Technical Brief

Priorities to Achieve Agronomic Gain in Kenya: Climate Risk Perceptions and Practice Adoption

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The CGIAR Sustainable Farming Program addresses key challenges in agri-food systems by fostering efficient production of nutritious foods and safeguarding the environment to create fair employment opportunities, as we simultaneously tackle climate change, soil degradation, pests, diseases, and desertification in Bangladesh, Benin, Burundi, Cambodia, Colombia, Côte d'Ivoire, Democratic Republic of Congo, Egypt, Ethiopia, Ghana, Guatemala, India, Kenya, Laos, Madagascar, Malawi, Mali, Mexico, Morocco, Mozambique, Nepal, Niger, Nigeria, Pakistan, Peru, Philippines, Rwanda, Senegal, Tanzania, Uganda, Uzbekistan, Vietnam, Zambia and Zimbabwe.

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1.Context of the Study

The Central Highlands Eco-Region Foodscape (CHEF) initiative operates in Kenya's Central Highlands, a mixed smallholder crop–livestock system. Although the region accounts for less than 10% of the country's land area, it contains roughly 25% of Kenya's cropland, making it a critical food-production zone. However, production systems in the region are hindered by erratic and declining rainfall, soil fertility loss, watershed degradation, and increasing climate stress. These challenges underscore the need for better water management, alongside climate-resilient agricultural practices that can boost productivity and income while safeguarding natural ecosystems. To achieve these outcomes, CGIAR in partnership with local partners focuses on co-developing interventions for sustainable landscape transformation. This initiative is aligned with Kenya's Climate-Smart Agriculture Strategy (2017-2026) and national landscape restoration priorities, supporting government efforts to promote sustainable farming, improved water management, and enhanced soil health to strengthen food security and climate resilience among smallholder farmers.

A central component of the initiative is the development of Minimum Viable Products (MVPs) informed by behavioral economics to help farmers manage climate-related risks more effectively. The MVPs aim to equip local organizations with actionable tools to support climate-resilient agronomic solutions that are grounded in farmer's observed behavioral patterns and adapted for broader landscape-level scaling. In our recent report we examine the factors that influence adoption of sustainable agricultural practice within the CHEF region. Specifically, we analyze the uptake of six practices—intercropping, organic fertilizer use, irrigation, no-tillage, crop diversification, and water conservation—with particular attention to how farmers perceive and respond to climate-related risks. While climate risk perception has been widely studied in agricultural contexts, most empirical analyses explain variation primarily through socio-demographic characteristics or access to information, extension services, and social networks. The psychological mechanisms by which risk perceptions translate into adaptive behaviors remain critically understudied We therefore address the following research questions:

1. What is the nature of the relationship between climate risk perception and adoption decisions?
2. Does the relationship between climate risk perception and adoption differ by gender of decision-maker and plot size?

2.Evidence Base and Diagnostic Insights

2.1 Data

The Landscape Crop Assessment Survey and Agronomy Prioritization Tool (APT-LCAS) baseline data was collected across three adjacent Counties in Kenya's Central Highlands—Laikipia, Meru, and Nyandarua—to assess farming practices, smallholder diversity, climate-risk coping strategies, gender dynamics in decision-making, and adoption of sustainable agriculture (Figure 1A). Using a cluster-based sampling approach 622 households were surveyed to understand climate risk perceptions and agro-economic conditions. The survey collected data for the most recent cropping season, spanning November 2023 to November 2024, with a recall period of 12 months.

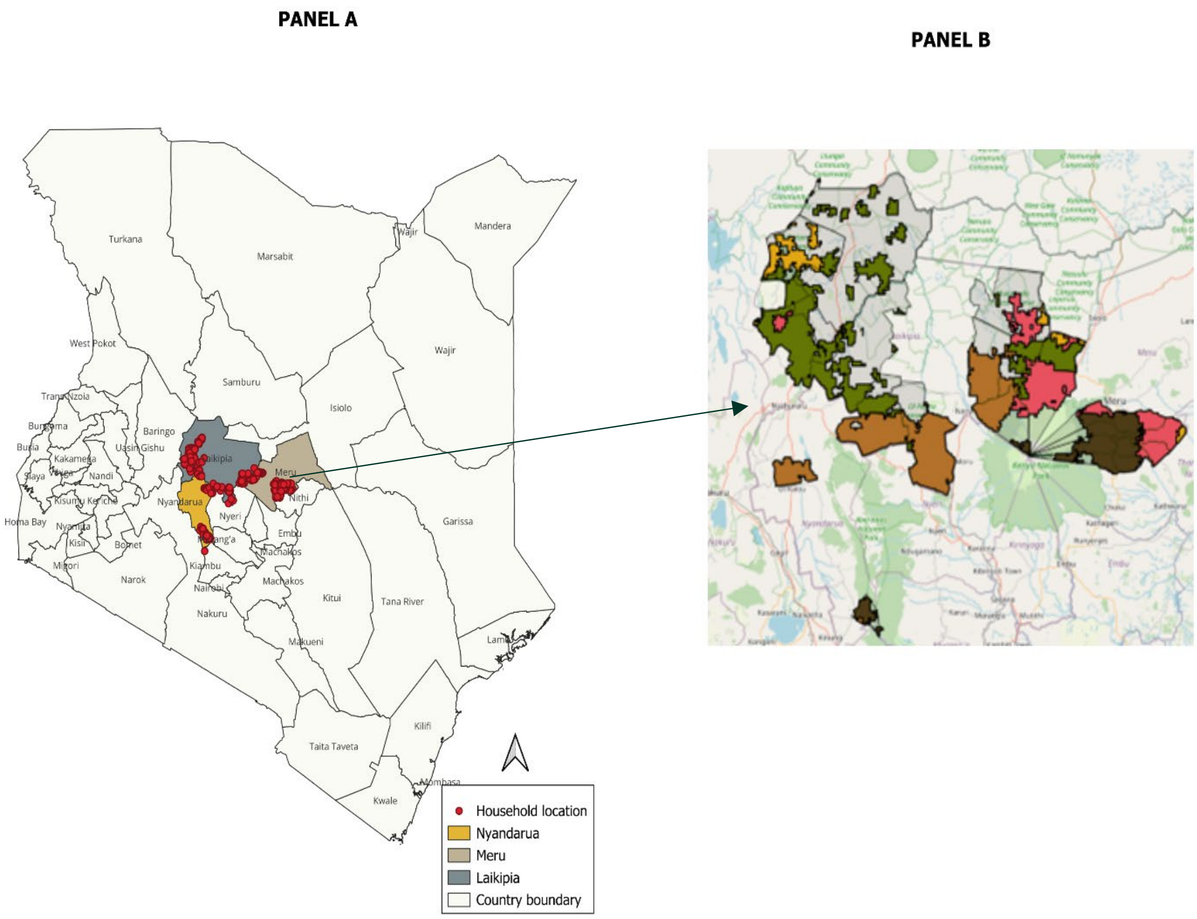


Figure 1: Study Region (left) and Classification of Ward based on Biophysical and Environmental Characteristics (right).

2.2 Key Descriptive Findings

2.2.1 Reported Climate Hazards: Farmers' Experience and Concerns

The survey examined two related aspects of perception about climate hazards: whether farmers believe they are experiencing climate-related hazards, and whether they are genuinely concerned about these hazards. This distinction matters because farmers may face events such as floods or droughts, but what drives action is how these experiences are internalized as concerns—and whether those concerns are strong enough to influence behavior. To capture these dimensions we construct two indices: (1) the Climate Change Experience Index (CCEXP), which captures farmers' self-reported experiences with climate-related challenges such as limited rainfall, drought, heat stress, floods, soil erosion, and declining soil fertility; and (2) the Climate Change Worry Index (CCWORRY), which reflects farmers' level of concern about climate related risks.

Figure 2 shows that approximately 60% of respondents reported frequent exposure to climate hazards. However, despite this experience, most expressed only low to moderate levels of concern, with only about 10% reporting high or very high concern.

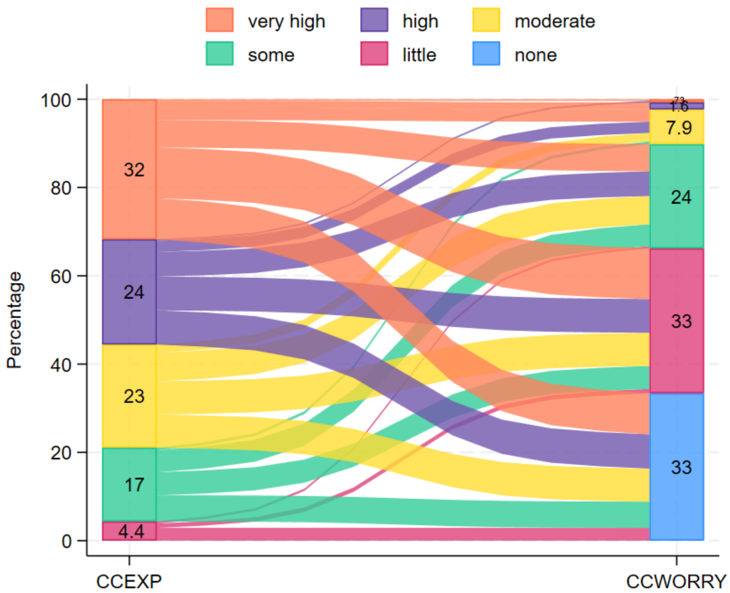


Figure 2: Flow of Responses Between Climate Change Experience (CCEXP) and Climate Change Concerns (CCWORRY)

The most frequently experienced hazard is food insecurity, followed by low rainfall, decline in soil fertility, and soil erosion—highlighting concerns about long-term land productivity (Figure 3, Panel A). In contrast, farmers' top perceived risks center on rainfall variability, particularly insufficient and excessive rainfall (Figure 3, Panel B). We also observe that while 91% reported experiencing floods, only 24% expressed concern about them, whereas drought experience (48%) closely matched concern levels (49%).

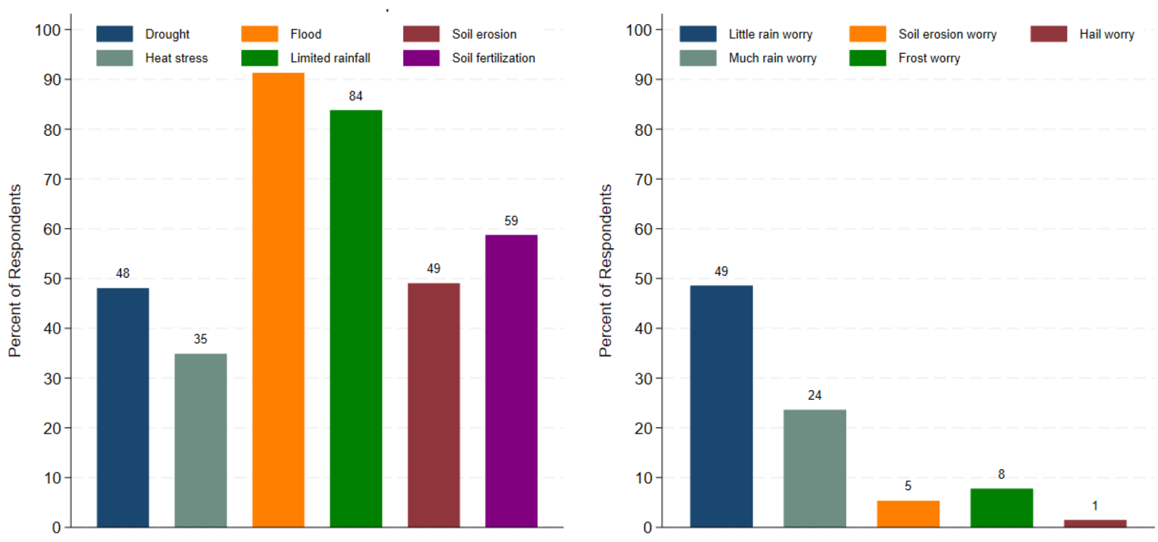


Figure 3: Farmers' Climate Exposure (left) and Climate Risk Concerns (right)

2.2.2 Adoption of Sustainable Agricultural Practices

Through the APT-LCS survey we also collected plot level data and household data on six sustainable agricultural practices, namely: intercropping, use of organic fertilizer, irrigation, no tillage, crop diversification, and water conservation practices. Overall, 64% of plots adopted two to three sustainable agricultural practices (SAPs), while 16% showed low adoption, including 4% with no SAPs at all. The most common practices included water conservation, crop diversification, and the use of organic inputs. Adoption patterns also varied by gender: female-managed plots had slightly higher uptake of intercropping (46% compared to 39%), organic inputs (72% compared to 66%), conservation no-till (16% compared to 11%), and water conservation (91% compared to 85%). However, irrigation was less common on female-managed plots (18% compared to 27%). Crop diversity showed no major gender differences.

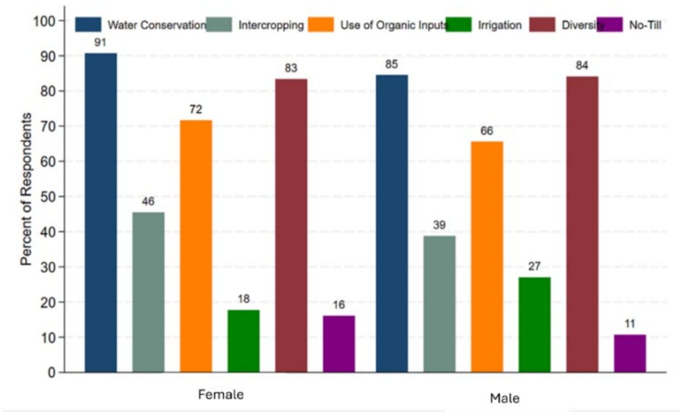


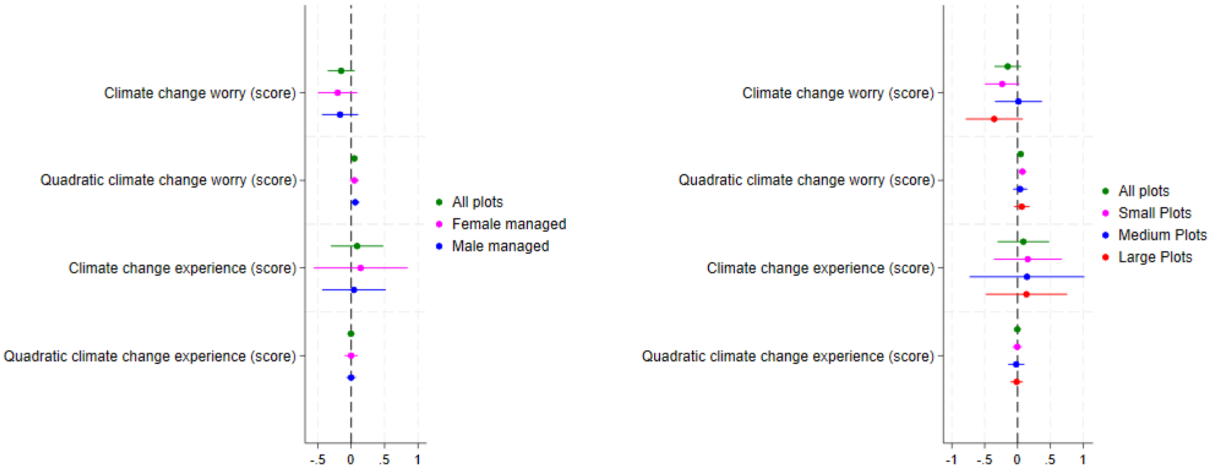
Figure 4: Distribution of Adoption of Sustainable Practices by Gender of the Plot Decision maker

2.3 Association between climate risk perception and adoption of sustainable agricultural practices

To examine how perception of climate hazards influences the adoption of sustainable agricultural practices, we used cross-sectional APT-LCAS climate add-on data and applied a Poisson regression approach. In our specification, the primary outcome variable is a count of the number of sustainable agricultural practices a farmer adopts on a given plot. We control for household and plot decision-maker characteristics, technology risk perceptions, behavioral factors—including optimism bias, general worry, social norms, and consensus heuristics—as well as geographical factors. We find that climate-related experience is not significantly linked to the adoption of sustainable agricultural practices, while concerns about climate hazards are. Adoption increases only once concern reaches a certain threshold, indicating a non-linear effect of risk perception. This suggests that farmers' perceptions of climate risk—rather than direct experience—drive adoption, highlighting the need for policies and grassroots efforts to focus on awareness, risk communication, and advisory services.

Besides climate risk perceptions, several socioeconomic and institutional factors also shape the adoption of sustainable agricultural practices. Farmers with higher education and older household heads adopt more practices, suggesting that experience and knowledge matter, and that respected older farmers can help encourage uptake among younger farmers. Group membership also significantly boosts adoption, highlighting the value of farmer organizations as platforms for peer learning and targeted training. On the technological side, frequent training supports adoption, but mobile phone ownership and short-term training are negatively associated with sustainable practices, possibly reflecting gaps in the quality or relevance of information and the tendency of wealthier, more commercial farmers to rely on conventional input-intensive methods.

We also examine how this relationship varies by gender of decision maker and plot size. In female-managed plots, higher concern about climate change does not translate into greater adoption; instead, adoption is mainly driven by the decision maker's education level and plot characteristics, pointing to structural and capacity constraints that limit women's ability to act on their concerns. In male-managed plots, adoption responds to high levels of climate concern and frequent training, suggesting that well-designed risk communication and repeated learning opportunities can effectively spur uptake among men. Further, disaggregating the data by plot-size we find that: On small plots, adoption increases only when climate concern reaches a high threshold and is also influenced by education and repeated training, while short-term training and extension appear ineffective, suggesting a need for more practical, plot-appropriate support. For medium and large plots, climate risk perceptions do not significantly affect adoption; instead, factors such as ethnicity and access to credit—especially for large plots—play a more important role.



Note: The left side figure presents the marginal effects of both the linear and quadratic terms of the climate change experience score and climate change worry score presented in Table 3 and the right-side figure for Table 4 of report. Estimates are obtained from Poisson regression controlling for household and plot decision-maker characteristics, behavioral factors, technological risk perception variables, and regional fixed effects. Standard errors are clustered at the household level.

Figure 5: Marginal Effects of Climate Change Experience and Climate Change Worry on Adoption Disaggregated by Gender of plot manager (left) and size of plot (right).

3.Propose Priorities for MVP Development

Based on the findings we propose the following priorities.

Recommendation Area	Key Strategies
1. Shifting Mindsets to Strengthen Farmer Capacity	i. Integrate climate risk and hazard frequency modules into training to shift perceptions. ii. Provide practical, context-specific packages of SAPs to boost resilience.
2. Target Risk Communication Strategically	i. Focus awareness on small, male-managed plots where perceptions strongly influence adoption. ii. Use locally relevant, visual, and experiential approaches to raise climate risk awareness. iii. Reinforce knowledge and skills through multiple sessions to improve perception and adoption of SAPs.
3. Address Women's Structural Barriers	i. Pair risk awareness with access to inputs, credit, knowledge, and incentives. ii. Co-design interventions with women farmers for greater relevance and uptake. iii. Leverage women's groups to improve access to knowledge, credit, and markets. iv. Recruit more women agents and adapt schedules to women's time constraints to close information gaps.
4. Scale Low-Resource, High-Impact Interventions	i. Promote organic inputs and soil & water conservation as scalable entry points.
5. Leverage ICT and Digital Platforms	i. Embed climate and SAP content in digital extension tools. ii. Address gendered digital divides by complementing ICT with video or community-based training.
6. Cultivate Climate and SAP Champions	i. Engage experienced farmers as advocates for sustainable practices.
7. Incentivize Adoption via Market Mechanisms	i. Use certification and premium pricing for sustainably produced crops to motivate farmers, particularly those with large and medium plots.

4.Next Steps for Learning and APT Agenda

While the analysis offers valuable insight into how climate risk perceptions shape adoption of sustainable agricultural practices, two key learning gaps remain due to data limitations. First, even when climate awareness exists, it remains unclear which specific constraints prevent farmers—particularly women—from translating that awareness into action. Factors such as limited technical knowledge, labor shortages, insufficient access to finance, or behavioral barriers are plausible. Understanding the relative importance of these constraints for different types of farmers would help design more targeted, gender-responsive interventions. Second, the finding that perceived climate risk predicts adoption more strongly than actual exposure raises new questions about what shapes risk perceptions themselves. Factors beyond lived experience, such as advisory messaging, peer influence, trust in institutions, and information access, could play a role and would be important for designing interventions.

Going forward, it would be valuable to experimentally test different intervention approaches—for example, alternative communication framings, advisory formats, or gender-tailored support—to understand which pathways most effectively shift perceptions and enable action. Complementing this with additional data collection, perhaps through light-touch follow-ups such as brief phone surveys or IVR-based interviews, would allow the initiative to track how awareness, perceptions, and attitudes toward practices evolve over time in response to these interventions. Such iterative monitoring would move the work toward adaptive learning, enabling partners to refine design choices as evidence accumulates.

5.Conclusion

What do these findings mean for our local partners? The CHEF program aims to build an agroecological foodscape — but to do that effectively, we need to know where and with whom to act first. Our findings tell us:

- Exposure to extreme climate events is not a sufficient condition for adoption of SAPs. To improve climate resilience, there is a need to change mental models or behavior of farmers.
- We also find that climate resilient strategies must be differentiated, and a one-size-fits-all approach will not work.
- Risk communication works best in smallholder, male-managed zones — here, awareness triggers change.
- For female-managed plots, awareness alone is not enough — we must remove structural barriers along with climate risk communications (like access to education, inputs, credit, or labor).
- Shifting medium and large plot owners to SAPs may need sustained efforts, using market incentives such as certification, premium pricing for sustainable products, carbon credits, or payments for ecosystem services.

6. Further Reading

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