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Timeline

2015-2016

Sample Size

10 districts in three northern regions of Ghana (Phase I), 302 farmers (Phase II)

Research Implemented by IPA

Yes

Testing Agricultural Technologies for Maize Production in Ghana

Abstract

Using improved hybrid seed varieties may generate higher yields for maize farmers in sub-Saharan Africa—where agricultural productivity is low relative to other regions—but many farmers have not adopted these seeds. This project, which was not a randomized evaluation, studied the comparative yields of several seed varieties and farmer purchasing decisions in an effort to understand the performance and adoption of seed varieties in northern Ghana. Researchers found that there was a wide variety in yields between seeds, with farmers who grew a foreign hybrid seed on average yielding more than double what those who used a local hybrid, and the local hybrid failing to outperform a more common local seed.

Policy Issue

In the last 40 years, agricultural yields in Sub-Saharan Africa have risen far less dramatically than they have in other parts of the developing world—and much of the growth that has occurred has been due to an increase in land used for agriculture, not an increase in productivity. One reason for the low rate of productivity growth is that farmers in Sub-Saharan Africa have been slower to adopt technologies that have increased agricultural productivity elsewhere. Evidence suggests that farmers can achieve greater agricultural productivity by adopting improved seed varieties, but many farmers in Sub-Saharan Africa do not use these seeds. As a result, researchers are interested in learning more about the yields of different seed varieties and in identifying how farmers make decisions about which

varieties to use.

Context of the Evaluation

This study is taking place in Ghana's Upper West, Upper East and Northern regions. Data from recent research shows that only 20 percent of farmers in northern Ghana use improved seeds. This is not a regional anomaly: only 24 percent of harvested cereals in Sub-Saharan Africa are improved varieties, while over 75 percent meet this definition in South Asia and East Asia.¹ Several constraints may lead individual farmers in Ghana not to adopt improved seed varieties. First, improved seed varieties may not be available to farmers from local retailers. Second, while previous field tests have suggested that hybrids may have higher yields, farmers may not have enough evidence that higher-performing varieties will prove profitable in their local environment. This lack of demand may lead retailers to reduce their supply of improved seeds further. Farmers may also be wary of the possibility of counterfeit seeds.

Details of the Intervention

Note: This study was not a randomized controlled trial.

The Testing Agricultural Technologies (TAT) project was designed with the immediate aim of improving information about the performance of new seeds in northern Ghana, and with the longer-term goal of studying the means by which farmers learn about and test new technologies. The study comprised two phases:

Phase I

In this project's first phase, researchers compared the performance of five seed varieties. One of the five is **Obaatanpa**, a local open-pollinated variety (OPV) seed that is most commonly used by farmers in the region. The other four have all been proven in at least one context to have a higher yield than Obaatanpa, but less is known about them in the local context of northern Ghana. They are:

- **Adikanfo**, a foreign hybrid variety.
- **Sika-Aburo**, another foreign hybrid variety.
- **Mamaba**, a local hybrid variety.
- **Sanzal-sima**, a local OPV used less commonly than Obaatanpa.

To measure the relative performance of the five varieties of seeds, IPA collaborated with the Savanna Agricultural Research Institute (SARI), and the International Food Policy Research Institute (IFPRI) to set up demonstration plots in ten districts in the three northern regions of Ghana.

In each district, a primary demonstration farm was set up in a farmer's field, where each of the five seed varieties were planted and grown under the same conditions and care protocols, and under the supervision of a SARI scientist or an Agricultural Extension Agent

(AEA) from the Ministry of Food and Agriculture. An additional four trials in each district were meant to replicate the growth, but under more realistic conditions. In these trials, farmers planted the seed they were currently using in their fields along with one foreign hybrid and one other variety. SARI Scientists and AEAs were instructed to visit these additional plots every week and to assist farmers during key stages in the production process.

Phase II

As a follow-up to the on-site trial experiments, IPA launched a second phase of the project in 2016. Three main activities were carried out during May and June:

1. With the help of agricultural extension agents, community sensitization meetings were held with farmers in each area. The meeting began with a group discussion of the results of the Phase I trial.
2. The research team then explained that farmers could purchase subsidized starter packs of Pioneer and Obaatanpa if they were interested in testing these on their own land.
3. Afterward, the research team delivered the starter pack to the farmers.

Researchers collected detailed information from 302 farmers about farmer and plot characteristics, farmers' purchasing decision, farming practices, feedback on improved seeds, and farmers' availability to pay for improved seeds.

Results and Policy Lessons

Phase I

Preliminary results from the first phase suggest that the benefits of foreign hybrids are worth their cost, while the most commonly used local seed outperforms other available local seeds.

Average Yields: The most commonly grown seed variety, Obaatanpa, yielded an average of 3190 kg/ha. Neither Mamaba nor Sanzal-sima had higher mean yields than Obaatanpa's, contradicting experts' previous field tests in other contexts. However, the two foreign hybrids, Adikanfo and Sika-Aburo, did have higher yields than Obaatanpa. Adikanfo had the highest mean yields, which were 57 percent higher than Obaatanpa's, and 27 percent higher than Sika-Aburo's.

Yield Variation: Mamaba, the local hybrid, had the highest variation in yields between different districts—but was relatively consistent from one plot to the next within a district. Sika Aburo also had high levels of variation. Sanzal-sima, meanwhile, had high levels of variation both between and within districts. Adikanfo and Obaatanpa performed relatively consistently both within and between districts.

Profitability: A profitability analysis suggests that, despite their higher cost, on average the foreign hybrids Adikanfo and Sika Aburo were more profitable per hectare than other varieties. Adikanfo had the highest mean profits, which were 16 percent higher than Sika Aburo's and 37 percent higher than Obaatanpa's. Obaatanpa's mean profits exceeded both

Mamaba and Sanzal-sima's.

It is important to note that these results are particular to the growing season of the period studied, which included ample rainfall. These results cannot speak to characteristics of seeds not tested under these conditions, such as drought resistance.

Phase II

Preliminary results from the second phase suggest that demand was high for higher-yield seeds among farmers, and that these seeds did lead to higher profits than more common local seeds. However, there were large gaps between yields and revenues on trial plots and on farmers' own fields for every seed type, suggesting that barriers other than seed availability may prevent farmers from maximizing profits.

Purchasing decision: There was significant interest in higher-yield seeds from farmers in the communities hosting the trials: nearly half of the farmers for whom starter kits were available decided to purchase them. On average, characteristics of farmers who purchased Adikanfo, one of the imported hybrid seeds, differed from those who did not: they had larger farms, were less likely to be natives of their current village, and had higher levels of education. They were also more likely to have seen other farmers planting Adikanfo than those who did not purchase the seeds.

Farming practices: While some farmers adopted improved seeds, with the exception of an increase in row-planting, farmers tended not to adopt other recommended practices along with the new seeds.

Average yields and profitability: Farmers who planted Adikanfo had the highest yields, at 2.5 tons of maize per hectare. This was more than twice as high as average yields for Obaatanpa. Among farmers who adopted Adikanfo, yields were not as high as those found on the trial plots, but their net revenue from Adikanfo was still about four times higher than their revenue from Obaatanpa.

Overall, farmers' yields on their own plots were significantly lower than the yields found on the trial plots, and even farmers who used Obaatanpa (the most commonly-available seed) did not maximize profits at the level of the trial plots run by extension agents. For example, farmers used much lower levels of agrochemicals, lower crop density, and less labor per acre than did the extension agents.

These results suggest that while improved seeds have the potential to markedly increase yields and profits, simply making these seeds more available may not be sufficient in realizing that potential.

Sources

[1] Akram-Lodhi, A. Haroon. "(Re) imagining Agrarian Relations? The World Development Report 2008: Agriculture for Development." *Development and Change* 39:6 (2008):

1145-1161.

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