

MOZAMBIQUE

Strategy Support Program



THE SUPPLY OF INORGANIC FERTILIZERS TO SMALLHOLDER FARMERS IN MOZAMBIQUE

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Inorganic fertilizer is one of a handful of agricultural technologies that has immense potential for raising the productivity of poor smallholder farmers, enabling them to increase income, accumulate assets, and set themselves economically on a pathway out of poverty. The low prevalence of fertilizer use by Mozambican farmers—below 5 percent—is evidence that farmers find it difficult to access fertilizers for their crops at a price that will allow them to obtain sufficient and reliable returns from their investment in fertilizer.

This brief presents the results of a study of fertilizer supply to investigate supply-side constraints for fertilizer use by smallholder farmers in Mozambique in which the government is implicated. The government actions that could constrain the supply of fertilizer include taxes (explicit or implicit) that are applied at various points along the fertilizer importation and marketing chain, or the absence of key public goods and services. This study examines how fertilizer is supplied to smallholder farmers and how they do or do not make use of it. It involved a review of the literature on fertilizer supply, demand, and use; interviews with key participants in fertilizer importation and marketing in Mozambique; and two surveys—one with farmers and the other with input suppliers—in two farming areas where fertilizer is used more than is the norm for the country as a whole.

CONTEXT

The economics of fertilizer use by many Mozambican smallholder farmers can be challenging. In 2010, the total amount of fertilizer used in the country was estimated at 51,400 metric tons. However, 90 percent of this fertilizer was applied to tobacco and sugarcane. Between 2005 and 2008, it is estimated that only between 4 and 5 percent of smallholder farmers used any inorganic fertilizer. There are several reasons for this:

- The input is costly, being a bulky commodity produced overseas and shipped inland from Mozambique's ports or, more commonly, imported into South Africa from overseas sources and then re-exported to the Mozambique market.
- Information for farmers as to how they can make most efficient and profitable use of fertilizer is limited. What limited understanding there is of yield response patterns to the application of inorganic fertilizer for the major crops grown by smallholder farmers in Mozambique is not communicated in a manner that can be easily understood by farmers or by local agricultural extension staff.
- On the crop output side, fertilizer use has substantial risks. Although the important cropping areas of Mozambique, particularly in the central provinces, have high potential productivity, variability in seasonal rainfall is an added source of risk in the use of fertilizer. Output markets are volatile, reflecting changing production conditions. Uncertain crop prices make it difficult for farmers using fertilizer to be confident that they

will obtain a sufficient return from the sale of the additional harvest that they obtain from the use of fertilizer to pay for the input.

- Finally, while many rural areas of Mozambique are densely populated, the country as a whole still has a considerable amount of uncultivated arable land. Therefore, opening new land to cultivation to produce more crops is generally less costly for Mozambican farmers than investing in yield-enhancing technologies, like fertilizer, on existing cultivated land. In consequence, the output prices for crops that are traded in local markets will be determined in part, due to reasonable integration of Mozambican crop output markets, by the lower costs of production in the land-surplus areas. The lower output prices that result consequently render profitable use of fertilizer on crops more difficult for smallholders to achieve.

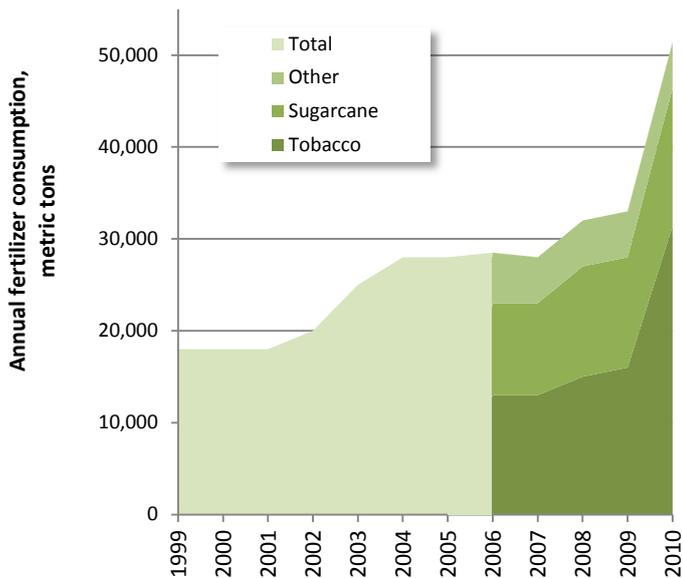
It is within this challenging economic context of fertilizer use by smallholder farmers that our study is situated. Relative to its neighbors, Malawi and Tanzania, Mozambique does not have a long history of its government promoting the adoption of inorganic fertilizer by smallholder farmers. However, in the last several years, more attention has been paid to increasing the use of inorganic fertilizers in the country. At policy level, this has involved the formulation of a draft fertilizer strategy and draft regulations for the fertilizer sector. Programmatically, a voucher-based fertilizer and seed subsidy program targeted at 25,000 smallholder farmers was undertaken in central and northern Mozambique in 2010 and 2011. Finally, commercially, there has been important new private investment in fertilizer supply and blending, particularly in central Mozambique, to serve both farmers in Mozambique and in neighboring countries inland.

FERTILIZER SUPPLY AND USE

Currently all of the inorganic fertilizer used in the country is imported. Estimates of annual total fertilizer consumption in Mozambique between 1999 and 2010 are graphed in the figure. From 2006 on, the figure disaggregates consumption by major crop, showing the dominance of tobacco and sugarcane in the national demand for inorganic fertilizer. There has been a rising trend in total fertilizer consumption. However, there is no evidence of any increase in use in the smallholder farming sector. Increased use of fertilizer on tobacco is the principal driver of increased consumption levels.

The reported 51,400 metric tons of fertilizer used in 2010 in Mozambique correspond to national application levels of about 11.4 kg/ha on cropped land. The annual average of smallholder inorganic fertilizer use reported in the 2005 to 2008 TIA (*Tribalho de Inquérito Agrícola*) agricultural surveys for Mozambique

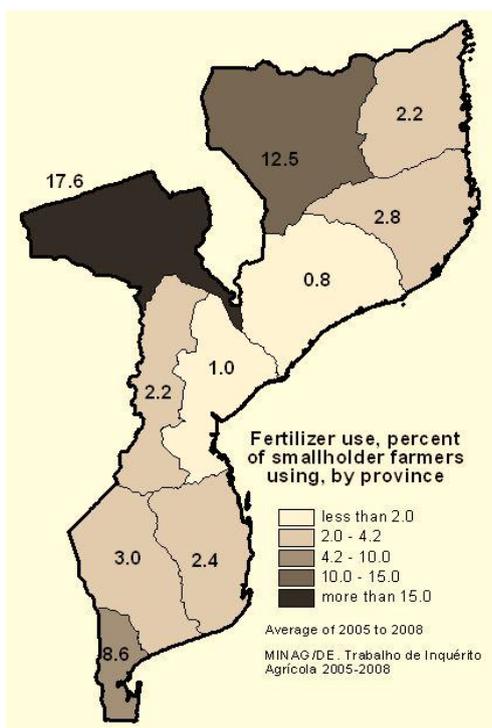
ANNUAL FERTILIZER CONSUMPTION, MOZAMBIQUE, 1999-2010



was only 4.2 percent. While higher prevalence of use is seen in Tete province, where smallholder contract farming of tobacco is relatively common, fertilizer use by smallholder farmers in Mozambique remains more the exception than the rule.

Because fertilizer is an imported commodity from international suppliers, global commodity and transport prices are the primary determinants of the price that fertilizer users in Mozambique pay for the input. A study in 2006 of fertilizer supply in Mozambique estimated the average delivered cost of fertilizer to several up-country regional trading centers to be US\$ 554 per mt (Chemonics & IFDC 2007). Of this price, the free-on-board (FOB) commodity price at the source in South Africa accounted for 48 percent, while transportation from the

SMALLHOLDER FERTILIZER USE BY PROVINCE, 2005-08



shipping port to Beira and on to the trading centers accounted for 33 percent. The margins obtained by the importers and traders were an estimated 8.1 percent of the cost, somewhat higher than what importers in Uganda and Tanzania obtain, for example. The study notes that fertilizer supply to Mozambican farmers is notably inefficient, with high costs due to the use of an expensive source in South Africa, whose fertilizer industry does not enjoy the economies of scale of the major international producers; the small volumes shipped; and the high transportation costs incurred through use of both small vessels engaged in coastal shipping and trucks traveling over poor road networks. Mozambique's delivered fertilizer costs in 2006 exceeded those of its landlocked neighbor Malawi by about \$60 per metric ton. In 2011, the average price of urea in Malawi was 15 percent lower than the average price in Mozambique (AMITSA 2012).

Mozambique is a price taker for fertilizer from international markets. Nonetheless, fertilizer importers could obtain their product from a cheaper producer than South Africa—competitive sourcing would lead to price reductions. The greatest scope for reducing costs is related to transportation. This would include improving port operations in Beira and Nacala, where virtually all fertilizer imported to Mozambique is off-loaded; using larger ships to bring in the fertilizer; and improving the domestic transportation infrastructure to reduce the costs of distribution after the fertilizer comes into the port. Economies of scale in shipping could be obtained through Mozambican importers' coordinating their shipments with those of other importers in the region, such as those in Malawi, Zambia, or Zimbabwe, so that larger shipments at lower unit cost could be off-loaded in the Mozambican ports.

LEGISLATION AND REGULATION OF FERTILIZER MARKETING

Attention is now being paid to establishing a regulatory framework for the importation, distribution, marketing, storage, and use of the input. The country currently has no specific laws or regulations governing how fertilizer should be marketed and handled. Early in 2011, a draft fertilizer strategy and draft regulations for the fertilizer sector in Mozambique were prepared by the Ministry of Agriculture (Zandemela 2011). Although still in draft form, it has been widely circulated for comment.

Here we examine the trade-off between the costs of proposed regulations on inorganic fertilizer in Mozambique and the benefits that those regulations provide for the farmer and the general public. Several issues arise.

- There is limited objective evidence on the degree to which adulterated fertilizers are sold in Mozambique. As such, the approach government is taking with its proposed legislation seems pragmatic. It appears to be grounded in an expectation that laws are needed so that the state will have instruments to regulate fertilizer quality in the marketplace when needed. They should not be burdensome on supply-chain actors for minor quality imperfections, but can be called into use in the case of egregious quality problems with fertilizer in the future.

Moreover, a vibrant and competitive agricultural input market in Mozambique will be somewhat self-regulating with regard to product quality. Firms that sell adulterated or otherwise poorly performing fertilizer are unlikely to retain their

customer base in subsequent farming seasons. If the proposed regulations on fertilizer are imposed with a heavy hand, they will restrict competition by placing relatively high hurdles for firms to enter or remain in the fertilizer business in Mozambique. With fewer traders and, consequently, less competition, in fact the chance of adulterated product's being sold is likely to increase.

- As standard commodities that are traded globally, high-analysis fertilizers have well-known properties and well-known risks associated with their use. The regulations proposed for Mozambique requiring firm-specific registration of individual high-analysis fertilizer products from all international suppliers, and import permits to then bring in the products, will contribute to limiting access to the national input markets for international suppliers. These regulatory hurdles will result in some limitation on the supply of fertilizer to farmers and effectively raise the price that they must pay. The regulations on fertilizer need to be appropriate for the purpose and prudently applied in this regard.
- The proposed regulations give very little role for the *Instituto Nacional de Normalização e Qualidade* (National Institute of Standards and Quality). This statutory agency is responsible for enforcing product standards for public health and safety by guarding against trade in dangerous, counterfeit, and substandard products. It can readily establish standards for high-analysis fertilizers. Placing the quality assurance of high-analysis fertilizers within the responsibility of the standards agency, rather than with Ministry of Agriculture agencies (as stated in the draft regulations), also would permit a broader set of distribution and marketing channels for fertilizer.
- Finally, these regulatory procedures impose costs in time and money for the fertilizer importer or trader—costs that farmers will ultimately pay for. The benefits for public health and safety from imposing these regulatory costs are quite small.

Mozambique is developing a system of control on the importation, marketing, and use of inorganic fertilizers. The government should ensure that the proposed regulations are as streamlined and light as possible, so that farmers derive the benefits of lower prices for the fertilizer that they obtain—benefits that likely exceed the value of any benefits from close regulation of fertilizer importation and marketing.

MARKETING OF FERTILIZER

The fertilizer marketing system in Mozambique is liberalized but not very well developed. The principal source of fertilizer is South Africa, from where fertilizers are generally imported duty free under regional trade rules. No value-added tax or other fees are charged on fertilizer imports. In general, government intervention in fertilizer importation and marketing does not seem to unduly constrain the operations of the firms involved.

While some of the sugar and tobacco firms will import their own fertilizer stocks, Agrifocus, the largest firm engaged in fertilizer importation and marketing in Mozambique, is their principal supplier. This firm also provides fertilizer to smaller fertilizer dealers. Two fertilizer blending plants have been established in central Mozambique in the past five to six years. Both firms obtain high-analysis fertilizers from South Africa or other international producers and blend the fertilizer into products demanded by tobacco and sugar producers in Mozambique or by other customers in neighboring countries.

To date, none of these fertilizer firms has established extensive networks of retail dealers across the country. The demand for fertilizers at smallholder level at present is too small to merit the creation of such networks. Most firms will establish regional depots in farming areas where fertilizer is used, but will not be found in the smaller agricultural trading centers. However, these depots will serve wholesale and retail functions equally, with even small farmers obtaining fertilizer there.

FERTILIZER RETAILERS

At retail level in the districts, access to fertilizers is still thin. Fertilizer dealers are present, even if not in great numbers. However, it is difficult to get a good understanding of the vibrancy of the retail agricultural inputs sector in the country. The number of retailers of agricultural inputs in Mozambique is not known exactly, although estimates are about 800 nationally. However, their distribution across the country is patchy, present in districts with higher agricultural potential, but with most districts having none. An agro-input dealers' association was established in the past several years, the *Associação Moçambicana de Provedores de Insumos Agro-pecuários*. However, it is as yet not very well known and its value to date uncertain.

In undertaking this study, two surveys were conducted—a trader survey and a farmer survey—in two farming areas of Mozambique where more fertilizer is used by smallholders than is the norm for the country as a whole: in Manica district in Manica province, and in Ribaué district in Nampula province. For the trader survey, the survey protocol was for 15 to 20 traders in each study area to be randomly selected from a list of agrodealers who market fertilizer. However, only 13 were interviewed in total, simply because the number of agrodealers in each area was insufficient. The survey was done in March and April 2011. Here we present selected findings.

- The median annual quantity of sales of fertilizer by traders in the sample is 360 bags, or 18 metric tons. Just over half of the traders are the sole owners of their businesses and operate from only one place of business. Most own a pick-up truck, with some owning larger trucks for transporting goods.
- The composition of their business sales is specialized in agriculture, but only three of the 13 traders in the sample reported obtaining more than 30 percent of the value of their total sales from fertilizer alone.
- Seventy percent of traders surveyed use only one supplier. The others reported using two suppliers. In Manica, the suppliers were all based in the regional capital, while in Ribaué, supplies came from several places, including Maputo.
- Fertilizer quality is not a major concern for most traders; only three mentioned any problems – one complained that fertilizer sometimes burns the crop; the others reported some poor packaging and being supplied caked fertilizer.
- Farmers, primarily small-scale farmers, constitute the majority of the traders' customers. The median amount of fertilizer purchased by farmers is a single 50-kg bag, although many transactions were much smaller. Sales of less than 50 kg were estimated to account for about 45 percent of their fertilizer sales. However, no trader obtained prepacked smaller packets of fertilizer from the wholesaler. Instead, they break 50-kg bags of fertilizer and either repack it themselves into 1-kg bags or simply sell it loose by volume.

- Most of the surveyed traders offer advice to farmers on proper use of fertilizer. However, the means by which traders obtain this information is varied and the quality of the information that they obtain is difficult to judge. Their own fertilizer supplier is the principal source of such information for 45 percent, with secondary sources including other fertilizer dealers, government extension staff, interactions with agricultural projects run by nongovernmental organizations, and their own experience.

FERTILIZER USE BY SMALLHOLDERS

In communities in the two survey areas, 160 smallholder farmers were randomly selected. 45.6 percent of them use fertilizer. Maize and vegetables are the two most commonly fertilized crops. The median application rate on maize among the farmers using fertilizer is 112.5 kg/ha. Here key findings are presented:

- Most farmers purchase fertilizer only once a year, with most doing so just before they apply it to their maize or vegetables. Farmers in Manica purchased two bags of fertilizer in 2010 on average, while those in Ribaué purchased one.
- The average distance to fertilizer supplier from the farm of the survey farmers was 22 km. The median cost of transporting the fertilizer per kilogram per kilometer for those who paid for transport was MT 1.00 in both study areas.
- For sources of information on how best to employ fertilizer on their crops, in Ribaué farmer group participation was the most commonly mentioned source of such information, while in Manica, the government extension service was most commonly mentioned, followed by farmers' groups.

CONCLUSION

The government of Mozambique has adopted a generally hands-off approach in engaging with efforts to improve farmer access to fertilizer. Private-sector investment decisions drive the development of these markets, with government primarily having somewhat distant oversight on these developments. Efforts are starting to strengthen the retail sector for agricultural inputs, but much work is still required in this regard. However, while overall some progress can be seen in the development of a private sector-led agricultural input market in Mozambique serving the needs of its smallholder farmers, given the problematic economics of fertilizer use by smallholders in Mozambique, the prospects for the future certainly remain murky.

This study pointed to several areas where government inaction is having an adverse effect on efforts to increase agricultural productivity in Mozambique through the increased use of inorganic fertilizer. The most important of these missing public goods are not specific to increasing smallholder adoption of inorganic fertilizer but are implicated in broad efforts to in-

crease economic growth in Mozambique, such as improving transportation links, regionally as well as locally.

There are two fertilizer-specific initiatives that the government should address to accelerate smallholder use of fertilizer in Mozambique.

- Information constraints. There are two areas where a lack of information with regard to fertilizer use results in either higher costs or inefficient use of inorganic fertilizer for smallholder farmers. First, farmers generally have very limited scientific information on the proper agronomic use of fertilizer on their crops within the particular agroecological conditions under which they farm. The second important information gap has to do with the economics of fertilizer use on maize and on the other crops grown by farmers on which fertilizer might profitably be used. An ongoing program of agronomic and economic research is required to compile, validate, and disseminate a consistent and robust set of simple crop- and area-specific fertilizer recommendations that are adaptable to changing market price conditions both for fertilizer and for the crops on which the fertilizer is used. Such recommendations should also be able to be modified appropriately for use by resource-constrained farmers who need to choose which elements of a recommended fertilizer application package they should prioritize in their farming practices.
- Regulatory reform: A considerably lighter regulatory regime that what is being proposed would allow more high-analysis fertilizer onto the Mozambique market in more places, resulting in lower costs for Mozambican farmers. The Ministry of Agriculture should be judicious in its implementation of this new legislation. The ministry must balance, with attention to the aggregate public interest, the need for continuing efforts at development of input markets against fraudulent behavior in these markets. The greater part of assuring the quality of fertilizers in open and competitive markets is achieved through self-regulation processes tied to sufficient information on product quality to inform farmers and ample choice in suppliers.

To conclude, there is clearly need for intensification of agricultural production in several areas of Mozambique. The government's efforts to enable smallholder farmers to profitably and appropriately make use of inorganic fertilizer, improved seeds and planting materials, and other improved agricultural technologies for higher agricultural production by smallholders on current cropland are welcome and should be expanded. Paying attention to supply-side factors related to the use of inorganic fertilizer and the other technologies is an important element of such efforts.

This note is a synthesis of IFPRI Discussion paper 01229 entitled *The Supply of Inorganic Fertilizers to Smallholder Farmers in Mozambique: Evidence for Fertilizer Policy Development* – <http://www.ifpri.org/sites/default/files/publications/ifpridp01229.pdf>

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