Feed the Future Innovation Lab for Food Security Policy

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# Can Input Subsidy Programs Promote Climate Smart Agriculture in Africa?

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## Background

Climate smart agriculture (CSA) has emerged as an approach to enhance the resilience of farming systems to the effects of climate change. CSA is defined by three principle objectives: 1) sustainably increasing agricultural productivity and incomes; 2) adapting and building resilience to climate change; and 3) reducing and/or removing greenhouse gases emissions, where possible. In Africa there is particular interest in identifying strategies to encourage farmers to adopt practices and technologies that enable their farms to be more resilient and productive, while at the same time identifying system-wide collective action to promote a wide range of *ex ante* risk management activities and *ex post* coping strategies.

Input subsidy programs (ISPs) provide a potentially useful means to encourage system-wide coordination and farmer behaviours that raise agricultural productivity and contribute to resilience objectives in Africa. Despite the opportunity costs associated with public spending on ISPs, there is clearly scope for market-smart ISPs to promote the development of input delivery systems that would improve smallholder farmers' access to technologies that could improve the stability of yields and overall resilience of African farming systems.

This brief summarizes findings from a recent study examining the feasibility of leveraging public investments in ISPs to promote adoption of CSA practices and technologies by African farmers. We examine how ISPs may promote resilience of farming systems in the face of climate shocks (*ex ante* risk management strategies), and how ISPs might be designed to mitigate the effects of climate shocks after they have occurred (*ex post* coping strategies). We focus on strategies that can be adopted by households at the farm level and those that can be implemented by governments at a system-wide level in recognition that collective action may often be required to effectively induce desired behavioral change.

## Input Subsidy Programs in Africa

The majority of ISPs in Africa focus on subsidizing improved seed and inorganic fertilizers for staple cereal production by smallholder farmers. A minority also provides subsidies for small grains and legumes. Most ISPs utilize closed voucher systems, where farmers redeem coupons for a prescribed input packet from government-run or designated outlets, or direct delivery systems wherein government or contractors deliver a prescribed input packet to farmers. These types of systems tend to limit farmers' choice of inputs, are rarely attentive to agro-ecological and livelihood variations across space, crowd out private sector participation, and are frequently characterized by elite capture of inputs.

Recently, however, countries have begun to take steps toward implementing more flexible, open voucher systems for ISPs in order to address some of these shortcomings. In Zambia for example, an electronic voucher system was piloted on a limited scale in 2015/16. This electronic system allows farmers to redeem vouchers for a wide range of inputs sold by registered private sector dealers.

How ISP inputs are distributed and the relative flexibility afforded to farmers in terms of input choice can influence their potential to be climate smart. On the one hand, systems that by-pass private market channels and provide identical input packets across a wide range of agro-ecological regions, such as those traditionally implemented in Zambia and Malawi, tend to undermine the development of private sector market channels, encourage maize mono-cropping and incentivize the production of crops in regions where they are poorly suited. These outcomes are clearly contrary to the goals of CSA. On the other hand, flexible voucher-based systems can lower the fiscal cost of ISPs borne by government and thereby create budget space for other important public investments in agriculture, encourage private investments in input supply systems and extension, and allow farmers to choose inputs that are appropriate for their farm systems. These outcomes are decidedly more climate smart than most prevailing ISPs.

## *Ex Ante* Household-Level Risk Management

Several practices have been identified as holding potential to enhance farm households' capacity to manage the effects of climate risks. While the evidence on the effectiveness of these strategies is thin in the context of African smallholder systems, prominent practices include zero or minimum tillage, intercropping and rotations, the use of manures and residue retention, and agro-forestry, *inter alia*.

We find that in most cases, ISPs have had either no effect on or have reduced SSA smallholders' use of CSA practices. For example, ISPs did not affect Ghanaian farmers' investment in soil and water conservation (Vondolia, Eggert, and Stage 2012), nor did they affect Malawian or Zambian smallholders' use of manure (Holden and Lunduka 2010, 2012; Levine 2015). And while Malawi's ISP had no statistically significant effect on intercropping, Zambia's ISP has reduced intercropping in general, but not intercropping involving legumes (Levine 2015). Moreover, Zambia's ISP has negatively affected crop rotation and fallowing (Mason, Jayne, and Mofya-Mukuka 2013; Levine 2015). The program has contributed to continuous cultivation of mono-cropped maize over time and within seasons in Zambia, all of which degrades soils, contributes to maize disease and pests, and leaves smallholders more vulnerable to climate shocks—the antithesis of CSA. Another feature of many ISPs that is decidedly *not* climate smart is perennial late delivery of subsidized fertilizer and seeds to beneficiary farmers. Late delivery diminishes these inputs' contribution to yields and biomass production while still contributing to greenhouse gas emissions associated with soil chemical interactions with nitrogen and with the production of synthetic fertilizers. Late delivery is particularly common when ISP inputs are disseminated through ISP distribution systems that largely sideline the private sector rather than working through agro-dealers and other existing input distribution networks.

These findings pertain largely to ISPs as they are currently implemented. Evidence suggests that with some modifications, ISPs could contribute to the adoption of CSA practices. For example, designing ISPs that are conditional on the adoption of improved land management practices or provide farmers with inputs that are more climate smart—such as seed varieties that are weather resistant or input packages aimed at promoting the adoption of biomass-generating legumes—might hold potential to make African farms more climate smart. However, to date there is little evidence that these benefits have been realized in practice or that a conditional ISP would be cost-effective, feasible to implement, or welfare improving for farm households. There is the risk that specific management practices being required for program eligibility may not be appropriate or profitable for farmers with particular soil, rainfall, or market conditions.

## *Ex Ante* System-Wide Risk Management

There are three potential avenues for ISPs to influence system-wide risk management outcomes in Africa. First, by expanding and stabilizing the demand for specified input types and quantities, ISPs can help to overcome some of the persistent risks to commercial legume seed multiplication in the region. Ensuring adequate supplies of these seeds on the market is critical to achieving crop diversification, biological nitrogen fixation, and rotations.

Second, ISPs may promote system-wide CSA resilience through promoting *market-smart* private investments. By encouraging private sector input supply chain development, market-friendly ISPs can improve input access conditions for farmers, making them less dependent on public input supply systems. Private input systems are less prone than public systems to financing delays and logistical delivery challenges.

Finally, the move toward digital platforms for delivering ISPs, such as electronic vouchers (e-vouchers), creates opportunities to use ISPs as delivery mechanisms for other sorts of products, such as soil testing and extension information.

## *Ex Post* Disaster Coping at Household-Level

ISPs are frequently scaled-up in the year following a severe weather event as part of drought-recovery strategies. In such cases, ISPs can help smallholder households acquire inputs and re-engage in production following a severe contraction in farm income, and to potentially re-stock depleted resources that were expended during the crisis to smooth consumption. ISPs can also theoretically be used to help farmers replant crops that failed to survive due to late or false onset rains. Realizing these benefits would require considerable the part of governments. In addition, because of the annual crop production cycle characterizing most of the region, it may take time, at least 6-9 months after a harvest failure, before ISPs could contribute benefits to recipients in the form of expanded crop output in the next season.

## *Ex Poste* System-Wide Disaster Coping

In their current form, ISPs tend to be costly and therefore compete directly for scarce public sector resources with other CSA risk coping and response strategies that might have more timely and direct impacts such as disaster risk management plans at various government scales, rapid repair of damaged infrastructure, emergency feeding, etc. However, modifications that enable ISP beneficiaries to utilize weather insurance may help farmers to avoid the sort of asset and resource depletion that is common after a weather shock to smallholder systems. In addition, ISPs may enable farmers to recover more quickly following extreme weather events if they are well targeted. In these ways, ISPs do offer some potential to support food systems and economies to recover following adverse weather shocks.

## Conclusion

ISPs may serve several catalytic functions at a system-level, which can support CSA objectives. However, ISPs can achieve little without coordinated public and private investments in areas such as site-specific adaptive research and extension, which are necessary to turn potential CSA practices into profitable and adoptable farm management strategies. In addition, if ISPs are unable to generate sufficient climate benefits, in terms of increased carbon sequestration or decreasing rates of forest conversion to cropland, the increased use of inorganic fertilizer resulting from ISPs will contribute to a net increase in greenhouse gas emissions. It is for these reasons that most ISPs in their current form are likely to work against the objectives of CSA. However, given that ISPs are likely to continue and often account for a large share of public expenditures to agriculture, it is worth the effort to encourage ISP reforms in ways that contribute to CSA.

## Recommendations

We propose the following as potential focus areas to improve the climate *smartness* of ISPs in Africa:

**Orient ISPs More toward Legume and other Climate -Smart Crops***:* Many ISPs currently focus primarily on staple cereal crops and inorganic fertilizers. For ISPs to have a more system-wide effect on cropping systems and management practices, seed system constraints for other crops must be addressed. ISPs can serve a catalytic role in this respect.

**Develop Detailed Farm Registries for ISP Beneficiaries***:* Detailed registries, that include geo-spatial information, are necessary to delivery support services such as soil testing, extension information targeted to specific micro-climates, and weather insurance, which may directly or indirectly support CSA objectives.

**Explore the Potential for Using ISPs to Overcome Adoption Constraints on CSA Farm Management Practices, Bearing in Mind that**:

- There is limited consensus on what practices are most effective in specific areas and given different resource constraints of smallholder farmers, and;
- Extension advice and monitoring capacity remains very thin in most of Africa.

**Support Systems to Improve Timing of Input Distribution through ISPs:** Most ISPs deliver fertilizer chronically late. Late delivery reduces yields and crop response to fertilizer. This unfavorably affects the ratio of crop output to GHG emissions.

**Improve Targeting Capacity of ISPs:** ISPs must more effectively target farmers who can use fertilizer profitably but are not already using it (or who are using it well below levels considered to be profit maximizing). This will reduce crowding out of commercial demand and contribute to increased fertilizer use. In addition, effective targeting following a disaster can help support ISPs to support *ex post* household recovery efforts.

**Promote More Secure Land Tenure/Property Rights (e.g., through Registration or Land Certification):** land tenure security is important for encouraging the adoption of CSA practices that improve productivity, sustainable land management, and increased use of commercially purchased fertilizer (Lawry et al. 2014; Sitko et al. 2014). Efforts to promote secure land tenure rights are a complement, not necessarily a substitute, for ISPs in promoting CSA, but the cost-effectiveness of both may be different and justify different levels of budget support.

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