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Improving Yields with Improved Recommendations

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LA FERDI EST UNE FONDATION RECONNUE D'UTILITÉ PUBLIQUE. ELLE MET EN ŒUVRE AVEC L'IDDRI L'INITIATIVE POUR LE DÉVELOPPEMENT ET LA GOUVERNANCE MONDIALE (IDGM). ELLE COORDONNE LE LABEX IDGM+ QUI L'ASSOCIE AU CERDI ET À L'IDDRI. CETTE PUBLICATION A BÉNÉFICIÉ D'UNE AIDE DE L'ÉTAT FRANÇAIS GÉRÉE PAR L'ANR AU TITRE DU PROGRAMME « INVESTISSEMENTS D'AVENIR » PORTANT LA RÉFÉRENCE « ANR-10-LABX-14-01 »

Abstract

We report preliminary results of an intervention that aims to promote the adoption of new technologies by small producers in the state of Tlaxcala. The intervention was carried out during the 2015-2017 agricultural cycle. The producers received a soil analysis, visits from specialized technicians and subsidized inputs in order to increase the per hectare productivity of their maize plots. The results show that, on average, the producers increased their productivity by 100-250 kilograms per hectare in comparison to those who did not receive the intervention.

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Introduction

According to the World Development Report (2008), GDP growth originating in agriculture is about four times more effective in reducing poverty than GDP growth originating outside agriculture. For this reason, policies that increase agricultural productivity can have a significant impact on poverty reduction.

Technology adoption is an important mechanism for improving agricultural productivity in poor countries. The Green revolution introduced high-yield crop varieties, chemical fertilizer and other modern agricultural practices to developing countries but the take-up of these technologies has been uneven. In many areas traditional farming practices still predominate and take-up of new agricultural technologies remains limited.

There has been considerable debate in both academic and policy circles about the sources of incomplete technology adoption in agriculture. In a recent review, Foster and Rosenzweig (2010) argue that limited adoption could reflect heterogeneity in costs or returns to the technology so that observed (low) adoption rates do not imply substantial unrealized gains. They argue that observational studies, even with panel data, typically face formidable endogeneity problems so that observed positive partial correlations between input use and yields or profits may not in fact be causal. In contrast, others argue that because of informational problems, market failures or behavioral biases there is substantial under-adoption of agricultural technologies. Both sides of the argument are, however, in agreement that the returns to input use, particular fertilizer, are likely to be heterogeneous and this heterogeneity has implications for adoption.

The Intervention

In this brief we summarize work in progress (Corral et al., In Progress) where we examine one particular source of heterogeneity in detail — heterogeneity in land quality — and its link to input use and hence technology adoption. In particular, we test whether heterogeneity in soil quality leads to a corresponding heterogeneity in the optimal recommended mix of fertilizers and whether such tailored recommendations improve outcomes in field conditions. This is particularly relevant in the developing world where fertilizer recommendations are usually of a generic nature, untailored to agro-climactic variations. In contrast, we provided localized recommendations (shopping list) and in addition examine the effect of varying the level of localization on outcomes. In addition to providing localized input recommendations we also offered in-kind grants to farmers to purchase inputs.

In particular, we designed an intervention in the state of Tlaxcala, Mexico for rainfed maize farmers with five arms experimental arms:

- T1: Individualized soil analysis and recommendations and an inflexible in-kind grant along with agricultural extension services.
- T2: Average soil analysis and recommendations and an inflexible in-kind grant along with agricultural extension services.
- T3: Average soil analysis and recommendations and a flexible in-kind grant along with agricultural extension services.
- T4: Average soil analysis and recommendations and no grant along with agricultural extension services.
- Control arm

The in-kind grants provided 2000 pesos (U.S $150) worth of inputs for half of average per-hectare cost. The inflexible grant restricted purchases to items on shopping list. The grant was applied sequentially, starting with sowing drill (800 pesos) and then used towards the fertilizer package. If total shopping list cost more than 2000 pesos, farmer were responsible for paying the difference. Farmers offered the flexible grant could purchase any inputs in dealer store and

did not have to hire the sowing drill.
Extension services consisted of 3 plot visits by extension workers along with 3 group training sessions (at sowing, 40 days after sowing and pre-harvest).

The program was widely advertised in all municipalities of Tlaxcala during 34 promotional meetings conducted in Jan. 2015. Eligibility was restricted to farmers that planned to sow maize with land less than 15 ha. and age between 18 and 70 years old. We ended up with a sample of 981 eligible farmers randomized into program in February 2015. Study farmers have on average lower yields than the Mexican average, are less likely to use hybrid seeds and more likely be rainfed. They are however more likely to use fertilizers and herbicides.

Results

Take-up rates of the recommendations and extension services are around 80 percent and significantly higher in T1-T3. This means that they apply significantly less Urea and DAP but more KCl. Thus fertilizer use among T1-T3 is significantly closer to the recommended dosages. We also find that T1-T3 have higher density of maize plants, partly due to the fact that the use of mechanized precision drills uses a higher density than the semi-precision drills that farmers typically use. Despite a severe drought in the area, T1-T3 managed to get higher yields relative to farmers in the control group. There are no differences in take-up, plant density, fertilizer use or yields among T1-T3 groups.

Interestingly, farmers appear more certain about the quality of their plots. We asked to rank their plots where 0 was the worst plot in the area and 10 the best plot and we then asked them how certain they were of their assessment. After the recommendations were given farmers update little their assessment but they report being more certain about it. Consistent with their more accurate assessment, farmers report lower CV of yields after the recommendations. Put differently, the recommendations provided a signal of the quality of their land that led to a decline in the expected volatility of yields. If farmers are risk averse, this decline in volatility should translate into higher investments. In 2015, an increase in investment could come from the tighter priors just discussed or from the grant farmers received in T1-T3. In 2016/17 we will ask again about practices and investments to see if they are indeed higher.

Conclusions and Policy Recommendations

The project is still ongoing as we are following farmers in 2016/17 to see if any of the practices and recommendations learned actually stick and are disseminated. From the analysis thus far, we can draw a couple of conclusions:

- First, the level of localization does not seem to matter for take-up, plant density or yields. As a result, and because individualized recommendations are more expensive, using area recommendations seems more desirable. We note that the area used to compute average recommendations is smaller than the state-wide recommendations currently used.
- Second, localized recommendations alone may not foster technology adoption. These interventions have to be supplemented with extension services, agro-dealer coordination so that the optimal input mixes will be available and in-kind grants.

References

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