



Non-farm employment, agricultural intensification and productivity change: Empirical findings from Uganda

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In 2015, with support from the International Development Research Centre (IDRC) of Canada, PEP, along with the African Development Bank (AfDB), Cornell University, the World Bank, and the African Economic Research Consortium (AERC) launched the new “Structural Transformation of African Agriculture and Rural Spaces” (STAARS) program – a major African initiative for high quality research and capacity building for agricultural transformation as a key pathway to reduce poverty and promote inclusive growth and sustainable development in the continent.

This brief summarizes the main outcomes and implications for policy of one of the projects supported under the STAARS initiative.

African researchers assess synergies and tradeoffs for agricultural intensification and productivity when farm households diversify into non-farm employment in Uganda.

In this study, a team of local researchers finds that non-farm income can protect against external shocks and help finance farm investment but at the cost of reduced family farm labor. Based on these results, the team outlines several recommendations to target the negative tradeoffs between non-farm employment, agricultural intensification, and productivity change.

Non-farm employment and technology adoption aim to enhance agricultural productivity in Sub-Saharan Africa

In addition to its traditional role of improving food security and nutrition, agriculture remains a key sector for encouraging growth, overcoming poverty, and creating employment opportunities in Sub-Saharan Africa (SSA). African agriculture faces the ongoing challenge of how to best accelerate productivity and promote sustainable agricultural intensification - a challenge that is increasing in the face of rapid population growth.

The innovation and spread of technology is essential to increasing agricultural productivity and intensification and thereby stimulating rural economic growth and poverty reduction. Unfortunately, the uptake of agricultural technology in SSA has been severely limited due to uninsured agricultural risk, credit constraints, transaction costs, poor access to information, weak institutional linkages, and poor infrastructure, as well as other factors.

Non-farm employment has been promoted as a means to help farmers in low-income areas overcome some of the key barriers to technology adoption, thereby promoting agricultural productivity, economic growth, and poverty reduction. However, research suggests there might be significant tradeoffs between non-farm employment and income and farm productivity

growth for smallholder agriculture. While significant research has been done on the relationship between non-farm employment and input use and family labor on the farm, limited empirical evidence is available on how non-farm employment affects agricultural intensification and productivity change – a question of significant policy relevance.

Recognizing an urgent need for careful, country-specific analyses of farm and non-farm linkages to inform appropriate policymaking in the process of agricultural and rural transformation, a team of African researchers conduct a study to assess



whether synergies or tradeoffs are more likely for agricultural intensification and productivity when farm households diversify into non-farm employment. Using nationally representative panel data for Uganda, three important policy questions are addressed:

(1) What are the main determinants of household participation in non-farm employment?

- (2) How does the opportunity to earn income from non-farm employment affect agricultural intensification and productivity?
- (3) What are the main determinants of farm technology intensification in terms of joint use of key inputs, for example, fertilizer, seeds and soil and water management practice (SWMP)?

Data and methodology

To assess the agricultural intensification and productivity effects of non-farm employment, the researchers use a balanced sample of 1846 households from the nationally representative Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) in Uganda over the years 2009, 2010 and 2011. The team uses a non-separable farm household model with missing markets to first investigate the determinants of non-farm employment, including participation and earnings before addressing the impact of non-farm employment on agricultural intensification and agricultural productivity.

Using the panel data and the sample selection model for two-step estimation with censored endogenous variables that controls for unobserved heterogeneity (e.g., differences in skills, ability, motivation, and culture) in intensification and productivity across farms, the researchers are able to identify the impact of non-farm employment on agricultural intensification without interference due to differences in these unobserved factors.

Key findings

The results show that, as in other SSA countries, the **level of agricultural technology adoption amongst farmers in Uganda remains low.**

Although all productivity indicators and the intensity of farm technology increase over the observed period, joint use of many improved farm technologies is minimal. Over this period non-farm income increases by about 350%, and the share of non-farm income increases from 0.11 to 0.28.

The results also reveal that **the poorest households in rural Uganda are more reliant on income diversification** than households in the upper income quartiles.

- Household non-farm employment increases with an increase in human capital (e.g. adult members and education), household (non-land) assets, and access to local public goods (e.g. roads and banks) – see table – suggesting that resource-poor farmers may face significant entry barriers to leveraging non-farm opportunities due to limited human and physical capital.
- Findings also reveal that households that recently experienced an agricultural shock and reside in a community with relatively low precipitation have a higher non-farm income –

Table: Key characteristics of sample households by non-farm income status

| Variable | HHs with non-farm income (N=2874) | HHs without non-farm income (N=2664) |
|---|-----------------------------------|--------------------------------------|
| Income from crop (1000 USh) | 588 | 710*** |
| Income from livestock (1000 USh) | 58 | 34* |
| Income from remittances (1000 USh) | 61 | 79* |
| Income from other sources (1000 USh) | 66 | 44* |
| Total household income (1000 USh) | 1162 | 826*** |
| Livestock (Tropical Livestock Unit) | 2.15 | 1.74** |
| Value of total assets (USh) per capita | 1564 | 1194** |
| Land holdings (acres) | 4.90 | 4.02** |
| share of land with fair soils | 0.19 | 0.24** |
| share of land with good soils | 0.52 | 0.41* |
| Number of household members | 7.00 | 6.26* |
| Years of schooling of household members | 7.61 | 5.73*** |
| Years of schooling of household head | 2.32 | 1.79** |
| Age of the household head | 46.06 | 49.81* |
| Gender of the HH head (male=1) | 0.74 | 0.67* |
| Inorganic fertilizer /acre | 0.64 | 4.12** |
| Share of area under SWMP | 0.36 | 0.16** |
| Cost of hired labor (1000 USh)/acre | 18.50 | 12.66** |
| Family labor use (person days)/acre | 153.03 | 168.10* |
| Total value of harvest (1000 USh)/acre | 2053 | 2518** |
| Total maize harvest (kg/acre) | 319 | 333* |
| Distance to the main road (km) | 7.59 | 8.65* |
| Rural community(Yes=1) | 0.86 | 0.94** |

The significance tests between households with and without nonfarm income are the t-tests for continuous variables and the Pearson chi2 test for categorical variables. *** p<0.01. ** p<0.05. * p<0.10.

suggesting that non-farm income is important in smoothing consumption and enhancing resilience in the event of external shocks.

- Non-farm income increases the quantity of improved seed usage and the intensity of hired labor – indicating that non-farm income could provide the means to undertake timely farm operations and to finance investment in the use of modern seeds.
- However, non-farm income decreases the use of family labor in farming activities, representing an exchange of farm and non-farm employment as well as a potential negative income effect of non-farm employment on labor use in agriculture.

Implications and recommendations for policy

The results of the study highlight the negative tradeoffs between non-farm employment, agricultural intensification and productivity change. Rural non-farm employment can reduce agricultural productivity for several reasons. In the presence of imperfect labor markets, farmers may incur high costs in reallocating remaining family labor to specific farm operations. Non-farm income may undermine incentives for investing in farm intensification practices that improve agricultural productivity. Lastly, family laborers may be more productive than hired workers.

The results also imply that, at the initial stages, non-farm employment is particularly significant in high-density areas with low agricultural potential, as well as in land-constrained areas with high agricultural potential to absorb the surplus labor associated with productivity growth. For non-farm employment to have positive outcomes on the rural economy the movement of surplus labor out of agriculture or employment in the non-farm sector should not lead to declining agricultural productivity.

Based on these empirical results, the authors recommend that policies be targeted to reduce the potential tradeoffs between non-farm employment and agricultural intensification and productivity change, so that some income from non-farm sources can be re-invested in farm productivity-enhancing innovations. Additional analysis may be required to understand the constraints on investment in agriculture and the kinds of policies that would foster use of non-farm income to improve farm productivity and modernization of smallholder agriculture. The complementarities of non-farm employment and agricultural productivity may be enhanced through better functioning labor markets, in the place of family workers engaged in non-farm activities, and improved access to productivity-enhancing inputs such as fertilizer and improved seeds, which are underutilized in Uganda.



This policy brief is based on the PEP project [STAARS-01](#), carried out with scientific support from PEP and financial support from Canada's IDRC.

To find out more about the research methods and findings, read the [full paper](#) (forthcoming)