

# FARM PRODUCTIVITY AND COMMERCIAL AGRICULTURE IN SUB-SAHARAN AFRICA

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## *Commercialization, trader networks, and farm technical efficiency* Evidence from Ethiopia, Ghana, Malawi, Nigeria, Tanzania, and Uganda

### Key messages

- Across six countries, technical efficiency is far from the frontier for many farms: mean efficiency ranges from 0.55 (Ethiopia) to 0.72 (Ghana), with wide dispersion within every country.
- Farms that sell crops are consistently associated with higher technical efficiency (lower inefficiency) in all six settings, even after controlling for inputs, household traits, and local context.
- Local market structure matters: denser trader networks are associated with higher efficiency in Ethiopia, Malawi, and Nigeria, but the relationship is weak in Tanzania and Uganda and reverses in Ghana, highlighting strong context dependence.
- Commercialization appears to work as “catch-up”: quantile results show the strongest associations for farms operating farthest from the frontier, with smaller marginal gains among already efficient farms.
- Returns to scale are below one in every country, suggesting that productivity gains will not come only from expanding land and labor; improving how inputs are used (efficiency) is a major margin for raising output.
- Policy should reduce the fixed costs of market entry and strengthen the rural “hidden middle” (aggregation, storage, logistics, and wholesale services) so that more farms can reach existing productive potential.



## WHY THIS STUDY MATTERS

Agricultural productivity in Sub-Saharan Africa remains low and highly uneven, both across and within countries (Figure 1). A large part of this gap reflects not only technology differences, but also technical inefficiency: many producers operate well below their feasible output given the inputs they already use. If market integration improves information, incentives, and coordination, it may help farms move closer to their production frontier without requiring immediate frontier-shifting innovation.

## DATA AND APPROACH

The analysis combines harmonized farm household surveys from Ethiopia, Ghana, Malawi, Nigeria, Tanzania, and Uganda with spatial measures of local market conditions. Country-specific production technologies are estimated using a True Random Effects stochastic frontier model with a flexible translog specification for land and labor, and modern-input indicators as frontier shifters. Technical inefficiency is then modeled as a function of market participation (whether the household sells crops), local trader density (a proxy for market thickness), MSME engagement, and household and contextual characteristics. To examine heterogeneity, technical-efficiency scores are also analyzed using quantile regressions.



## MAIN FINDINGS



### **LARGE UNREALIZED PRODUCTIVE POTENTIAL UNDER CURRENT TECHNOLOGIES.**

Efficiency scores span a wide interval in every country, including in the highest-performing settings. Mean technical efficiency is 0.55 in Ethiopia, 0.57 in Malawi and Tanzania, 0.59 in Nigeria, 0.68 in Uganda, and 0.72 in Ghana. This dispersion implies scope for sizable output gains from better use of existing inputs, not only from scaling up.



### **MARKET PARTICIPATION IS STRONGLY ASSOCIATED WITH OPERATING CLOSER TO THE FRONTIER.**

Across all six countries, selling crops is associated with substantially lower inefficiency in the frontier model. Estimated associations are economically meaningful and statistically strong and appear particularly pronounced in countries such as Ghana and Uganda. These patterns are consistent with channels such as stronger price incentives, better information flows, and learning through repeated buyer interaction, but they should be interpreted as correlations rather than causal effects.



### **TRADER DENSITY CAN MATTER, BUT RESULTS ARE COUNTRY-SPECIFIC.**

Higher trader density is associated with lower inefficiency in Ethiopia, Malawi, and Nigeria, suggesting benefits from thicker local markets and more competition among intermediaries. In Tanzania and Uganda, the association is small and statistically weak. In Ghana, trader density is positively associated with inefficiency, which could reflect reverse causality (traders locating where production systems are structurally weaker) or market segmentation where intermediary presence does not translate into better farm management. (See Figure 2)



### **COMMERCIALIZATION IS MOST STRONGLY LINKED TO EFFICIENCY GAINS AMONG LAGGING FARMS.**

Quantile regressions show a clear gradient: the commercialization–efficiency association is largest at the bottom of the efficiency distribution and declines toward the top. This points to catch-up dynamics, where market engagement helps the least efficient producers improve input allocation, timing, and management practices, while already efficient farms have less room to gain.



### **DECREASING RETURNS TO SCALE HIGHLIGHT THE CENTRAL ROLE OF EFFICIENCY.**

Estimated returns to scale are below one in every country (roughly 0.54 in Nigeria to 0.87 in Ghana). This implies that expanding land and labor alone is unlikely to deliver proportional output gains. Policies that relax coordination constraints and improve market functioning can therefore complement technology adoption by helping farms use current inputs more effectively.

## ROBUSTNESS CHECKS AND CAUSAL SIGNALS

Three features strengthen interpretation of the patterns. First, production frontiers are estimated separately by country to avoid conflating technology differences with inefficiency. Second, the True Random Effects framework separates time-invariant farm heterogeneity from time-varying inefficiency. Third, distributional analyses (quantile regressions and nonlinear descriptive patterns) show that relationships vary systematically across the efficiency distribution. Even so, the study is not an experiment: commercialization and trader density can be endogenous. The results should therefore be read as robust associations.

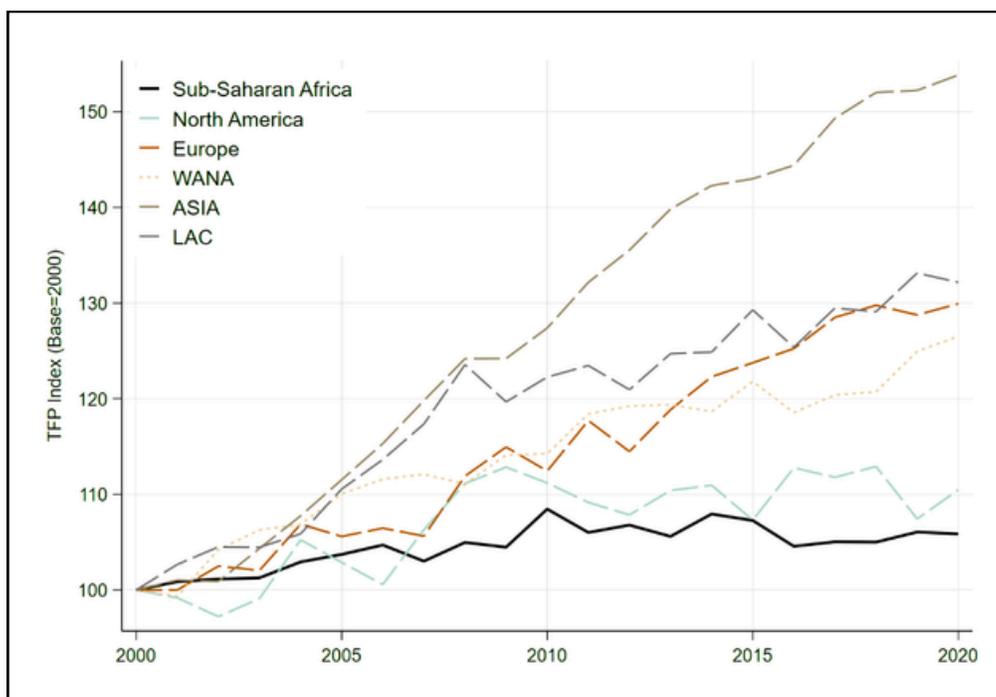
## LIMITATIONS AND RESEARCH GAPS

- Causality is not guaranteed. Households may self-select into markets, and traders may locate in response to unobserved local productivity trends.
- Output values, labor inputs, and prices are survey-based and can contain measurement error; weather shocks and quality differences are only partly captured.
- Ghana relies on repeated cross-sections rather than a household panel, limiting within-household identification compared with the other countries.
- The trader-density proxy captures market thickness but not other features that may matter for performance, such as contract enforcement, service quality, or buyer power.

## POLICY RECOMMENDATIONS

- **Reduce fixed costs of market entry.** Invest in feeder roads, rural buying points, storage and drying, and reliable market information so that more farms can cross the threshold from subsistence to selling.
- **Strengthen the rural “hidden middle.”** Support competitive networks of aggregators, traders, and logistics and warehouse services. Where appropriate, ease working-capital constraints for intermediaries and improve basic market infrastructure to lower transaction costs.
- **Target the lowest-performing farms first.** Because commercialization is most strongly linked to catch-up, combine market-access investments with extension and management support for producers far from the frontier.
- **Promote competitive and transparent local market structures.** Because the effects of trader density differ across countries, simply increasing the number of intermediaries is not sufficient. Policies that encourage competitive entry of traders, improve price transparency, and strengthen contract enforcement can prevent thin or concentrated markets from limiting the efficiency gains associated with commercialization.
- **Build evidence on what works.** Monitoring systems and impact evaluations should go beyond yield changes and explicitly track technical efficiency and market-system indicators (such as trader density and commercialization intensity). This would allow policymakers to distinguish between technological gains and improved use of existing resources, and to identify which market interventions generate frontier catch-up.
- **Integrate market development with managerial upgrading.** Market access alone may not be sufficient if farms lack managerial capacity to respond to price incentives. Complementary investments in farm management skills, input timing, and production planning can amplify the efficiency gains associated with commercialization.

**FIGURE 1. TOTAL FACTOR PRODUCTIVITY OVER TIME ACROSS THE GLOBE, BY REGIONS.**



**FIGURE 2. CORRELATION BETWEEN TRADER DENSITY AND TECHNICAL EFFICIENCY, BY COUNTRY.**

