Feed the Future Innovation Lab for Food Security Policy

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The Rewards of an Improved Enabling Environment: How Input Market Reform Helped Kenyan Farmers Raise Their Fertilizer use by 36%

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Introduction

Raising agricultural productivity remains a major challenge in developing countries. Farm productivity is especially low in Sub-Saharan Africa, where fertilizer use lags far behind the rest of the world. Identifying effective strategies for raising fertilizer use in Africa has been a longstanding policy priority. While most of the region has struggled to raise fertilizer use in a sustainable manner, several countries have recorded impressive steady growth in fertilizer use, suggesting that there may be important success stories from which to learn.

Kenya may provide one such success story. National fertilizer use doubled between the early 1990s and 2010 (Figure 1). Farmers' use of fertilizer per hectare rose by 34% and maize yields rose by 18% over the same period. In the maize breadbasket areas specifically, over 90% of smallholder farmers use fertilizer on maize with application rates comparable to areas of Green Revolution Asia (Ariga and Jayne 2009). The doubling of fertilizer use in Kenya was achieved by smallholder farmers purchasing fertilizer at commercial prices rather than through input subsidy programs. This brief summarizes findings from a detailed study (Sheahan, Ariga, and Jayne 2016) explaining how these successes were achieved. We conclude that there is substantial scope for other African countries to achieve comparable increases in fertilizer use by creating a more hospitable enabling environment that promotes competition and investment by the private sector.

Approach

We use five waves of panel data from the nationwide Rural Household Survey of Egerton University's Egerton University's Tegemeo Institute, covering years following the reforms in Kenya. We establish the relationship between input marketing policy reforms, changes in retail fertilizer price levels attributable to these reforms, and changes in the distance traveled by farmers to obtain fertilizer associated with rapid new investment by fertilizer retailers in rural areas. We then quantify the impacts of these changes on smallholder demand for commercial fertilizer and maize production.

How the Reforms Improved the Enabling Environment

Prior to reform, fertilizer markets in Kenya were controlled by state or quasi-state agencies that set prices at state-run retail locations, established maximum selling prices for private retailers, and controlled which firms could receive licenses.

The reform process was initiated after growing realization that rent-seeking behavior was negatively affecting farmers' access to fertilizer and that maximum fixed selling prices were hindering private retailers from distributing fertilizer in remote rural areas. Consequently, many farmers needed to travel long distances to access fertilizer, and these transaction costs impeded demand.

In response to these concerns, the Government of Kenya (GoK) eliminated import quotas, controls on fertilizer prices, and preferential access to foreign exchange in the early 1990s. Following the reforms in the early 1990s, fertilizer supply channels evolved to accommodate new private sector entry, and the distribution of commercial fertilizer to farmers throughout the country increased significantly. After the elimination of fixed maximum selling prices, private firms

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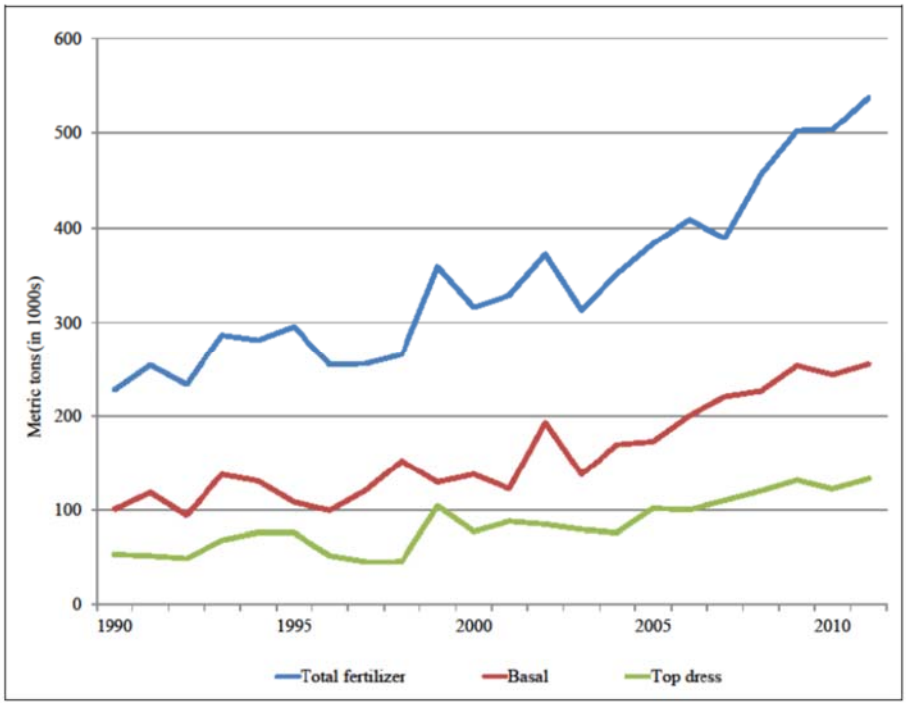
Figure 1. Trends in Fertilizer Use in Kenya, 1990-2013



Source: Ministry of Agriculture, Government of Kenya.

invested heavily in their fertilizer supply chains and new firms entered the market, which ultimately improved competition. There were virtually no input subsidy programs in Kenya between 1990 and 2007. After 2007, the GoK did initiate the National Accelerated Agricultural Inputs Access Programme, a fertilizer and seed subsidy scheme and a fertilizer subsidy program through its National Cereal and Produce Board.

Outcomes of Fertilizer Market Reforms

The main outcomes of these reforms were: (1) a decline in fertilizer marketing margins between the Port of Mombasa and upland retail markets; and (2) an expansion in the number of rural retailers carrying fertilizer in their stores. Both of these changes reduced the costs that farmers incurred in obtaining fertilizer.

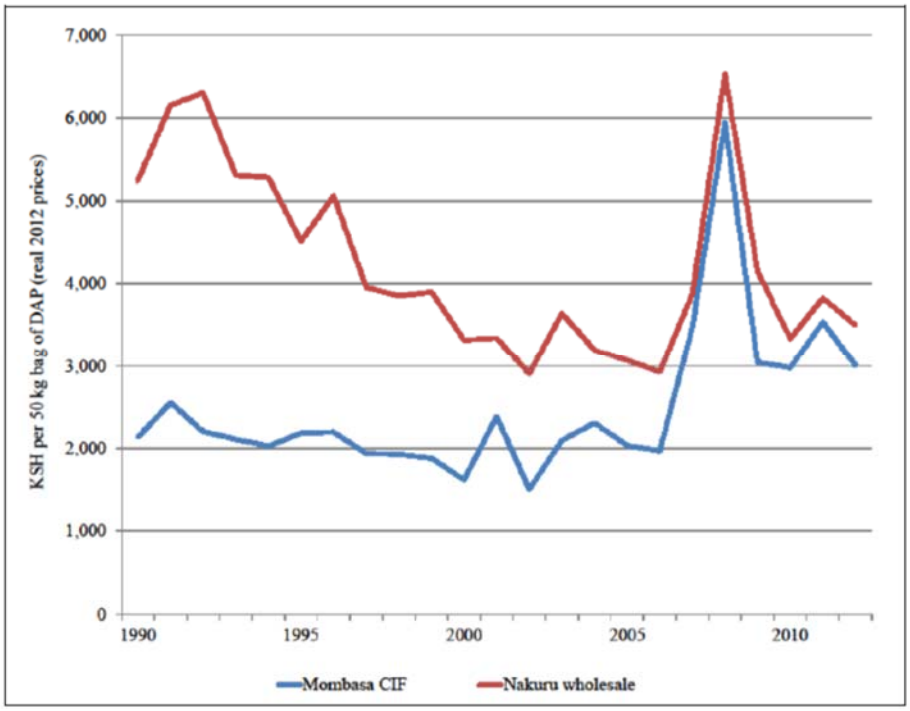
Declining Marketing Margins: While the import price of fertilizer at Mombasa stayed relatively constant in inflation-adjusted terms between 1990 and 2007, prices declined considerably in major maize producing regions in the western half of Kenya (Figure 2).

Key informants identified four reasons for the narrowing of marketing margins:

- The reforms increased competition in local distribution as more firms entered the market;
- The reforms attracted international companies to partner with local importers, thereby increasing the latter's access to cheaper sources of international finance;
- The reforms encouraged new investment by companies in more efficient fertilizer supply chain operations; and
- Private companies expanded into regional fertilizer distribution, which allowed them to capture economies of scope, exploit backhaul operations, and pass cost savings on to farmers.

Key informants also indicated that local and international private companies' committed to investing in long-term cost-reducing fertilizer logistics and transport infrastructure in response to: a) the improved enabling environment after the elimination of price controls and other policy restrictions on the marketing of fertilizer; b) the concurrent liberalization of agricultural commodity markets; and c) the perception of reduced risks in the

Figure 2. Major Reduction in Fertilizer Marketing Margins in Kenya, 1990-2013



Source: Ministry of Agriculture, Government of Kenya.

fertilizer industry after the government phased out non-commercial fertilizer distribution programs in the mid-1990s.

The domestic diammonium phosphate (DAP) fertilizer marketing margin declined by 45% over the period 1997 to 2010, which was almost totally passed along to farmers in the form of lower fertilizer prices. This decline is consistent with GoK reported trends in up-country wholesale prices. Our analysis finds that 60% of the variation in DAP prices paid by Kenyan farmers over the period 1997 to 2010 is explained by changes in domestic marketing margins between Mombasa and the farmers' point of purchase. We, therefore, attribute roughly 60% of the overall 45% reduction in fertilizer prices to the effects of input market reforms.

Increased Farmer Access to Fertilizer: The number of rural fertilizer retailers increased dramatically after the reforms were initiated. The estimated number of rural fertilizer retailers in Kenya rose from 5,000 in 1996 to 8,000 by 2000. Fertilizer retailers moved further into rural areas and became more accessible to smallholders, leading to lower 'last mile' costs for farmers moving fertilizer from retail shops to their farms.

The nationwide farm survey data shows a substantial decline in the distance traveled by farmers to the nearest retail fertilizer seller over this period. Distances more than halved between 1997 and 2007, corresponding the substantial increase in the number of fertilizer retailers operating in Kenya's rural areas immediately following the reform period.[1]

Impact of Input Market Reforms on Fertilizer Demand and Maize Demand

Based on the estimated changes in nitrogen prices and distances traveled by farmers to purchase fertilizer that are attributable to Kenya's input market reforms, we then estimated the effect of these changes on smallholder fertilizer use and maize production. See the full paper for

[1] AGRA and CNFA conducted major agro-dealer promotion programs in Kenya, but these efforts occurred after reductions in fertilizer distance were observed in the survey data. Moreover, the decline in distances traveled occurred in every one of the regional zones covered in the survey including those not covered by major agro-dealer promotion programs.

details on model construction and estimation procedures (Sheahan, Ariga, and Jayne 2016). To distinguish the various pathways through which maize production could change, we first estimate the response as measured in total household maize production, then separately by maize yield (controlling for maize area) and hectares under maize.

Impacts of Declining Retail Fertilizer Prices: Our estimation results show that between 1997 and 2010, the observed fall in real nitrogen prices attributable to the reforms led to a 36% increase in nitrogen use on smallholder maize fields. This increase in fertilizer use attributable to input market reforms is estimated to have resulted in a 9% increase in national maize production, which is comprised of both a productivity effect (intensification) and area planted to maize effect (extensification). These results hold under a range of robustness checks, model specifications, and other estimation methods.

Using the highest and lowest values from the survey years between 1997 and 2010 as shown in Figure 1, total national fertilizer use (not specific to maize) nearly doubled, the total area under maize increased by 49%, total yield by 18%, and total maize production by 58%. Our estimates, therefore, show the substantial contribution of falling fertilizer-marketing margins attributed to the input reforms to fertilizer demand and maize production outcomes, but also leave considerable room for other effects to have also been instrumental.

Impacts of Increasing Fertilizer Retailer Accessibility: We find that the increased proximity of farmers to retail fertilizer distributors over the 1997 to 2010 period did not statistically affect farmers' demand for fertilizer. We also find that the reduction of distance to the nearest fertilizer dealer had no clear effect on farmers' maize production. However, we do find that households closer to fertilizer dealers are more likely to use fertilizer relative to their less accessible neighbors. This cross-sectional result is unrelated to our goal of specifically identifying how the quantity of fertilizer demanded by a given household changed as its distance to the nearest fertilizer retailer dropped.

Concluding Remarks

The importance of raising staple crop productivity and modern agricultural input use in Sub-Saharan Africa warrants efforts to identify and potentially replicate those strategies that have been successful in the region. Large-scale input subsidy programs have proven themselves effective in raising national fertilizer use, but many African governments are starting to question whether they constitute an effective approach for promoting sustainable agricultural productivity growth. In light of subsidies' mixed track record, policy makers are searching for alternative policy tools for promoting fertilizer use.

Kenya instituted several input market reforms in the early 1990s that targeted the root causes of high domestic fertilizer distribution costs. Our results show that decreases in the portion of fertilizer prices attributable to the reforms (internal marketing margins) contributed to a 36% increase in commercial fertilizer use on maize by smallholder farmers and a 9% increase in maize production. On the other hand, decreasing distances to fertilizer retailers from the perspective of a given farming household did not raise fertilizer use or maize supply, although relatively less accessible households (on average, across time) do apply less fertilizer to their maize.

Kenya represents a case of how major reforms to agricultural input markets, resulting in substantial new entry and investment by private fertilizer distribution firms, have promoted the achievement of important national policy objectives at little or no fiscal cost to the government. And while these policy reforms were implemented over 25 years ago, their benefits continue to accrue to Kenyan farmers and consumers even today. This policy approach to increasing fertilizer use contrasts sharply with other approaches—namely input subsidy programs—that have been adopted recently by many African countries, including Kenya in more recent years. We believe that other African countries have comparable potential to significantly raise fertilizer use and agricultural output by providing similar incentives to private firms through improving the enabling environment in which they operate.

This brief summarizes findings from the following study:

Sheahan, Megan, Joshua Ariga, and T.S. Jayne. 2016. Modeling the Effects of Input Market Reforms on Fertilizer Demand and Maize Production: A Case Study from Kenya. *Journal of Agricultural Economics 63*.3. Get the article:

http://onlinelibrary.wiley.com/doi/10.1111/1477-9552.12150/abstract

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