

Tanzania fertilizer use increased after intervention, but changes were not sustained, study shows

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Maize growing in the Morogoro region of Tanzania. Credit: Benjamin Norton

Smallholder farmers in Sub-Saharan Africa tend to use very small amounts of fertilizer, limiting their crop productivity. A 2016

intervention in Tanzania increased farmers' fertilizer use and their crop yields. However, a follow-up study from an international team of researchers has found that the 2016 effects proved temporary, and farmers have since reverted to baseline low rates of fertilizer use and low crop yields.

The new study is [published](#) in the journal *Economic Development and Cultural Change*.

"We saw some promising impacts from the [first study](#), when we provided farmers with both plot-level information about their soils and vouchers to purchase fertilizer. But the farmers who had [yield](#) gains did not continue using fertilizer after the study and vouchers ended, nor did the effects seem to encourage others to adopt," said co-author Hope Michelson, associate professor in the Department of Agricultural and Consumer Economics, part of the College of Agricultural, Consumer and Environmental Sciences (ACES) at the University of Illinois Urbana-Champaign.

The original 2016 study included 1,050 smallholder maize farmers in Tanzania. One group of farmers received plot-specific fertilizer recommendations based on a test of their soils and vouchers to purchase fertilizer, one group received just the plot-specific recommendations, one group received just the vouchers, and a control group received neither. Only the group that received both recommendations and vouchers increased their fertilizer purchase and application as well as maize yields.

The 2019 follow-up study, led by Abdulrazzak Tamim, now a doctoral student at the University of California, Berkeley, found that fertilizer use for all groups had returned to previous low rates (around 1% of the farmers) and the yield effect had dissipated. The research team concluded the farmers faced liquidity constraints—without the vouchers,

they were not able to purchase additional fertilizer. Another factor: 2016 yield effects may not have been large enough to convince the farmers that fertilizers were worth the investment.

"We think the main reason is lack of liquidity, but the explanation could also be related to other structural factors such as fertilizer availability or access on the supply side. For the original study, an agri-dealer came to the villages with the fertilizers that were recommended for the area, which solved the issues of access and delivery," Michelson said.

The project's collaboration with the region's well-respected Sokoine University of Agriculture could also have helped to assuage farmers' doubts about the quality of fertilizer provided by agri-dealers in the original study. Once farmers had to travel to obtain the fertilizer and were unsure about the quality (a factor Michelson has explored in other studies), they may have had concerns that impacted their decision not to invest.

The researchers found the 2016 effects were driven by the most productive farmers with the largest plots and most fertile soils. Even so, the benefits were not sufficient to convince these nor other farmers to continue the practice. Or perhaps they were unable to save money to invest in fertilizer.

Michelson said the weather in 2016 may have been a contributing factor. There was a severe drought in the area, which affected yields across the board. Farmers who used fertilizer had higher yields compared to the [control group](#), but not compared to their own yields the previous year. They simply maintained the status quo while others had declining yields.

"They didn't have increased revenues relative to the norm, so perhaps they couldn't save enough to purchase fertilizer in the next year," she noted.

The findings point to the challenges of learning in an agricultural environment for both farmers and researchers, Michelson stated. If the effect of a new technology is smaller than the year-to-year variability due to weather shocks, insect pests, or other external factors, it's difficult to observe the impact of your investments.

Another dimension of the study was how to obtain reliable, objective measures of crop yield.

"There's been some methodological excitement around the possibility of measuring smallholder production and yields using satellite imagery. That was something we wanted to explore, but it was complicated to do, and we did not get consistent results," Michelson said.

The findings from the initial study were based on farmers' self-reported yield and plot measurements. The researchers compared this data retroactively with yield measured from satellites, but they did not pick up the same effects. They determined the initial results were likely reliable, indicating current limitations to satellite-derived yield measures on small farms with inter-cropping and variable production systems.

Michelson concluded the study underscores how important it is to follow projects through and continue to measure impacts.

"If researchers have the scope and resources, they should go back and observe the longer-term effects of what happened," she concluded. "The results from the initial study were very promising, as many farmers adopted the use of a [fertilizer](#) that is really needed in the region. However, when you see the effect is not persisting even after the yield increases are well documented, it raises new questions about persistence, constraints, and policy that need to be explored."

More information: Abdulrazzak Tamim et al, Relaxing Credit and

Information Constraints: Five-Year Experimental Evidence from Tanzanian Agriculture, *Economic Development and Cultural Change* (2024). [DOI: 10.1086/731589](https://doi.org/10.1086/731589)

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