

# NIGERIA

## Strategy Support Program II



### IMPACT OF FERTILIZER SUBSIDIES ON THE COMMERCIAL FERTILIZER SECTOR IN NIGERIA: EVIDENCE FROM PREVIOUS FERTILIZER SUBSIDY SCHEMES

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**U**nder the Agricultural Transformation Agenda (ATA), the government of Nigeria is implementing a new fertilizer program in which the government will withdraw from fertilizer marketing and distribution to promote the development of the private sector to take on these functions. We assess the impact of previous fertilizer subsidy programs on the private fertilizer sector as the basis for evaluating the new program. Using farm level data on fertilizer use in 2003, 2006, 2007, and 2010, we show that previous government fertilizer subsidy programs in Nigeria crowded out the private fertilizer sector to some degree. We find that one ton of subsidized fertilizer supplied by government reduced the demand for commercially supplied fertilizer by between 0.19 and 0.35 tons. The crowding-out effect of the subsidy was likely greater in states with higher state-level subsidy rates. Secondly, the subsidy reduced the open-market fertilizer price, possibly due to leakage of subsidized fertilizer into commercial channels. Thirdly, households which were likely to have access to subsidized fertilizer were closer to urban centers, as well as being headed by males with higher education. Finally, few farmers used both commercial and subsidized sources. Success of the new fertilizer subsidy scheme in Nigeria partly depends on effectively reducing the crowding-out of private input traders in the fertilizer market. This can be done not only through improved targeting of beneficiaries and ending the participation of government and its agencies in fertilizer marketing and distribution, but also by implementing effective complementary policies for enhancing the development of private fertilizer suppliers.

#### FERTILIZER POLICY AND MARKET IN NIGERIA

Agricultural input subsidies have been widely used in developing countries to raise farmers' demand for inputs in order to increase productivity and achieve food security. Such subsidies have also been used to develop a competitive private sector for inputs supply. Fertilizer subsidy can crowd in or crowd out the private fertilizer sector depending on the production environment, fertilizer market characteristics, and the design of the subsidy program. Recent literature from several countries in sub-Saharan Africa (Malawi, Zambia) suggests that fertilizer subsidies generally crowd out the participation of private input traders in supplying agricultural inputs, particularly fertilizer, to farmers.

We analyze the crowding-in / crowding-out effects of government fertilizer subsidy programs in Nigeria by considering the subsidy scheme that was implemented in Nigeria until recently. The structure of the national fertilizer market and the role played by the subsidy program in altering the operations of that market led to the evolution of a complex fertilizer distribution structure in which there were parallel markets of private fertilizer suppliers and subsidized government-distribution of fertilizer (Figure 1). Although fertilizer distributed by the private sector was not subsidized, the price of the fertilizer offered by private traders was affected by the fertilizer subsidy in place.

Analyzing the effect of crowding-out under such a complex scheme provides a useful baseline for the government in its planning to implement a new fertilizer subsidy. This new subsidy program is planned to involve discontinuing government participation in fertilizer marketing and distribution and targeting specific small-holder farmers using vouchers.

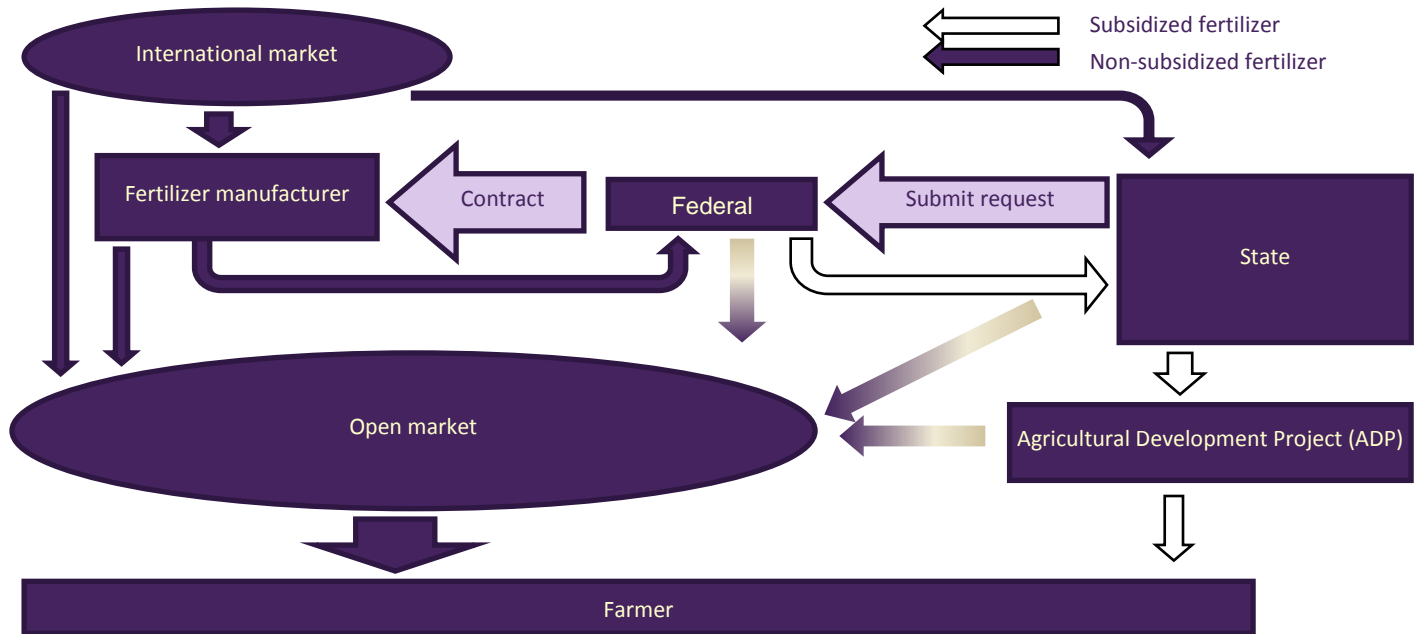
A voucher-based fertilizer distribution has been implemented in Nigeria only on a small scale until recently and it showed better targeting than the existing subsidy program and minimal leakage of subsidized fertilizer to those who were not intended to benefit from the program. Under the Agricultural Transformation Agenda (ATA), the government plans to scale-up the voucher program to the entire country. The ATA envisages improving targeting of the beneficiaries, which should reduce leakage of subsidized fertilizer. In such a context, a greater benefit may arise from the change in the structure of the national fertilizer market. It thus becomes important to understand the extent to which previous fertilizer subsidy programs crowded out private input trader participation.

#### CROWDING-IN/OUT

Subsidies on fertilizer “crowds-in (out)” commercial fertilizer market if increasing the quantity of subsidized fertilizer increases (reduces) the quantity of commercial fertilizer purchased (Box A). A subsidy can crowd-in the commercial sector if, among others: (1) the government does not compete with private input traders by participating in the marketing and distribution of subsidized fertilizer that is cheaper than that which the traders provide; (2) the subsidy increases fertilizer demand by increasing awareness by farmers of the benefits of fertilizer, thereby increasing supply; and (3) transaction volumes increase for private dealers so that the transaction costs and price per unit of fertilizer supplied drop.

Subsidies on fertilizer can, however, crowd-out the commercial sector if: (1) the price of subsidized fertilizer lowers the open market price; (2) the recipients of the subsidized fertilizer are poorly targeted; and (3) the fertilizer policies of government are unpredictable, creating uncertainties for investors in the private supply of inputs.

**FIGURE 1. PREVIOUS FERTILIZER SUBSIDY SCHEME IN NIGERIA**



Source: Authors.

**BOX A: CROWDING IN/OUT**

An increase in subsidized fertilizer quantity changes total fertilizer consumption directly through the increased use of subsidized fertilizer and indirectly through the effect of the subsidy on the amount of commercial fertilizer purchased:

$$\frac{\partial T}{\partial G} = \frac{\partial G}{\partial G} + \frac{\partial C}{\partial G} = 1 + \frac{\partial C}{\partial G}$$

- T = Total fertilizer consumption
- G = quantity purchased through subsidy
- C = quantity purchased through commercial channel

$\frac{\partial C}{\partial G} > 0$ : <b>Crowding-in</b>	$\frac{\partial C}{\partial G} < 0$ : <b>Crowding-out</b>
Subsidized fertilizer increases the demand for commercial fertilizer	Subsidized fertilizer reduces the demand for commercial fertilizer, though total fertilizer use may increase

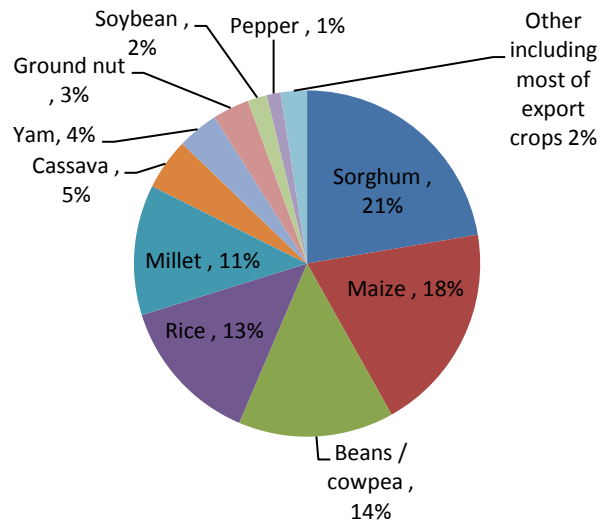
Source: Authors' modification from Xu Z, WJ Burke, TS Jayne & J Govereh. (2009). Do Input Subsidy Programs "Crowd In" or "Crowd Out" Commercial Market Development? Modeling Fertilizer Use Decisions in a Two-Channel Marketing System. *Agricultural Economics* 40(1): 79-94.

**EMPIRICAL EVIDENCE OF CROWDING-OUT**

**Data**

We empirically examine the crowding-in / crowding-out effects of previous fertilizer subsidy programs in Nigeria using two datasets: (1) the LSMS-ISA dataset (Living Standard Measurement Survey - Integrated Survey on Agriculture) collected in 2010, and (2) the NSAEC (National Survey on Agricultural Export Commodities), a pseudo-panel of data collected from export crop growers in Nigeria in 2003, 2006, and 2007, and. The LSMS data covers all types of farmers in Nigeria. Although the NSAEC data only covers export crop growers, findings from the data are still relevant to the whole fertilizer market in Nigeria, since export crop producers are found across the entire country and also grow other crops. While the export crops produced by these farmers account for only a small share of total fertilizer use in Nigeria (Figure 2), and these producers only account for 14 percent of Nigerian farmers, these export crop growers account for 27 percent of the total fertilizer used in Nigeria, mostly through intensive application for cereal crops, rather than on their export crops (Table 1).

**FIGURE 2. SHARE OF FERTILIZER USED BY EACH CROP IN NIGERIA BETWEEN JAN - AUG 2010**



Source: Authors' calculation from LSMS data.

**TABLE 1. FERTILIZER USE BY EXPORT GROWERS**

	Export crop growers	Non-export crop growers
Percentage among farmers	14	86
Share of fertilizer use (%)	27	73

Source: Authors' calculation based on LSMS data.

### Dominance of single-sourcing

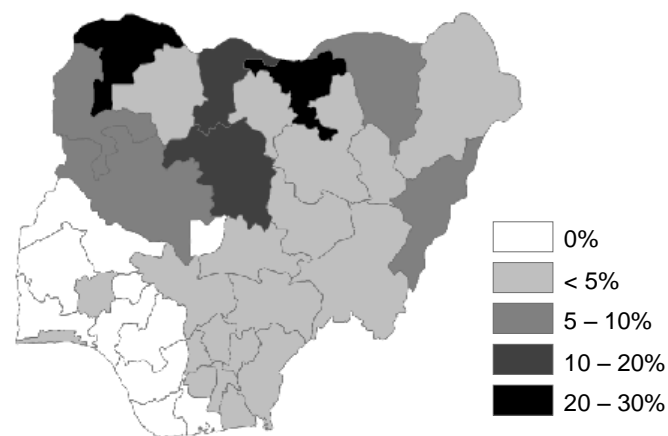
We classified the reported sources of fertilizer into public and commercial sources based on the literature and experts consultation (Table 2). The supply of subsidized fertilizer under previous fertilizer subsidy programs in Nigeria was partly influenced by political factors. The share of farmers who receive subsidized fertilizer (among all farmers, including non-users of fertilizer) varied across the states within the same agro-ecological zones (Figure 3).

**TABLE 2. SUBSIDIZED AND COMMERCIAL SOURCES**

	Public sources	Commercial sources
NSAEC data	Ministry of Agriculture (Extension services) Agro service centers Farm service centers	Cooperative societies Local markets Other sources
LSMS data	Government Political leaders All free fertilizer (regardless of source)	Markets (local / main) Friends / neighbors All others

Source: Authors.

**FIGURE 3. SHARE OF FARMERS BUYING FERTILIZER FROM SUBSIDIZED SOURCE (2010)**



Source: Authors' calculation from LSMS data.

In the NSAEC data, only 20 to 30 percent of farmers used fertilizer (Table 3). Among those, a majority used commercial sources only (80-90 percent), or public sources only (7-8 percent), while only about 3 percent used both commercial and public sources, except in 2007. Such dominance of single-sourcing is also observed in the LSMS data for all types of farmers. In other words, farmers' demand for fertilizer could have been met by a single source alone. Use of subsidy under such fertilizer demand conditions could lead to more crowding-out rather than crowding-in.

**TABLE 3. % OF HOUSEHOLDS BY SOURCE OF FERTILIZER OBTAINED**

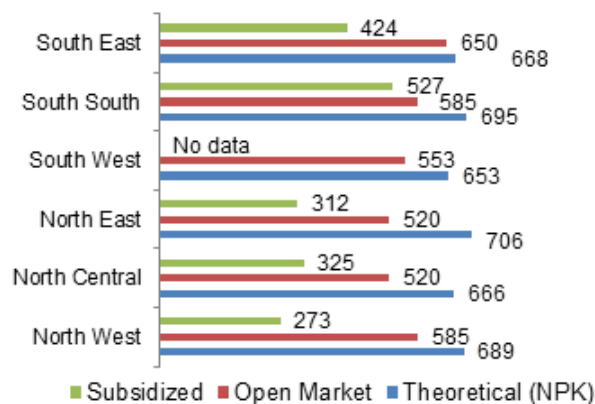
Year	NSAEC data			LSMS data
	2003	2006	2007	2010
Do not use fertilizer	80	79	70	75
Use fertilizer	20	22	30	25
Use commercial sources only	89	88	83	83
Use subsidized sources only	8	9	7	13
Use both sources	3	3	11	4

Source: Author's calculation from LSMS data.

### Depression of commercial fertilizer price

We compared the theoretical import parity price of NPK with the open market price and the subsidized fertilizer prices in each geo-political zone of the country (Figure 4). The theoretical price is calculated from the CIF price of NPK at Lagos port reported by the Department of Fertilizer, plus transportation costs from Lagos to regional centers inferred from major fertilizer distribution companies in Nigeria. The open market and subsidized prices used in the analysis are median prices reported for each region. Due to the transportation costs from Lagos, fertilizer prices, in theory, should be higher in the more distant North and East than in the South and the West. However, both subsidized and open market prices for fertilizer are lower in the Northern states than in the Southern states, reflecting the generous subsidies offered in the northern states and the heavy influence of these subsidies on open market prices. The fertilizer subsidies lowered open market prices in these areas, likely through the leakage of subsidized fertilizer into the open market. This depressing effect of subsidies on open market prices can lead to a crowding-out of the private sector.

**FIGURE 4. DEPRESSING EFFECTS OF SUBSIDY ON FERTILIZER ON OPEN MARKET PRICES (NPK PRICE IN US DOLLAR/TON, 2010)**



Source: Authors' calculations.

## Extent of crowding-out

We then estimated the crowding-in / crowding-out effects using econometric techniques that account for various complexities of fertilizer market structure. A majority of Nigerian farmers use no fertilizer. Fertilizer from commercial sources could contain fertilizer diverted from subsidized sources. Although the availability of subsidized fertilizer in particular locations depends on the fertilizer distribution activities of government, farmers decide how much subsidized fertilizer to obtain. Farmers may decide the quantity of subsidized fertilizer and commercial fertilizer that they will use simultaneously. Our analysis incorporates these behavioral patterns.

We found that fertilizer subsidy crowded out the demand for commercial fertilizer in Nigeria in the order of 19 to 35 percent under previous subsidy programs (Table 4). Providing an additional one ton of government subsidized fertilizer reduced the demand for commercially-supplied fertilizer in the private sector by between 0.19 and 0.35 tons. Older, male headed and better educated farmers with larger households, who are located near urban areas, use more commercial fertilizer. Farmers with larger household who were located near urban areas were also more likely to obtain subsidized fertilizer. Few farmers, however, bought fertilizer from both sources. This indicates that significant amounts of subsidized fertilizer were obtained by farmers who would have otherwise bought fertilizer at commercial market price in the absence of subsidized fertilizer. This underscores the weaknesses of the previous subsidy policy that made subsidized fertilizer more accessible to farmers who could afford to buy fertilizer without the subsidy program.

*This Policy Note deals with topical issues of general interest and is intended to promote discussion; it has not been formally peer reviewed, but it has been reviewed by at least one internal and/or external reviewer*

TABLE 4. ESTIMATED CROWDING-OUT EFFECTS

Crowding-out effect (%)	
NSAEC data	LSMS data
19.3%	34.6 %

Source: Authors' calculations.

Overall, we draw the following key policy messages:

- Most subsidized fertilizer under the previous subsidy scheme was obtained by farmers who would otherwise have purchased fertilizer from private commercial sources, thus crowding-out the commercial fertilizer sector.
- Providing one ton more of subsidized fertilizer through government channels reduced the amount of fertilizer sold through private commercial channels by between 0.19 and 0.35 tons.
- Few farmers buy fertilizer from both subsidized and commercial sources.
- Previous fertilizer subsidy programs depressed the open market fertilizer price, possibly due to leakages of subsidized fertilizer into the commercial fertilizer sector.
- The new fertilizer policy for Nigeria should be well targeted to avoid leakages into the commercial sector.

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