Rainfall Shocks, Labour Migration, and the Climate Adaptation Deficit: Remittances as a Missed Opportunity in Smallholder Maize Systems in Southwest Nigeria

Dara Adeduntan & Adeola Adeagbo

Department of Agricultural Economics, University of Ibadan, Nigeria

Abstract

Climate change poses escalating threats to smallholder agricultural systems across sub-Saharan Africa, intensifying the frequency and severity of rainfall variability, pest pressure, input price shocks, and soil degradation. In this context, migration, already a widespread livelihood strategy in rural Nigeria operates simultaneously as a climate vulnerability amplifier (depleting agricultural labour) and a potential adaptation resource (generating remittance income). This paper examines the intersection of migration, remittances, and climate adaptive capacity among maize farming households in Saki East Local Government Area, Oyo State, Nigeria, using primary survey data from 180 farming households.

The study finds that while 63.33% of households receive remittances averaging ₦96,452 per season, approximately 95% of these transfers are consumed rather than invested in climate-adaptive farm practices. Multiple linear regression analysis reveals that remittance receipt does not significantly predict farm-level investment ($\beta = 0.002$, $p = 0.936$), while access to extension services ($\beta = 0.098$, $p = 0.002$) the primary institutional channel for climate-smart technology diffusion emerges as the strongest investment driver. The analysis documents a critical climate adaptation deficit: farm insurance uptake is near-zero, irrigation investment is minimal, and post-harvest storage infrastructure is largely absent across the sampled households. These gaps leave smallholder maize systems highly exposed to climate-induced shocks with no financial buffer.

The paper argues that remittances represent a latent climate adaptation resource that structural and institutional barriers prevent from being mobilised productively. It proposes a climate-adaptive remittance investment framework — integrating weather-indexed micro-insurance, remittance-backed adaptive input credit, and climate-focused extension advisory — to close the adaptation deficit in Nigeria's smallholder maize systems. These findings contribute empirical evidence from the Global South to Tropentag 2026's thematic focus on climate change impacts, adaptation strategies, and data-driven approaches to agro-ecosystem resilience.

Keywords: Climate Change Adaptation, Remittances, Smallholder Agriculture, Maize Systems, Nigeria, Agricultural Resilience, Extension Services, Weather-Indexed Insurance

1. Introduction

Smallholder agriculture in sub-Saharan Africa faces intensifying rainfall variability, pest pressur

e, and input price shocks, with maize among the most affected crops (IPCC, 2022). Rural out-migration compounds this stress by thinning and ageing farm labour. Migration also brings remittances, which could finance adaptive investments such as drought-tolerant seed, irrigation, storage, and insurance. The New Economics of Labour Migration (NELM) framework treats remittances as household insurance against agricultural risk (Stark & Bloom, 1985). Evidence from sub-Saharan Africa, however, suggests that remittances are mostly consumed rather than invested in climate-adaptive practices (Eghan, 2022; Ali et al., 2023). This paper documents the adaptation deficit in Southwest Nigeria, identifies why remittances do not close it, and proposes an institutional framework for climate-resilient agro-ecosystems.

2. Materials and Methods

The study uses structured household questionnaires administered to 180 maize farmers in Oyo State, Southwest Nigeria, a rain-fed, bimodal-rainfall area. Households were selected through four-stage multistage random sampling. Data cover socioeconomic characteristics, migration and remittance receipt, and farm investment, measured with a 10-item Relative Score Index (RSI). Households were classified as low- or high-adaptive relative to the mean index (0.64). Multiple regression was used to identify determinants of the farm investment index, with climate relevance assessed for each significant variable. Remittance data were recorded per season.

3. Results and Discussion

3.1 Household profile and climate vulnerability

Table 1 summarises indicators most relevant to adaptive capacity. Of the 180 households, 63% receive remittances. Access to extension services is limited, with 56% of households having none, and extension is the main channel through which climate-smart technologies reach farmers. Credit exclusion is severe, with 78% of households lacking access, which constrains investment in higher-cost adaptive infrastructure. Over half of household heads (55%) are aged 30–60 years, and 27% are over 60, indicating an ageing labour force.

Table 1. Climate-relevant household indicators (N = 180)

Indicator	Share of households
Receives remittances	63%
Has extension access	44%
Has credit access	22%
Age 18–35 years	18%
Age 30–60 years	55%
Age over 60 years	27%

Source: Field survey, 2025.

3.2 The climate adaptation deficit

Farm insurance uptake is near zero across the sample, which is notable given the rainfall dependen

ce of maize and the use of remittances as a buffer against rainfall shocks (Akobeng, 2022). Irrigatio n adoption is minimal, and post-harvest storage is largely absent, leaving harvested maize exposed to quality losses and price volatility. Households are investing at the margin of their current income but not in the longer-horizon infrastructure that provides genuine resilience.

3.3 Remittances and adaptive investment

Table 2 reports the regression results. Remittance receipt has no significant effect on farm investm ent ($p = 0.936$), which suggests that remittances are not currently functioning as an adaptation fina ncing instrument. This is consistent with Akobeng (2022), who finds that remittances protect consum ption rather than fund productive risk reduction. The significant drivers are access to extension ($p = 0.002$), farm income ($p = 0.008$), marital status ($p = 0.015$), education ($p = 0.016$), and farming experienc e ($p = 0.020$). Knowledge delivery and income reinvestment are therefore the main pathways to adap tive investment under current institutions.

Table 2. Determinants of the farm investment index (multiple regression, $R^2 = 0.487$)

Variable	Coefficient	Std. error	p-value	Interpretation
Migrant remittance (₦)	0.002	0.029	0.936	Not significant
Access to extension	0.098	0.030	0.002***	Main channel for cli mate-smart technolo gy
Monthly farm incom e	0.000	0.000	0.008***	Finances incremen al adaptive investm ent
Married	0.164	0.066	0.015**	Hausehdd stability
Years of education	0.008	0.003	0.016**	Awar eness of climat erisks
Farming experience	0.004	0.002	0.020**	Recognition of clima te pattern change
Age	-0.001	0.002	0.464	Not significant
Access to cr edit	0.044	0.036	0.220	Not significant

*Note: ** significant at 5%; *** significant at 1%. Source: Field survey, 2025.*

3.4 Shock coping and the rde of remittances

Remittances act mainly as a consumption buffer. During rainfall failure they fund food purchases, a nd during input price spikes they supplement income for smaller input purchases. They rarely supp ort input substitution, storage, or market-oriented production. Farm labour hire, which was scored as an investment, is the one area where remittances partly substitute for lost household labour. Househ olds therefore use remittances to survive climate shocks rather than to reduce their exposure to the m.

4. A Climate-Adaptive Remittance Investment Framework

Closing the gap requires addressing three binding constraints: lack of financial products that make adaptive investment affordable, lack of knowledge channels for productive remittance use, and lac k of risk-management products that make adaptive investment less risky than consumption. We prop

ose four linked instruments:

(i) **Weather-indexed micro-insurance.** Payouts are triggered by local rainfall deficits and bundled with formal remittance transfers, so migrants can cover farm households at the point of sending. Pilots in Ghana, Kenya, and Ethiopia offer implementation models.

(ii) **Remittance-linked input credit.** Regular remittance receipts act as a collateral proxy for seasonal climate-smart input loans.

(iii) **Climate-focused extension.** Advisory services are expanded in migrant-sending communities, with agents trained to advise on productive use of remittances.

(iv) **Collective infrastructure investment.** Cooperatives pool remittances for shared irrigation and storage, supported by governance capacity-building and matched public or NGO financing.

5. Conclusions

Remittances in Southwest Nigeria represent an unrealised climate adaptation resource. They are consumed before they can be invested, while farm insurance, irrigation, and post-harvest infrastructure remain largely absent. Extension access, education, and farming experience are the active ingredients of adaptation under current conditions. The proposed framework addresses the structural barriers that keep remittances from functioning as climate finance and offers a concrete empirical case from Nigeria's smallholder maize sector.

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