasongi et al., 2024).

The capacity to respond to these pressures remains limited. Across study regions, 39 per cent of Tanzanian survey respondents had experienced some form of coffee-related training in the previous five years, primarily from local institutions, a considerably lower share than their Ethiopian counterparts. Only 0.4 per cent of Tanzanian respondents reported receiving training from coffee buyers (Grabs et al., 2026a).

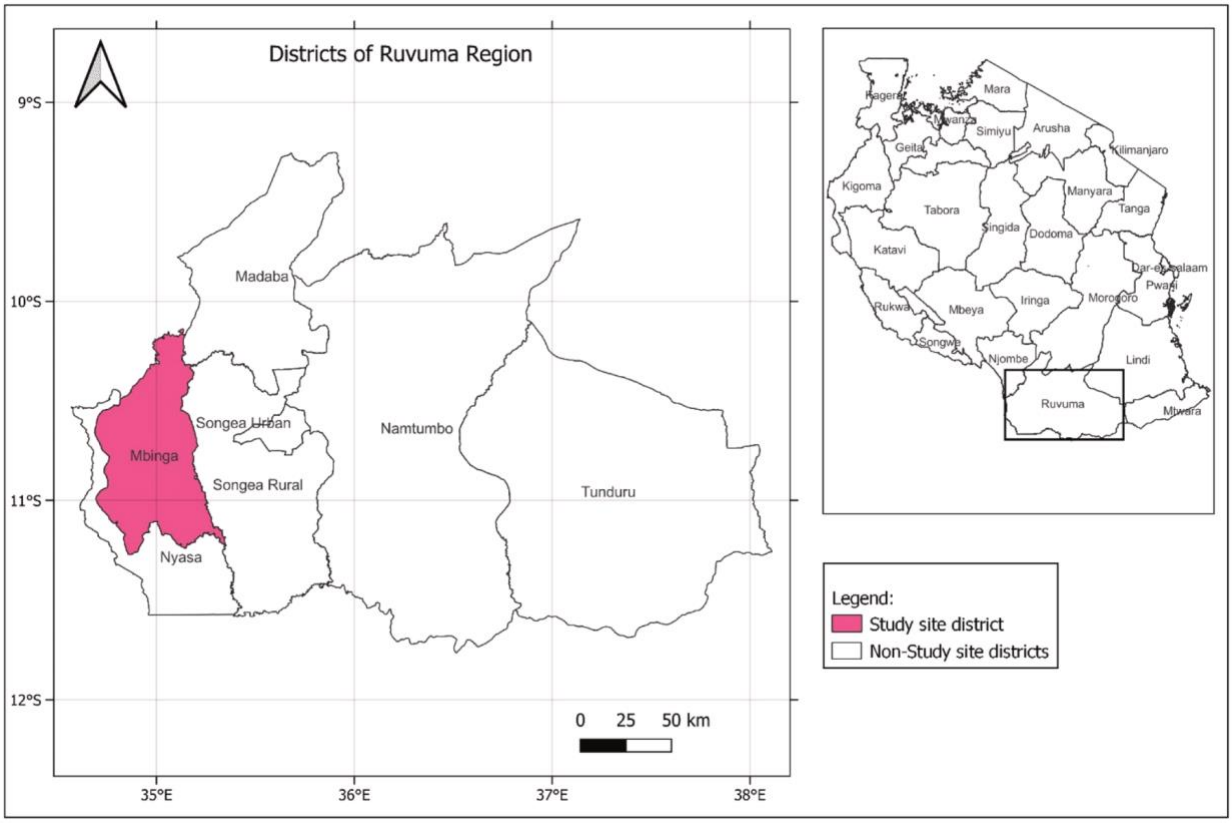


Figure 2: The geographical location of the study area.

Source: *Kasongi et al. (2024)*

Country Background: Ethiopia

National Sector Organisation

Ethiopia is the birthplace of Arabica coffee and the world's fifth-largest producer, accounting for approximately 4.5% of global production (ICO, 2023). Coffee is the country's dominant export and the primary source of foreign currency. Over 6 million smallholder farmers cultivate coffee in Ethiopia, and an estimated 15 million people — more than 20 per cent of the economically active population — are employed in the sector (Tefera, 2022). Unlike most producing countries, approximately 50–55 per cent of Ethiopia's coffee production is consumed domestically, reflecting the crop's deep cultural significance (Grabs et al., 2026a). Ethiopia is also the centre of global Arabica coffee genetic diversity, making the protection of its coffee variety biodiversity a priority for both national and international actors (Grabs et al., 2026a).

Country-Level Policy and Market Governance

Ethiopia developed a Climate Resilient Green Economy (CRGE) strategy in 2011 and a Climate Adaptation Plan (CAP) in 2019. The CRGE aspires to enhance climate resilience, reduce greenhouse gas emissions from 2010 levels, and make Ethiopia a middle-income country. However, neither the CRGE nor the CAP contains a coffee-specific climate change adaptation and mitigation strategy (Grabs et al., 2026a). The recently released comprehensive Ethiopian Coffee Strategy (2019–2033) intends to boost exports of high-quality, climate-friendly coffee and improve farmer incomes.

The EUDR represents an additional regulatory pressure: given that coffee is disproportionately grown in conservation-priority areas and that shade-grown coffee systems are particularly susceptible to remote sensing misclassification, Ethiopian smallholders face heightened risks of market exclusion due to classification errors (Gallemore et al., 2025). A local-scale modelling study of southwestern Ethiopia found that projected suitable coffee areas by the 2090s overlap substantially with forested highlands, raising serious concerns about the commercial viability of these future production zones under EUDR regulations (Mamuye et al., 2025).

Regional Climate Change Trends and Experiences

Climate change is directly felt by Ethiopian coffee communities. Among surveyed farmers in southwest Ethiopia, 68% had received some form of coffee-related training, primarily from government institutions. However, training focused on climate change specifically remains limited. Farmers report changing rain and temperature patterns, increased incidence of coffee diseases and pests, and in some areas, hailstorms. Soil management and restoration practices are adopted by 72% of southwestern Ethiopian survey respondents, and agroforestry and shade tree planting are deeply embedded in Ethiopian coffee culture (Grabs et al., 2026a). Ethiopian farmers also show higher rates of adoption of resistant varieties (over 40 per cent) compared to Tanzanian counterparts (Grabs et al., 2026a).

High- and mid-altitude areas of Ale, Gera, and Goma are already experiencing rainfall conditions outside the optimal ranges for coffee production, meaning that even areas historically considered climatically suitable are under pressure (Mamuye et al., 2024). Looking ahead, climate change is driving a spatial reorganisation of coffee production in Ethiopia: rising temperatures are rendering lowland areas increasingly unsuitable, shifting cultivation pressure toward highland zones. However, highland areas face their own challenges, including increased population density, restricted land tenure systems that limit farmers' ability to relocate, and growing competition from other crops and land uses (Megerssa et al., 2025a). The expansion of khat, eucalyptus, and other commercially attractive crops into former coffee-growing areas represents a significant trend, as farmers facing reduced coffee viability and income seek more climate-resilient or economically rewarding alternatives (Megerssa et al., 2025a). The rising incidence of coffee berry disease (CBD) and coffee wilt disease (CWD), which are exacerbated by changing climatic conditions, further threatens sector productivity (Megerssa et al., 2025a).

References

Bunn, C., Läderach, P., Rivera, O.O., & Kirschke, D. (2015). A bitter cup: climate change profile of global production of Arabica and Robusta coffee. Climatic Change, 129(1–2), 89–101. https://doi.org/10.1007/s10584-014-1306-x

Gallemore, C., Gezahegn Berecha, A., Eneyew, A., Grabs, J., Jespersen, K., Kasongi, N., M., Mamuye, M., Maskell, G., Mathe, A., Mwalutolo, D., Niehues, I., Terry, S., & Yamungu, N. (2025). Avoiding access inequity due to classification errors in zero-deforestation value chains: Coffee and the European Union Deforestation Regulation. Land Use Policy, 157, 107609. https://doi.org/10.1016/j.landusepol.2025.107609

Grabs, J., Berecha Yadessa, G., Castellón Durán, M., Eneyew Bekele, A., Gallemore, C., Garedew Terefe, W., Gure Lemessa, S., Hailemariam Mamo, M., Kasongi, N. D., Mamuye Kebede, M., Mwalutolo, D. A., Niehues, I., Noe, C., Ponte, S., Regasa Megerssa, G., Silvano, P., Yamungu, N., & Jespersen, K. (2026a). Resilience of what and for whom? Climate change mitigation and adaptation in the global, Ethiopian, and Tanzanian coffee sectors. World Development, 200, 107299. https://doi.org/10.1016/j.worlddev.2025.107299

Grabs, J., Ponte, S., & Castellón Durán, M. (2026b). The business of climate change: Changing sources of green capital accumulation in the coffee sector. New Political Economy. Advance online publication. https://doi.org/10.1080/13563467.2026.2614691

ICO. (2023). Total production by all exporting countries. International Coffee Organization. http://www.ico.org/historical/1990%20onwards/Excel/1a%20Total%20production.xlsx

Kasongi, N., Yamungu, N., Gallemore, C., & Jespersen, K. (2024). Projected rising temperatures and vapour pressure deficit threaten Arabica coffee production in Tanzania's burgeoning coffee region: Empirical insight from Mbinga District, Tanzania. Environmental Challenges, 16, 100974. https://doi.org/10.1016/j.envc.2024.100974

Kath, J., Byrareddy, V. M., Craparo, A., Nguyen-Huy, T., Mushtaq, S., Cao, L., & Bossolasco, L. (2020). Not so robust: Robusta coffee production is highly sensitive to temperature. Global Change Biology, 26(6), 3677–3688. https://doi.org/10.1111/gcb.15097

Mamuye, M., Gallemore, C. T., Jespersen, K., Kasongi, N., & Berecha, G. (2024). Changing rainfall and temperature trends and variability at different spatiotemporal scales threaten coffee production in certain elevations. Environmental Challenges, 15, 100950. https://doi.org/10.1016/j.envc.2024.100950

Mamuye, M., Gallemore, C., Kasongi, N., Jespersen, K., & Berecha, G. (2025). Local-scale analysis of projected climate change impact on Arabica coffee distribution in selected districts of southwestern Ethiopia: Are the future production areas commercially viable? Ecological Informatics, 91, 103392. https://doi.org/10.1016/j.ecoinf.2025.103392

Megerssa, G. R., Garedew, W., Jespersen, K., Grabs, J., & Bekele, A. E. (2025a). Impact of climate change on Ethiopian Arabica coffee production and current challenges it poses to coffee value chain. Sustainable Futures, 10, 101459. https://doi.org/10.1016/j.sftr.2025.101459

Pham, Y., Reardon-Smith, K., Mushtaq, S., & Cockfield, G. (2019). The impact of climate change and variability on coffee production: a systematic review. Climatic Change, 156(4), 609–630. https://doi.org/10.1007/s10584-019-02538-y

Ponte, S., Silvano, P., Kasongi, N., Grabs, J., & Mwalutolo, D. (2026). Power and governance in value chains: How climate change and domestic regulation are reshaping the Tanzanian coffee industry. The European Journal of Development Research, in press.

Rushton, D. (2019). Map of the month: Bringing smallholder coffee farmers out of poverty. Carto, 5 December. https://carto.com/blog/enveritas-coffee-poverty-visualization

TCB. (2017). Report of the Midterm Evaluation of the Tanzanian Coffee Industry Development Strategy 2011–2021. Bureau of Agricultural Consultancy and Advisory Service Sokoine University of Agriculture.

Tefera, A. (2022). Coffee Annual—Ethiopia. United States Department of Agriculture, Foreign Agricultural Service.

CASE STUDY 1: GLOBAL COFFEE ROASTER

The Sourcing Dilemma at NordRoast AG

Sarah Hoffmann has spent the last eleven years thinking about where coffee comes from. As Head of Sustainable Sourcing at NordRoast AG, a mid-sized specialty roaster based in Hamburg, Germany, that question has never felt more urgent or more difficult to answer. NordRoast was founded in 1987 and has grown steadily into one of Germany's more recognisable specialty roasters, with distribution across twelve European markets. The company sources from fourteen origins. Ethiopia and Tanzania together account for nearly 40 per cent of its green bean volume, a concentration that reflects both the quality of East African Arabica and the difficulty of replicating those flavour profiles elsewhere.

The past three years have been a reckoning for the European specialty coffee industry. In 2025, a combination of drought in Brazil and erratic rainfall in Vietnam sent global coffee prices to their highest level in decades, exposing the fragility of supply chains that most industry peers had quietly assumed were stable. For NordRoast, the immediate impact was manageable. Long-term sourcing relationships and a modest inventory buffer absorbed most of the shock. But the message is unmistakable: climate change is no longer a future risk to be managed in the next strategic planning cycle. It is here.

At the same time, the regulatory environment has shifted. The EU Deforestation Regulation now requires NordRoast to verify that its coffee has not been sourced from recently deforested land, a requirement that has proven far more complex to implement than it initially appeared, particularly for smallholder suppliers in Ethiopia.

Since the private equity round eighteen months ago, the pressure has taken on a different quality. The new shareholders ask about Scope 3 emissions in the same breath as EBITDA margins. Sarah has been given a deadline: a credible net-zero commitment by the end of the quarter. This is now a business requirement, not a values statement.

Sarah has read the research. She knows that up to 50 per cent of current coffee-growing areas could become unsuitable by 2050 (Bunn et al., 2015; Pham et al., 2019). In Tanzania, Mbinga has grown in significance precisely because conditions in Kilimanjaro and Arusha have deteriorated. Now it too faces a worsening climate trajectory, with temperatures and vapour pressure deficit levels already approaching critical thresholds for Arabica production (Kasongi et al., 2024). In Ethiopia, the picture is more complex: the country remains the genetic heartland of Arabica, but production is shifting geographically as lowland areas become less suitable and highland zones come under increasing pressure (Regasa Megerssa et al., 2025a).

What she does not know is what NordRoast should actually do about it.

The pressure comes from every direction simultaneously. Investors want a net-zero commitment. Retail partners want certified sourcing (preferably Rainforest Alliance) because their sustainability teams have already built it into supplier scorecards. NGO partners, who have been running farmer training programmes in NordRoast's sourcing origins for years, keep reminding Sarah that what farmers actually need is income stability and adaptation support, not another audit. And the procurement team keeps warning that any additional compliance cost imposed on suppliers will either be absorbed by farmers (who can least afford it) or passed back as higher green bean prices. Sarah has until the end of the quarter to bring a recommendation to the board and has spent the past several weeks working through the possibilities. She has narrowed it down to three options.

Option A: Pursue a Net-Zero Strategy

The first option is to pursue a full net-zero strategy. This would mean commissioning an independent carbon footprint audit of the entire supply chain (from farm to roastery) and setting science-based targets for emissions reductions across Scopes 1, 2, and 3. The most meaningful lever on Scope 3 would be carbon insetting: funding on-farm mitigation projects in Ethiopia and Tanzania, such as shade tree planting and soil carbon programmes, designed to reduce emissions while supporting farmer resilience. The approach would require real financial commitment and a long time horizon. Whether that investment would ultimately serve the farmers as much as it serves NordRoast's climate commitments is a question Sarah has not yet been able to answer to her own satisfaction.

Option B: Join a Coffee-Climate Coalition

The second option is to join an industry-wide climate coalition. One established model is the initiative for coffee&climate (c&c), a multi-stakeholder platform supporting climate adaptation in coffee-producing regions. Several NordRoast peers, including two larger roasters and a major trading company, are already in discussions about participating. The model offers shared data, pooled resources, and the possibility of harmonising reporting standards to reduce the compliance burden on shared suppliers. Sarah is not yet convinced that the interests around the table are sufficiently aligned to produce meaningful outcomes, but she has not ruled it out.

Option C: Commit to 100% Certified Sourcing

The third option is to mandate 100 per cent certified sourcing, specifically to require Rainforest Alliance certification for all suppliers within three years. This is the most straightforward option to explain to the board and to retail partners: certification provides a recognised, auditable standard and would signal unambiguously that NordRoast takes responsible sourcing seriously. What gives Sarah pause is whether certification actually delivers the climate resilience outcomes she needs to credibly defend, or whether it is, as her NGO partners keep telling her, primarily a compliance mechanism that shifts costs onto the suppliers least able to absorb them (Grabs et al., 2026b). Furthermore, it seems quite clear that while certification might help, it is unlikely to be sufficient to comply with the EU Deforestation Regulation.

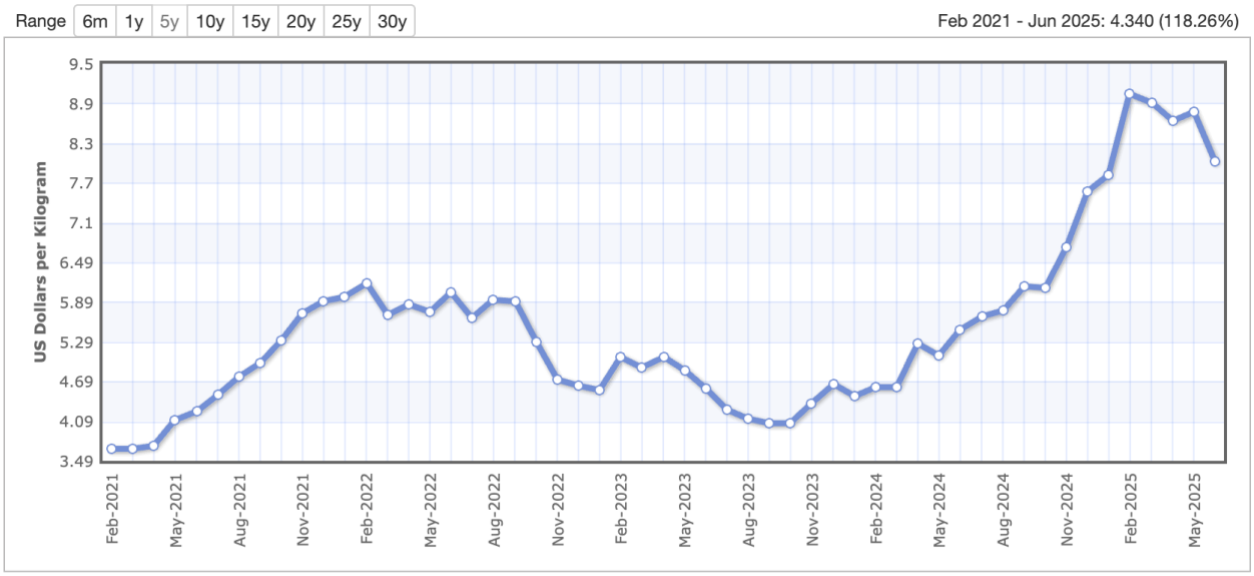
This case was prepared as part of the PACSMAC research project for educational purposes. All company names and individual characters are fictional.

PREPARATION QUESTIONS

1. Choose one option. Why is it the right one for NordRoast and why should the board approve it?
2. What is the weakest point of your chosen option, and how will you defend it when the cooperatives, national authorities, and NGO push back?
3. Climate action costs money and effort. Who pays under your option, and is that fair?

EXHIBITS

Exhibit A. *Green Arabica coffee prices in historic comparison*

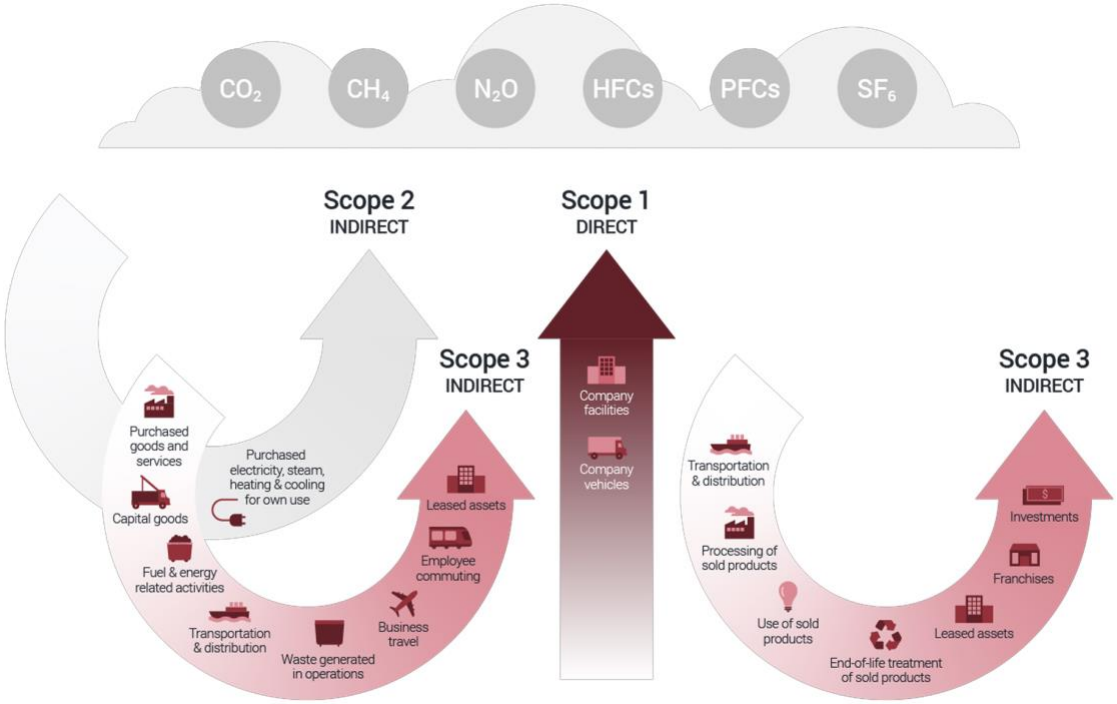


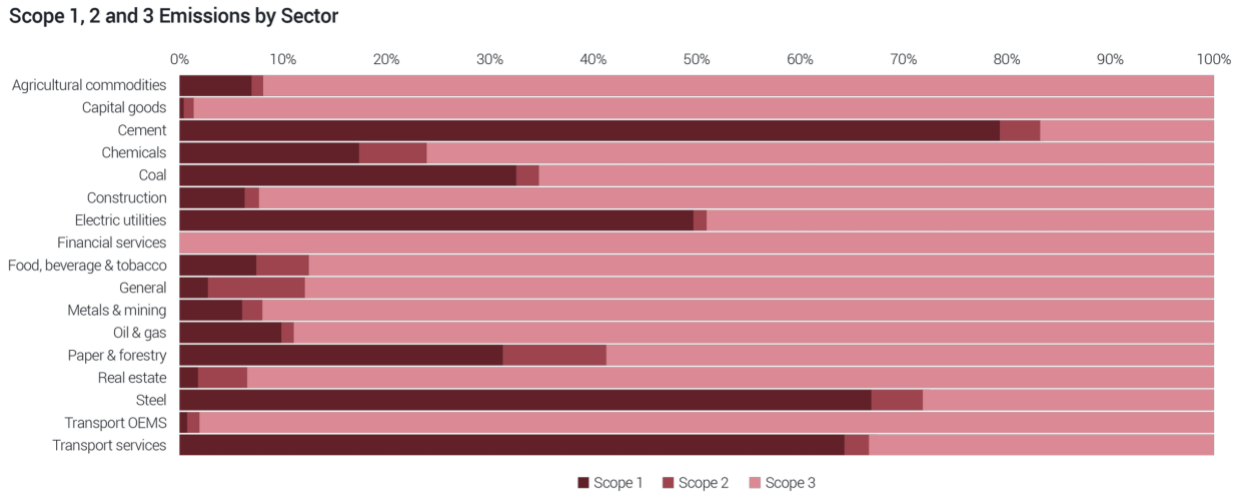
Description: Coffee (ICO), International Coffee Organization indicator price, other mild Arabicas, average New York and Bremen/Hamburg markets, ex-dock

Unit: US Dollars per Kilogram

Source: *IndexMundi*

Exhibit B. *Scope 1, 2, and 3 emissions and their relative relevance*





Source: *CDP*

FURTHER READING AND RESOURCES

CDP (2024). CDP Technical Note: Relevance of Scope 3 Categories by Sector. https://cdn.cdp.net/cdp-production/cms/guidance_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf?1649687608

Bunn, C., Läderach, P., Rivera, O. O., & Kirschke, D. (2015). A bitter cup: Climate change profile of global production of Arabica and Robusta coffee. Climatic Change, 129(1–2), 89–101. https://doi.org/10.1007/s10584-014-1306-x

Greenhouse Gas Protocol: Agricultural guidance: https://ghgprotocol.org/agriculture-guidance and Land Sector and Removals Standard: https://ghgprotocol.org/land-sector-and-removals-standard

IndexMundi: https://www.indexmundi.com/commodities/?commodity=other-mild-arabicas-coffee&months=60

Initiative for Coffee & Climate: https://coffeeandclimate.org/

Kasongi, N., Yamungu, N., Gallemore, C., & Jespersen, K. (2024). Projected rising temperatures and vapour pressure deficit threaten Arabica coffee production in Tanzania's burgeoning coffee region: Empirical insight from Mbinga district, Tanzania. Environmental Challenges, 16, 100974. https://doi.org/10.1016/j.envc.2024.100974

Pham, Y., Reardon-Smith, K., Mushtaq, S., & Cockfield, G. (2019). The impact of climate change and variability on coffee production: A systematic review. Climatic Change, 156(4), 609–630. https://doi.org/10.1007/s10584-019-02538-y

Rainforest Alliance Certification Program: https://www.rainforest-alliance.org/for-business/certification/

Regasa Megerssa, G., Garedew, W., Jespersen, K. Grabs, J., Eneyew Bekele, A. (2025a). The impact of climate change on Ethiopian Arabica coffee production and current challenges it poses to the coffee value chain. Sustainable Futures, 10, 101459

CASE STUDY 2A: NATIONAL COFFEE AUTHORITY ETHIOPIA

The Strategy Gap at the Ethiopian Coffee and Tea Authority

Dr. Tigist Alemu has spent her career in agricultural policy. As Senior Adviser on Climate and Sustainability at the Ethiopian Coffee and Tea Authority in Addis Ababa, she has watched climate change move from the margins of the policy conversation to its centre, and she is not convinced the institutions around her have kept pace.

Coffee is not simply an export commodity in Ethiopia. It is the country's dominant source of foreign exchange, a cornerstone of rural livelihoods for over 15 million people, and a crop whose origins are Ethiopian in the most literal sense. Wild Arabica still grows in the forest systems of Kaffa, the genetic heritage of every cup of coffee consumed anywhere in the world. The ECTA's mandate is to develop, regulate, and promote the sector. Tigist's job, more specifically, is to ensure that mandate survives a changing climate.

It is a harder job than it sounds. Ethiopia has national climate commitments; namely, the Climate Resilient Green Economy strategy and the Country Adaptation Plan, but neither contains a coffee-specific climate strategy. The Ethiopian Coffee Strategy runs to 2033 and sets ambitious targets for production volumes and export revenues. What it does not contain is a serious reckoning with how climate change will affect the geography of coffee production over that same period. Tigist has been trying to insert that reckoning into the policy conversation for three years. She has not yet succeeded.

The research is unambiguous in its direction if not always in its specifics. Production is shifting. Lowland areas that have historically supported coffee farming are becoming less suitable as temperatures rise and rainfall patterns grow less predictable. Highland areas, where conditions remain more favorable, are coming under pressure from population growth, land tenure complexity, and competing land uses. The picture is not uniform. Some highland districts show relatively stable suitability projections well into the century (Mamuye et al. 2025), but the overall trajectory is one of geographic contraction and increasing variability (Mamuye et al. 2024). At the same time, the EU Deforestation Regulation is creating new compliance pressure on shade-grown systems that are among the most ecologically significant coffee landscapes on earth, adding a regulatory dimension to what is already a complex production challenge (Gallemore et al., 2025).

What makes Tigist's position particularly difficult is not the science. It is the politics. Coffee generates foreign exchange that the Ethiopian state depends on. Any signal that coffee's long-term viability is in question risks undermining investor confidence, destabilizing rural communities, and handing ammunition to those who would argue that Ethiopia's climate commitments are incompatible with its development ambitions. Tigist does not believe that, but she understands

why the argument has force, and she has sat across the table from enough senior officials to know that nuance does not always survive a budget meeting.

There is one more complication she cannot ignore. In the districts where coffee suitability is declining most rapidly, farmers are not waiting for policy guidance. They are already diversifying by shifting land toward khat, eucalyptus, and other crops that offer more reliable returns under changing conditions (Regasa Megerssa et al., 2025a). Policy, in other words, may already be behind farmer behavior rather than ahead of it. Tigist finds this both reassuring and unsettling: reassuring because it suggests farmers are adapting; unsettling because it raises the question of whether the ECTA's role is to lead the sector or to follow it.

She has been asked to present a strategic recommendation to the ECTA's senior leadership next month and has been working towards it for weeks. It has not simplified with time. The two directions her analysis keeps returning to point in very different ways.

Option A: Double Down on Coffee

The first option is to intensify Ethiopia's support for coffee as its primary export crop. This would mean expanding extension services, accelerating the distribution of climate-resistant varieties, investing in processing infrastructure to improve quality and consistency, and developing a coffee-specific climate adaptation strategy within the existing Ethiopian Coffee Strategy framework. It would also mean pursuing premium market positioning by building Ethiopia's reputation for exceptional single-origin Arabica in specialty markets where quality commands significantly higher prices per kilogram, reducing Ethiopia's dependence on volume-based export revenues.

That premium positioning strategy, however, carries a complication Tigist has been watching closely. The EU Deforestation Regulation requires importers to verify that coffee has not been sourced from recently deforested land, a requirement that is proving particularly difficult to implement for shade-grown systems in Ethiopia's forest coffee landscapes, where remote sensing tools frequently misclassify biodiverse agroforestry as forest, placing any production from those areas off-limits. The same forest systems that are central to Ethiopia's premium identity are now facing regulatory scrutiny that could restrict their market access precisely at the moment Ethiopia is trying to position them as its competitive advantage. The risk Tigist cannot dismiss is that doubling down locks Ethiopia into dependence on a crop whose climate suitability is contracting in the regions that need economic alternatives most urgently.

Option B: Explore Crop and Livelihood Diversification

The second option is to begin piloting diversification programmes in the lowland districts where coffee suitability is declining most rapidly. This would not mean abandoning coffee — the highland regions where production remains viable would continue to receive full support — but it would mean acknowledging formally that coffee is not the right long-term answer for every farming household in every district, and beginning to build the policy infrastructure for alternatives. Spices, horticulture, and agroforestry systems that incorporate non-coffee crops have

shown promise in some contexts and would build on existing farming knowledge without requiring complete livelihood restructuring (Megerssa et al., 2025a).

The political risk is significant. Any official signal that Ethiopia is hedging on coffee invites difficult questions about export revenue projections, rural employment, and the coherence of the national agricultural strategy. Trading partners and international buyers who have invested in Ethiopian supply chains would want reassurance. And within the ECTA itself, there is institutional resistance to any framing that positions coffee as a declining asset rather than a strategic one.

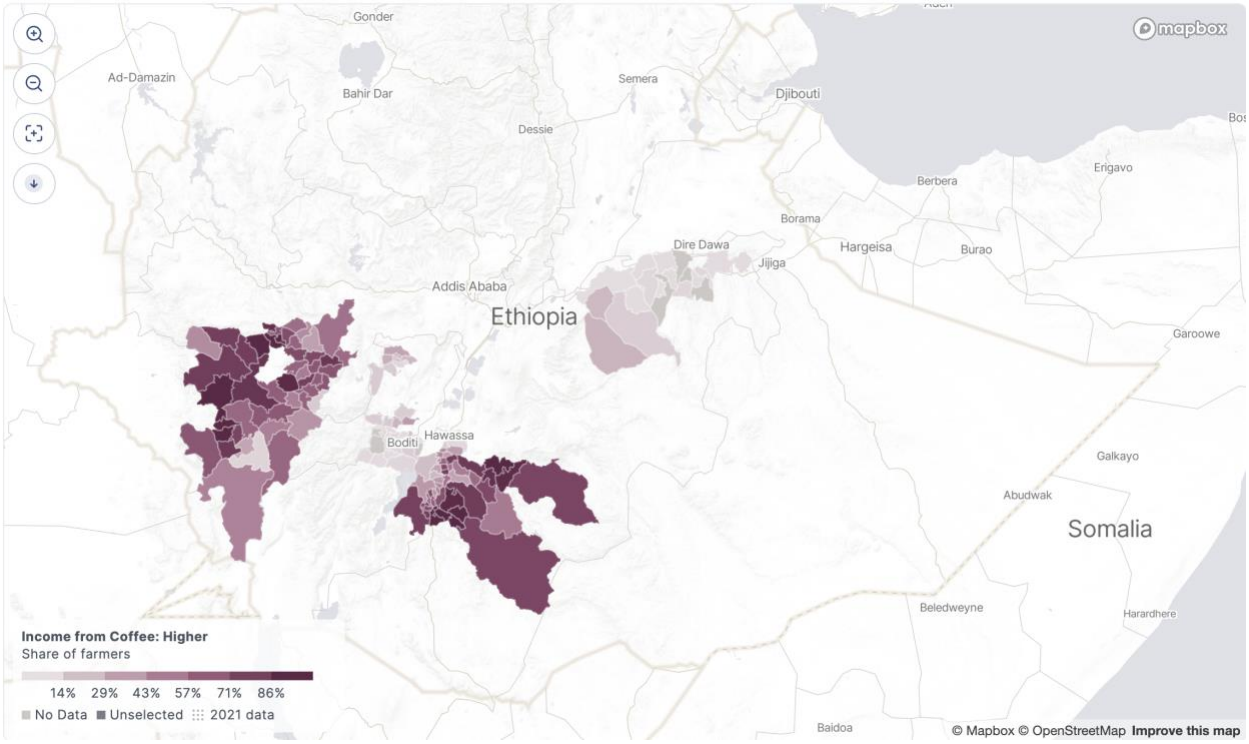
This case was prepared as part of the PACSMAC research project for educational purposes. All individual characters are fictional. The Ethiopian Coffee and Tea Authority is a real institution, referenced here for educational purposes only.

PREPARATION QUESTIONS

1. Choose one option. Why is it the right strategic choice for Ethiopia? And what would you say to a farming household in a declining lowland district that asks what it means for them?
2. Farmers in declining regions are already diversifying without waiting for policy guidance. Does your chosen option lead farmer behaviour, follow it, or ignore it?
3. Ethiopia's coffee sector generates foreign exchange the state depends on. At what point does climate risk become large enough to justify a policy shift that accepts short-term economic costs?

EXHIBITS

Exhibit A. *Ethiopian coffee map — proportion of income from coffee*



Source: *Enveritas/Here We Grow. Find and use the interactive version at: https://ethiopia-sustainability.enveritas.org/*

Exhibit B. *Projected climate-related changes to coffee suitability in Southwestern Ethiopia (extract)*

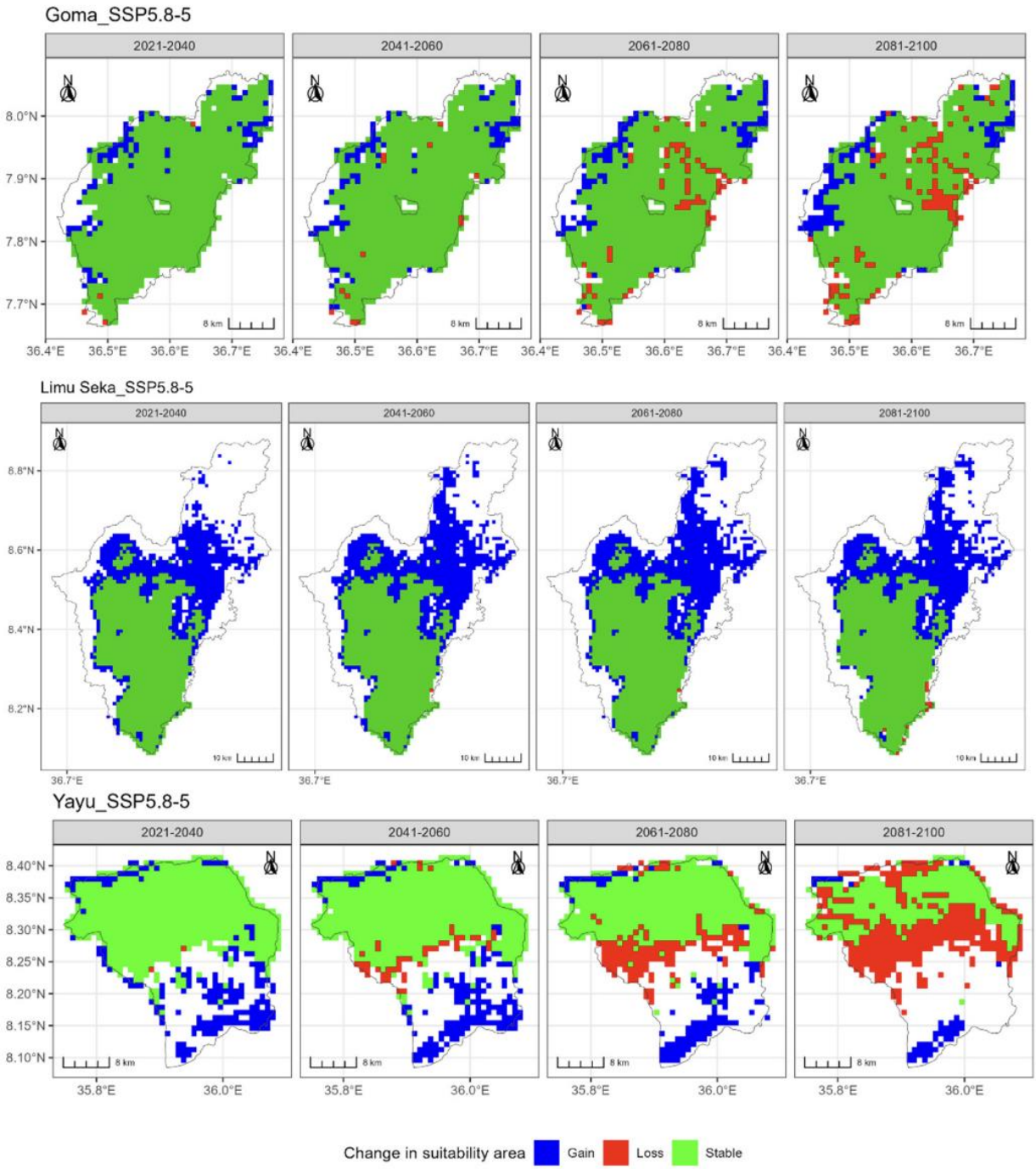


Fig. 8. Projected changes (gains, losses, and stable) in the suitable areas for coffee growth under the SSP585 scenario.

Source: *Mamuye et al. (2025). Review Figure 8 in the paper for all analyzed subregions.*

FURTHER READING AND RESOURCES

ECTA (2019). Comprehensive Ethiopian Coffee Strategy, 2019 to 2033. Executive Summary.

Gallemore, C., Berecha, G., Eneyew, A., Grabs, J., Jespersen, K., Kasongi, N. 'gwinamila, Mamuye, M., Maskell, G., Mathe, A., Mwalutolo, D., Niehues, I., Terry, S., & Yamungu, N. (2025). Avoiding access inequity due to classification errors in zero-deforestation value chains: Coffee and the European Union Deforestation Regulation. Land Use Policy, 157, 107609. https://doi.org/10.1016/j.landusepol.2025.107609

Mamuye, M., Gallemore, C., Jespersen, K., Kasongi, N., & Berecha, G. (2024). Changing rainfall and temperature trends and variability at different spatiotemporal scales threaten coffee production in certain elevations. Environmental Challenges, 15, 100950. https://doi.org/10.1016/j.envc.2024.100950

Mamuye, M., Gallemore, C., Kasongi, N., Jespersen, K., & Berecha, G. (2025). Local-scale analysis of projected climate change impact on Arabica coffee distribution in selected districts of southwestern Ethiopia: Are the future production areas commercially viable? Ecological Informatics, 91, 103392. https://doi.org/10.1016/j.ecoinf.2025.103392

Regasa Megerssa, G., Garedew, W., Jespersen, K. Grabs, J., Eneyew Bekele, A. (2025a). The impact of climate change on Ethiopian Arabica coffee production and current challenges it poses to the coffee value chain. Sustainable Futures, 10, 101459. https://doi.org/10.1016/j.sftr.2025.101459

Regasa Megerssa, G., Eneyew Bekele, A., Grabs, J., Garedew, W., Jespersen, K. (2025b). How do institutions reshape the resilience of the Ethiopian coffee sector amidst the pressures of climate change? Sustainable Development, early view

CASE STUDY 2B: NATIONAL COFFEE AUTHORITY TANZANIA

Mapping the Future: The Tanzania Coffee Board

James Mwenda has seen the projections. As Head of Climate and Sustainability at the Tanzania Coffee Board (TCB) in Dar es Salaam, he has read the research, attended the regional conferences, and sat through enough presentations about vapour pressure deficit and temperature thresholds to know that the maps his predecessors used to plan Tanzania's coffee sector no longer tell the whole story. Tanzania's coffee sector supports over 450,000 smallholder households. It generates approximately US$100 million in annual export revenue. It is, by any measure, a significant part of the rural economy in the regions where it operates: Kilimanjaro, Arusha, Kagera, and increasingly the Southern Highlands. But the sector's geography is shifting in ways that complicate every planning assumption the TCB currently works with. James has been with the TCB long enough to have watched that shift in his own data. The production figures from Kilimanjaro that he inherited when he joined the board told one story. The figures he works with today tell another.

The shift is already visible. Production in Kilimanjaro and Arusha, historically Tanzania's most productive Arabica regions, has been declining as temperatures rise and conditions deteriorate. Mbinga, in the Southern Highlands, has grown to fill some of that gap, becoming one of the country's most important Arabica origins. The problem, which James finds himself returning to with increasing unease, is that Mbinga's climate trajectory is also worsening. Research on Tanzania's coffee-growing regions suggests that temperatures are projected to exceed optimal thresholds for Arabica production across all elevation zones, with vapour pressure deficit levels in lowland areas already approaching critical limits (Kasongi et al., 2024). The frontier has moved south, but it is not clear how much further south it can move.

Against this backdrop, the TCB is operating under a sector strategy whose targets are out of touch with reality. The Coffee Industry Development Strategy set targets of 300,000 metric tonnes by 2025. Current production is a fraction of that figure. The gap between ambition and output is not simply a function of underinvestment. It reflects structural conditions that investment alone cannot resolve. At the same time, the AMCOS (Agricultural Marketing Cooperative Society) system, which was designed to give smallholder cooperatives a stronger market position, has underperformed. Many AMCOS remain financially dependent on trader credit, which limits their ability to invest in quality upgrades, maintain independence in price negotiations, or absorb increasingly frequent climate-related production shocks.

James has no interest in catastrophism, but he does have considerable interest in getting the planning right. The question he is trying to answer, and that he has been asked to address in a strategic brief to the TCB's board of directors, is not whether climate change is affecting the sector. That debate is settled. The question is what the TCB should do about it, given constrained

resources, political pressure to maintain production volumes, and a set of options, each carrying significant risks. He has identified three.

Option A: Follow the Frontier

The first option is to support the expansion of coffee production into areas of the Southern Highlands and Western Tanzania where rainfall patterns have been less disrupted and where temperatures currently remain within viable ranges. This would mean directing land access support, extension services, and processing infrastructure toward new smallholder entrants in these regions, building productive capacity where conditions are currently more favourable.

The logic is pragmatic: if the geography of viable coffee production is shifting, public investment should shift with it. The concern is whether that logic holds over the planning horizon required for infrastructure investment. Investments made now in infrastructure and extension capacity could become stranded within a generation. James is not opposed to this option, but he is wary of building the sector's future on a frontier that may itself be retreating.

Option B: Deepen What Exists

The second option sets aside the question of production geography and focuses instead on the value that Tanzania's existing farmers capture from the coffee they grow. This would mean reforming the AMCOS system to give cooperatives genuine financial independence from traders, reducing the credit dependency that currently constrains their negotiating power. It would mean investing in cupping and grading infrastructure to qualify Tanzania's best Arabica for specialty and direct trade premiums. And it would mean strengthening the auction system to improve price transparency and ensure that quality is rewarded at the farm level.

The argument for this option is that Tanzania's problem is not only climatic. It is structural. Farmers who receive higher prices for quality coffee have stronger incentives to invest in the practices that protect quality under climate stress. Better-capitalised cooperatives are more resilient to production shocks. The risk is political: the trading companies that currently benefit from AMCOS credit dependency have significant influence, and reform of that system has been attempted before without success.

Option C: Plan for What Is Coming

The third option is the one James finds most intellectually compelling and most politically difficult. It would mean using the available climate research, including the district-level projections from Kasongi et al. (2024), to develop an explicit suitability map for Tanzania's coffee-growing regions, and using that map to guide public investment decisions. Regions with longer-term suitability would receive sustained support. Regions where the climate trajectory is clearly unfavourable would receive transitional support to help farmers shift livelihoods, rather than continued investment in coffee infrastructure that will not be viable in twenty years.

The difficulty is what it requires the TCB to say publicly: that some farming communities whose identity and livelihoods are built around coffee are in regions where that future is closing. No

institution finds that communication easy. No politician finds it convenient. James has not yet found a way to make it palatable, only a way to argue that the alternative, continuing to invest as though the maps have not changed, is worse.

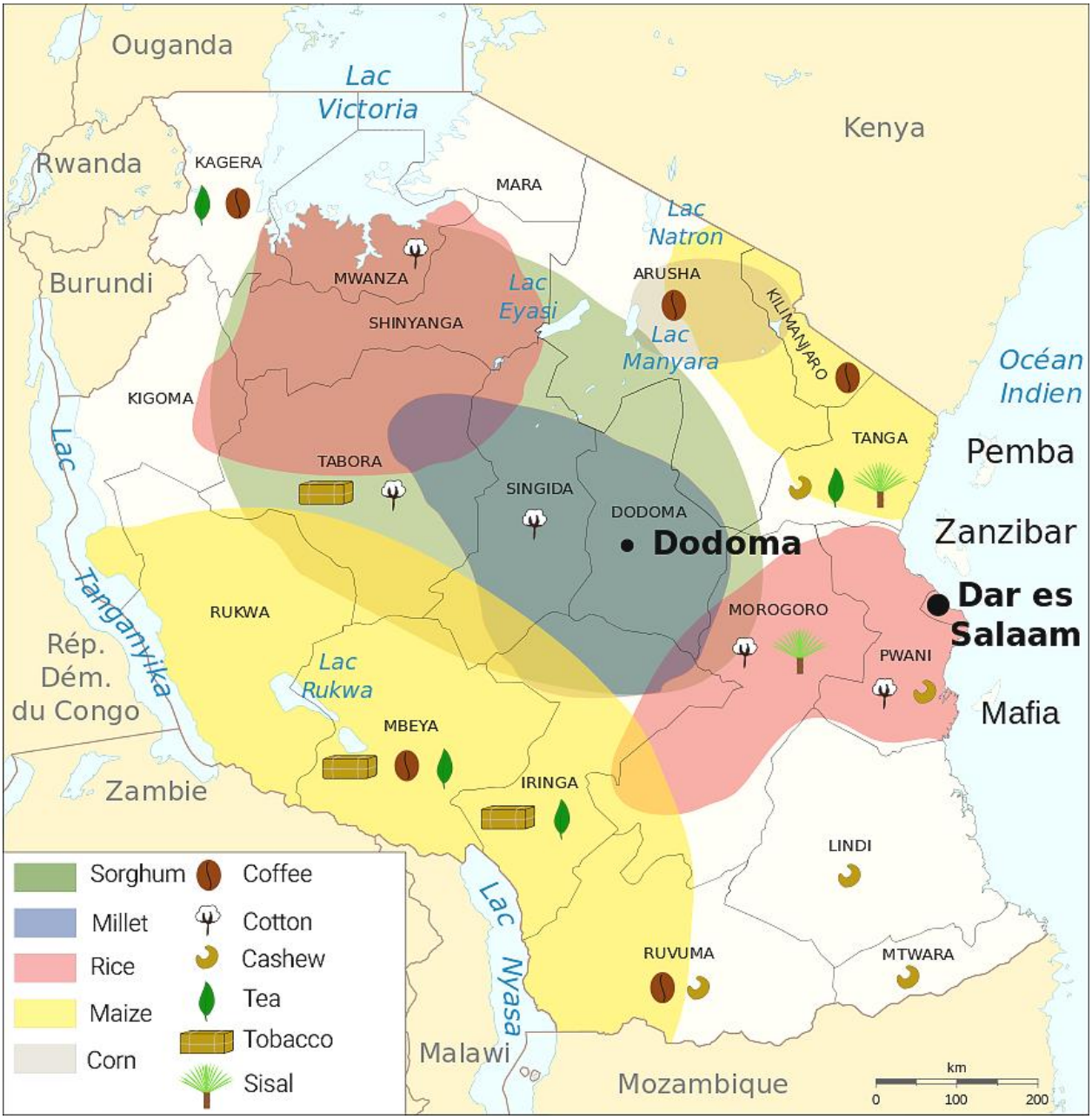
This case was prepared as part of the PACSMAC research project for educational purposes. All individual characters are fictional. The Tanzania Coffee Board is a real institution, referenced here for educational purposes only.

PREPARATION QUESTIONS

1. Choose one option. Why is it the right one for Tanzania's coffee sector, and what does it mean for farmers in regions where the climate trajectory is already unfavourable?
2. Tanzania's production targets have lost contact with reality. Does your chosen option engage with that honestly, or does it defer the reckoning?
3. Market governance and climate adaptation are sometimes treated as separate agendas. Which of the three options takes both most seriously, and why?

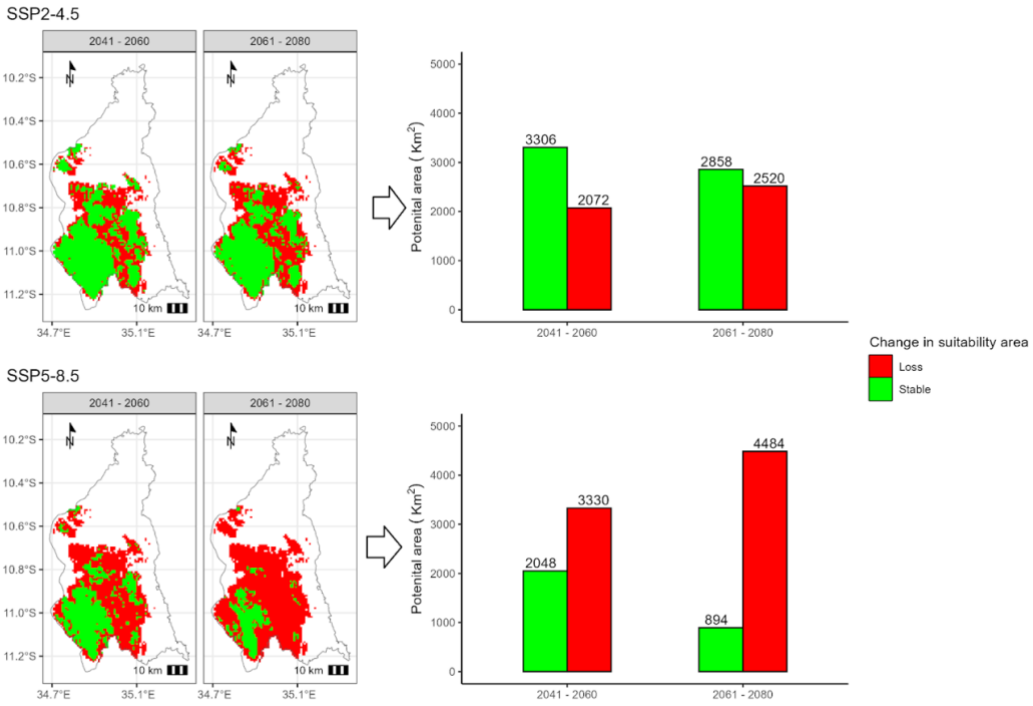
EXHIBITS

Exhibit A. *Tanzania Agricultural Map*

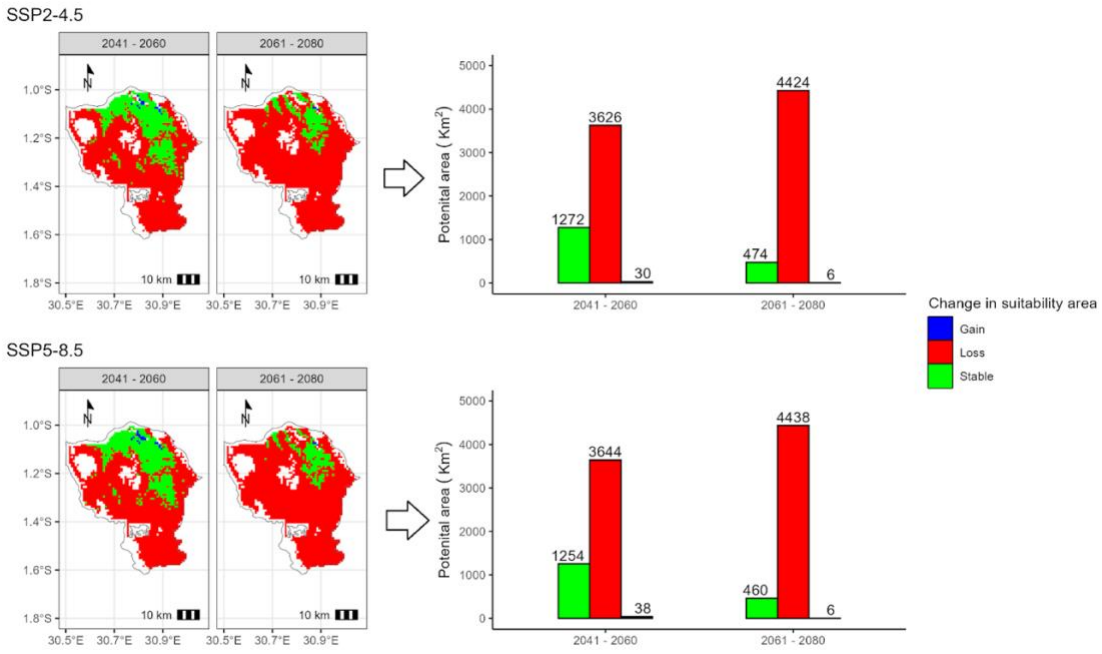


Source: *The United Republic of Tanzania, Agricultural Sector Development Programme. https://asdp.kilimo.go.tz/*

Exhibit B. *Projected climate-related changes to coffee suitability in Mbinga and Kyerwa Districts, Tanzania (extracts)*



Mbinga District (producing Arabica coffee)



Kyerwa District (producing Robusta coffee)

Source: *Kasongi (2025)*

FURTHER READING AND RESOURCES

Gallemore, C., Berecha, G., Eneyew, A., Grabs, J., Jespersen, K., Kasongi, N. 'gwinamila, Mamuye, M., Maskell, G., Mathe, A., Mwalutolo, D., Niehues, I., Terry, S., & Yamungu, N. (2025). Avoiding access inequity due to classification errors in zero-deforestation value chains: Coffee and the European Union Deforestation Regulation. Land Use Policy, 157, 107609. https://doi.org/10.1016/j.landusepol.2025.107609

Kasongi, N., Yamungu, N., Gallemore, C., & Jespersen, K. (2024). Projected rising temperatures and vapour pressure deficit threaten Arabica coffee production in Tanzania's burgeoning coffee region: Empirical insight from Mbinga district, Tanzania. Environmental Challenges, 16, 100974. https://doi.org/10.1016/j.envc.2024.100974

Kasongi, N. (2025). Spatial-temporal changes of coffee suitable growing areas under future climatic scenarios and household adaptations in Mbinga and Kyerwa districts, Tanzania [Unpublished doctoral dissertation] University of Dar es Salaam

Ponte, S., Silvano, P., Kasongi, N., Grabs, J., & Mwalutolo, D. (2026). The changing features of governance in agro-food value chains: How climate change and domestic regulation are reshaping the Tanzanian coffee industry. European Journal of Development Research, early view.

Silvano, P., Mwalutolo, D., Kasongi, N., Noe, C. & Yamungu, N. (2023). Tanzania's coffee landscape: The climate and market dynamics. PACSMAC Working Paper, available at: https://pacsmac.com/resources/

TCB. Tanzanian National Coffee Sustainability Curriculum. https://www.coffee.go.tz/uploads/documents/en-1720694516-Tanzania%20coffee%20curriculum%20Manual_June%202023%20Final%206.pdf

CASE STUDY 3: INTERNATIONAL DEVELOPMENT NGO

The Programme Dilemma at GreenFutures International

Elena Marchetti designs agricultural development programmes in sub-Saharan Africa. As Programme Director for Food Systems at GreenFutures International, a Geneva-based NGO with operations across twelve countries, she has watched the development landscape shift underneath her from a focus on food security, to market linkages, to climate resilience. Each wave has brought new donor priorities, new reporting frameworks, and new pressure to demonstrate impact in terms that funders can recognise and publicise.

The current wave is climate. And it is more complicated than the ones that came before. GreenFutures has run coffee-focused agricultural development programmes in Ethiopia and Tanzania for over a decade, funded primarily by bilateral donors such as the EU, USAID, and DFID. The programmes support smallholder farmers through extension services, cooperative strengthening, and market access. They have produced genuine results: higher yields, better processing quality, stronger cooperative governance. But the funding landscape has shifted. Donors now require all programmes to demonstrate credible 'climate-smart' credentials. Without them, renewal is unlikely. The problem is that nobody can agree on what 'climate-smart' actually means.

Elena has sat through enough donor briefings to know that when the EU says 'climate-smart', it is thinking about carbon footprints, net-zero alignment, and measurable emissions reductions — the kind of outputs that can be reported to European parliaments and incorporated into corporate sustainability disclosures. When farmers in Jimma Zone in Ethiopia or Mbinga District in Tanzania say they need help dealing with climate change, they are talking about something else entirely. They are talking about rainfall that no longer arrives when it should, about soils that recover more slowly after drought, about coffee varieties that are struggling at altitudes where they once thrived, and about children who are leaving farming because the returns no longer justify the risk. These are adaptation problems. They require a different set of interventions from the mitigation agenda that donors are increasingly funding; and in some cases, they require an honest conversation about whether coffee farming remains viable at all in certain locations, a conversation that sits uncomfortably with programmes built around strengthening the coffee sector.

Elena has submitted programme redesigns before. She knows how to write proposals that satisfy donor frameworks while preserving space for the field work she believes in. But the gap between what donors want to fund and what farmers need has grown wider than she can bridge through careful proposal writing alone. She must submit a redesigned programme portfolio for the next five-year funding cycle within the month. The question she cannot resolve is whose definition of

climate action should drive it. This requires a clearer choice than she has had to make before. She has narrowed it down to two options.

Option A: Align with Donor Priorities (Mitigation-Led)

The first option is to redesign GreenFutures' programme portfolio around measurable mitigation outcomes. This would mean building carbon footprinting into the programme methodology, designing on-farm insetting projects that generate credits alignable with roaster and trader net-zero commitments, and developing monitoring and evaluation frameworks capable of producing the kind of quantified emissions data that satisfies donor reporting requirements.

The appeal is straightforward: this is what funders are asking for, and securing the funding is what keeps GreenFutures in the field at all. There is also a genuine argument that mitigation and farmer welfare are not mutually exclusive: shade tree planting, for instance, sequesters carbon and provides agroforestry benefits simultaneously. The concern, which Elena cannot entirely dismiss, is that programmes designed around donor metrics tend to drift toward serving those metrics rather than the people those metrics are meant to represent (Grabs et al., 2026a).

Option B: Align with Farmer Priorities (Adaptation-Led)

The second option is to redesign the portfolio around what farmers in Ethiopia and Tanzania actually report needing. Survey data from GreenFutures' own field teams, consistent with the broader research literature, points to a clear set of priorities: support for managing erratic rainfall and drought, access to locally appropriate resistant varieties, soil restoration, and income diversification options for households in areas where coffee suitability is declining (Grabs et al., 2026a).

This would mean investing in farmer-led approaches: documenting local knowledge, supporting local experimentation, and building on existing practices rather than importing standard technical packages. It would also mean, in some regions, supporting farmers in reducing their dependence on coffee altogether, which is politically uncomfortable for donors whose programmes are framed around strengthening the coffee sector. The risk is real: adaptation outcomes are harder to quantify than emissions reductions, and a portfolio that cannot demonstrate measurable climate impact in terms that donors can recognise and report against may not survive the next funding review. Ethiopian farmers already adopt agroforestry and resistant varieties at high rates, which raises a further question Elena has been turning over for weeks: in those contexts, what does GreenFutures actually add?

This case was prepared as part of the PACSMAC research project for educational purposes. All company names and individual characters are fictional.

PREPARATION QUESTIONS

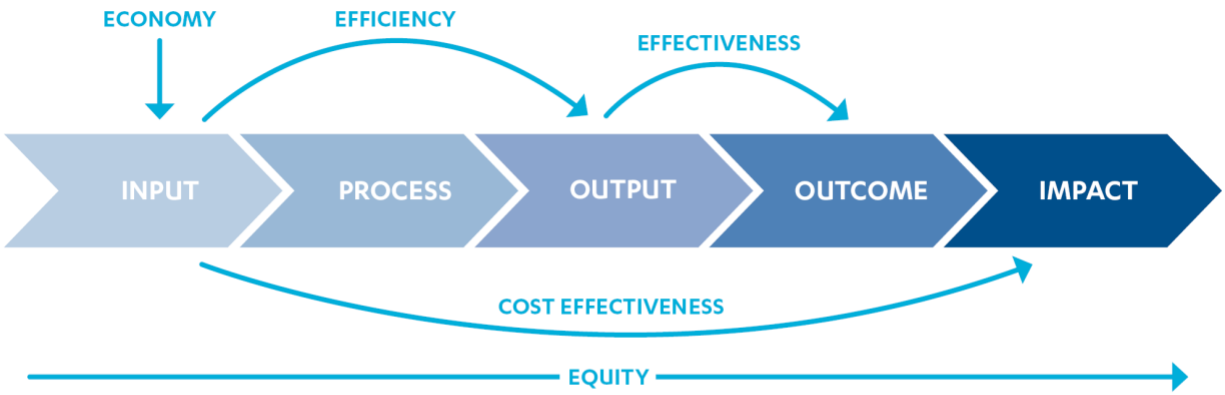
1. Choose one option. Why is it the right one for GreenFutures, and how will you make the case for it to actors who do not share your organisation's mandate or priorities?

2. What is the weakest point of your chosen option, and how will you defend it when other actors at the forum challenge its relevance or feasibility?

3. Donor funding shapes what gets measured, and what gets measured shapes what gets done. How does your chosen option address or reproduce that problem?

EXHIBITS

Exhibit A. *DFID results chain to illustrate impacts of development programs*



Framework components

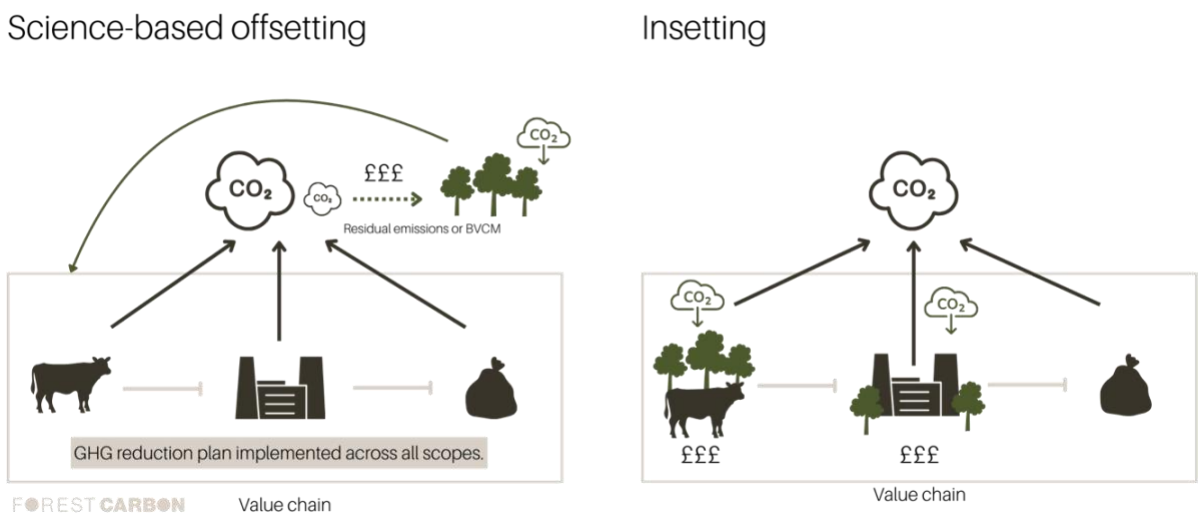
Input:	Process:	Output:	Outcome:	Impact:
Staff, raw materials, capital. (eg vaccine and vaccination consumables)	The methods by which inputs are used. (eg delivery logistics)	Results delivered directly by DFID or our agents. (eg children vaccinated)	We exercise less direct control over outcomes than outputs. (eg children less susceptible to major childhood diseases)	Long-term transformative change. (eg poverty reduced)

The four Es and cost effectiveness

Economy:	Efficiency:	Effectiveness:	Equity:	Cost effectiveness:
Are we (or our agents) buying inputs of the appropriate quality at the right price?	How well are we (or our agents) converting inputs into outputs? ('Spending well')	How well are the outputs from an intervention achieving the intended effect? ('Spending wisely')	How fairly are the benefits distributed? To what extent will we reach marginalised groups? ('Spending fairly')	What is the intervention's ultimate impact on poverty reduction, relative to the inputs that we (or our agents) invest in it?

Source: *ICAI*

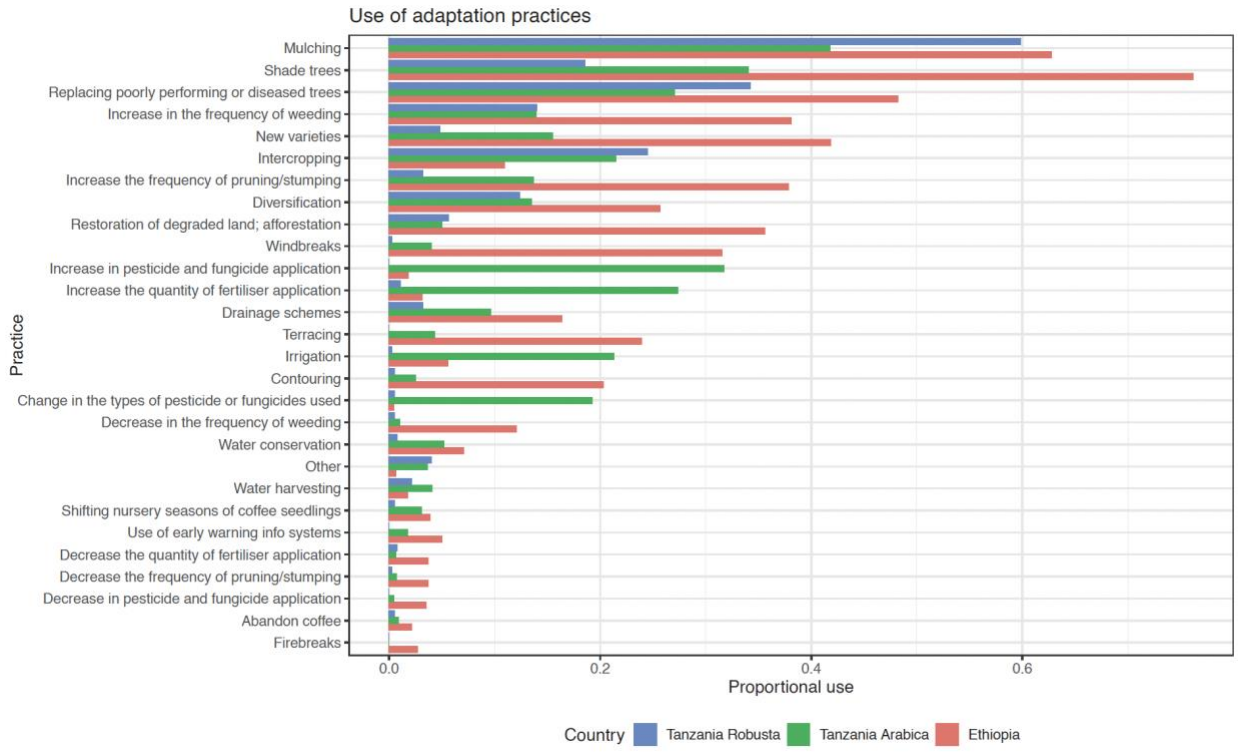
Exhibit B. *Carbon offsetting versus insetting*



Insetting involves interventions along a company's value chain that are designed to generate Greenhouse Gas (GHG) emissions reductions and carbon storage, and at the same time create positive impacts for communities, landscapes and ecosystems. For example, nature-based solutions, such as agroforestry, reforestation, or regenerative agriculture can reduce agricultural supply chain emissions. Insetting may also include energy or community activities. Insetting takes a different approach from offsetting by focusing on reducing emissions within a company's own supply chain, rather than compensating for them through external projects.

Source: *ForestCarbon*

Exhibit C. *Farmers' home-grown climate adaptation practices*



Source: *Grabs et al. (2026a)*

FURTHER READING AND RESOURCES

ForestCarbon (2025). Carbon insetting vs carbon offsetting: decarbonisation strategies for supply chains. https://www.forestcarbon.co.uk/news/carbon-insetting-vs-carbon-offsetting

Grabs, J., Berecha Yadessa, G., Castellón Durán, M., et al. (2026a). Resilience of what and for whom? Climate change mitigation and adaptation in the global, Ethiopian, and Tanzanian coffee sectors. World Development, 200, 107299. https://doi.org/10.1016/j.worlddev.2025.107299

Grabs, J., Ponte, S., & Castellón Durán, M. (2026b). The business of climate change: Changing sources of green capital accumulation in the coffee sector. New Political Economy, online first, 1–20. https://doi.org/10.1080/13563467.2026.2614691

ICAI (2018). DFID's approach to value for money in programme and portfolio management. https://icai.independent.gov.uk/html-version/dfids-approach-to-value-for-money-in-programme-and-portfolio-management/

Initiative for Coffee and Climate: Coffee & Climate Toolbox. https://coffeeandclimate.org/cc-toolbox/

Morales, L. V., Robiglio, V., Baca, M., Bunn, C., & Reyes, M. (2022). Planning for Adaptation: A System Approach to Understand the Value Chain's Role in Supporting Smallholder Coffee Farmers' Adaptive Capacity in Peru. Frontiers in Climate, 4. https://doi.org/10.3389/fclim.2022.788369

CASE STUDY 4A: LOCAL COOPERATIVE ETHIOPIA

Jimma Highland Coffee Cooperative

The Jimma Highland Coffee Cooperative in Goma district, southwestern Ethiopia, looks like a success story. Eight hundred members, two washing stations, a Rainforest Alliance certification, and direct relationships with specialty buyers in Europe and Japan built over a decade. Dawit Bekele, who has managed the cooperative for ten years, is proud of what it has become. He is also uncertain about what it should become next.

Cooperatives like Jimma Highland exist because smallholder farmers cannot easily access specialty markets alone. The cooperative aggregates their production, manages quality control at the washing stations, negotiates with exporters, and maintains the certifications and relationships that justify premium prices. For its members, it is the primary mechanism through which climate-resilient farming practices, better prices, and market information reach the farm level. What the cooperative decides to prioritise in the coming years will shape what is available to its members, and what is not.

The cooperative sits at the intersection of several pressures that pull in different directions. Climate change is already affecting production in the district. Rainfall patterns in Goma's mid- and high-altitude zones have shifted outside optimal ranges for Arabica, affecting both yield consistency and quality (Mamuye et al., 2024). The timing and intensity of the main rainy season have become less predictable, which complicates decisions about when to harvest and how to manage post-harvest processing. Members who farm at lower altitudes are feeling the effects most acutely. Those at higher altitudes have so far been less affected, but they are watching what is happening below them with unease.

What makes Dawit's situation particularly complicated is not the climate data. It is the people. The cooperative's 800 members do not speak with one voice. Some, particularly younger farmers and those at lower altitudes, are already experimenting with alternative crops alongside coffee: spices, honey, horticulture. They want the cooperative to formalise and support what they are already doing. Others, particularly those who have invested heavily in coffee-specific inputs and whose livelihoods depend on the premium prices the cooperative commands, are resistant to any signal that the cooperative is hedging on coffee. They worry, not unreasonably, that diversification will dilute the focus and the relationships that make the cooperative's specialty positioning possible. And then there are the external actors. The government extension service recommends resistant varieties and agroforestry. The NGO running a climate programme in the district promotes diversification. The specialty buyers who visit twice a year want consistent, high-quality Arabica and have limited interest in Dawit's members growing vegetables. Each brings resources. Each brings advice. The advice does not always point in the same direction.

The cooperative is approaching a period of decisions that will be difficult to reverse: where to invest, what to prioritise, and how to hold together a membership that does not agree. Dawit is not yet sure what he will recommend. He knows that whatever direction the cooperative takes in the coming years will be hard to undo, and that the members pulling in opposite directions are each, in their own way, right about something.

Option A: Invest in Coffee

The first option is to deepen the cooperative's investment in what has made it successful. This would mean expanding washing station capacity, accelerating the distribution of climate-resistant varieties among members, and strengthening the agroforestry practices that underpin shade-grown quality. It would also mean using the cooperative's relatively favourable suitability projections strategically by positioning Goma as a reliable, high-quality origin at a moment when conditions in other parts of Ethiopia and East Africa are deteriorating. As competing origins struggle, a well-capitalised cooperative in a stable highland zone could capture a larger share of specialty market demand precisely because others cannot.

The case for this option rests on what the cooperative has already built: a Rainforest Alliance certification and the export relationships that took a decade to establish and do not transfer to other products. They are also genuinely valuable in a market where provenance and consistency command premiums. Protecting and extending that value is, in Dawit's view, a stronger foundation for climate resilience than dispersing the cooperative's attention across products it has no experience selling. What he cannot fully resolve is how much weight to place on favourable but uncertain suitability projections, and whether investments made now will retain their value if conditions shift faster than the models suggest.

Option B: Widen the Base

The second option is to formalise what a significant share of members are already doing. This would mean creating organisational support through aggregation, quality control, and market linkages, for spices, honey, and horticultural products that members are currently producing informally and selling through their own channels. The cooperative would not be asking members to change their behaviour so much as recognising and supporting what many of them are already doing independently.

The risk is structural. The cooperative's washing stations, certification, buyer relationships, and reputation are all coffee-specific. Spreading organisational attention and resources across multiple products risks weakening the quality focus that justifies the premium prices the cooperative currently commands. Specialty buyers do not visit Goma because Dawit's members grow good vegetables. They visit because the Arabica is exceptional. What the option forces Dawit to sit with is a different question: what it means for the members already diversifying to do so without cooperative support, navigating markets alone, without the aggregation, quality control, or bargaining power that membership is supposed to provide. Whether the cooperative's specialty

reputation can survive a strategic pivot, or whether diversification quietly becomes managed decline, is a question Dawit cannot answer with confidence.

This case was prepared as part of the PACSMAC research project for educational purposes. All organization names and individual characters are fictional.

PREPARATION QUESTIONS

1. Choose one option. Why is it the right one for the Jimma Highland Coffee Cooperative, and how will you make the case for it to the other actors at the forum?

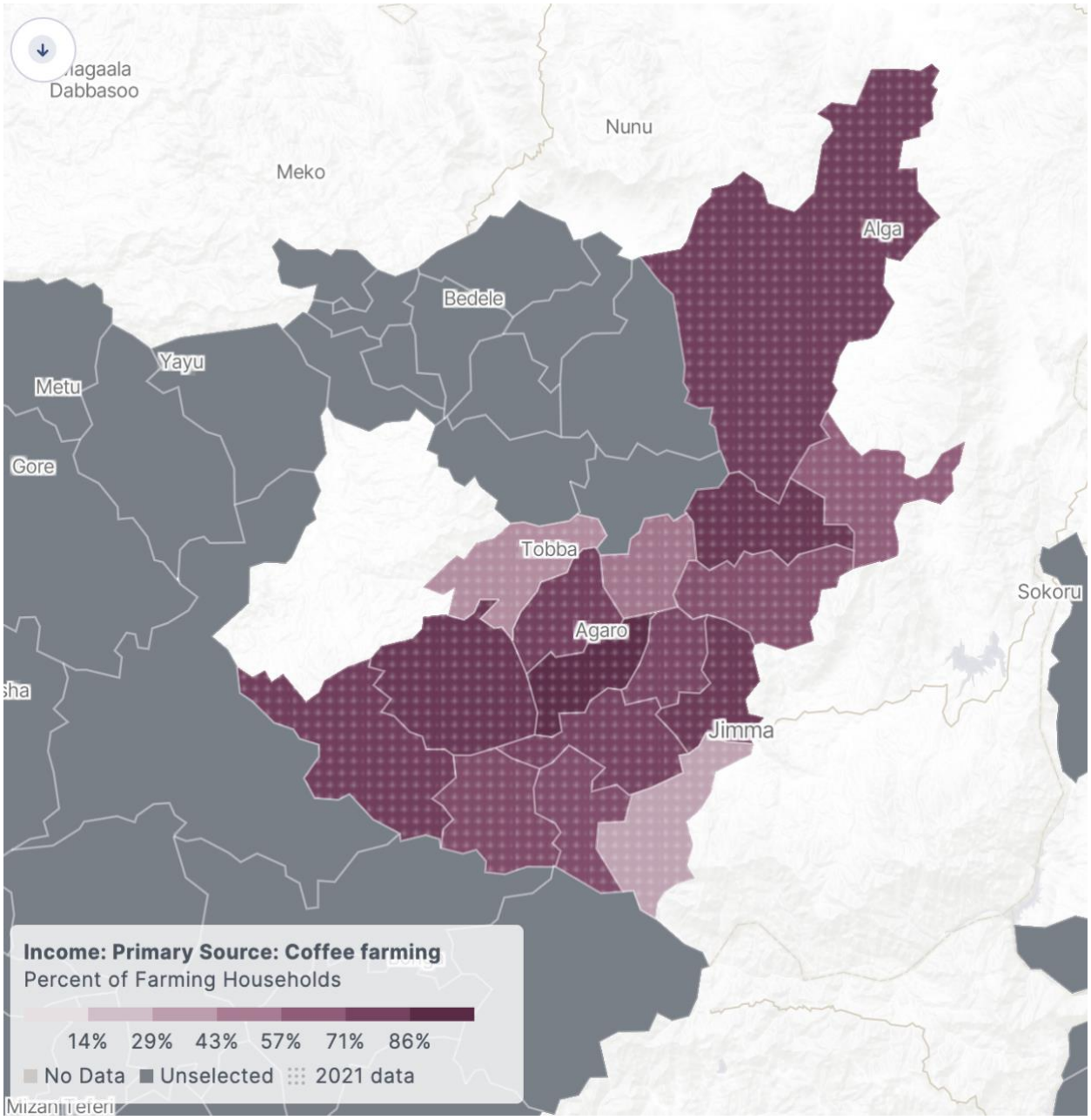
2. The cooperative's specialty buyers, the government extension service, and the NGO working in the district all offer different advice. Whose guidance should carry most weight in this decision, and why?

3. Dawit's members are not unanimous. Does a cooperative have an obligation to follow its members, or to lead them?

4. Climate projections for Goma are relatively favourable but carry uncertainty. How does your chosen option account for the possibility that conditions change faster than the models suggest?

EXHIBITS

Exhibit A. *Jimma region coffee map — coffee as primary source of income*



Source: *Enveritas/Here We Grow. Find and use the interactive version at: https://ethiopia-sustainability.enveritas.org/*

Exhibit B. *Projected climate-related changes to coffee suitability in Southwestern Ethiopia (extract)*

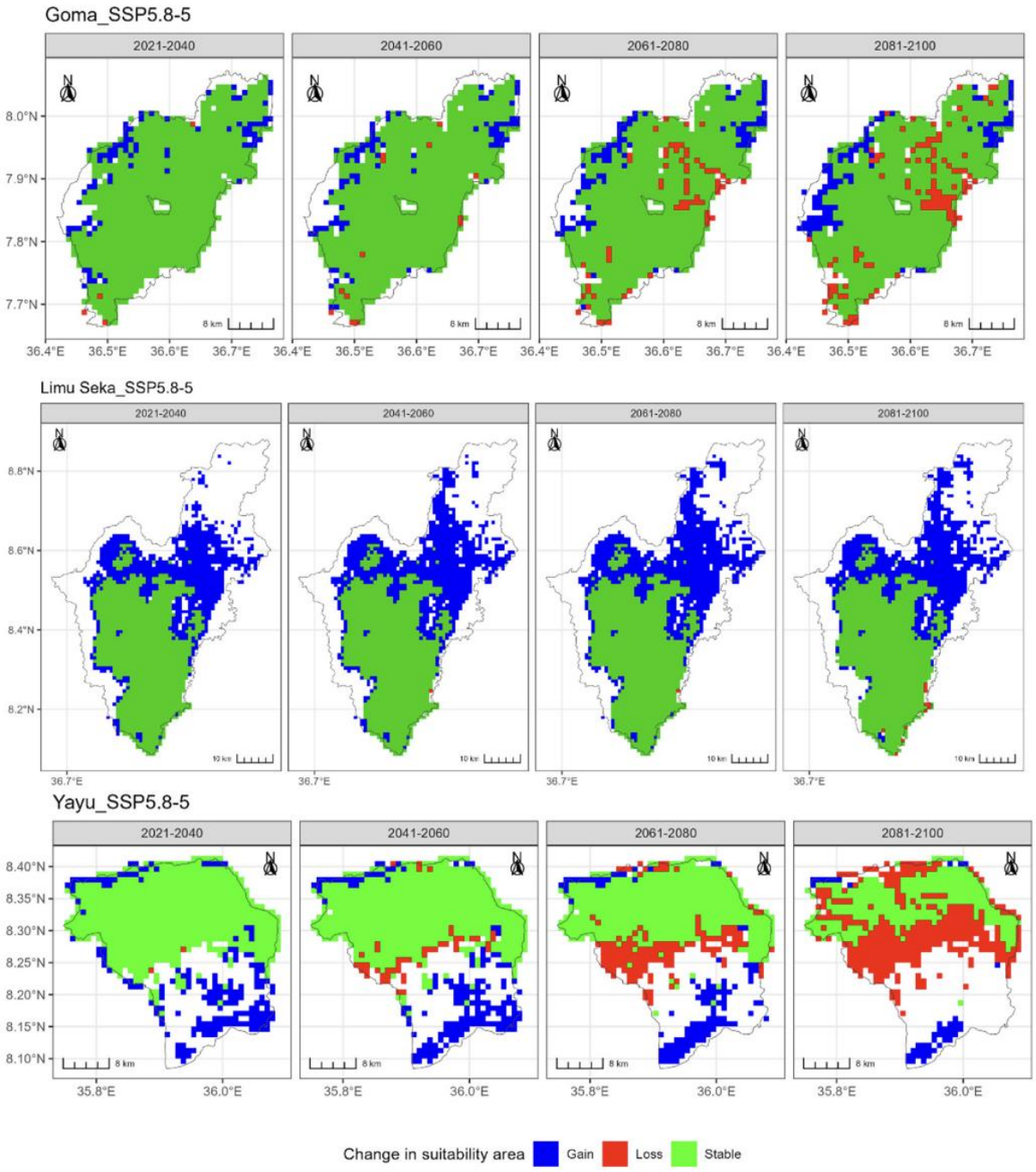


Fig. 8. Projected changes (gains, losses, and stable) in the suitable areas for coffee growth under the SSP585 scenario.

Source: *Mamuye et al. (2025). Review Figure 8 in the paper for all analyzed subregions.*

FURTHER READING AND RESOURCES

Mamuye, M., Gallemore, C., Jespersen, K., Kasongi, N., & Berecha, G. (2024). Changing rainfall and temperature trends and variability at different spatiotemporal scales threaten coffee production in certain elevations. Environmental Challenges, 15, 100950. https://doi.org/10.1016/j.envc.2024.100950

Mamuye, M., Gallemore, C., Kasongi, N., Jespersen, K., & Berecha, G. (2025). Local-scale analysis of projected climate change impact on Arabica coffee distribution in selected districts of southwestern Ethiopia: Are the future production areas commercially viable? Ecological Informatics, 91, 103392. https://doi.org/10.1016/j.ecoinf.2025.103392

Mojo, D., Fischer, C., & Degefa, T. (2017). The determinants and economic impacts of membership in coffee farmer cooperatives: Recent evidence from rural Ethiopia. Journal of Rural Studies, 50, 84–94. https://doi.org/10.1016/j.jrurstud.2016.12.010

Regasa Megerssa, G., Garedew, W., Jespersen, K. Grabs, J., Eneyew Bekele, A. (2025a). The impact of climate change on Ethiopian Arabica coffee production and current challenges it poses to the coffee value chain. Sustainable Futures, 10, 101459. https://doi.org/10.1016/j.sftr.2025.101459

Regasa Megerssa, G., Eneyew Bekele, A., Grabs, J., Garedew, W., Jespersen, K. (2025b). How do institutions reshape the resilience of the Ethiopian coffee sector amidst the pressures of climate change? Sustainable Development, early view

CASE STUDY 4B: LOCAL COOPERATIVE TANZANIA

Mbinga Highland Coffee Cooperative

The Mbinga Highland Coffee Cooperative has 600 members, limited financial reserves, and a dependence on trader credit that shapes almost every decision Fatuma Mwalimu can make as its Chairperson. She was elected to that position four years ago. For its members, the cooperative is the primary touchpoint markets, financing, and technical support that smallholder farmers cannot access alone. What the cooperative can offer shapes the options available to each of its members. That is what makes the decisions Fatuma faces consequential beyond her own tenure.

The cooperative operates across several villages in the Mbinga highlands, currently one of Tanzania's most productive Arabica regions. It sells through the AMCOS system, which was designed to give smallholder cooperatives greater market power but has underperformed in practice. Fatuma has spent much of her time in the role trying to understand why. The traders who provide financing between harvests are the same ones who buy the coffee, and every attempt to find an alternative has hit the same wall: without credit, members cannot cover input costs, and without buyers, there is nowhere to sell.

The cooperative also operates with limited access to external support. Survey data suggest that fewer than four in ten Tanzanian coffee farmers received any coffee-related training in the previous five years, and almost none of that came from buyers (Grabs et al., 2026a). In a region facing an unambiguous climate trajectory, that gap in technical support matters more than it once did.

The climate trajectory for Mbinga is something Fatuma has come to understand gradually, and it has not made her situation easier. The highlands where the cooperative's members farm retain viable growing conditions for now, and projections suggest they will continue to do so for several decades. But the direction is clear and the elevation has run out. Unlike some highland regions, where uncertainty about long-term suitability still leaves room for optimism, Mbinga's trajectory points in one direction (Kasongi et al., 2024).

Among the cooperative's members, the response to these pressures has not been uniform. Some, particularly those farming at lower altitudes where the effects are already visible, have started growing other crops alongside coffee, including vegetables and fruit. None of it is formalised or supported by the cooperative, but it is present enough for Fatuma to be aware of it. Others are holding on, partly out of attachment to coffee farming and partly because they have no viable alternative yet. A few younger members have stopped farming altogether. Fatuma was elected to represent all of them — a task she is finding harder than it sounds.

Option A: Invest in Quality

The first option is to use the remaining time to build the cooperative's quality and market position as deliberately as possible. This would mean investing in processing infrastructure to improve

consistency, pursuing specialty market access to command higher prices per kilogram, and finding alternative financing arrangements to reduce the trader credit dependency that currently limits the cooperative's room to act.

The case rests on the projections: the highlands should retain viable conditions for several decades, and a cooperative that uses that window to strengthen its position would be better placed to manage what comes after than one that does not. Any strategy the cooperative pursues requires some degree of financial autonomy first. What Fatuma cannot fully resolve is whether investment in coffee infrastructure now builds toward a viable future or simply postpones a harder conversation.

Option B: Build Beyond Coffee

The second option is to start building the foundations for a broader livelihood base before the cooperative's financial position weakens further. Members are already growing other crops alongside coffee. The cooperative offers them no organisational support for any of it. For members already making that shift without cooperative support, the absence of aggregation or market linkages is the difference between a viable side income and produce that cannot find a buyer. Developing aggregation and market linkages for crops already present in members' fields would not require abandoning coffee immediately, but it would begin the organisational work of becoming something more than a single-crop cooperative.

The difficulty is that the cooperative's relationships and credibility have been built around coffee, and moving before alternatives are properly established carries real risk to the income members depend on now. Fatuma is also working with thinner margins and less institutional capital than a cooperative with a long history in a specialty market. Whether starting that process from a position of relative weakness makes it more likely to succeed is something she has not been able to resolve.

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PREPARATION QUESTIONS

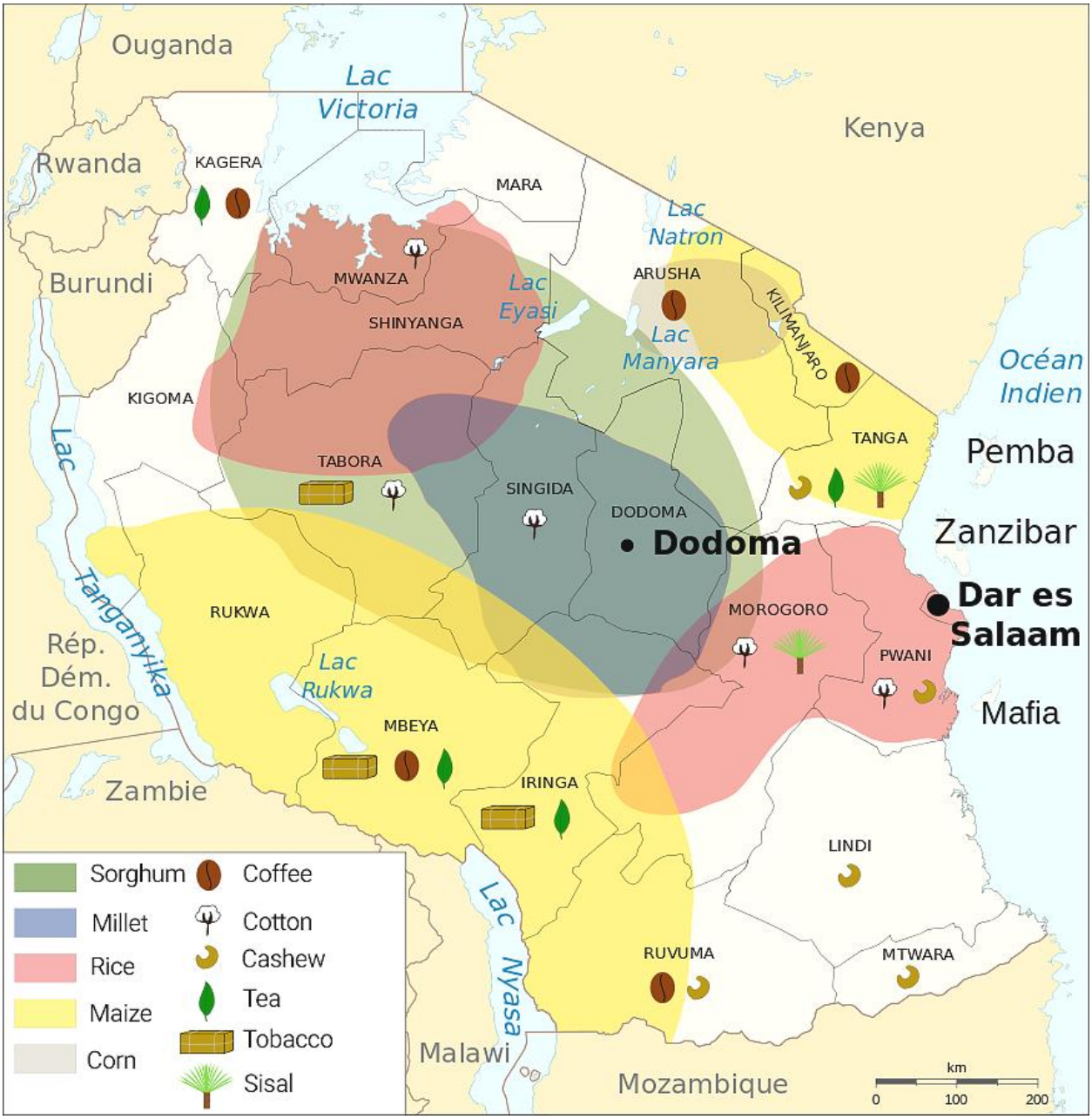
1. Choose one option. Why is it the right one for the Mbinga Highland Coffee Cooperative, and what does it mean for members who are already diversifying without cooperative support?

2. Fatuma was elected by the members she serves. Does that change what she is obligated to recommend, compared to a hired manager facing the same choice?

3. Both options require some degree of financial autonomy the cooperative does not currently have. Which option depends on it more, and what happens if it cannot be achieved?

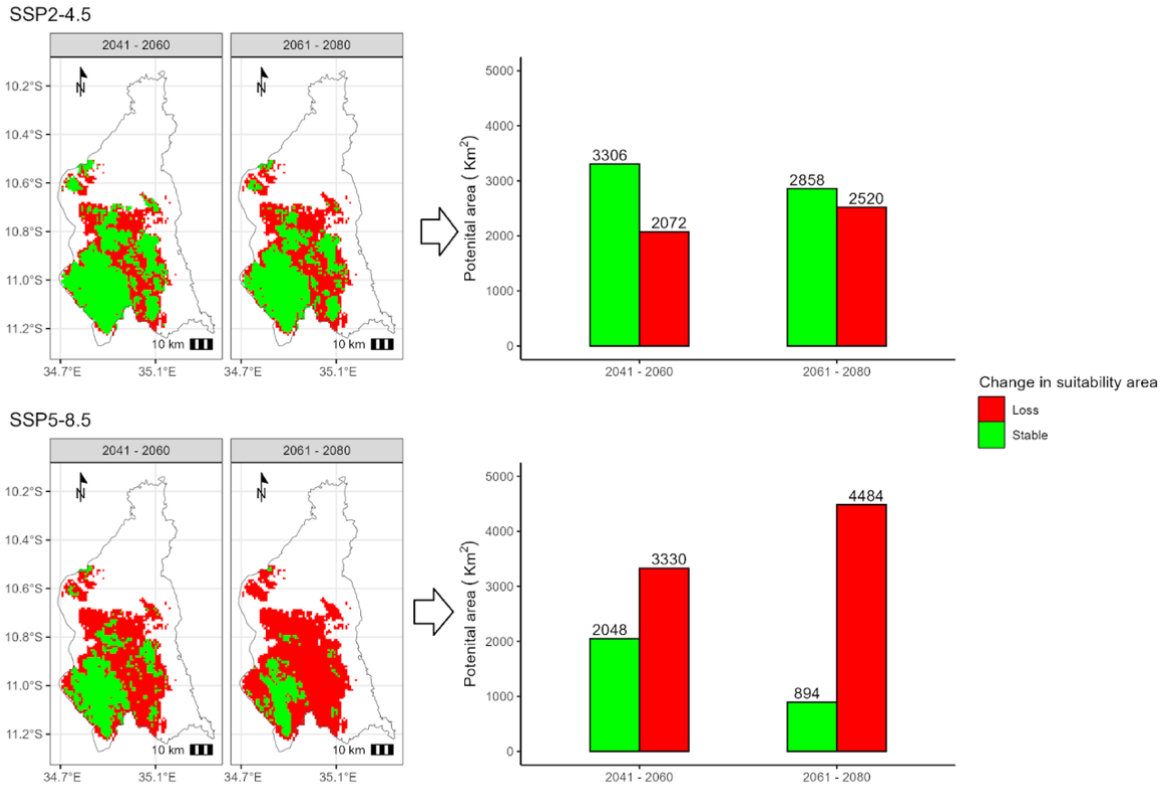
EXHIBITS

Exhibit A. *Tanzania Agricultural Map*



Source: *The United Republic of Tanzania, Agricultural Sector Development Programme. https://asdp.kilimo.go.tz/*

Exhibit B. *Projected climate-related changes to coffee suitability in Mbinga Districts, Tanzania (extracts)*



Source: *Kasongi (2025)*

FURTHER READING AND RESOURCES

Kasongi, N., Yamungu, N., Gallemore, C., & Jespersen, K. (2024). Projected rising temperatures and vapour pressure deficit threaten Arabica coffee production in Tanzania's burgeoning coffee region: Empirical insight from Mbinga district, Tanzania. Environmental Challenges, 16, 100974.

Kasongi, N. (2025). Spatial-temporal changes of coffee suitable growing areas under future climatic scenarios and household adaptations in Mbinga and Kyerwa districts, Tanzania [Unpublished doctoral dissertation] University of Dar es Salaam.

Ponte, S., Silvano, P., Kasongi, N., Grabs, J., & Mwalutolo, D. (2026). The changing features of governance in agro-food value chains: How climate change and domestic regulation are reshaping the Tanzanian coffee industry. European Journal of Development Research, early view.

Silvano, P., Mwalutolo, D., Kasongi, N., Noe, C. & Yamungu, N. (2023). Tanzania's coffee landscape: The climate and market dynamics. PACSMAC Working Paper, available at: https://pacsmac.com/resources/

Silvano, P., & Jespersen, K. (2025). Rules, Norms, and Resistance: The Limits of Gender Equality in Tanzania's Coffee Sector. Forum for Development Studies, 1–26. https://doi.org/10.1080/08039410.2025.2488269

TCB. Tanzanian National Coffee Sustainability Curriculum. https://www.coffee.go.tz/uploads/documents/en-1720694516-Tanzania%20coffee%20curriculum%20Manual_June%202023%20Final%206.pdf