

CLIMATE CHANGE ADAPTATION, LIVELIHOODS & INCOME DIVERSIFICATION

Evidence from impact evaluations in Sub-Saharan Africa

Overview

Climate change is driving smallholder farmers across Africa to adjust their livelihoods and diversify their incomes. Adaptation strategies, from changing crops and engaging in off-farm work to migrating and adopting conservation agriculture, are increasingly promoted as pathways to build resilience. But do these strategies improve household welfare? And do the benefits differ across contexts, crops, and household types?

This research bite synthesises evidence from impact evaluations examining the effects of climate change adaptation on livelihoods and income diversification in Sub-Saharan Africa. It draws on studies from Ethiopia, Ghana, Kenya, Niger, Nigeria, Togo, and Zambia. The findings show that adaptation strategies can improve food security and income, but effects are not uniform and depend on the type of strategy, crop, household characteristics, and complementary support.

A brief overview of the impact evaluation studies surveyed is as follows:

Four (4) papers in Ethiopia provided evidence CCA, livelihoods, and income diversification based on impact evaluation. Etana et al. (2021) assessed the impact of eight adaptation strategies on livelihood sustainability using endogenous switching regression with 810 households across three agro-ecological zones. Belay et al. (2023) examined the effect of climate-smart agriculture (CSA) practices on household income and food security using propensity score matching with a sample of 385 households. Sedebo et al. (2022) evaluated the impact of climate-smart adaptation practices on wheat yield using ESR and PSM with 537 wheat producers. Tilahun et al. (2023) analysed the impact of CSA adoption on food security using principal component analysis and multinomial endogenous switching regression, drawing on data from 384 households.

In Ghana, Alhassan (2020) examined the effect of on-farm and non-farm flood adaptation strategies on food security and recovery using a multinomial endogenous treatment effect model with 230 households.

Two studies in Kenya provided impact evaluation evidence on the relationship. Ahmed et al., (2023) analysed the relationship between climate-adaptive practices and food security, resilience, and livestock outcomes using OLS and Poisson regressions with baseline data from a clustered RCT (788 households). Thorlakson & Neufeldt (2012) evaluated agroforestry's contribution to climate adaptation, farm productivity, and income diversity using mixed methods with 119 households.

In Niger, Zakari et al. (2022) investigated the factors influencing adaptation strategies and their impacts on household income and food security using logit regression and matching techniques with 1,783 households.

Two studies in Nigeria provided evidence. Ogunpaimo et al. (2021) assessed the impact of climate change adaptation on household food security using panel probit, PSM, and difference-in-difference with 3,500 farm households. Onyeneke (2019) analysed the effect of adaptation decisions on rice profitability using multivariate probit, IV regression, and endogenous treatment effect models with 240 rice farmers.

In Togo, Mikémina et al. (2019) simulated the impact of adaptation strategies (irrigation, SWC, fertiliser reduction) on farm income under climate change scenarios using a bio-economic model with 450 households.

In Zambia, Umar (2021) explored the gendered experiences of conservation agriculture as a climate adaptation strategy using mixed methods with 761 households and 33 FGDs.

Intervention & Sub-intervention

Intervention: Climate change adaptation strategies, including:

1. On-farm practices: crop diversification, changing crop types, improved seeds, crop rotation, changing planting/harvesting dates, soil and water conservation, irrigation, conservation agriculture, agroforestry, use of organic/inorganic fertiliser, climate-smart agriculture (CSA) practices
2. Off-farm strategies: non-farm employment, livelihood diversification, income diversification, petty trade, transportation services
3. Other strategies: migration, land management, use of climate information services, livestock diversification

Summary of Key Findings

Adaptation improves food security and income, but effects vary by strategy. In Niger, adopters of adaptation strategies had 7-9% higher food security and 7,722 FCFA higher income than non-adopters. In Ethiopia, CSA adopters had 20.30% higher farm income and 6.27-8.15 points higher food consumption scores. In Nigeria, CCA adopters had 9% higher food security. However, not all strategies yield positive returns. In Ghana, farmers using CIS had lower income and assets than non-users due to high implementation costs.

Diversification matters, but who benefits depends on the type of diversification. In Ethiopia, non-farm employment and migration significantly increased livelihood sustainability for

households that used them; but would have reduced sustainability for non-users. In Ghana, both on-farm and non-farm strategies improved food security, but non-farm strategies were more effective for faster recovery from flood shocks. In Nigeria, livelihood diversification (85%) and crop diversification (84.2%) were among the most utilised strategies. In Niger, crop diversification (72.74%) and income diversification (67.97%) were the main strategies.

The number of strategies matters. In Ethiopia, farmers using more than four adaptation strategies had significantly more sustainable livelihoods than those using fewer. In Nigeria, farmers using five or more adaptation options had 382,982 Naira higher profits than those using fewer. In Ethiopia (Tilahun et al., 2023), farmers adopting all five CSA packages had 41.2% higher food expenditure, 39.8% better HFIAS scores, and 12.1% higher food consumption scores.

Adaptation can be a double-edged sword. Non-farm employment and migration are beneficial for vulnerable households but not for better-off households. In Ethiopia, using improved seeds did not benefit actual users; non-users would have benefited more. In Togo, reducing fertiliser application increased vulnerability to climate change by 10-12%.

Context and complementary support are critical. In Zambia, conservation agriculture provided climate adaptation benefits, but high weed pressure, labour demands, and low access to manure and implements limited adoption. In Ethiopia, education, extension access, and climate information were key drivers of CSA adoption. In Togo, irrigation and soil and water conservation were identified as "no regret" adaptation options with positive impacts on livelihoods while preserving the resource base.

Gender matters. In Zambia, men and women experienced climate change similarly but benefited differently from conservation agriculture. Women valued moisture retention more; men valued higher yields. Women dominated manual weeding and basin making; men dominated oxen-powered tillage. In Ethiopia, male-headed households were more likely to adopt CSA practices, but female-headed households were more likely to adopt crop diversification and livelihood diversification in Nigeria.

What This Means for Policy

One size does not fit all. Adaptation strategies that work for one crop, region, or household type may not work for another. Policies must be context-specific and tailored. As Mikémina et al. (2019) show, irrigation benefits wealthier farmers more, while SWC benefits poorer farmers more.

Diversification is not universally beneficial. Non-farm employment and migration are effective for vulnerable households but can reduce welfare for better-off households. Targeting matters. In Ethiopia, "had these factors been used by the non-users, it would have resulted in reduced livelihood sustainability."

The number and combination of strategies matter. Farmers using multiple complementary strategies achieve better outcomes. Policies should promote portfolios of practices, not single interventions. Tilahun et al. (2023) show that the full CSA package yields 41% higher food expenditure.

Complementary support is essential. Adaptation alone is not enough. Farmers need access to credit, extension, markets, and affordable inputs to implement strategies effectively. Without these, adaptation can backfire, as seen in Ghana, where CIS recommendations increased costs without commensurate yield gains.

Next, the studies revealed that gender matters. Men and women experience climate change differently and benefit differently from adaptation strategies. Gender-responsive programming is critical. In Zambia, women valued moisture retention; men valued higher yields. In Nigeria, female farmers were more likely to adopt crop diversification.

Avoid maladaptation. Some adaptation strategies, such as fertiliser reduction in Togo or CIS without complementary support in Ghana, can increase vulnerability. Policies must identify and discourage maladaptive practices.

Address barriers to adoption. High labour demands, lack of access to manure/implements, low trust in information services, and land fragmentation are binding constraints that require policy attention.

Evidence Gaps

Long-term effects unknown. Most studies are cross-sectional or cover only one season. The sustained impacts of adaptation strategies over multiple years are not well understood.

Mechanisms are not fully understood. Why do some adaptation strategies benefit some households but not others? Crop-specific and household-type analyses are needed. The sesame-cowpea contrast in Burkina Faso (Ouedraogo et al., 2023) highlights the need for crop-specific research.

Gender-disaggregated impacts are under-researched. While Umar (2021) provides important insights, more studies are needed on how adaptation strategies affect men and women differently across different contexts.

Trade-offs are poorly documented. Adaptation can improve one outcome (e.g., dietary diversity) while reducing another (e.g., income). Systematic analysis of trade-offs is lacking.

Maladaptation is understudied. The Ghana CIS study and Togo fertiliser reduction study show adaptation can backfire, but the conditions under which adaptation becomes maladaptive are not well understood.

Non-farm and off-farm strategies are under-evaluated. Most studies focus on on-farm practices. The impacts of income diversification, migration, and non-farm employment on household welfare deserve more rigorous evaluation.

Scaling mechanisms are not well understood. How to scale successful adaptation strategies from pilot to national level remains a critical evidence gap.

About This Research Bite

This is a visual summary of impact evaluation studies examining the effects of climate change adaptation on livelihoods and income diversification in Sub-Saharan Africa, drawn from a systematic review of the evidence. For the full map, visit <https://products.iced-eval.org/egm-cca.html>

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