



FEED THE FUTURE ALL-IN PROJECT IN BRIEF

SOIL TESTING FOR SOIL ACIDITY MANAGEMENT ON SMALLHOLDER FARMS IN KENYA

Lead Principal Investigator
John Olwande, Tegemeo Institute of Agricultural Policy and Development

Project Partners
County Departments of Agriculture, Michigan State University

Development Innovation
Soil testing

Commodity
Maize

Targeted Population
Small-scale farmers

Country/Location
Kenya

Timeline
2021-2024

Funding
\$400,804 (USAID)

High soil acidity is a significant cause of low and stagnant agricultural productivity in Kenya, particularly for maize, which is the country's main staple crop. Few small-scale farmers test their soils to make soil management decisions. This ALL-IN project is testing practical ways to encourage farmers to test their soils and to apply appropriate soil amendments. It includes an estimate of farmers' willingness to pay for soil testing. The results provide guidance on promoting effective soil management for sustainable agricultural productivity growth in Kenya and across Sub-Saharan Africa.

The Challenge

In Kenya, maize yields and agricultural productivity in general have stagnated or declined in spite of major efforts to expand the use of fertilizers. Over time, fertilizer use on maize has significantly increased among smallholder farmers but maize yields have stagnated or declined, indicating that soils have been compromised by poor land management and input use practices.

One of the main reasons for this failure is high soil acidity. In 2014, Kenya's National Accelerated Agricultural Inputs Access Programme (NAAIAP), found that 30 percent of 9,600 soil samples from 4,800 farms had pH levels below 5.5, which is the threshold for optimum maize plant growth.¹ Some areas had soils with a pH as low as 3.8. Soil science has established that high soil acidity, defined as low pH, causes a chemical reaction that binds macronutrients like phosphorus into the soil, keeping it from uptake by growing plants. In this case, adding more phosphorus to the soil has no effect on plant growth.

While soil acidity is a well-known problem, soil testing is uncommon and few farmers know the conditions of their own soils. In one study,² fewer than one out of 200 farmers in the sample had their soils tested. In that study, despite

RESEARCH INNOVATION

The high cost and limited availability of soil testing facilities have been cited among the reasons for low rates of soil testing among small-scale farmers in Kenya. Interviews with officials at the departments of agriculture in the four counties of this research project establish that most smallholder farmers view soil testing as costly and unaffordable. However, farmers' own valuations of soil testing and their willingness-to-pay (WTP) for the services are not known.

An experimental auction is one way to elicit farmers' WTP for soil testing. This project uses the Becker-De Groot-Marschak (BDM) method,¹ which involves a simple game of bidding that provides strong incentives for farmers to reveal the true maximum price they are willing to pay for a basic soil test. To incentivize farmers to bid their true valuation, the research team provides KES 2,000 (about \$20) to all participants. The cost for a basic soil test is about \$10 per soil sample. The results of these experimental auctions provide information on farmers' valuation of soil testing and insights on how soil testing products can be priced and incentives that might work to promote soil testing among farmers.

¹ Becker, G.M, et al. 1964. "Measuring utility by a single-response sequential method." *Behavioral Science*.

that nearly half of the plots had soil pH below 5.5, not one farmer applied lime, an amendment that reduces soil acidity. Few use non-acidifying fertilizers.

Research Design

This ALL-IN project led from the Tegemeo Institute of Agricultural Policy and Development, Egerton University, is building evidence on practical ways to encourage farmers to update their knowledge about the condition of their soils and encourage them to apply appropriate soil management practices.

The project takes place in villages across four counties that are among the most important for maize production in Kenya: Bungoma, Kakamega, Trans Nzoia and Uasin Gishu. These counties are among those in which the government conducted soil tests in 2014 and found that the soils were generally highly acidic.

The project is being implemented as a randomized controlled trial (RCT) to evaluate the impact of soil test information on farmers' willingness to pay for and use soil acidity management recommendations. The sample is randomized at the level of individual villages as the variation of soil pH within a village is less than eight percent. The total of 1,200 households will participate in one of three groups:

- T1: Soil testing conducted on farmers' largest or most important maize plot at no cost to farmers and they are provided results and written soil acidity management recommendations
- T2: No soil testing but farmers are provided written soil acidity management recommendations at the sub-county level based on 2014 soil testing by the NAAIAP
- Control: Neither provided soil testing nor recommendations based on NAAIAP soil testing

The project includes an additional 400 households to test willingness to pay for basic soil testing with an experimental

auction during the household survey. Farmers who bid successfully in the experimental auction will have soil samples taken immediately.

A remaining challenge even after farmers are provided recommendations for applying lime to combat soil acidity is that lime might not be available in local input shops. Exploratory interviews in the study area found that the use of lime is extremely limited. The average price of a 50 kg bag of lime ranges from KES 400 (\$4) to KES 500 (\$5), and only a few agro-dealers stock it and only in small quantities.

The research team is exploring partnerships with lime suppliers to make these amendments available in the study area. Not all the soils will require lime but may require non-acidifying fertilizer blends that should be readily available at prices similar to the most widely applied fertilizers.

Development Impact

The project supports the government, development agencies, and private sector investors in promoting and facilitating proper soil management among farmers for sustainable agricultural productivity growth. By addressing widespread soil acidity, this project aligns with Feed the Future and USAID efforts in Kenya to expand economic opportunities for smallholder farmers and entrepreneurs to build resilience of households, communities and markets to shocks and stresses, and diversify agricultural production. Agriculture is critical across Sub-Saharan Africa considering the challenge of feeding and employing a rapidly growing population in the coming years.

¹ Government of Kenya. 2014. Soil suitability evaluation for maize production in Kenya.

² Olwande, J., et al. 2021. "Farmers' Perceptions of Soil Quality and Soil Fertility Management in Kenya." Working Paper.

FEED THE FUTURE ADVANCING LOCAL LEADERSHIP & INNOVATION NETWORKS (ALL-IN)

This research is funded by the Feed the Future Advancing Local Leadership & Innovation Networks (ALL-IN) initiative, an innovative collaboration between the Kenya-based think tank International Centre for Evaluation and Development (ICED) and the U.S.-based Feed the Future Innovation Lab for Markets, Risk & Resilience at the University of California at Davis.

Launched in 2020, ALL-IN advances host-country leadership in defining and implementing research projects and to deepen host-country networks. The initiative funds research to develop and test financial and market innovations that take the most promising agricultural tools for rural families in developing economies from the lab to the field.

Historically, Feed the Future Innovation Labs have built their research programs on partnerships between researchers at U.S. universities and researchers at host-country universities and institutions. Historically, these partnerships have been led, in both program administration and the ideas that drive the research, from the U.S. ALL-IN shifts this leadership role to researchers and institutions in Africa.

ALL-IN builds on research capacity in African countries by inverting the traditional model of research collaborations led from U.S. universities. With funding through ALL-IN, researchers at African institutions lead these collaborations, defining research priorities and leveraging their local knowledge, skills and ideas to build actionable evidence for effective policy with U.S. university research partners to supplement their own skills, talents and ideas. ALL IN also addresses capacity gaps among many research institutions in managing large and complex awards.

Learn more at www.iced-eval.org/all-in/

This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID) cooperative agreement 7200.AA19LE000004. The contents are the responsibility of the Feed the Future Innovation Lab for Markets, Risk and Resilience and do not necessarily reflect the views of USAID or the United States Government.

ABOUT FEED THE FUTURE

As the U.S. Government's global hunger and food security initiative, Feed the Future works to give families and communities in some of the world's poorest countries the freedom and opportunity to lift themselves out of food

insecurity and malnutrition. By equipping people with the knowledge and tools they need to feed themselves, Feed the Future addresses the root causes of poverty and hunger, helping people end their reliance on aid and creating important opportunities for a new generation of young people—all while building a more stable world.