Lessons learned from private sector-friendly input subsidy programs in Tanzania and Ghana

David L. Mather

GISAIA/Tanzania Working Paper #6

April 2016

Keywords: Africa, fertilizer subsidy, smallholder agriculture

JEL codes: Q12, Q18

Author affiliations:
David Mather (Assistant Professor, International Development), Department of Agricultural, Food, and Resource Economics, Michigan State University (East Lansing, Michigan, USA).

ACKNOWLEDGMENTS

Financial support for this study was provided by the Bill & Melinda Gates Foundation (BMGF) through the Tanzania component of the GISAIA project (Guiding Investments in Sustainable Agricultural Intensification in Africa). One component of GISAIA/Tanzania involves collaborative research and capacity building between Michigan State University (MSU) and Sokoine University of Agriculture (SUA). http://fsg.afre.msu.edu/gisaia/index_Tanzania.htm

The author is grateful for the financial support provided by BMGF, without which this study would not have been possible. I thank Dr. David Nyange (MSU) for facilitating meetings with officials from the Tanzanian Ministry of Agriculture, Livestock and Fisheries (MALF) and as well as with other key fertilizer supply chain stakeholders in Tanzania. I thank Dr. Shashi Kolavalli (International Food Policy Research Institute; IFPRI) for similar assistance in Ghana.

I also wish to thank the following key informants from the Tanzanian government, private sector, and civil society for their time and for sharing their knowledge about NAIVS and the Tanzanian private sector fertilizer supply chain: Dr. Andrew Msolla (AFAP), Canuth Komba (MALF, Ag Inputs Directorate), Dr. David Rohrbach (World Bank), Pal Stormorken (Yara International), Salum Mkumba (Tanzania Fertilizer Society), and Janet Bitegeko and Susan Masagasi (Agricultural Council of Tanzania).

The opinions expressed in this report are those of the author alone and do not represent the views of BMGF.

1. INTRODUCTION

As has been recognized by donors and African governments alike in recent years, one of the keys to reducing rural poverty and improving the nutritional status of rural households in sub-Saharan Africa (SSA) will be to achieve wide-spread improvements in food crop productivity among smallholder farmers. Since the Abuja Declaration of 2006 and the international food price crisis of 2007/08, there has been a resurgence of large government-led fertilizer subsidy programs during this time period across a growing number of SSA countries including Ghana, Kenya, Malawi, Mali, Nigeria, Rwanda, Tanzania and Zambia. In contrast to the government-led input subsidy programs of the pre-structural adjustment era in SSA, which typically took the form of state monopsonistic control of input distribution and a pan-territorial subsidized input price for all buyers, most of the large-scale fertilizer input subsidy programs (ISPs) from 2000 onward have attempted to improve program efficiency (and reduce the overall budget required) by using 'smart subsidy' design criteria, as proposed by Morris et al (2007).

Perhaps the most common and visible design element of many of the recent programs is for the government to target vouchers (which can be redeemed for fertilizer at a subsidized price) or fertilizer itself to a specific subset of farm households, based on specific geographic and household-level criteria. However, use of vouchers alone does not make a program a 'smart subsidy', as Morris et al (2007) note that a range of design elements are needed for a truly 'smart' program. While Morris et al (2007) provide 10 key considerations for the design and implementation of a 'smart' input subsidy program (ISP), one of their key criteria is to "favor market-based solutions: interventions designed to promote increased use of fertilizer should be designed to support market development and not undermine incentives for private sector investment." Where appropriate, public-private partnerships should be promoted as a first step along the road to full privatization." Thus, a critical feature of how Morris et al (2007) define a 'smart' input subsidy program is for it to be specifically designed to work within (and support the development of) the existing private sector input distribution system, thereby reducing the well-known inefficiencies of the previous state-led approaches.

Therefore, a 'smart' ISP is a public-private partnership that limits the government's role in the program primarily to the distribution of vouchers that enable recipient households to acquire a specified quantity of fertilizer at a subsidized price from a local private input dealer that is participating in the ISP. In practice, this means that the government does not physically handle fertilizer, but rather focuses primarily on distributing vouchers based on pre-established targeting criteria. The role of participating private sector fertilizer supply chain actors is to physically handle all ISP fertilizer from the port to targeted villages as well as to allow voucher recipients to redeem their vouchers for a limited quantity of fertilizer, acquired at a subsidized price. It follows that the government and private sector fertilizer and seed supply chain actors need to coordinate so that the private sector knows well ahead of planting where voucher-led demand will be in a given season, so that these supply chain actors can adequately plan their importation, distribution, and retailing of subsidized fertilizer. The use of vouchers within the existing private sector input supply system is therefore intended to stimulate private fertilizer market development by both increasing aggregate demand for fertilizer and improving links between farmers and input suppliers (ibid, 2007).

In a review of existing ISPs in sub-Saharan Africa, Wanzala-Mlobela (2013) considered Tanzania's National Agricultural Input Vouchers Scheme (NAIVS) to be the most private-sector friendly ISP of its era, and that Ghana's Food Security Program (GFSP) was also viewed to be quite private-sector friendly. In this paper, we highlight a number of lessons learned (good and bad) from the design and implementation of these two programs with respect to meeting the related 'smart subsidy' goals of supporting input market development and not undermining incentives for private sector investment. For example, while the private sector took care of the physical handling (importation, wholesaling, and retailing) of subsidized fertilizer for both NAIVS and GFSP, there are a number of ways in which program design and/or implementation helped and/or hindered the development of a market-driven agricultural input system in each country.

2. Ways in which an ISP can support input market development

2.1 Introduction

There are a number of ways in which a well-designed ISP can support input market development while also meeting program goals such as improving household and national food security in the short-term. We start with a brief description of NAIVS, as its design offers examples of how an ISP can help support and work within the existing private sector agricultural input system and address key constraints to system development. NAIVS had three main goals: (1) to improve farmer access to inorganic fertilizer for use on maize/rice and improved maize/rice seed; (2) to provide a rapid, sustained and predictable increase in smallholder farmers' effective demand for inorganic fertilizer and improved maize/rice seed so as to promote longer-term investment by the private sector fertilizer and seed supply chains (World Bank, 2009). A third and long-term goal of NAIVS was that by improving both physical access to fertilizer for smallholders and reducing the financial risk involved for both smallholders and the supply chain suppliers, this would provide a relatively low-risk learning opportunity and experience for all actors in the supply chain for fertilizer and improved seed use in maize and rice production. Ideally, this lower-risk 'experimentation period' would lead to both an increase in smallholder demand for commercially priced fertilizer and improved seed, and an increase in supply chain actor investments in physical infrastructure, human capital, and exchange relationships so as to 'jump-start' the development of a spatially wider market-driven agricultural input distribution system.

First, the ISP needs geographic and household-level criteria for targeting vouchers that helps promote the sustained adoption of improved technology -- fertilizer and improved seed (and other complementary inputs and plot management practices) – such that use of improved inputs continues even after subsidies are eventually phased out. Second, the ISP also needs to be designed and implemented such that it provides an environment in which private sector importers, wholesalers, and retailers choose to make investments in physical capital, human capital and exchange relationships that can increase the spatial coverage of the input market distribution system while also driving down input costs.

2.2 Targeting criteria that helps support market development via sustained technology adoption

In order for an ISP to promote sustained adoption of inorganic fertilizer for use on a staple crop such as maize or rice, it should target vouchers to a specific sub-population of households that live in areas where fertilizer use on such staple crops should be profitable, yet who are known or assumed to have had limited to no recent use of fertilizer. Lack of prior fertilizer use on maize/rice could be due to a number of challenges faced by rural households, including: (a) lack of physical access to input retailers; (b) credit constraints, (c) lack of knowledge of the net returns to fertilizer use, and/or (d) aversion to invest in a new technology given the inherent riskiness of rain-fed maize or rice production. Thus, a key assumption behind a truly 'smart' subsidy scheme is that in the absence of targeted subsidies, there are smallholders who could afford the market price of inorganic fertilizer yet do not use it due to one or more of the challenges above. A second assumption is that by subsidizing these inputs (ideally for a pre-announced and fixed period of time), this will reduce farmers' risk of experimentation and learning regarding the profitability of fertilizer use on a staple crop under their own farm conditions, while providing sufficient aggregate fertilizer demand for private sector retailers to invest in distribution systems.

Tanzania's NAIVS program from 2008/09 to 2013/14 provides a good example of targeting criteria for smallholder voucher recipients that was developed with the goal of building smallholder demand for market-priced fertilizer in the longer-term, after subsidies were eventually phased out. Thus, the initial district-level targeting criteria was to only target vouchers to areas of medium to high potential where fertilizer use on maize/rice was expected to be profitable.[1] There were three main household-level criteria for eligibility for voucher receipt:

1) Be a resident farmer who grows one hectare or less of maize or rice;
2) Household has not have used fertilizer on maize (rice) within the past five years;
3) The ability and willingness to afford the 'top-up' for the allowable quantity of subsidized fertilizer – i.e. upon redeeming the voucher at or before planting, the recipient needed to be willing and able to pay 50% of the market rate of the fixed quantity of subsidized fertilizer.

Thus, the NAIVS household-level targeting criteria was not specifically intended to reach the 'poorest of the poor' as households unable to pay 50% of the market price of fertilizer would not likely be able to afford fertilizer and/or improved seed once subsidies were phased out. It is important to note that the goal of some programs is to quickly alleviate household food insecurity and reduce poverty, in which case, the subsidy rate may be higher than 50%. In fact, Morris et al (2007) note that it can be appropriate to target some poorer households for both equity concerns and to help avoid food insecurity in the short-term. However, while such programs may help poor households in the short-term, targeting households that will likely not

[1] A few years later, political pressure from districts not included in NAIVS led the GoT to expand the program to distribute at least some vouchers to irrigated areas within low-medium potential zones.

be able to afford market-priced fertilizer in the medium- to long-term is not likely to build fiscally sustainable demand for market-priced fertilizer.

Lesson #1: Targeting households that can afford 50% or more of the market price of fertilizer (i.e. not the poorest of the poor) is theoretically more likely to help increase the number of farmers who purchase fertilizer at market rates in the longer-term. The subsidy enables such farmers to experiment with fertilizer use on staple crops with less risk.

While NAIVS targeted households that could conceivably afford to purchase market-priced fertilizer in the medium- to longer-term, on the other hand, program designers did not want subsidized fertilizer to displace or 'crowd-out' existing demand for commercially-priced fertilizer. Thus, voucher recipients had to also meet the first two criteria, which were intended to ensure that vouchers did not go to farmers who were already capable of self-financing fertilizer for use on maize/rice, which tend to be smallholders with larger farm sizes, access to fertilizer via interlinked credit (such as via an out-grower cash crop scheme), and/or sufficient non-farm income to self-finance such inputs at planting.

One reason why avoiding crowding-out is important is because the publically-stated goal of many of ISPs is to induce higher levels of smallholder fertilizer use, which are assumed to lead to improvements in crop productivity and thus higher household incomes and improved food security. However, the degree to which an ISP raises total smallholder fertilizer use depends on the extent to which receipt of subsidized fertilizer crowds-out (or crowds-in) the quantity of commercial fertilizer that a subsidy recipient smallholder theoretically would have purchased at the market rate in the absence of a subsidy (Ricker-Gilbert, Jayne, and Chirwa 2011).

Lesson #2: Targeting criteria (in design and in practice) should minimize the potential for subsidized fertilizer to be received by households that may have purchased fertilizer at the market rate in the absence of a subsidy.

NAIVS succeeded in meeting the three criteria above as a majority of voucher recipients in 2009/10 had not used fertilizer on maize or rice in the previous five years and the median area planted to maize (rice) of voucher recipients was not greater than one hectare (Mather and Minde, 2016). NAIVS' success in implementing targeting criteria as planned may have been due to the fact that the village voucher committee (VVC) tasked with identifying voucher recipients included not only village leadership, but also several additional resident farmers elected by the village to serve on the VVC, as well as the local extension agent.

3. Ways in which a 'private sector-friendly' ISP may hinder input market development

3.1 Late delivery of vouchers and/or fertilizer

In both Tanzania (Mwaijande, 2014; Aloyce et al, 2014) and Ghana (Benin et al, 2013), vouchers and/or fertilizer were delivered late in some years of the program in at least some regions. Basal fertilizer is most effective if applied at planting, thus delays in receipt of subsidized fertilizer can result in lower yields. This would of course reduce the program's effectiveness at

increasing staple food production and/or building longer-term demand for market-priced fertilizer.

Late delivery of vouchers and/or inputs appears to be a challenge for many programs, regardless of how private-sector friendly they are. While this is a serious problem for the effectiveness of any program, we do not address this challenge here except as follows. When late delivery of vouchers is caused at least in part by a lack of sufficient time between the beginning of a country's fiscal year and the planting months of the main season, as in Ghana, the government may need to arrange to approve for an input subsidy program's budget on a different time-table than the rest of the budget, as is the case with cocoa subsidies in Ghana.

Lesson #3: if late delivery of vouchers is caused at least in part by a lack of sufficient time between the beginning of a country's fiscal year and the planting months of the main season, the government should arrange to approve for an input subsidy program's budget on a different time-table than the rest of the budget.

3.2 Selection of agro-dealers that participate in the ISP

At the beginning of NAIVS, village and district-level officials had the primary discretion of which agro-dealers operating in their district could participate in NAIVS. This was intended to ensure the selection, where possible, of retailers known to, and trusted by, local communities (World Bank, 2014). Thus, private sector wholesalers and importers supplying the agro-dealers with fertilizer largely had to work with agro-dealers selected by government officials each year. However, after several years of this arrangement, importers met with the Ministry of Agriculture, Food Security and Cooperatives (MAFC) and insisted that MAFC enable importers and/or the distributor they work with in a given district to be allowed to select which agro-dealers they would work with in that district.

There are a number of reasons why a fertilizer importer would want to be able to select agro-dealers with which they will work. First, fertilizer importers need to be able to trust agro-dealers to both provide proper information to farmers about their fertilizer brand, so that farmers would more likely have a good experience using the fertilizer and perhaps decide to buy it at the commercial price in the future. Second, importers need to be able to trust agro-dealers to repay both the top-up fee (the 50% of market price of fertilizer paid by voucher recipients) and subsidy amounts of all the fertilizer they received from wholesalers and importers (the subsidy amount is paid by the government).

After several years of NAIVS, importers had gained enough information via repeated transactions with both wholesalers and agro-dealers to know which they trusted and which they did not. While there were agro-dealers who performed as expected in the first few years of NAIVS, there were enough 'bad apples' that importers wanted more control over which agro-dealers they would work with to distribute fertilizer via NAIVS. In summary, faced with a demand for an institutional change in the program design from a key implementing partner (private sector fertilizer importers), MAFC agreed that beginning with the 2012/13 season,

importers participating in NAVIS would have primary discretion in selecting which agro-dealers they would work with in a given district (Mather and Ndyetabula, 2016).

Lesson #4: Private sector importers and distributors -- and not Government -- should have primary discretion in deciding which agro-dealers the private sector importers and distributors work with while participating in an ISP.

3.3 Problems created by late announcement of key program information from year to year

3.3.1 Effects on bulk purchasing

Another goal of a smart subsidy is to capture economies of scale in nascent private sector fertilizer industries. As Morris et al (2007) explain, "by increasing aggregate demand for fertilizer and providing incentives to retailers, wholesalers, importers, and others, market-smart subsidies can allow the domestic fertilizer industry to capture economies of scale in sourcing, packaging, storing, marketing, and sometimes even producing fertilizer (p.105)." However, in Ghana, volatility in the time that key program elements (such as importation quotas by private sector importer) are announced each year hinders the ability of importers to import fertilizer for both the subsidized and commercial markets in a cost-minimizing way. For example, because all fertilizer in Ghana is imported, the earlier that importers are able to determine the likely fertilizer demand for the upcoming season, the easier it is for them to coordinate their international shipping orders in a way that minimizes their fertilizer cost per metric ton (MT).[2]

However, because fertilizer importers are not told their quota for subsidized fertilizer under Ghana's Fertilizer Subsidy Program (GFSP) -- how much fertilizer the Ministry of Food and Agriculture (MoFA) will enable a given importer to sell at a subsidized rate -- until approximately six weeks prior to the onset of the planting season, this can force importers to pay higher shipping costs per metric ton (MT) in order to get the fertilizer to the port in enough time for them to ship it inland by the planting period (Resnick and Mather, 2016). Second, because some of the importers currently operating in Ghana are not operating on a large scale, they may need to wait to discover their GFSP quota before they place an order for commercial fertilizer. This implies that their commercial fertilizer may also be imported at a higher shipping cost per MT than would be the case if they knew their subsidized quota well in advance of the planting season. In fact, some of the smaller importers may need to bundle their fertilizer orders for fertilizer they intend to sell to both the subsidized and commercial end markets in Ghana in one shipment, and perhaps even coordinate such a shipment with other importers so as to minimize their shipping costs per MT.

Lesson #5: Delays in determining quotas for participating private sector importers makes bulk purchasing more difficult and leads to higher fertilizer costs

[2] This section is based on interviews with private sector fertilizer importers in Ghana in March 2015 (Resnick and Mather, 2016).

3.3.2 Delays in delivery of inputs to subsidy recipients

The late announcement of key program information leads to not only late importation of GFSP fertilizer, but also late delivery of GFSP inputs to recipient farmers, which can result in significant negative yield loss for them. This problem is mentioned several evaluations of the program (Banful 2009; Benin et al. 2013; Ghartey and Associates 2009) as well as by Ghana's Audit Office (Missah et al. 2013).

To the Ghana Ministry of Food and Agriculture (MoFA)'s credit, the length of time between the program announcement (in a given year) and the beginning of the farming season in February has gradually improved since 2008, but at no time has the program ever preceded the start of the planting season (Resnick and Mather, 2016). It is important to note that there are not many months between when the GoG annual budget is approved (October) and when planting starts (February). However, GoG have managed to fund and implement a program of subsidized inputs to cocoa farmers in a much more timely way because each year the cocoa subsidy program is approved prior to the rest of the budget.

Lesson #6: Delays in announcing key program decisions such as fertilizer importers' quotas of subsidized fertilizer results in delay of importation and then delay in delivery of inputs to subsidy recipients, which reduces farmer yields

3.3.3 Effects of delays in delivery of inputs to subsidy recipients on farmers' purchase and application of market-priced fertilizers

Late delivery of subsidized fertilizer can also have negative effects on farmers' application of market-priced fertilizer. For example, late announcement of the program results in late delivery of subsidized fertilizer. Given the relatively large share of GFSP fertilizer in total fertilizer use for maize or rice, any delay in delivery of subsidized fertilizer for maize/rice production can result in distortions of smallholder fertilizer purchasing behavior, a potential reduction in their commercial fertilizer demand, and delay in their application of either subsidized or commercial fertilizer. Taken together, this can result in lower yields than could be achieved if subsidized fertilizer were delivered on time (several weeks before main season planting). It follows that if a large enough group of smallholders in a given region are waiting on subsidized fertilizer to arrive to see whether or not they can obtain some of this (before potentially buying fertilizer at the commercial price), this also may have negative consequences for distributor and retail sales of fertilizer for use on maize and rice.

Lesson #7: Delays in delivery of inputs to subsidy recipients may also lead to delays in the purchase and application of market-priced fertilizers

3.4 Lack of transparency and inclusiveness regarding importation quotas and determination of subsidized price paid by farmers

3.4.1 Limited transparency of bids made by importers of ISP fertilizer

There is a perceived lack of transparency regarding the Ghanaian MoFA's determination of key elements of the program each year, such as the determination of the pan-territorial price of a given type of fertilizer or seed and quotas of fertilizer or seed assigned to specific importers and

regions (Resnick and Mather, 2016). For example, the pan-territorial subsidy is based on three components: (1) the lowest price quoted by importers bidding for GFSP fertilizer quotas for their cost of importing a given type of program fertilizer and paying all domestic port charges; (2) the cost of transporting program fertilizer from importer warehouses at the port to wholesaler (distributor) warehouses in regional capitals; and (3) the storage and other costs of distributors as well as those of retailers who are expected to deliver subsidized fertilizer to areas known to contain farmers with vouchers or passbooks (Benin et al. 2013; MoFA 2011). However, the price bids for fertilizer importation made by each company as well as expected transport costs to regional capitals are often not published in the annual GFSP implementation bulletin.[3] The reason why transparency on the cost of fertilizer importation bids is important is common to any government procurement from the private sector; namely, transparent bidding helps to avoid the potential for government officials to be paid 'under the table' for awarding quotas to specific fertilizer importers.

Lesson #8: Bids made by fertilizer importers to the government for importing fertilizer for the subsidy program should be made public each year.

3.4.2 Lack of distributor/retailer input into setting a pan-territorial subsidized price

In Ghana, the process of determining the price components of subsidized fertilizer involves only MoFA and importers, thus distributors and retailers are not included in negotiating the margin that they themselves receive for covering their financial costs of wholesale and retail services.[4] Subsequently, distributors claim that this margin is not sufficient enough for them to cover both their wholesaling costs and the cost of hiring a retail agent to deliver subsidized fertilizer (at the fixed 'subsidy price') to smaller towns close to where farmers are known to have the passbooks (i.e. registration) required to receive subsidized fertilizer (Resnick and Mather, 2016)[5]. A representative from the Ghanaian distributor/retailer association (GAIDA) noted that because the margin they receive from MoFA/importers is very small, most distributors cannot afford to pay their own retail agents (or others) to deliver subsidized fertilizer to villages. This means that farmers who want to access subsidized fertilizer must travel to the nearest distributor warehouse to acquire it, perhaps without knowing whether or not subsidized fertilizer is still available at a given warehouse.

Lesson #9: Representatives from each level of the fertilizer supply chain should be involved in determining marketing margins for subsidized fertilizer for each level of that chain. Not including distributor/retailer representatives in setting the distributor/retailer margin for selling subsidized fertilizer can result in distributors selling subsidized fertilizer from their warehouses, not via retailers who have shops in villages and/or visit villages.

[3] For instance, MoFA (2011) provides an exception where importers' bids were made public.

[4] Noted by Benin et al (2013) and confirmed in interview with GAIDA (Resnick and Mather, 2016). For example, the subsidy price in 2015 only included a margin for distributors/retailers of 2 cedis per bag, which distributors/retailers claim is insufficient for them to cover the cost of transporting subsidized fertilizer to villages.

[5] Only farmers who have received a passbook from an extension officer can access subsidized fertilizer. That said, the only criteria for receiving a passbook is that the farmer produce food crops. The passbook is intended to reduce the likelihood of smuggling by only allowing registered farmers to purchase subsidized fertilizer.

Secondly and relatedly, the lack of distributor/retailer input in the determination of the distributor and retailer margin can have negative consequences for all members of the fertilizer supply chain, thereby questioning the GoG's intention of using this program to promote market-led development. For example, since distributors only sell subsidized fertilizer from their warehouses, this means that farmers bear the costs of both transport to/from these warehouses (which may be substantial, and is certainly less efficient than if retailers brought fertilizer to villages) and search costs for a warehouse that has subsidized fertilizer in stock. This implies that resource-poor farmers are at a disadvantage in terms of accessing subsidized fertilizer (yet those are the farmers who were the intended recipients, in the early and later years of the program). In addition, this may disrupt and/or distort fertilizer retailer behavior because if there are some villages with minimal demand for fertilizer and commercial rates, it may not be cost-effective for them to take any fertilizer (subsidized or commercial) from a distributor's warehouse to some villages. If this negative effect on retailer presence in villages is wide-spread, this undermines the very rationale of the program itself – to provide a learning experience for smallholders who are not accustomed to using fertilizer or improved seed in maize/rice production.

Lesson #10: Not including distributor/retailer representatives in setting the distributor/retailer margin for selling subsidized fertilizer can result in some villages not being visited by retailers where there may be demand for market-priced fertilizer

Given these difficulties, as of early 2015, distributors/retailers in Ghana preferred to have no subsidy program relative to the current one (Resnick and Mather, 2016). That is, because the margin they receive for participating is not large enough for them to pay retailers to deliver fertilizer at the subsidized price to villages, they believe that in the absence of a subsidy, their sales and profits would be higher because there would be more demand at the village level for commercial fertilizer. By contrast, Tanzania's NAIVS includes representatives of each stage of the fertilizer supply chain (importers, distributors, retailers) when setting the subsidized price for a particular district. This not only enables distributors and retailers to ensure that they are paid a sufficient margin to cover their cost of delivering subsidized inputs to specified villages, but also ensures that input dealers operating in areas with lower road density and poorer market access are able to negotiate for a margin large enough for them to service villages targeted by NAIVS.

3.5 Inability of government to repay fertilizer importers on time

From 2008/09 to 2013/14 and then in 2015/16, private sector fertilizer importers imported the fertilizer distributed as part of NAIVS, and they paid the full cost of importation, distribution, and retail. After the season, they were supposed to be repaid in full from the 50% farmer contribution and the 50% government subsidy for each bag of subsidized fertilizer they had distributed. However, following the 2012/13 and 2013/14 seasons, the GoT was not able to repay importers fully for what they were owed by GoT, and this debt was one factor in NAIVS stopping completely for the 2014/15 season (Mather and Ndyetabula, 2016). The importers noted that they had to take out a second loan on the fertilizer form those seasons, which

reduces their returns and can result in higher fertilizer costs for market-priced fertilizer as well. The GoT brought back NAIVS in 2015/16 and most private sector importers participated as before, although they were still owed money by GoT from the prior seasons. As in previous seasons, the importers were not paid on time, and were still owed money by GoT from prior seasons. In 2016/17, the private sector importers refused to participate until repaid in full by GoT. The GoT decided to then go ahead with another year of NAIVS, though only using the quasi-private sector Tanzania Fertilizer Company to import and distribute fertilizer for the program.

Beginning in 2012, Ghanaian fertilizer importers have faced similar problems with late payments from the GoG (Resnick and Mather, 2016). This combined with late announcements by the GoG regarding whether or not a program would go forward in 2015/16 led two of the largest private sector importers to stop their participation in the ISP (ibid, 2016).

Lesson #11: Inability of the government to pay importers on time can increase fertilizer costs, because firms who have to take out second loans pass on the costs to the rest of the fertilizer supply chain. More significantly, it can also reduce private sector willingness to engage in such public-private sector initiatives in the future.

3.6 Limiting fertilizer choice for program recipients

As with many other large-scale ISPs, NAIVS limited the types of inorganic fertilizer that could be accessed with a voucher. For example, voucher recipients had a choice of only two basal fertilizers (DAP and Minjingu Rock Phosphate (MRP)[6]) and only urea for top-dressing (though in a few areas sulfate of ammonia was available). However, in two years of the program, farmers in the southern highlands were restricted even more in that in those two years, NAIVS only permitted one basal fertilizer (MRP) to be redeemed with a basal fertilizer voucher. The reason given by the GoT for this decision was to help to build demand for MRP, which is produced by a local Tanzanian firm. However, farmers in many districts protested against the lack of choice as they found that MRP did not give as good a yield response as DAP. This is consistent with agricultural research zonal center trials that found that DAP was a better source of P than Minjingu products in most areas (Mlingano, 2013), as rock phosphate tends to work better on crops with longer growing periods, such as sugar cane. In years in which MRP or Minjingu Mazao was the only basal fertilizer, many farmers reportedly did not redeem their basal fertilizer voucher.

Lesson #12: Government should not severely limit the types of fertilizer available for use on food crops within a subsidy scheme; at a minimum, they should provide options that are most popular among farmers who purchase market-priced fertilizer for a given crop.

3.7 Using blanket fertilizer recommendations

Another short-coming of NAIVS (and many other programs) is that even though Tanzania has district-level fertilizer recommendations for maize and rice, NAIVS employed blanket fertilizer

[6] In later years, Minjingu Mazao was available.

recommendations across all areas targeted.[7] The unfortunate implication is that fertilizer response rates may not be high enough to be profitable if the blanket fertilizer recommendation for a given zone is inappropriate. Because fertilizer needs vary spatially, applying a single fertilizer recommendation can undermine longer-term demand for fertilizer in the event that the recommendation is not appropriate for a given area, and farmers' fertilizer-grain response rates are poor.

It would appear that the reason that NAIVS (and many other programs) only offer a few types of subsidized fertilizer as well as blanket fertilizer recommendations for maize and rice is to reduce logistical challenges and costs. However, a top-down program design such as NAIVS is not the only option for how an ISP could be designed. For example, in Burundi, the government recently supported an ISP that began with soil testing to update zonal-specific fertilizer recommendations for a variety of subsistence crops (Jayne et al, 2016). Eligible farmers then indicated the type of fertilizer they desired six months before planting, were able to order fertilizer in 25 kg bags, and had to make a down-payment equivalent to 20% of the expected cost at that time.[8] The farmer demands were then aggregated to the district level, and then the government held an auction to determine which fertilizer companies would provide specific fertilizers requested by farmers in a given district. This design thus helps to improve the probability that program fertilizer used in a given area is applied based on updated area-specific fertilizer recommendations. In addition, the program design helps to reduce side-selling by increasing farmer commitment to pay the additional 40% of the market price they owe (the subsidy was 40%), because farmers who do not pay the additional 40% at planting cannot get their initial 20% down-payment returned to them.

Lesson #13: Government should begin an ISP with updated fertilizer recommendations for target crops, not employ blanket fertilizer recommendations, and consider implementing a bottom-up design so that farmers have more choice in deciding which subsidized fertilizers to purchase.

4. CONCLUSIONS

Tanzania's National Agricultural Input Vouchers Scheme (NAIVS) and Ghana's Food Security Program (GFSP) are viewed as two of the most private sector-friendly input subsidy programs (ISPs) of their generation (2000-2013). In this paper, we highlight a number of lessons learned (good and bad) from the design and implementation of these two programs with respect to meeting the related 'smart subsidy' goals of supporting input market development and not undermining incentives for private sector investment.

<u>Lessons related to ways in which an ISP can support input market development</u>

Lesson #1: Targeting households that can afford 50% or more of the market price of fertilizer (i.e. not the poorest of the poor) is theoretically more likely to help increase the number of farmers who purchase fertilizer at market rates in the longer-term. The subsidy enables such farmers to experiment with fertilizer use on staple crops with less risk.

[7] That said, Tanzania's fertilizer recommendations are 20+ years old, though are in the process of being updated

[8] Based on personal communication with Joshua Ariga of the International Fertilizer Development Center.

Lesson #2: Targeting criteria (in design and in practice) should minimize the potential for subsidized fertilizer to be received by households that may have purchased fertilizer at the market rate in the absence of a subsidy.

Lessons related to ways in which a 'private sector-friendly' ISP may hinder input market development

Lesson #3: if late delivery of vouchers is caused at least in part by a lack of sufficient time between the beginning of a country's fiscal year and the planting months of the main season, the government should arrange to approve for an input subsidy program's budget on a different time-table than the rest of the budget.

Lesson #4: Private sector importers and distributors -- and not Government -- should have primary discretion in deciding which agro-dealers the private sector importers and distributors work with while participating in an ISP.

Lesson #5: Delays in determining quotas for participating private sector importers makes bulk purchasing more difficult and leads to higher fertilizer costs.

Lesson #6: Delays in announcing key program decisions such as fertilizer importers' quotas of subsidized fertilizer results in delay of importation and then delay in delivery of inputs to subsidy recipients, which reduces farmer yields.

Lesson #7: Delays in delivery of inputs to subsidy recipients may also lead to delays in the purchase and application of market-priced fertilizers

Lesson #8: Bids made by fertilizer importers to the government for importing fertilizer for the subsidy program should be made public each year.

Lesson #9: Representatives from each level of the fertilizer supply chain should be involved in determining marketing margins for subsidized fertilizer for each level of that chain. Not including distributor/retailer representatives in setting the distributor/retailer margin for selling subsidized fertilizer can result in distributors selling subsidized fertilizer from their warehouses, not via retailers who have shops in villages and/or visit villages.

Lesson #10: Not including distributor/retailer representatives in setting the distributor/retailer margin for selling subsidized fertilizer can result in some villages not being visited by retailers where there may be demand for market-priced fertilizer.

Lesson #11: Inability of the government to pay importers on time can increase fertilizer costs, because firms who have to take out second loans pass on the costs to the rest of the fertilizer supply chain. More significantly, it can also reduce private sector willingness to engage in such public-private sector initiatives in the future.

Lesson #12: Government should not severely limit the types of fertilizer available for use on food crops within a subsidy scheme; at a minimum, they should provide options that are most popular among farmers who purchase market-priced fertilizer for a given crop.

Lesson #13: Government should begin an ISP with updated fertilizer recommendations for target crops, not employ blanket fertilizer recommendations, and consider implementing a bottom-up design so that farmers have more choice in deciding which subsidized fertilizers to purchase.

REFERENCES

Aloyce G. M., Gabagambi, D. M., and J.P. Hella. 2014. "Assessment of operational aspects of the input supply chain under national agriculture input voucher scheme (NAIVS) in Tanzania." *Journal of Development and Agricultural Econo*mics 6(3): 94-104. DOI: 10.5897/JDAE2013.0516

Banful, Afua Branoah. 2009. "Operational Details of the 2008 Fertilizer Subsidy in Ghana-Preliminary Report," Washington, DC: IFPRI.

Benin, Sam, Michael Johnson, Emmanual Abokyi, Gerald Ahorbo, Kipo Jimah, Gamel Nasser, Victor Owusu, Joe Taabazuing, and Albert Tenga. 2013. "Revisiting Agricultural Input and Farm Support Subsidies in Africa: The Case of Ghana's Mechanization, Fertilizer, Block Farms, and Marketing Programs," IFPRI Discussion Paper 01300. Washington, DC: IFPRI.

Ghartey Associates Limited. 2009. "Assessing the Effectiveness and Efficiency of the Coupon System of Distribution of Fertilizer to Peasant Farmers." Tema, Ghana.

Jayne, T.S., N.Mason, B.Burke, and J.Ariga. 2016. "Agricultural Input Subsidy Programs in Africa: An Assessment of Recent Evidence." MSU International Development Working Paper No. 145. Michigan State University.

Mather, D., B. Waized, D.Ndyetabula, A.Temu and I.Minde. 2016. "The effects of NAIVS on private sector fertilizer and seed supply chains in Tanzania." GISAIA/Tanzania Working Paper #3.

Mather, D. and I. Minde. 2016. "Fertilizer subsidies and how targeting conditions crowding in/out: An assessment of smallholder **f**ertilizer demand in Tanzania." GISAIA/Tanzania Working Paper #5.

Mather, D. and D. Ndyetabula. 2016. "Assessing the drivers of Tanzania's fertilizer subsidy programs from 2003-2016: An application of the Kaleidoscope Model of policy change." Feed the Future Innovation Lab for Food Security Policy Working Paper 34.

Ministry of Food and Agriculture (MoFA). 2011. "*2011* Fertilizer Subsidy Programme: Implementation Guidelines." Accra, Ghana: MoFA.

Missah, Henry, Alberta Owoo, Sampson Osei-Boadu, and Emelia Bonney. 2013. “Performance Audit Report of the Auditor General on MoFA’s Support to Farmers to Increase Food Crop Production.” Accra, Ghana: Ghana Audit Service.

Mlingano ARI. 2013. “Integrated Soil Fertility Management (ISFM) Component of Tanzania Accelerated Food Security Project: A Synthesis Report.” ISFM Research Team, Mlingano Agricultural Research Institute (ARI), Ministry of Agriculture, Food Security and Cooperatives (MAFC), Tanga, United Republic of Tanzania.

Morris, M., V. Kelly, R. Kopicki, and D. Byerlee. 2007. *Fertilizer use in African agriculture: Lessons learned and good practice guidelines*. Washington, D.C. World Bank.

Mwaijande, F. 2014. “Performance evaluation of National Agricultural Inputs Voucher Subsidy.” Ministry of Agriculture, Food Security and Cooperatives, Government of the United Republic of Tanzania, Dar es Salaam.

Resnick, D. and D. Mather. 2016. Agricultural Inputs Policy under Macroeconomic Uncertainty: Applying the Kaleidoscope Model to Ghana’s Fertilizer Subsidy Program (2008-2015). Food Security Policy Research Paper 19.

Ricker-Gilbert, J., T.S. Jayne, and E. Chirwa. 2011. Subsidies and Crowding out: A Double-Hurdle Model of Fertilizer Demand in Malawi. *American Journal of Agricultural Economics* 93.1: 26–42.

Wanzala-Mlobela, Maria, Porfirio Fuentes, and Solomon Mkumbwa. 2013. “Practices and Policy Options for the Improved Design and Implementation of Fertilizer Subsidy Programs in sub-Saharan Africa.” Muscle Shoals, AL: IFDC.

World Bank. 2009. Accelerated food security program of the United Republic of Tanzania under the global food crisis response program. Report No: 48549-TZ.