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The Effects of NAIVS on Private Sector Fertilizer and Seed Supply Chains in Tanzania

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ABSTRACT: The recent wave of targeted subsidy programs in Africa have arguably been more attentive to minimizing 'crowding out' of existing smallholder demand for commercial fertilizer to thereby improve program efficiency in raising smallholder total fertilizer use, relative to untargeted, universal subsidy schemes. To our knowledge, there are no studies that have assessed the extent to which a truly 'smart' fertilizer subsidy program has achieved goals associated with 'jump-starting' the sustainable development of a market-driven agricultural input distribution system: (1) to improve smallholder access to inorganic fertilizer 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/seed supply chains. We use a range of data sources to assess the extent to which Tanzania's National Agricultural Input Voucher Scheme program has achieved these goals. We find that NAIVS did lead to significant increases in use of inorganic fertilizer in maize/rice production from 2008/09 to 2012/13 and that most subsidy recipients had not previously used fertilizer on these crops. We also find evidence of infrastructural investments made by agro-dealers and distributors during this time period, which key informants say were due in part to the increased demand from NAIVS. Finally, we find a significant increase over time in the amount of agricultural inputs given to agro-dealers by distributors on credit; an indicator that repeated transactions between them appear to have reduced transaction costs of exchange.

1. INTRODUCTION

Within the past decade, a variety of economic and political factors and events have led both African governments and international donors to attempt to more seriously address the challenge of sustainable agricultural input intensification among smallholder African farmers. This has led to a resurgence of large-scale, government-led fertilizer subsidy programs across a growing number of SSA countries including Ghana, Kenya, Malawi, Nigeria, Rwanda, Tanzania and Zambia. The publically stated goal of many of these programs 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, 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, a critical feature of what Morris et al (2007) call 'smart' input subsidy programs is for them 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.

The recent wave of targeted subsidy programs in Africa have arguably been more attentive to minimizing 'crowding out' or 'displacing' existing smallholder demand for commercial fertilizer (Ricker-Gilbert et al, 2011) and thereby improve program efficiency in raising smallholder total fertilizer use relative to untargeted, universal subsidy schemes. While many of the new programs in SSA use vouchers and/or are asserted to be 'smart' by implementers, the extent to which they actually have characteristics of truly 'smart' programs as defined by Morris et al (2007) in design and/or in practice varies considerably (Wanzala et al, 2013). For example, as of 2013, the only large-scale programs that allowed the private sector to handle the physical distribution of program fertilizer from port to retail were in Ghana, Kenya, and Tanzania (ibid, 2013).

While there is a growing literature that has assessed the performance of the new 'smarter' large-scale government-led agricultural input subsidy programs in SSA, to date, existing studies have predominantly focused on measuring household-level effects of voucher receipt, such as its effect on commercial fertilizer demand (see Jayne et al, 2013 for a list), household income (Mason et al, 2015), or the benefit-cost of specific programs (Chirwa and Dorward, 2013; Jayne et al, 2013). To our knowledge, there are no studies that have assessed the extent to which a truly 'smart' fertilizer subsidy program has achieved goals associated with 'jump-starting' the sustainable development of a market-driven agricultural input distribution system: (1) to improve smallholder access to inorganic fertilizer improved maize/rice seed, among growers who previously had little to no experience using these inputs in staple crop production; (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).

The National Agricultural Input Voucher Scheme (NAIVS) of the Government of Tanzania (GoT) was clearly the most private-sector friendly large-scale agricultural input voucher program that began in sub-Saharan Africa prior to 2014 (Wanzala et al., 2013), as it embodies considerably more criteria of a 'smart' subsidy program (Morris et al., 2007) than programs during the same time period implemented in Ghana, Malawi, Kenya, Zambia, Nigeria, Senegal, etc. Thus, studying NAIVS from 2008/09 to 2013/14 provides an ideal case with which to assess the performance of the most private-sector friendly agricultural input subsidy program of its era with respect to the two goals noted above.[1] In this paper, we use a combination of secondary and primary data sources to address if and how NAIVS has affected the demand and supply sides of the private sector fertilizer supply chain in the following ways:

<u>Demand side:</u>

i. To what extent has NAIVS improved smallholders' physical access to inorganic fertilizer and improved seed for use in maize (rice) production?
ii. To what extent has NAIVS provided smallholders who had previously not used inorganic fertilizer with the experience of applying it.

<u>Supply Side:</u>

iii. To what extent have agro-dealers and distributors made longer-term investments in physical infrastructure during the NAIVS period (2008/09—2013/14)?
iv. To what extent have exchange relationships between members of the fertilizer supply chain improved during the NAIVS time period?

It is important to note that because NAIVS targeted nearly all maize and rice-producing districts in the country, it is not possible for us to test for a causal relationship between the NAIVS program and supply chain actors' subsequent economic choices (such as investments made). That is, the widespread spatial coverage of NAIVS means that there is effectively no counter-factual district or village to use for causal impact analysis at those levels. However, because the goals of NAIVS are clear, we nevertheless aim to assess the extent to which they appear to have been met, understanding that while NAIVS very likely had a large role in the

[1] Existing studies of NAIVS have assessed the program's performance relative to its intended design and implementation plan (Pan and Christiaensen; 2012; Aloyce, Gabagambi, and Hella, 2014; Mwaijande, 2014; World Bank, 2014) or have estimated the household-level impact of voucher receipt (Mwaijande, 2014; World Bank, 2014).

outcomes we observe, that we are not able to definitively attribute such outcomes solely to NAIVS. In addition, in many of our key informant interviews, we asked supply chain actors to what extent investments they made were due to NAIVS.

The paper is organized as follows. In section two, we provide a brief background on the history of fertilizer subsidy programs in Tanzania and in section three, we describe the data sources used for qualitative and quantitative analysis. In section four, we more specifically outline the goals of NAIVS. In section five, we describe the results of our qualitative and quantitative analysis of private sector fertilizer and seed supply chains during the NAIVS period with respect to the research questions noted above. We then offer a summary of findings and implications for agricultural input policy in the conclusion section.

2. BACKGROUND

2.1 History of GoT fertilizer policy prior to NAIVS

2.1.1 Independence to 1994

As in many African countries, soon after independence, the GOT subsidized agricultural inputs for a wide range of crops and was in fact a monopoly supplier of inorganic fertilizer. However, universal subsidization of agricultural inputs was not fiscally sustainable, and these subsidies were phased out from 1991 to 1994 during the structural adjustment period. While general liberalization of agricultural markets began in 1986, as of 1994, the GoT had completely liberalized agricultural input markets due to their commitment to private-sector led development. In response, private sector fertilizer and seed supply chains developed in various regions of the country, primarily to service cash crop production, though there was some demand for commercially priced fertilizer for use in smallholder maize production in the northern and southern highlands zones.

2.1.2 Return of fertilizer subsidies in 2003

Beginning in 2003, the Ministry of Agriculture, Food Security and Cooperatives (MAFC) of GoT began to subsidize fertilizer again following a poor harvest and concern about falling fertilizer use in the country. Under this program, the GOT covered the internal transport cost from the port to inland regional capitals for a *limited* quantity of fertilizer for a specified number of regions. However, by 2007, the assessments of this program by both the Agricultural Council of Tanzania (ACT) and MAFC itself concluded that hubs and agro-dealers were not passing on the cost savings of the subsidized quantities to smallholders (there was no enforcement mechanism).[2]

2.1.3 Shift from universal fertilizer subsidies to targeted voucher approach

After learning about Malawi's targeted voucher approach to distributing fertilizer subsidies, ACT organized a study tour for MAFC officials to visit Malawi to study their voucher scheme, which ACT believed would help solve the problem of how to ensure that smallholders actually receive a subsidized price for fertilizer. For various reasons[3], instead of using a government parastatal to distribute both vouchers and fertilizer (as in Malawi and Zambia), MAFC decided to limit the GoT role to distributing vouchers and coordinating with the private sector to enable the private sector to import, distribute and retail fertilizer to the village level that voucher recipients could obtain at a subsidized price.

[2] Personal communication with Dr. Andrew Msolla (AFAP) and Susan Masagasi (ACT). The program's main design flaw was that it relied on hubs and agro-dealers to voluntarily pass on the savings they received on subsidized fertilizer to smallholders (there was no enforcement mechanism).

[3] Tanzania already had reasonably well-functioning private sector supply chains for fertilizer and seed; and the GoT had completely dismantled their agricultural input marketing parastatal in 1994.

2.1.4 Scale-up of targeted voucher approach (2008/09 to 2013/14)

In response to the international food price crisis 2007/08 and a poor short season maize harvest in both Tanzania and Kenya, the GoT, with significant financial support from the World Bank, took the GoT's existing private sector-friendly pilot targeted voucher scheme, made some modifications, and scaled it up rapidly (from 2 districts in 2007/08 to 58 districts distributed across 11 Regions in 2008/09). From 2008/09 through 2012/13, the National Agricultural Input Voucher Scheme (NAIVS) invested approximately US$300 million in providing more than 2.5 million smallholder farmers with a limited quantity of subsidized fertilizer and seed sufficient for one acre of maize or rice (World Bank, 2014). Based on specific 'smart' regional and household targeting criteria, each targeted farmer who met the criteria and was willing and able to pay 50% of the cost of 2-3 bags of fertilizer was offered three vouchers (for seed, basal and top dress fertilizer). Voucher recipients obtained a limited quantity of fertilizer (at 50% the market rate) and 10 kg (25 kg) of maize (rice) seed at 100% subsidy by taking the voucher to a private sector agro-dealer (participating in the program) and paying the 'top-up' amount.

3. DATA SOURCES & METHODS

3.1 Secondary data

In this paper, we use household survey data from three main sources. The first is the 2007/08 Agricultural Census, which was implemented by the National Bureau of Statistics in collaboration with staff from the Ministry of Agriculture. This survey interviewed n=52,594 rural households in every district of the country, and is representative at the district level. The survey instrument asks rural households retrospective questions regarding household-, crop- and plot-level information regarding land access and use, crop production and marketing, input use, livestock production and sales, etc. during the 2007/08 main and short seasons.

The second household survey dataset is the National Panel Survey (NPS), also implemented by National Bureau of statistics (NBS), which consists of a sub-sample of both urban and rural households from the 2005/06 Household Budget Survey that were first re-interviewed in 2008/09, then again in 2010/11 and 2012/13. The NPS includes n=2,354 households that were re-interviewed in three separate waves and is representative at the zonal level. The agricultural component of the NPS survey asks rural households retrospective questions regarding household-, crop- and plot-level information regarding household demographics, land access and use, crop production and marketing, input use, livestock production and sales, etc. during the previous main and short seasons of each survey year, as well as questions about non-farm income generating activities, household assets, and access to health, education, and agricultural extension services.

The third source of household survey data is from the World Bank/REPOA survey of rural households, agro-dealers, and village leaders in 2010 (covering the 2009/10 main and short seasons) and 2011 (covering the 2010/11 main and short seasons). The household level surveys interviewed n=2,000 households in 2011 and 2,040 households in 2012, all from villages that had been targeted by NAIVS. Although this sample is not based on population-based sampling, it covers 200 villages from 10 districts in 9 of the regions that received the bulk of NAIVS vouchers from 2008/09 through 2010/11. These regions are located in three agro-ecological zones: the southern highlands, northern highlands and west (Kigoma). In each village where household surveys were implemented, REPOA also interviewed two or more agro-dealers that serviced that village, including both agro-dealers who were participants and non-participants in the NAIVS program. REPOA interviewed n=88 agro-

dealers in 2011 and n=144 in 2012; the number of agro-dealers is less than the number of villages given that some agro-dealers serviced more than one village. For each village, REPOA also interviewed a village leader.

3.2 Primary data

Between March to October 2014, SUA/MSU faculty re-visited four districts from the World Bank/REPOA survey effort in 2012, including Njombe district (Njombe region), Mbeya District Council (Mbeya region), Ulanga district (Morogoro region), and Arumeru district (Arusha region). These districts were purposively selected from among the REPOA 2012 sample using the following criteria: (i) zones important for maize and/or rice production; (ii) to provide variation in agro-ecological potential as well as market access. Njombe and Mbeya represent the high potential maize production zones of the southern highlands (and some rice), though many parts of this zone have poor road infrastructure and thus poor access to input and output markets, especially during the main rains. Morogoro region is in the Eastern zone and is known for rice production, and Ulanga in particular has quite poor input and output market access. The Arusha region is known for both maize/rice production but has enjoyed much better access to fertilizer and improved seeds (and maize/rice output markets) prior to NAIVS relative to other regions of the country. For political and historical reasons, the northern highland regions have long enjoyed better road infrastructure and other public goods infrastructure (water systems, schools, clinics), and their agricultural input and output markets are much more developed due to high demand from neighboring Kenya (and export markets) for horticultural crops as well as maize and rice.

In each district, we went to as many of the villages that were sampled by REPOA in 2012 as possible given budget and time constraints.[4] In the event we did not have time to re-visit all the villages within a given district that were interviewed for the 2012 World Bank/REPOA survey, we purposively sampled villages to ensure our sample included villages with both good and poor market access. In each village, we also re-interviewed as many agro-dealers (previously interviewed by REPOA in 2012) as possible. In addition, our sample included some agro-dealers who were new since 2012 and others who REPOA had not interviewed. In each village, we also interviewed the extension worker assigned to that village and a village leader. In each district, we also interviewed the district agricultural, irrigation and cooperative officer (DAICO), and the main hub agro-dealers (distributors/wholesalers) that serviced the agro-dealers in the World Bank/REPOA sample villages. Finally, we interviewed four of the largest fertilizer importers in Dar es Salaam as well as the four largest companies in Tanzania (based in Arusha) that either import maize and/or rice seed and/or multiply some themselves from foundation seed.

3.3 Methods

In order to address the research questions posed in the introduction above, we use a combination of quantitative analysis of the existing World Bank/REPOA agro-dealer survey data and household survey data from the most recent Agricultural Census and the three waves of the NPS. We combine this quantitative analysis with qualitative findings from our key informant interviews of agro-dealers, extension agents, village leaders, fertilizer wholesalers/distributers, and district agricultural officials in four different districts (from four regions), as well as interviews with many of the largest fertilizer (seed) importers.

[4] Njombe (4 of 6), Mbeya DC (4 of 7), Ulanga (3 of 17), and Arumeru (16 of 41).

4. OVERVIEW OF NAIVS GOALS

NAIVS had three main goals, with the first to improve smallholders' physical access to fertilizer and improved seed. This was achieved by a joint public-private sector effort to both improve smallholders' effective demand for inorganic fertilizer and improved seed use in maize (rice) production while ensuring that the private sector was prepared and organized so as to deliver sufficient fertilizer and seed (intended for redemption by voucher recipients) to specific districts selected many months before planting.[5]

The second goal of NAIVS was two-fold. First, to reduce the credit constraint for smallholders (and the risk of experimentation with this new technology), by reducing the price of two bags of fertilizer by 50% (and one bag of seed by 100%). Second, by providing the private sector fertilizer and seed supply chain actors with a predictable level of increased effective smallholder demand for fertilizer and seed, this reduced the risk faced by the supply chain to service areas which previously had little to no demand for use of fertilizer and/or improved seed in maize/rice production.

The third goal of NAIVS is related to the first two, in that by improving 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. For example, NAIVS vouchers enabled smallholder voucher recipients to experiment fertilizer/improved seed use on maize/rice on their own fields so as to learn for themselves the extent to which the value of the yield gains from use of these inputs outweighs their additional costs. The guarantee of a large increase in effective demand for specific fertilizers and seeds was designed to enable private sector importers, wholesalers, and agro-dealers to assess over time where demand for commercially-priced inputs would exist in the absence of subsidies and also make investments in physical infrastructure, human capacity and exchange relationships with other supply chain actors, that would likely pay off over the medium to long term. Finally, repeated transactions with different actors within the supply chain should enable the economically viable (and professional) actors to sort out which actors above or below them on the supply chain with which to work, and lower their actual business costs by improving trust between such actors with repeated transactions over time.

5. RESULTS

5.1 Evidence of change in factors contributing to low smallholder input use

5.1.1 Farmer physical access to inorganic fertilizer and improved seed for maize

Smallholder farmers cannot even consider whether or not the net returns to an improved technology like fertilizer or improved seed are greater than the additional input costs if the nearest fertilizer or seed retailer is far from their village. Unfortunately, there is no survey data available prior to 2010/11 that measures distance from the village to the nearest retailer of maize seed, thus we cannot assess the extent to which physical access to fertilizer retailers

[5] The private sector role in NAIVS was to import, wholesale, and retail fertilizer and seed to areas designated by MAFC (several months prior to the season) that would receive input subsidy vouchers. The government had three main roles in the program: (i) distribute vouchers using criteria noted above; (ii) coordinate with private sector to ensure each supply chain knew well in advance the quantity of different types of subsidized fertilizer/seed would be required for a district; (iii) repay importers for 50% of the value of subsidized fertilizer/seed that was redeemed that season.

was a problem prior to NAIVS. However, NAIVS specifically targeted districts and villages within districts with moderate to high agro-ecological potential for maize (rice) production but which were known to have no or limited physical access to inorganic fertilizer and improved maize (rice) seed (World Bank, 2014).

5.1.2 Farmer awareness of and experience with fertilizer and improved seed for maize

Before investigating whether use of improved inputs in smallholder maize production has changed since NAIVS began, we first note that there has not been much change before and after NAIVS in the percentage of smallholders growing maize: 67% of smallholders grew the crop in 2007/08 compared with 70% in 2012/13, and stayed close to 90% across this time period in the southern highlands, the main surplus zone (Mather et al, 2015).

Prior to NAIVS, it was clear that smallholder maize/rice productivity (yields) were quite low relative to potential yield levels, and that this was likely due to several constraints. For example, median maize yields from the 2007/08 Ag Census were 800-900 kg/ha, depending on the region, while trials in higher potential zonal research stations achieve 2,000kg/ha or so (Mather et al, 2015). In this section, we investigate the extent to which NAIVS provided smallholders who had previously not used inorganic fertilizer with the experience of applying it on maize on their own plots, by reducing one or more constraints to fertilizer access and use on maize.

The 2007/08 Agricultural Census provides a reasonable 'snapshot' of use of inorganic fertilizer and improved seed in smallholder maize and paddy production in the year prior to NAIVS[6]. This survey shows that although nearly all of Tanzania's maize production (and much of its paddy production) is produced by smallholders, few of them (12.9%) were using inorganic fertilizer or improved seed (18.4%) in maize production in the main season prior to the beginning of NAIVS (Table 1). Although the southern highlands is a high potential zone that produces much of the country's maize, only 17% of maize growers there used improved maize seed in 2007/08. It is clear that fertilizer use on maize increased considerably in the regions that produce the most surplus maize, the southern highlands and northern zones. For example, comparing 2007/08 (the year before NAIVS started) with the peak year of NAIVS (2011/12), the percentage of households that applied fertilizer to maize increased from 21% (13%) in 2007/08 to 46% (13 to 21%) in the southern (northern) highlands (Table 1). This is not a surprising finding as those zones received the majority of NAIVS vouchers targeted to maize. The western zone was also targeted with vouchers for maize, and we see a large increase in the percentage of households there using fertilizer on maize as NAIVS scaled up (Table 1).

While one might expect percentages of smallholders applying fertilizer to maize or rice to increase dramatically when a large-scale fertilizer subsidy scheme is implemented, in practice, this only happens if the scheme manages to reach farmers who were not already using fertilizer on maize. That is, if the vouchers do not displace or 'crowd out' existing smallholder demand (use of) for commercial fertilizer. For example, in the case of Kenya's two fertilizer subsidy programs in 2009/10, although approximately 8% of smallholders received subsidized fertilizer, this did not result in an increase in a significant overall increase in the percentage of smallholders using fertilizer on maize (commercial or subsidized) even

[6] While it is true that international prices of DAP and Urea nearly doubled in the 4 months prior to the main planting seasons for maize in the southern highlands and eastern zones in 2007/08 (the season captured by the 2007/08 Agricultural Census), the same percentage of maize producers (13%) used fertilizer on maize in the 2002/03 Ag Census as compared with the 12.9% who did in 2007/08.

in areas where use rates were lower prior to the subsidy schemes (Mather and Jayne, 2015). The problem those programs faced is that 85-95% of voucher recipients (depending on the region) had purchased commercial fertilizer for maize prior to the subsidy program. Thus, subsidized fertilizer simply displaced a considerable amount of commercial sales that would have occurred anyway (on average). By contrast, Tanzania's NAAIAP is the only large-scale fertilizer subsidy scheme of the 2008-2014 period that managed to avoid crowding out at a national level (Mather, 2016). The reason for this success is because NAIVS managed to not only design truly 'smart' regional and household targeting criteria but also carry it out in practice.

By contrast, the results for use of improved maize seed over time are difficult to explain. For example, in the southern highlands, the percentage of households using improved maize seed fell dramatically from 17% in 2007/08 (just before NAIVS) to 9% in 2008/09 (first year of NAIVS, then climbed steadily back to 17% by 2013. However, there was a dramatic increase in the percentage of households using improved maize varieties in the north (lake) zone between 2010/11 (34%; 19%) and 2012/13 (60%; 30%) (Table 1). Apart from increases in those zones, NAIVS does not appear to have facilitated a dramatic increase in use of improved maize varieties to correspond with the large increase in fertilizer use on maize. This may be due to inadequate use of demonstration trials by extension agents and/or seed companies, as seed companies interviewed by the authors noted that many smallholder farmers believed that the benefits of higher yields from fertilizer did not require use of improved OPV or hybrid maize varieties.[7] Although the hybrid maize varieties were likely developed to be used in combination with inorganic fertilizer, only 4% of maize growers used both fertilizer and an improved maize variety in 2007/08, and this percentage only increased to 7% by 2012/13 (Table 1).

It is not possible to assess with NPS data the extent to which vouchers were received by households who had previously not used these inputs prior to NAIVS (as the program targeting criteria intended). However, the World Bank/REPOA survey shows that in 2009/10, 75% of households that had received a voucher in 2008/09 or 2009/10 and who were growing maize in the 2009/10 main season had not used improved seed in the 5 years prior to the beginning of NAIVS (Table 2).[8] Likewise, 60.7% of maize growers who received a voucher the first two years of NAIVS had not used improved seed in the 5 years prior to the beginning of NAIVS. This evidence strongly suggests that the NAIVS household-level targeting criteria intended to target household that had no recent fertilizer or improved seed use were largely implemented in practice (especially in the main maize growing regions of the southern highlands).

Another goal of NAIVS was not simply to introduce smallholders to use of improved inputs who had previously not used them in maize/rice production, but also to provide a period of increased effective demand during which fertilizer supply chain actors could make investments in physical infrastructure and supply chain coordination arrangements so as to increase the physical access of commercial fertilizer to many more villages and more smallholders – not simply voucher recipients. Ideally, we would measure changes in smallholder physical access to fertilizer and/or improved maize seed using the average distance from a village (in a representative sample) to the nearest retailer of fertilizer and/or

[7] Personal communication between Dr. Betty Waized and Dr. Daniel Ndyetabula and seed company representatives in Arusha, 2014.

[8] The survey questions that asked for recall information on household use of improved seed and/or inorganic fertilizer did specifically ask what crops those inputs were used on.

improved seed prior to and after NAIVS. As this data was not collected in the 2007/08 census, we instead find that the percentage of villages and wards in which one or more households purchased *commercially-priced* fertilizer for use on maize increased quite dramatically in the southern highlands and western zones between 2008 and 2009, and somewhat in the central zone (Table 3).

5.1.2 Farmer awareness of and experience with fertilizer and improved seed for paddy production: Before investigating whether use of improved inputs in smallholder paddy production has changed since NAIVS began, we first note that there has not been much change before and after NAIVS in the percentage of smallholders growing paddy: 18.5% of smallholders grew the crop in 2007/08 compared with 16.5% in 2012/13 (Mather et al, 2015). Prior to NAIVS, only 7.7% of smallholder maize growers applied inorganic fertilizer to paddy in 2007/08, including only 5.6% and 7.6% in two of the primary rice production zones, the southern highlands and eastern zones, respectively (Table 4). NAIVS appears to have had a large positive effect on smallholder paddy growers' access to fertilizer in the southern highlands (Table 4), enough to double the national average percentage of paddy growers using fertilizer from 7.7% to 14.4%. Only 5.4% of paddy growers used an improved variety prior to NAIVS (2008), yet although NAIVS distributed paddy seed free to rice-growing voucher recipients, NAIVS appears to have barely improved use of and/or access to improved rice varieties, and that was only achieved in 2012/13 (Table 4). More investigation is needed to better understand why improved variety use has remained so low even after NAIVS.

As in the case of maize, the NPS did not ask farmers who received a voucher if they had purchased commercial fertilizer prior to NAIVS. However, the NAIVS goal of targeting paddy farmers who had not used improved inputs previously appears to have been met almost entirely, as 87% (90%) of voucher recipients in the World Bank/NAIVS household survey had not used inorganic fertilizer (improved seed) in paddy production in the 5 years prior to NAIVS (Table 5).

5.2 Case study evidence of physical infrastructure investments made by fertilizer supply chain actors

5.2.1 Njombe district (Njombe region)

Investment in storage infrastructure was among the major observable effects of NAIVS on the private sector fertilizer supply chain in Njombe district. For example, several agro-input distributors (also called hub agro-dealers) operating in this region reported that due to increased effective fertilizer demand from NAIVS, they had been able to access enough credit to enable them to build large modern warehouses to serve as storage and distribution centres for inputs, thereby reducing problems at the village level of late arrival of inputs. Thus, hub agro-dealers in Njombe built three large modern warehouses between 2008 and 2013, and several fertilizer importers had also built large new warehouses recently in the same region. The Agro-Dealers (AD) that buy inputs from these hub agro-dealers to distribute/sell to farmers in villages have also increased in both numbers and the types of investments made in their physical infrastructure – moving from temporal investments (i.e. renting space in shops) to permanent investments (i.e. buying space for a shop) in or near the wards and villages where they distribute inputs.

5.2.2 Mbeya rural district (Mbeya region)

Prior to NAIVS, private sector importers such as Yara International had already started major investments in their input distribution networks in this region in terms of warehouses,

distribution centres and building relationships with hub agro-dealers. They made these investments based on the high potential for maize production and existing input demand from other crops (coffee, Irish potatoes and vegetables) that require the use of fertilizers, improved seeds and other agro inputs. Yet, similar to what we observed in Njombe, Yara and other importers and distributors reported that they increased their investments in warehouse and distribution centre construction due to the increased demand from NAIVS.

5.2.3 Ulanga district (Morogoro region)

Although Ulanga district has high potential for rice production, it has very poor access to input and output markets due to inadequate road infrastructure. For example, to get to Ulanga, one must use an old ferry that has been operating for years under very poor maintenance, such that ferry breakdown for days to weeks is common. The result is that transport of inputs and outputs into and out of this district is quite expensive. Prior to NAIVS, there were only two agro-dealers operating in the entire district. Even during the first few years of NAIVS, most of the inputs delivery to this district was done by agro-dealers from other districts that only visited the district but had no permanent shops. However, as of 2014, there were 40 agro-dealers selling fertilizer and/or improved seed, primarily for use on rice and/or sugar cane, and some of these have permanent shops. These consist of both existing shops (that sell a wide range of consumer goods) deciding to stock and sell agro-inputs as well as new shops opening with agro-inputs as their core business. Unfortunately, as of 2014, there were still no large warehouses for storage and distribution of agro inputs, thus inputs still have to be delivered by ferry from neighboring Kilombero district. However, investment in permanent shops by at least some agro-dealers in this district suggests that NAIVS provided a sufficient learning experiment for farmers in this district to create effective demand for such inputs at commercial rates.

5.2.4 Arumeru district (Arusha region)

Compared to the other districts which we visited, the agro-input supply chain in Arumeru was considerably more developed prior to NAIVS for a number of reasons, including: much better road infrastructure relative to every other region of the country, and the use of fertilizer, seed and various agro-chemicals in the production of cash and horticultural crops for export to Nairobi and/or Europe. Nevertheless, during the NAIVS period, there were increases in the number of agro-dealers and investments in distribution infrastructure. For example, since the beginning of NAIVS, the number of agro-dealers operating in the district increased from 15 to 74, with 51 of them having permanent shops. In addition, a number of large warehouses have been built recently by agro-dealers and/or importers.

5.3 Larger sample evidence of improved smallholder physical access to agro-dealers

5.3.1 Physical infrastructure investments made by agro-dealers

The case study evidence above from key informant interviews in 2014 with hub agro-dealers and agro-dealers covered only four of the eleven districts visited by the World Bank study team. However, our finding from those four districts of increased numbers of agro-dealers and increases in the number of agro-dealers investing in temporary or permanent shops in villages targeted by NAIVS is also seen in the larger World Bank/REPOA dataset of agro-dealers from 11 districts (that covers nine regions and four main agro-ecological zones). For example, there is an increase in the percentage of agro-dealers that had a permanent shop in all zones but Kigoma, and the overall percentage increases from 22 to 26% between 2009/10 and 2010/11 (Table 6). There was also a dramatic increase in the percentage of agro-dealers in the sampled villages who had a temporary (seasonal) shop in the village in each of the zones, with the aggregate sample percentage increasing from 9.7 to 23.6% (Table 6). Finally,

there is also an increase in the northern highlands and Morogoro in the percentage of agro-dealers who at least delivered inputs directly to the village via trucks (Table 6).

Because the agro-dealers participating in NAIVS sold fertilizer and seed at both subsidized and commercial rates, this evidence of a significant increase in agro-dealers' physical presence in a village during the planting period (whether with a permanent or temporary shop, or even with simply a visit to the village by truck) is consistent with two of our earlier findings. First, this is consistent with an increase in the percentage of households applying inorganic fertilizer to both maize (Table 1) and to paddy (Table 4) – whether the fertilizer was subsidized or not. Second, this is also consistent with our finding that the percentages of villages in which one or more households purchased fertilizer at the market rate for use on maize increased dramatically before and after NAIVS (Table 3).

In addition, we see that among those agro-dealers who report about the use of a permanent shop in the village, the percentage that owned agro-input shops increased from 67% in 2009/10 to 86% in 2010/11 in the southern highlands (a region that we noted above has high potential for maize production yet historically limited physical access to agricultural inputs for smallholders). This suggests that, although the increased presence of agro-dealers' shops (permanent, temporary) and/or visits in villages targeted by NAIVS noted here is observed in years during which NAIVS provided vouchers to over a million rural households per year, the investments made in permanent shop ownership (at least in the southern highlands) suggests that smallholder access to fertilizer and improved seed for use in maize/rice production may well continue in areas with permanent (or even temporary) shops after subsidies have ended.

5.3.2 Number of agro-dealers and their business experience

As noted above, our case study finding of increased numbers of agro-dealers over time (from four districts) is also seen in a larger number of agro-dealers that REPOA found in sampled villages in 2009/10 (n=81) and 2010/11 (n=144) (Table 7). This raises several questions regarding the characteristics of new entrants into the agro-dealer business. First, during our field research in four districts, we heard anecdotal evidence that some agro-dealers that participated in NAIVS were not 'real business people' with experience in agriculture' who were merely taking advantage of the new business opportunity provided by the NAIVS program. However, as NAIVS progressed over time, two things are clear from the REPOA data from 11 districts: first, as the number of agro-dealers grew from 2009/10 to 2010/11, the average number of years of business experience of agro-dealers in the REPOA sample increased from 9 to 12.7 years between 2009/10 and 2010/11 (Table 7). The average increase was actually much higher in all zones except the northern highlands, the zone where the agro-dealer distribution system was already relatively well established prior to NAIVS). The second thing we observe is that the new entrants in 2010/11 did not bring down the average number of years of experience in selling agricultural inputs (Table 7).

5.3.3 Institutional development of exchange relationships

Another benefit of a sustained period of 'semi-guaranteed market demand' for supply chain actors during NAIVS was the ability to engage in repeated transactions with various supply chain actors, and this enabled actors to: (i) learn from experience which actors were trustworthy, professional, etc; and (ii) to establish rules of the game regarding exchange/transactions between actors. The result of repeated transactions appears to have significantly reduced the transaction costs of uncertainty of repayment that those who

obtained inputs on loan face when dealing with other businesses that they may not know much if anything about. These transaction costs include real financial costs such as risk of non-repayment, monitoring and inspection costs, etc. For example, the development of trust in exchange relationships from the importer to distributor to agro-dealer levels of the fertilizer supply chains is especially important given that both agro-dealers and hub agro-dealers face considerable credit constraints. By contrast, the larger importers are able to access loans sufficient to import fertilizer and/or seed. Yet given the credit constraints faced by hub-agrodealers and agro-dealers, importers are not able to sell fertilizer or seed to them without providing them with some form of trade credit. For example, importers may send a certain quantity of inputs to a hub-agrodealers, and the hub-agrodealers will be given two weeks to re-pay the value of the inputs they received at no interest. Subsequently, hub-agrodealers often provide a similar arrangement with agro-dealers.

The agro-dealer survey data from 2009/10 and 2010/11 suggest that repeated transactions between hub-agrodealers and agro-dealers did in fact reduce transaction costs between these two types of actors and increase trust between them, as we find that the percentage of inputs that agro-dealers received from hub-agrodealers increased from an average of 15.6% in 2009/10 to 44.8% in 2010/11 (Table 7). This is a remarkable development given that we noted above that there were new entrants in 2010/11 (as NAIVS scaled up to its largest level) and also that this three-fold increase in the percentage inputs provided on credit is observed in all four zones/regions covered by the World Bank/REPOA survey. In our 2014 re-interview of agrodealers in 4 districts of that survey, we found that the percentage of inputs that agro-dealers obtained on credit continued to increase in at least two of them. For example, in Mbeya District (Ulanga) the average percentage of inputs on credit across agro-dealers interviewed was 54% (35%) in 2010/11 and this increased to 81% (75%) in 2013/14.

6. CONCLUSIONS

While there are likely to be a range of factors, which contribute to low maize and rice, yields in Tanzania, an obvious constraint is the fact that as of the Agricultural Census of 2007/08, few smallholders outside of the Southern Highlands region used inorganic fertilizer on maize or improved maize seed. In this paper, we use a combination of secondary and primary data sources to address if and how NAIVS has affected the demand and supply sides of the private sector fertilizer supply chain.

Demand side: To what extent has NAIVS improved smallholders' physical access to inorganic fertilizer and improved seed for use in maize (rice) production?

Evidence from representative survey data clearly indicates the following improvements in smallholder access to use of fertilizer and improved seed in maize production. For example, there was a significant increase in the percentage of households applying fertilizer to maize (rice) as NAIVS was initiated in 2008/09 (the first year of the NPS), as compared with the year prior to NAIVS (2007/08, covered by the last Agricultural Census). At the national level, the percentage of smallholders applying fertilizer to maize (paddy) increased from 12.9% (7.7%) in 2007/08 (the year before NAIVS) to 19% (14.4%). in 2008/09 and then to 23.2% in 2010/11. This increase was considerably larger in the primary maize-producing zone (southern highlands), as it doubled from 21% in 2007/08 to 39% in 2012/13.

It appears that NAIVS also helped improve smallholder access to commercially priced fertilizer for use on maize, as the percentage of villages in the southern highlands which one or more farmers purchased fertilizer at the market rate for use on maize increased from 37.9% in the year before NAIVS (2007/08) to 57.5% in 2012/13. We note, however, that there is a

clear increase in smallholder maize producer access to fertilizer noted here was observed in years during which NAIVS vouchers were distributed. Thus, an important empirical question for future research to address is the extent to which these gains in smallholder access to fertilizer for use on maize or rice are sustained in years with no subsidies.

Demand side: To what extent has NAIVS provided smallholders who had previously not used inorganic fertilizer with the experience of applying it on maize on their own plots? Most recipients of NAIVS vouchers (75%) had not previously used fertilizer (on any crop) prior to NAIVS, and this percentage was considerably higher in the southern highlands (86%). In addition, ,ost recipients of NAIVS vouchers (60.7%) had not used improved seed (for any crop) prior to NAIVS, and this percentage was quite high (89%) in the southern highlands. The implication of these findings is that the targeting criteria of NAIVS – to reach farmers who had not previously used inorganic fertilizer or improved seed in maize/rice production -- was implemented as intended in most cases. The efficiency implications of effective targeting are quite significant given that unlike in neighboring Malawi, Zambia and Kenya, where targeted fertilizer subsidies led to crowding-out of commercial fertilizer use (Jayne *et al.,* 2013)[9], in Tanzania, fertilizer subsidies avoided crowding-out at the national level and led to some crowding-in in the southern highlands (Mather, 2016).

Supply Side: To what extent have agro-dealers and distributors made investments in physical infrastructure during the NAIVS period? District-level case-study evidence finds that importers and wholesalers in four districts (from four key regions for maize or rice production) indicate that the increase in effective demand for fertilizer due to NAIVS led them to invest in construction of new warehouses, while agro-dealers increased in number. For example, in both Njombe district (Njombe region) and Mbeya DC district (Mbeya region), hub-agro-dealers built or increased investments in warehouses between 2008 and 2014. In Ulanga district (Morogoro region), prior to NAIVS, there were only two agro-dealers operating there, as most of the inputs delivered to this region came via truck delivery from hubs and agro-dealers with storage in other districts. However, as of 2014, there 40 agro-dealers in the district. Since the beginning of NAIVS, the number of agro-dealers operating in Arumeru district (Arusha region) increased from 15 to 74, with 51 of them having permanent shops.

Evidence from the World Bank/REPOA survey of agro-dealers in 200 villages across 11 districts (in 9 regions) finds that the percentage of agro-dealers who had a permanent shop in sampled villages increased from 2001 to 2012 in all zones except Kigoma; the overall average increase was from 22% to 26% of agro-dealers interviewed. Likewise, the percentage of agro-dealers who had a temporary shop in sampled villages increased from 9.7% to 23.6%.

Supply Side: To what extent have exchange relationships between members of the fertilizer supply chain improved during the NAIVS time period? Evidence from the same survey of agro-dealers across 11 regions finds that the percentage of inputs that agro-dealers received from hub-agrodealers increased from an average of 15.6% in 2009/10 to 44.8% in 2010/11. Likewise, the percentage of inputs received on credit by agro-dealers increased to even higher levels between 2010/11 and 2013/14 in two of the districts that we re-visited in 2013/14.

[9] It should be noted that crowding out estimates vary considerably both across and within countries, with the highest levels in Kenya and the lowest in Malawi (Jayne et al, 2013).

A key question for future research is to assess the extent to which gains in fertilizer/seed access achieved under NAIVS are sustained in villages/districts where subsidies have been removed, and what the results of that analysis imply for agricultural input policy, agricultural marketing and trade policy, and general public good provision. Another question is to assess what percentage of NAIVS recipients who had not used fertilizer previously in maize or rice production are now purchasing commercially-priced fertilizer and improved seed (now that subsidies have considerably diminished in the past two seasons and/or stopped in many areas previously targeted by NAIVS.

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 Economics 6(3): 94-104.

Chirwa, E., Dorward, A., 2013. Agricultural Input Subsidies: The Recent Malawi Experience. Oxford University Press.

Jayne, T. S., D. Mather, N. Mason, and J. Ricker-Gilbert. 2013. "How do fertilizer subsidy programs affect total fertilizer use in sub-Saharan Africa? Crowding out, diversion, and benefit/cost assessments." Agricultural Economics, 44 (6), 687–703.

Mather, D., B. Waized, D. Ndyetabula, A. Temu, I. Minde and D. Nyange. 2015. "Smallholder maize-nitrogen response rates, soil fertility, and profitability of inorganic fertilizer use on maize in Tanzania." Presentation at the International Conference of Agricultural Economists, 12 August 2015, Milan, Italy.

Mather, D. and T.S. Jayne. 2015. "Fertilizer subsidies and the role of targeting in crowding-out: An assessment of smallholder fertilizer demand in Kenya." Presentation at the International Conference of Agricultural Economists, 13 August 2015, Milan, Italy.

Mather, D. 2016. "Fertilizer subsidies and how targeting conditions crowding in/out:
An assessment of smallholder fertilizer demand in Tanzania." Unpublished manuscript.

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.

National Bureau of Statistics. 2009. National Panel Survey 2008/09. Government of the United Republic of Tanzania.

National Bureau of Statistics. 2011. National Panel Survey 2010/11. Government of the United Republic of Tanzania.

National Bureau of Statistics. 2013. National Panel Survey 2012/13. Government of the United Republic of Tanzania.

Pan, L. and L. Christiaensen. 2012. "Who is Vouching for the Input Voucher? Decentralized Targeting and Elite Capture in Tanzania." World Development 40(8): 1619–1633.

Poulton, C., J. Kydd, and A.Dorward. 2006. "Overcoming Market Constraints on Pro-Poor Agricultural Growth in Sub-Saharan Africa." Development Policy Review 24(3): 243-277.

Wanzala, M., P. Fuentes, S. Mkumbwa. 2013. Practices and Policy Options for the Improved Design and Implementation of Fertilizer Subsidy Programs in Sub-Saharan Africa. NEPAD Policy Study.

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

World Bank. 2014. Public Expenditure Review: National Agricultural Input Voucher Scheme (NAIVS).

World Bank. 2015. World Bank Commodities Price Data Base available at: www.worldbank.org/prospects/commodities

Table 1. Percentage of smallholder maize growers applying inorganic fertilizer to maize or using improved maize seed by year

	--- Among smallholder maize-growing households, main season ---							
	% HHs that applied inorganic fertilizer to maize				% HHs that used improved maize seed			
Zone	2007/08	2008/09	2010/11	2012/13	2007/08	2008/09	2010/11	2012/13
S.Highlands	21.1	34.9	46.1	39.4	17.0	8.9	12.5	17.0
Northern	13.1	19.4	21.2	22.4	36.5	37.3	34.1	60.6
Eastern	4.3	3.1	3.1	2.9	13.5	16.2	5.6	19.9
Central	1.2	5.9	5.4	10.4	12.1	12.9	5.5	15.1
Lake	1.1	1.5	1.1	1.1	21.1	18.4	15.4	30.6
Western	3.0	15.2	20.8	24.5	20.4	7.5	0.0	12.8
South	42.1	4.0	5.1	6.3	12.8	4.7	5.8	5.5
Total	12.9	15.6	20.1	19.0	18.4	15.1	11.9	24.9

Sources: Agricultural Census 2007/08; National Panel Survey 2008/09, 2010/11, 2012/13

Table 2. Percentage of NAIVS voucher recipients that grew maize in 2009/10 but had not obtained inorganic fertilizer or improved seed in 2008/09 or within the last five years

	Among voucher recipients growing maize in 2009/10:			
Zone /region	% HHs that **did not use** inorganic fertilizer (on any crop) during:		% HHs that **did not use** improved seed (on any crop) during:	
	2008/09	5 years prior	2008/09	5 years prior
S.Highlands	80.9	86.0	89.7	89.7
North	51.5	61.8	46.0	34.3
Morogoro	93.7	89.3	93.7	89.3
Kigoma	86.1	94.4	86.1	75.0
Total	69.6	75.5	68.5	60.7

Source: World Bank/REPOA household survey, 2009/11

Table 3. Percentage of villages and wards in which one or more households purchased commercial fertilizer for use on maize by year

	% villages with commercial fertilizer applied to maize (main season)				% wards with commercial fertilizer applied to maize (main season)			
Zone	2007/08	2008/09	2010/11	2012/13	2007/08	2008/09	2010/11	2012/13
S.Highlands	37.9	54.4	58.0	57.5	44.9	54.4	70.0	70.0
Northern	21.3	32.8	30.6	29.5	27.0	32.8	44.5	42.9
Eastern	14.0	11.3	4.6	5.4	20.4	11.3	19.1	19.7
Central	7.0	9.9	10.3	10.6	9.2	9.9	14.7	14.7
Lake	2.5	3.2	3.9	3.9	3.4	3.2	12.4	12.5
Western	15.6	24.1	28.8	28.4	18.9	24.1	39.8	40.5
South	84.6	11.2	20.9	19.5	90.2	11.2	34.4	31.9
Total	21.4	22.4	23.4	24.0	25.6	22.4	34.2	35.1

Sources: Agricultural Census 2007/08; National Panel Survey 2008/09, 2010/11, 2012/13

Table 4. Percentage of smallholder rice growers applying inorganic fertilizer to rice or using improved rice seed by year

	Among smallholder paddy-growing households, main season							
	% HH that applied inorganic fertilizer to paddy				% HHs that used improved paddy seed			
Zone	2007/08	2008/09	2010/11	2012/13	2007/08	2008/09	2010/11	2012/13
S.Highlands	5.6	19.8	27.9	27.7	4.2	0.0	2.4	5.5
North	22.9	100.0	48.6	71.4	42.3	0.0	12.1	57.7
Eastern	7.6	3.3	6.6	9.3	6.0	5.8	2.6	0.0
Central	0.0	0.0	0.0	0.0	3.1	0.0	9.0	0.0
Lake	11.4	0.0	1.8	0.0	5.3	0.0	0.0	7.0
Western	0.4	0.0	6.6	8.8	3.5	0.0	0.0	0.0
South	25.9	6.9	6.5	11.6	2.6	2.0	0.0	0.0
Total	7.7	9.6	11.0	14.4	5.4	1.8	2.2	6.1

Sources: Agricultural Census 2007/08; National Panel Survey 2008/09, 2010/11, 2012/13

Table 5. Percentage of NAIVS voucher recipients that grew paddy in 2009/10 but had not obtained inorganic fertilizer or improved seed in 2008/09 or within the last five years

	Among voucher recipients growing paddy in 2009/10:			
	% HHs that **did not use** inorganic fertilizer (on any crop) during:		% HHs that **did not use** improved seed (on any crop) during:	
Zone / region	2008/09	5 years prior	2008/09	5 years prior
S.Highlands	87.0	89.1	87.0	89.1
Northern	65.7	51.4	65.7	51.4
Morogoro	96.9	94.4	96.9	94.4
Kigoma	0.0	100.0	0.0	100.0
Total	90.1	87.2	90.1	87.2

Source: World Bank/REPOA household survey, 2009/11

Table 6. Percentage of agro-dealers with different types of shops servicing villages targeted by NAIVS, 2009/10 & 2010/11

	---- % of Agrodealers with shop type by year ----						Among AD's with permanent shop, % shops owned (not rented)	
Zone	% with permanent shop in village		% with temporary shop in village		% with no shop (deliver by truck)			
	2009/10	2010/11	2009/10	2010/11	2009/10	2010/11	2009/10	2010/11
S.Highlands	13.6	15.9	18.2	38.6	11.4	11.4	66.7	85.7
N.Highlands	33.9	37.5	7.1	8.9	14.3	32.1	26.3	28.6
Morogoro	7.7	26.9	3.8	7.7	11.5	30.8	50.0	28.6
Kigoma	27.8	16.7	5.6	55.6	5.6	0.0	20.0	0.0
Total	22.2	26.4	9.7	23.6	11.8	21.5	34.4	36.8

Source: World Bank/REPOA agro-dealer surveys of 2011 and 2012.

Table 7. Business experience and other characteristics of agro-dealers, 2009/10 and 2010/11

Zone / region	# of agro-dealers sampled		# years of business experience		# of years with shop selling ag inputs		% of inputs (value) received from hub on credit	
	2009/10	2010/11	2009/10	2010/11	2009/10	2010/11	2009/10	2010/11
S.Highlands	19	44	10.4	15.0	7.2	10.1	15.0	47.8
Northern	38	56	10.1	10.6	5.7	7.7	18.9	46.0
Morogoro	10	26	3.9	12.7	14.4	5.3	15.5	35.2
Kigoma	14	18	8.6	15.8	10.6	7.7	4.3	51.7
Total	81	144	9.1	12.7	7.8	7.7	15.6	44.8

Source: World Bank/REPOA agrodealer surveys of 2011 and 2012.