Credit, Uncertainty, and Monitoring for Technology Adoption

Researchers:

Tanguy Bernard

Joshua Deutschmann

Ouambi Yameogo

Fieldwork: Centre De Recherche Pour Le Developpement Economique et Social

Sample: 396 farmers in 40 villages

Initiative(s): Agricultural Technology Adoption Initiative (ATAI)

Target group: Farmers

Outcome of interest: Technology adoption

Intervention type: Credit Extension services Fertilizer and agricultural inputs Information Community monitoring

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Partner organization(s): Centre De Recherche Pour Le Developpement Economique et Social, International Institute of Tropical Agriculture (IITA), CGIAR, Gates Foundation, UK International Development

Aflasafe is a new product that farmers growing groundnuts or maize can apply to reduce aflatoxin—a poisonous substance. Although using Aflasafe could open lucrative export markets for farmers in sub-Saharan Africa, farmers have been slow to adopt without sufficient incentive. In Senegal, researchers conducted a randomized evaluation of a new contract arrangement between farmers and cooperatives to understand its impact on farmers' decisions to adopt Aflasafe, aflatoxin levels, and output sales. Farmers who received the new contracts were more likely to adopt Aflasafe, and were more likely to sell their harvest to a cooperative. Farmers in areas with high aflatoxin levels produced higher quality groundnuts.

Policy issue

Smallholder farmers in low-income countries may not invest in upgrading the quality of their agricultural outputs if they do not have access to high-quality inputs, like fertilizer, credit to finance the investment, or guaranteed demand for their products to make the investment worthwhile. In addition to spurring agricultural productivity, the adoption of high-quality inputs is important in curbing the growing spread of pests and plant diseases that pose a threat to crops and human health alike. Specifically, aflatoxin is a poisonous substance that can sprout on crops in hot, humid climates and cause cancer in humans as well as economic harm by destroying up to 25 percent of crops [1]. Many export markets set strict aflatoxin standards for food safety. Reducing aflatoxin incidence could help address rising liver cancer rates as well as open export markets in areas suffering from low quality standards and high rates of aflatoxin. The International Institute of Tropical Agriculture (IITA) developed a new product—Aflasafe—that reduces aflatoxin incidence when farmers apply the product during the growing season.

Despite the health risks associated with frequent exposure to aflatoxin, awareness among farmers and the general public remains low. As Aflasafe becomes more available, it is not clear how to best induce widespread adoption by farmers. Can certain contract features that provide access to both Aflasafe for farmers and better incentives for quality drive farmers to adopt Aflasafe and, thereby, reduce aflatoxin levels in their crops?

Context of the evaluation

More than 40 percent of cultivated land in Senegal is dedicated to groundnut production which are the country's most valuable agricultural export, and widely consumed locally. However, the groundnut industry in Senegal has suffered from limited access to international markets and high-aflatoxin levels in foodstuffs for export.

While a majority of farmers included in this evaluation have adopted high-quality inputs, like fertilizer, they do not currently have strong incentives to invest in inputs that increase the quality of their groundnuts. Farmers producing low-aflatoxin groundnuts are not linked to buyers with a guaranteed demand for higher-quality groundnuts. This uncertainty about the price farmers may receive for their harvest, as well as a lack of credit and information, may limit farmers' adoption of quality-improving technologies.

Farmers often belong to cooperatives that provide the information and credit needed to buy seeds and fertilizer to sustain production. These cooperatives also organize an outlet for farmers to sell their crops almost exclusively to the state-owned groundnut company at a fixed price with no bonus for quality. Other smaller processing firms and exporters, however, may pay farmers more for high-quality, low-aflatoxin groundnuts fit for export.



Peanut farmer holding their crop

Photo: Shutterstock

Details of the intervention

In partnership with two farming cooperatives in the groundnut basin, researchers tested the impact of a new contract on the decisions of groundnut farmers to adopt Aflasafe and the quality of their groundnuts. The new contract aimed to alleviate obstacles to adoption. It provided farmers with credit to purchase Aflasafe, training on how to use the technology, and a

guaranteed price premium conditional on quality certification.

Researchers randomly assigned 396 farmers from 40 villages to either receive the new contract offer or to a comparison group that did not receive the offer. Combining three key features (credit, training, and a price premium), farmers who received the contract offer were offered Aflasafe at no up-front cost during planting and were required to repay after harvest. They were also promised a higher price for their harvest, conditional on producing low-aflatoxin groundnuts, and assistance in applying the product from trained cooperative workers. Farmers in the comparison group did not receive the intervention. They could purchase Aflasafe, but had to pay up front. They were also informed that they could have their groundnuts tested for aflatoxins, but they did not receive a promise of a price premium. All farmers, regardless of whether or not they were offered the new contract, were offered a free aflatoxin test and information about Aflasafe.

This evaluation took place in the Kaolack and Fatick regions of Senegal's groundnut basin, between June 2019 and June 2020. Researchers utilized both surveys and administrative data sets from cooperatives. Researchers collected data on farmers' aflatoxin awareness, adoption rates of Aflasafe, groundnut quality (as measured by levels of aflatoxin contamination and compliance with international food safety standards), and sales to the cooperatives after harvest.

Researchers informed participants of the level of aflatoxins detected on their groundnut samples as soon as possible after results became available, such that farmers could make informed decisions about how to manage their crops. While the adoption support varied for the purpose of this study, Aflasafe was not withheld from the comparison group to purchase at an upfront cost.

Results and policy lessons

Farmers who received the contract offer were more likely to purchase and use Aflasafe, and were more likely to sell their harvest to a cooperative. Farmers in high-risk areas produced higher-quality groundnuts that were compliant with international standards.

Aflasafe Adoption: Among farmers offered the new contract, 90 percent adopted Aflasafe—an 80 percentage point increase relative to farmers in the comparison group who did not receive the contract offer.

Groundnut Quality: Farmers in areas at high-risk of aflatoxin contamination who received a contract offer produced groundnuts that were 49 percent more likely to comply with the strictest international standards.

Groundnut Sales to Cooperatives: Farmers offered the new contract increased their output sales to the cooperative. On average, they were 13 percentage points (56 percent) more likely to sell their harvest to the cooperative relative to 23 percent of farmers in the comparison group.

Researchers found that certain behaviors among farmers and the nature of the relationship between a farmer and a cooperative also impacted sales. Commercial sales increased the most among farmers that demonstrated high levels of reciprocity, that were new members to the cooperative, or already played a leading role within the cooperative. Thus, relationships may play an important role in contract design, especially in settings where formal enforcement is limited

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1. https://www.who.int/foodsafety/FSDigest_Aflatoxins_EN.pdf