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Policy Brief

The effects of Kenya's 'smarter' input subsidy program on crop production, incomes, and poverty

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SUMMARY

Kenya joined the ranks of sub-Saharan African (SSA) countries implementing a targeted input subsidy program for inorganic fertilizer and improved seed in 2007 with the establishment of the National Accelerated Agricultural Inputs Access Program's "Kilimo Plus" initiative. Implemented from 2007/08, Kilimo Plus aimed to provide 50 kg each of basal and top dressing fertiliser, and 10 kg of improved maize seed to resource poor smallholder farmers with the goals of increasing access to inputs, raising yields and incomes, improving food security, and reducing poverty. But did the program achieve its goals, and what are the lessons learned from Kilimo Plus and other targeted input subsidy programs (ISPs) in SSA for the design and implementation of future county-level input policies and programs in Kenya? Results suggest that, despite replacing what would have been commercial fertilizer purchases by farmers, Kilimo Plus did substantially increase maize production and reduce poverty depth and severity of recipient households. Moreover, the program's positive effects are somewhat larger than those of targeted ISPs in Malawi and Zambia. Much of Kilimo Plus's relative success vis-à-vis the Malawi and Zambia programs is likely due to its effective targeting of relatively resource-poor farmers and its implementation through vouchers redeemable at private agro-dealer shops. Kenyan counties considering implementing ISPs should bear in mind these findings, but also carefully weigh the cost effectiveness of ISPs relative to other much-needed investments, including rural roads and agricultural research, development, and extension. Indeed, since Kilimo Plus alone is not sufficient to bring households out of poverty, a more holistic approach to improving production and sustainable intensification is required. This may imply use of vouchers for other crops and inputs, particularly those which enhance soil health such as lime, as well as an increase in complementary public/private investments in research, extension, irrigation, transport infrastructure, information, and affordable and appropriate innovations.

BACKGROUND

Often cited as a prime example of successful private sector-led fertilizer market development in sub-Saharan Africa (SSA) (Ariga and Jayne, 2009), Kenya joined the ranks of SSA countries implementing an input subsidy program (ISP) for improved seed and inorganic fertilizer in 2007. While other ISPs in the region (e.g., Malawi, Zambia, and Nigeria) have been studied in detail, relatively little is known about the effects of Kenya's targeted ISP, the National Accelerated Agricultural Inputs Access Program's "Kilimo Plus" initiative. Running from 2007/08 and sometimes touted as a 'smart subsidy' program (Morris et al., 2007), Kilimo Plus was somewhat 'smarter' than other ISPs in the region because it:

- Targeted (in practice) resource-poor farmers, and
- Was implemented through vouchers redeemable at private agro-dealers.

However, Kilimo Plus was less 'smart' than these other programs because private sector fertilizer markets in Kenya were already well developed, and Kenyan smallholder farmers were using relatively more fertilizer than farmers in the other countries, prior to the implementation of Kilimo Plus (Ariga and Jayne, 2009; Sheahan et al., 2013; Sheahan et al., 2014). Although previous studies have analyzed the targeting of Kilimo Plus (Sheahan et al., 2014) and the extent to which it raises farmers' total fertilizer use (Mather and Jayne, 2015), to our knowledge, this study is the first to rigorously measure the effects of the program on smallholder crop yields, incomes, and poverty. Given Kilimo Plus's stated objectives of raising crop yields and incomes and reducing poverty, it is important to know if the program achieved these goals. Moreover, under the devolved system of governance, county governments have embarked on input subsidy programs. It is, therefore, important that county governments understand how the design and implementation of Kilimo Plus and other ISPs in the region affect their performance, and so draw lessons for the programs they have initiated.

KEY FEATURES OF KILIMO PLUS

Based on the official criteria, Kilimo Plus was to be targeted at households that:

- Were unable to afford farm inputs at unsubsidized prices;
- Grew maize and had at least 2.5 acres of land;
- Were 'vulnerable' members of society (e.g., female- and child-headed households); and
- Had not received government support in the past (MOA, 2007).

Smallholder households selected to participate in Kilimo Plus were to receive a voucher good for 100 kg of inorganic fertilizer (50 kg of basal and 50 kg of top dressing) and 10 kg of improved maize seed, all for free. The vouchers could be redeemed at accredited agro-dealer shops. This was to be a one-time grant (i.e., beneficiaries would receive the free inputs for just one season). In 2009/10, which is captured in the panel survey data used in this study, approximately 5% of Kenyan smallholder households participated in Kilimo Plus (MOA, 2013). Table 1 summarizes the number of households and districts targeted and the value of a Kilimo Plus voucher each year from 2007/08 through 2011/12, the most recent year of data available.

Table 1: Kilimo Plus number of beneficiaries, number of districts covered, and value of vouchers, 2007/08-2011/12

Year	HHs targeted	Districts targeted	Voucher value (nominal Ksh)
2007/08	36,000	40	6,500
2008/09	92,876	70	7,300
2009/10	175,973	131	5,687
2010/11	125,883	95	6,500
2011/12	63,737	63	8,000

Source: MOA (2013)

DATA AND METHODOLOGY

To estimate the effects of a household's participation in Kilimo Plus on its crop production, incomes, and poverty, we draw on data from the Tegemeo Agricultural Policy Research and Analysis (TAPRA) Rural Household Survey, a 5-wave, nationwide survey conducted by the Tegemeo Institute of Agricultural Policy and Development in conjunction with Michigan State University. In the analysis, we use the last three waves of the data (collected in 2004, 2007, and 2010). These cover two agricultural years prior to the establishment of Kilimo Plus (2003/04 and 2006/07), and one year during the Kilimo Plus period (2009/10). The analytical sample consists of 1,064 households that were interviewed in each of these three survey waves. The data include detailed information on the crop and livestock production and sales of the households, as well as their demographic characteristics, asset holdings, and off-farm income generating activities. The survey data were used to construct Foster-Greer-Thorbecke (1984) poverty indices for each household based on the US$1.25 per capita per day international poverty line: (i) a household was considered poor if its income fell below this poverty line (i.e., poverty incidence =1 for poor households and = 0 for non-poor households); (ii) the household's poverty gap = 0 for non-poor households and is the proportion distance from the poverty line for poor households; and (iii) the household's poverty severity is its squared poverty gap.

Several different statistical methods were used to estimate the effects of Kilimo Plus participation on the outcomes of interest. These include simple difference-in-differences (DID), fixed effects estimation, propensity score weighting-DID, and propensity score matching-DID. The methods correct, in different ways and under different assumptions, for the fact that households are not randomly selected to participate in Kilimo Plus. Details are discussed in the full working paper associated with this policy brief, but the results are generally similar across the different statistical methods. For simplicity and to facilitate comparison with studies from other countries, this policy brief focuses on the fixed effects estimation results.

FINDINGS AND POLICY IMPLICATIONS

Although previous findings suggest that the majority of Kilimo Plus recipients were using commercial fertilizer prior to the program (Sheahan et al., 2014) and that an additional 100 kg of Kilimo Plus fertilizer only raised fertilizer use in Kenya by approximately 49 kg (because the other 51 kg simply replaced what would have been commercial fertilizer purchases without the program), the findings of this study suggest that Kilimo Plus significantly raised maize production in Kenya. On average, participation in Kilimo Plus increased beneficiary households' maize production by approximately 361 kg in the main season, primarily by increasing their maize yields (by about 556 kg/acre) (Table 2). Kilimo Plus also increased the maize share of farmers' total value of crop production (by about 4 percentage points) but did not affect their total area cultivated. Moreover, while the program did not significantly affect net crop income, net total household income, or poverty incidence, it did substantially reduce the poverty gap and severity of poverty (by approximately 10 and 11 percentage points, respectively; see Table 2). These latter findings suggest that Kilimo Plus succeeded in raising the average incomes of the poor. This is consistent with Sheahan et al.'s (2014) finding that Kilimo Plus's criterion of targeting relatively resource-poor farmers (MOA, 2007) was successfully implemented on average.

The effects of Kilimo Plus on maize production and poverty are substantially larger than those of the ISPs in Zambia and Malawi, and this is likely due to the 'smarter subsidy' features of Kilimo Plus. Whereas a 100 kg increase in ISP fertilizer in Malawi and Zambia is associated with an approximately 200 kg increase in maize production (Mason and Tembo, 2015; Ricker-Gilbert and Jayne, 2011), in Kenya, a similar increase in Kilimo Plus fertilizer is associated with a 361 kg increase in maize production (Table 2). A likely reason for Kilimo Plus's larger impacts on maize production is its implementation through vouchers redeemable at accredited agro-dealers' shops, and resultant more timely access to the inputs relative to Malawi's and Zambia's programs (which distribute fertilizer through parallel government distribution systems that are plagued by late delivery). Moreover, Kilimo Plus reduced poverty severity by 11 percentage points compared to just 4 percentage points for Zambia's ISP.[2] Kilimo Plus's greater success at reducing poverty severity is likely due to its more effective targeting of resource-poor farmers. In contrast, Zambia's ISP fertilizer went disproportionately to households with more land and assets (Mason and Tembo, 2015).

[1] The effect of Kilimo Plus on households' acres planted to maize is not statistically different from zero for the other statistical methods, so this result is not emphasized here.

[2] Comparable results are not available for Malawi.

What are the implications of these findings for Kenya as it moves toward devolved, county-level ISPs? First, like the national-level Kilimo Plus, county-level ISPs should strive to target resource-poor farmers (to improve program impacts on poverty reduction) and those that cannot afford fertilizer at commercial prices (to reduce the quantity of commercial fertilizer purchases that are simply replaced by ISP fertilizer and thus to increase program impacts on total fertilizer use and maize production). Second, county-level ISPs should continue to use vouchers redeemable at private agro-dealer shops to encourage private sector participation, and improve timely availability of inputs and subsequent farm operations. Third, as our results suggest that the maize-focused Kilimo Plus may have led to more maize-centric production systems, county-level ISPs might consider allowing the vouchers to be used for crops other than maize and even for other crop inputs (e.g., herbicide, lime, etc.), farm equipment, and livestock or fisheries inputs to put farmers in the driver's seat and promote diversification. Ultimately, however, Kenyan counties should consider whether ISPs are the best use of scarce resources, or whether other types of programs or investments would provide higher returns to agricultural growth and poverty reduction. In particular, there is need to consider a more holistic approach to enhancing productivity and reducing incomes. This may entail increasing complementary public /private investments in research, extension, irrigation, transport infrastructure, information as well as affordable and appropriate innovations.

Table 2: Estimated effects of Kilimo Plus participation on household crop production, incomes & poverty

Outcome variable	Estimated effect of Kilimo Plus participation
Net total income (Ksh)	+32,809
Net total income per capita per day (Ksh)	+7
Poverty incidence (1=poor)	-0.06
Poverty gap	**-0.1**
Poverty severity	**-0.11**
Net crop income – both seasons (Ksh)	+16,443
Net crop income – main season (Ksh)	+9,022
Net crop income/acre – main season (Ksh)	+1,512
Maize kgs produced – both seasons	**+430**
Maize kgs produced – main season	**+361**
Maize share of total crop value – both seasons	**+0.04**
Number of different field crops grown	-0.08
Total acres cultivated – main season	-0.08
Acres cultivated with maize – main season	**+0.41**
Maize output/acre – main season (kg maize/acre with maize)	**+556**

Notes: Estimates in bold are statistically different from zero at the 10% level or lower. All Ksh values are in real 2010 terms. Figures reported are (household) fixed effects estimates.

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For the full details of this study, see the forthcoming Tegemeo Working Paper entitled, "The effects of Kenya's 'smarter' input subsidy program on smallholder behavior and incomes: Do different quasi-experimental approaches lead to the same conclusions?"

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