



Evans School Policy Analysis and Research (EPAR)

Agricultural Transformation in Tanzania: Scope of Work

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EPAR Technical Report #353
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March 3, 2017

Structural transformation, the reallocation of economic activity across sectors (typically from agricultural to manufacturing and/or services) is a key component of theories of economic development. Conventional approaches to monitoring structural transformation rely on aggregate, typically macroeconomic indicators; e.g., inter-sectoral shifts in labor participation, wage rates, and contributions to value addition and national income. Such measures suffer a number of significant drawbacks: their computation and reporting, particularly in the context of weak statistical systems, is typically significantly error-prone¹ and lagged; they provide little or no insight into important drivers and sub-national patterns of transformation; and they do not consider the ways transformation impacts lives and livelihoods - particularly of the poor. Conventional approaches focus on the long-term macro outcomes rather than the nascent livelihood level shifts that progressively drive aggregate transformation.

The spread of nationally representative household surveys tracking panels of households over time opens the possibility for an alternative approach to tracking transformation, particularly agricultural transformation in low-income countries. These panel datasets include rich information on household livelihoods, income, resource use and the production and disposition of agricultural commodities. Household-scale tracking opens up new opportunities to detect and potentially shape emerging trajectories of agricultural transformation across different regions or farmer segments within a country, based on analyzing the emergence and evolution of household characteristics hypothesized to represent hallmark attributes of agricultural and structural transformation at the micro level. Analyzing and monitoring transformation as it happens at the micro scale may support policy makers to better recognize opportunities for fine-tuning policies or investment strategies aimed at achieving more inclusive outcomes.

This report will use data from three waves (2008-09, 2010-11, and 2012-13) of the Tanzania National Bureau of Statistics National Panel Survey (TNPS), conducted in conjunction with the World Bank's Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA), to analyze transformation trajectories of households in Tanzania over time. The sample includes both farm and non-farm households, but for this analysis we will only include households reporting agricultural activities in at least one of the survey waves. The TNPS tracks and interviews each individual in the original sample of households in the subsequent panels, including individuals that split off from their original household to form or join a separate household. We

¹ Consider, for example, the recalibration of national GDP in Ghana and Nigeria in the order of 40-60% as a consequence of systematic, long-term mis-measurement of the components of economic growth.

*EPAR uses an innovative student-faculty team model to provide rigorous, applied research and analysis to international development stakeholders. Established in 2008, the EPAR model has since been emulated by other UW schools and programs to further enrich the international development community and enhance student learning.*¹

Please direct comments or questions about this research to Principal Investigators Leigh Anderson and Travis Reynolds at eparinfo@uw.edu.

include these splitoff households in our analyses, tracking them from the first wave in which they were separately interviewed.

Description of the transformation attributes and status of TNPS panel households

The survey provides detailed data on agricultural production, farm management, livelihoods, and individual and household demographics.² Based on these data, we will construct indicators of various household attributes hypothesized to signify a trajectory of agricultural transformation. These transformation attributes will include:³

- 🏠 Land Consolidation: Total household land holding of the household
- 🏠 Agricultural Diversification: The share of production value from non-staples or livestock
- 🏠 Agricultural Intensification: The value of [purchased?] inputs per ha or per animal
- 🏠 Agricultural Productivity: The ratio of production value from agricultural activities to the value of agricultural inputs
- 🏠 Agricultural Commercialization: The share of agricultural production marketed
- 🏠 Agricultural Profit: Annual farm enterprise income or profit
- 🏠 Off-Farm Diversification: The share of household income from non-farm/off-farm sources
- 🏠 Prosperity: Total household income/consumption

We will evaluate the status of panel households for indicators of each of these transformation attributes in each survey wave, and will record whether households experienced a positive or negative change between survey waves. The threshold for distinguishing a real change from more minor fluctuations will be based on the median change and distribution reported for each indicator. Since we are working with only three waves and potentially small changes, we will look at each indicator for tradeoffs between a reduced sample size, and exploring more extreme positive and negative changes to uncover differences.

We will also assign to each household a transformation status in each wave based on changes in their transformation attributes⁴. Households reporting any agricultural activity in a wave after reporting no agricultural activity in the previous wave will be considered to have **entered** agriculture. Conversely, households reporting no agricultural activity in a wave after reporting agricultural activity in the previous wave

² The TNPS relies on a multi-stage stratified random sample where the primary sampling unit is the enumeration area (EA). The sample consists of eight administrative zones, each with a rural and an urban cluster, for a total of 16 sampling strata. EAs are based on the 2002 Census, and eight households per EA are randomly selected to participate in the survey. The survey data are representative at the national, urban/rural, and agro-ecological zone levels; however, sample size limitations preclude reliable statistics at the regional or district level. Households were interviewed in the 11 months following harvest about the prior growing season.

³ Slightly modified from Stan Wood's Tractably Tracking Transformation Trajectories, Oct. 2016 (hereafter, SRW, 2016); we will need theory and a lit review to back up whichever ones we end up, and to justify the choice of indicators/proxies as well.

⁴ From SRW, 2016, but excluding "graduated" defined as not being above \$3/person/day. Since a household could simultaneously be "graduated" and in any of the other categories, should we break out all transformation statuses by sub-populations included by poverty status

Need to discuss: poverty status is also covered by one of the transformation attributes (prosperity - total household income/consumption)

will be considered to have **exited** agriculture. Households reporting agricultural activity in consecutive survey waves will be evaluated based on the number of transformation attributes for which they experienced a positive change. Households will be considered **entrenched** if they experienced positive changes in 0 or 1 attributes, **transitional** if they experienced positive changes in 2 or 3 attributes, and **transforming** if they experienced positive changes in 4 or more attributes.

Our analysis will allow us to track the proportion of households experiencing changes in transformation attributes between each wave, as well as the proportion of households in each transformation status category. We will break down these statistics to separately consider various sub-populations, including male- and female-headed households, households cultivating more or less than 2 hectares, households with mean per capita daily income/consumption above and below the poverty line, rural and urban households, and households living in areas with different levels of agricultural potential and market access.

Analysing correlates of change

Beyond describing the transformation attributes and statuses of TNPS panel households, we will also analyze what factors are associated with changes in attributes and status. We propose using both a deductive and an inductive approach in parallel.

Leveraging existing theory and empirical studies, we will conduct regression analyses looking at changes between survey waves controlling for hypothesized household socioeconomic characteristics, farm management decisions, and local/regional factors such as agroecology, rainfall, infrastructure, and institutions that the literature suggests may be associated with agricultural transformation.

Leveraging the bounty of data now available, we will conduct principal components analysis (PCA) looking for empirical patterns in socioeconomic characteristics, farm management decisions, and local factors among clusters of households. This approach will allow us to simultaneously consider vastly more measures than prudent for regression that may:

- be household relevant (but whose effects were washed out at the national level);
- be more relevant in both a contemporaneous and country context (i.e. Tanzania beginning in 2008);
- be sufficiently collinear that we can combine groups into indices to improve the efficiency of the econometrics;
- have just been missed.

Our initial thinking is to perform this PCA for all households (with landholding size, a consumption index and gender of household head included and maybe an agro-ecological x market access distinction from the analysis Stan sent), and then separately for smallholders and non-smallholders, below and above median consumption level, and female and male headed households. The reasoning is the ambiguity of causality (and understanding what is truly exogenous and therefore potentially a viable investment entry point) and the assumption of transformation factors having the same “smooth and continuous” and average effect across sub-populations. We begin by throwing everything in because we cannot well distinguish whether poor consumption drives low productivity or vice versa - or if both of these measures are endogenous to, for example, land endowments. We then look at groupings because we do not know if certain attributes such as extreme poverty or gender bias create a “trap” such that any other factor of transformation “behaves” differently for these sub-populations.

This analysis will allow us to better understand the dynamics of agricultural transformation among sub-populations in Tanzania, and the factors associated with attributes of agricultural transformation. The findings may be useful for policy makers in determining what investments, interventions, and policies might be most effective for supporting inclusive agricultural transformation.

The outputs will include a technical report presenting the findings of our analyses on the trends in agricultural transformation attributes and statuses of Tanzanian household over time and on the factors associated with agricultural transformation attributes, along with a cleaned dataset aggregating data from the three waves of the TNPS and associated data preparation and analysis do files.

Proposed Timeline:

- 🎬 March 31: Dataset cleaned and prepared with data for all sample households across all 3 TNPS waves and constructed variables for indicators of agricultural transformation attributes
- 🎬 April 14: Description of changes in agricultural transformation attributes and status between survey waves, by sub-population
- 🎬 April 28: Regression analysis and PCA to identify factors associated with indicators of agricultural transformation
- 🎬 May 12: Draft report presenting background, methods, analysis, and findings
- 🎬 May 31: Final report and cleaned data files

Appendix 1

Stan Wood: Tractably Tracking Transformation Trajectories, Oct. 2016 v. 4