A WELL-TIMED NUDGE

Enabling farmers to prepay for fertilizer when they had cash on hand was effective in promoting fertilizer adoption.

The persistence of low agricultural yields in Africa, even as other regions (notably South Asia) have enjoyed dramatic increases in farm productivity, is a vexing problem in agricultural development. One possible explanation for this discrepancy is low adoption of inorganic fertilizer. If used correctly, fertilizer has the potential to dramatically increase yields and be a highly profitable investment. Many experts have called for, and some African governments have adopted, heavy subsidies for fertilizer. If fertilizer is so profitable, the reasoning goes, farmers must not be using it because they do not have access to cash or credit needed to buy it.

An alternative view, rooted in behavioral economics, is that what drives low fertilizer use is not only unaffordability, but issues of timing and impatience. At harvest time, when farmers have available cash, they may not be motivated to buy fertilizer, and pre-purchasing it may be inconvenient. Later in the season, when it is time to apply fertilizer to crops, farmers may find that they do not have enough money left to buy it. If this view is correct, it would suggest that policies that encourage farmers to buy fertilizer when they have cash immediately after harvest could increase fertilizer investment.

J-PAL affiliates Esther Duflo (MIT), Michael Kremer (Harvard University), and Jonathan Robinson (UC Santa Cruz) investigated these issues with a randomized evaluation in western Kenya. **Can small, time-limited offers for advanced fertilizer purchase increase fertilizer adoption? Could this type of "nudge" achieve a similar impact on fertilizer adoption as a traditional subsidy program, at a lower cost?**

- **Farmers had high demand for the ability to purchase fertilizer in advance.** Among farmers who were offered advanced purchasing, 31 percent bought fertilizer in the first season of the program, and 39 percent bought it in the second season. The incentive offered to the farmers was small (free delivery), suggesting that farmers were attracted by the ability to commit to purchasing fertilizer in advance.

- **Fertilizer adoption increased while advanced purchasing was offered, but once the program was removed, fertilizer usage went back to what it had been.** Fertilizer adoption went up by 11-14 percentage points among farmers who were offered advanced purchasing. When the program ended, farmers in the treatment group reverted back to the same level of adoption as the comparison group.

- **Prepayment had an impact on adoption comparable to a large subsidy during the growing season.** Providing farmers with the option to purchase fertilizer in advance was as effective at increasing fertilizer adoption as a 50-percent discount, offered at the time when fertilizer needed to be applied.

EVALUATION

The evaluation was conducted in collaboration with International Child Support (ICS), an NGO operating in Busia district, a relatively poor, low-soil-fertility area in western Kenya. Farmers in the region primarily grow maize for subsistence. In a previous study in the area, the same authors found that by using limited quantities of fertilizer, farmers could achieve annualized returns on the order of 52–85 percent. This implies that the average farmer could increase profits from maize by about $10 to $15 per season, on a base of about $90, by using the optimal amount of fertilizer.

Despite these potential returns, only 40 percent of farmers in the sample had ever used fertilizer, and only 29 percent had used it in the previous two growing seasons. When asked why they did not use fertilizer, farmers overwhelmingly said that they wanted to use fertilizer but did not have the money to purchase it.

The researchers evaluated a program called the Savings and Fertilizer Initiative (SAFI). In the basic version of SAFI, a field officer visited farmers immediately after harvest (when they tend to have cash on hand) and offered them the opportunity to purchase a voucher for fertilizer. Farmers were charged full price but were offered free delivery on a date of their choice. This small incentive was intended to reduce the inconvenience of buying fertilizer, and thus potentially also reduce procrastination. Farmers had to make a decision and a purchase immediately.

In the second growing season, a different set of farmers was randomly assigned to one of four different variations on the program or a comparison group:

	① BASIC SAFI	② SAFI WITH TIMING CHOICE	③ FREE DELIVERY, LATE SEASON	④ 50% SUBSIDY, LATE SEASON
Incentive	Free delivery	Free delivery	Free delivery	Free delivery and 50-percent discount
Timing of sales visit from SAFI officer and purchase	Immediately after previous season's harvest	Farmer chooses timing of purchase	During the growing season, at fertilizer application time	During the growing season, at fertilizer application time
Timing of fertilizer delivery	Farmer chooses	Farmer chooses	During the growing season, at fertilizer application time	During the growing season, at fertilizer application time

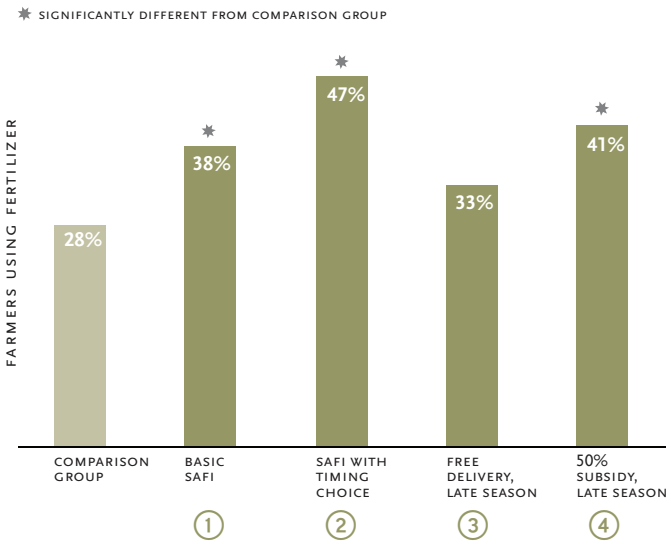
Researchers tracked take-up of the program and fertilizer use among the farmers, testing how the variations in timing and the incentive offered influenced fertilizer adoption.

Featured Evaluation: Duflo, Esther, Michael Kremer, and Jonathan Robinson. 2010. "Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya." *American Economic Review*, forthcoming.

RESULTS

Farmers showed significant demand for the program. In the first season, 31 percent of the farmers who were offered SAFI bought fertilizer through the program. In the second season, 39 percent of the farmers offered basic SAFI ①, and 41 percent of those offered SAFI with timing choice ②, bought fertilizer through the program. The cost of forgoing free delivery and getting fertilizer on their own was relatively small (on average, a 30-minute walk to town, which the vast majority of farmers take occasionally), and overbuying fertilizer is a costly mistake (resale is difficult in this area). Thus, SAFI's popularity suggests that farmers preferred having a commitment device for purchasing fertilizer.

FIGURE 1: SAFI PROGRAM INCREASED FERTILIZER ADOPTION



SAFI increased fertilizer adoption, but only for the duration of the program. The basic SAFI program ① increased fertilizer adoption by 11–14 percentage points versus the comparison group in the first season, and 16–18 percentage points in the second season. However, the program did not lead to a sustained level of increased fertilizer use. Farmers who received SAFI in each season dropped back to the same adoption rate as the comparison group in the following season when SAFI was not offered. This indicates that SAFI's impact came from the features of the program itself, not because people learned about fertilizer through using it. This finding suggests that farmers need incentives to help them overcome procrastination every year.

Free delivery during the growing season has, at most, a much smaller effect on fertilizer adoption. While SAFI ① increased adoption by 16–18 percentage points in the second season, free delivery at full price ③ was associated with a 9–10 percentage point increase in adoption, a result which was not statistically significant. The much larger impact of SAFI is further evidence that the ability to pre-commit, not the free delivery itself, drove the increase in fertilizer use.

The impact of SAFI was comparable to that of a 50-percent discount at fertilizer application time. The 50-percent discount ④ increased fertilizer adoption by 13–14 percentage points, an effect not statistically different from the impact of the basic SAFI program ①. This finding supports the theory that issues of timing, impatience, and procrastination—rather than simply affordability—are barriers to investment in fertilizer among the farmers. A small "nudge," designed to account for these timing and self-control problems, had (in this experiment at least) the same effect as the type of subsidies offered by many governments.

Many farmers are aware of their difficulties with saving. In SAFI with timing choice ②, farmers were asked when they would like the field officer to return to offer the SAFI program. A significant fraction (44 percent) asked the field officer to come back immediately after harvest, so that they could "tie their hands" into fertilizer use. If farmers were not time inconsistent (see Policy Lessons), it would not make sense to do this—it would be better to purchase fertilizer later and keep cash on hand in case an emergency came up.

There was no evidence of impulse purchasing. If impulse purchasing explained the popularity of the basic SAFI program, one might expect to see lower rates of fertilizer adoption under SAFI with timing choice ②, where farmers could delay making their decision. However, the version of SAFI where farmers had to make an immediate decision ① and the version where they could choose the timing of their purchase ② had comparable effects on fertilizer adoption, suggesting that farmers were not making impulse purchases.

For Further Reading: Ashraf, Nava, Dean Karlan, and Wesley Yin. 2006. "Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines." *The Quarterly Journal of Economics* 121(2): 635-672.

Choi, James J., David Laibson, and Brigitte C. Madrian. 2011. "$100 Bills on the Sidewalk: Suboptimal Investment in 401(k) Plans." *The Review of Economics and Statistics*, August 2011, 93(3): 748–763.

POLICY LESSONS

A small "nudge" at the appropriate time was as powerful as a heavy subsidy—and may be a better policy. Critics of fertilizer subsidies contend that they promote overuse of fertilizer, leading to environmental damage and ultimately reduced effectiveness. Large subsidies are also fiscally costly, typically regressive (benefiting the wealthiest farmers most), and often necessitate that the government get involved in fertilizer distribution. A SAFI-style program could reduce these negative side effects, since the smaller incentive would not promote overuse among farmers who are able to save money for fertilizer.

To compare the relative desirability of heavy subsidies, a SAFI-style program, and no intervention, the researchers created a model to estimate which policy option delivers the highest welfare—i.e. which makes society as a whole better off. They find that a SAFI-style program improves welfare relative to taking no policy action, and it may provide larger welfare gains than heavy subsidies.

SAFI helped farmers overcome problems of timing and impatience. The SAFI program enabled farmers to make an investment they wanted and planned to make, but were not able to carry out. In the study region, two thirds of farmers who make plans to use fertilizer do not follow through with those plans. Even among those farmers who use fertilizer, many procrastinate: the vast majority (96–98 percent) purchase it only right before they need to apply it.

A simple explanation for these facts is that saving money for fertilizer is difficult, and farmers may overestimate their ability to save. Economists have labeled this type of behavior as "time inconsistency." In essence, time inconsistency means that the way people plan to act in the future is different from the way they actually do act when the future arrives. The popularity of SAFI suggests that many farmers are aware of that difficulty and therefore have demand for a commitment device to help them make good investments.

SELF-CONTROL: A UNIVERSAL DILEMMA

Time inconsistency is relevant to policy in many different contexts. In the US, a randomized evaluation at several large firms found that 36 percent of employees at the average firm were walking away from "free money": they failed to take advantage of their employer's retirement savings matching program, even though they could withdraw their money without penalty at any time. An information campaign did not significantly improve contribution rates, suggesting that the likely culprit was procrastination, not a lack of information (Choi et al. 2011). Another evaluation in the Philippines found high demand for a "commitment savings" program among microfinance clients (28 percent of clients). The program offered no extra perks except strict restrictions that tied up the deposited funds until a chosen savings goal had been reached (Ashraf et al. 2006).

Understanding the role of temptation, procrastination, and other self-control problems can help policymakers design small "nudges" that improve people's lives.

About J-PAL The Abdul Latif Jameel Poverty Action Lab (J-PAL) is a network of affiliated professors around the world who are united by their use of Randomized Evaluations (REs) to answer questions critical to poverty alleviation. J-PAL's mission is to reduce poverty by ensuring that policy is based on scientific evidence.

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