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AGRICULTURAL INPUT USE AND MARKET DEVELOPMENT IN AFRICA: RECENT PERSPECTIVES AND INSIGHTS

By

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BACKGROUND: Most Sub-Saharan Africa (SSA) countries acknowledge that increased use of modern seed/fertilizer technologies is needed to achieve sufficient agricultural productivity growth to meet economic development, poverty reduction, and food security goals. Since the early 1980s, the challenge has been to increase farmers' use of productivity-enhancing inputs in a cost-effective, financially sustainable, and environmentally sound manner.

In 2003, SSA farmers still lag far behind other developing areas in fertilizer use and adoption of improved seed varieties. However, there has been substantial progress in developing input markets in some countries. Although there is great variability across countries, FAO statistics show that overall fertilizer use and use per hectare in SSA rose by 16% and 5%, respectively, from 1980-89 to 1996-2000.

OBJECTIVES: Our objective is to describe recent efforts to stimulate input supply and demand in SSA and to discuss the lessons learned. We draw primarily on work conducted under the FS II Cooperative Agreement, including a set of papers commissioned for a special issue of *Food Policy*. We review six types of activities designed to improve input use: (1) profitability analysis to assess causes of limited input use and identify geographic priorities for market development, (2) research and extension to increase input use efficiency, (3) identification of policies and investments capable of reducing input costs, (4) programs promoting inputs in high-risk environments, (5) training to improve farmers' capacity for collective action, and (6) monitoring of policy reforms and their impacts on input market development.

PROFITABILITY ANALYSIS: Input profitability has been examined by SSA research when testing new technologies, but it has not often been taken into account in the policy process. Recent experience has shown, however, that input profitability analyses can make a major contribution to policy design and implementation. Examples include disaggregated crop/zone analyses using fertilizer response data and input/output price series to develop location-specific fertilizer guidelines (Rwanda, Malawi, Zambia) and collecting data on fertilizer demonstration plots for analysis of farm-level financial profitability and identification of factors affecting it (Rwanda, Ethiopia, and Mozambique).

In the Ethiopia and Mozambique cases, data were also used to evaluate profitability after adjusting for the effects of taxes, subsidies, and currency overvaluation. Analyses have shown that fertilizer use on cereal crops is often unprofitable given existing prices and crop response, underscoring the importance of developing fertilizer-responsive crop varieties, raising input use efficiency and reducing input and output marketing costs.

Analyzing the farm-level profitability of inputs is a relatively simple yet powerful type of analysis that is grossly underutilized in most countries. Rwanda stands out in terms of getting the results into policy discussions and building consensus around the use of profitability-based recommendations. The key contributing factors were: interdisciplinary and inter-institutional collaboration in the analyses; involving policy makers from the beginning to nurture local ownership; use of consensus-building workshops; and close donor collaboration (sharing data, avoiding duplication of effort) (Kelly and Nyirimana 2002).

IMPROVING INPUT USE EFFICIENCY: Integrated soil fertility management (ISFM) programs have evolved in response to low input profitability, particularly for fertilizer used on food crops. ISFM promotes improved management techniques and judicious use of both organic and inorganic fertilizers. There is a growing body of agro-economic analysis confirming the positive yield and income effects of ISFM. These techniques tend to be more knowledge intensive than traditional fertilizer recommendations, putting heavy demands on extension personnel. Although empirical evidence on adoption is limited, ISFM techniques are more likely to be adopted by farmers growing a commercial crop (even though they were developed primarily for food crops). Widespread adoption of ISFM technologies has the potential to stimulate demand for fertilizer and contribute to input market development, yet the empirical evidence on this potential is weak (Place et al. 2003).

Slower than desired adoption has prompted some researchers to use participatory research methods that focus on developing farmers' ability to take a generic input recommendation and adapt it to their particular resource constraints and risk situation. For example, researchers have developed simulation models to understand the yield impacts of rainfall risk on different levels and timing of fertilizer applications; the information is then passed on to farmers who use it to adapt fertilizer applications in response to early season rainfall. Preliminary evidence suggests that the type of institution implementing these participatory research programs can affect outcomes. For example, NGO implementation leads to greater attention to farmer training and greater likelihood of adoption than when the implementation is carried out by university researchers or by Ministry of Agriculture researchers (Snapp et al. 2003).

IDENTIFYING POTENTIAL INPUT COST REDUCTIONS: In many African countries, domestic marketing costs account for 50% or more of the farm-gate price of fertilizer. Understanding the relative importance of the diverse factors contributing to these high prices is the first step toward identifying feasible options for lowering prices. Lower prices (all else equal) should improve fertilizer profitability, stimulate demand, and thus encourage expansion of supply networks.

It has sometimes been argued that low input use is a sign of market failure, without considering that input use may not be profitable to farmers without public investments to drive down marketing costs. Studies of the structure of fertilizer costs in Ethiopia, Zambia, Malawi and Kenya show that fertilizer costs to farmers could be reduced through the following: reducing port fees, coordinating the timing of fertilizer clearance from the port with up country transport, reducing transport costs through port, rail, and road improvements, reducing high fuel taxes, and providing incentives for firms to invest in transport services (Jayne et al. 2003).

Estimated reductions in the farm-gate price of fertilizer from implementing the full range of options identified in each country range from 11 to 18%. The possible impact of these reductions on quantity demanded is difficult to predict, given the lack of estimates of the price elasticity of fertilizer demand. Using elasticities calculated for other developing countries (in the range of -0.5 to -1.0), the above cost reductions would generate increases in quantity demanded ranging from 5.5% using the lowest cost reductions and assuming inelastic demand, to 18% using the highest cost reductions and assuming elastic demand. This would represent a substantial increase in aggregate fertilizer use given the relatively high levels already consumed in both Kenya (35 kg/ha) and Ethiopia (16 kg/ha).

Cross-country comparison of marketing cost structures can also be used to identify potential avenues to reduce input marketing costs and risks. Such analyses show

that in Kenya, Ethiopia, Malawi, and Zambia, the CIF price of fertilizer is about half of the farm-gate price, costs of $30-50/ton are incurred at the port, and domestic marketing costs (half being transport, handling, transit losses, and storage) account for $200/ton or more of the farm-gate price. Profit margins for importers, wholesalers and retailers typically make up 10% or less of the farm-gate price.

Table 1, comparing the urea price structure in Malawi, Zambia and Ethiopia, shows a similarity in CIF prices coupled with strongly divergent domestic marketing costs. Malawi has unusually high margins and financing costs and Ethiopia has unusually low margins. High margins in Malawi have been attributed largely to uncertainty created by frequent but unpredictable government interventions in the market. Margins are low in Ethiopia partly because the cost of government agents who played an important role in retail distribution was excluded.

Table 1. Examples of Urea Price Structure: 1998, 1999

	Malawi	Zambia	Ethiopia
		($US)	
CIF price at import point	126.50	133.00	125.00
Taxes	2.94	2.00	0.00
Port handling	8.50	5.50	12.57
Bagging	21.00	17.00	4.55
Port storage	1.50	3.00	0.74
Inland transport, handling, and storage	82.60	166.50	99.91
Financing/capital costs	41.89	12.90	7.03
Markup/margins	113.93	27.80	5.80
Farm-gate price	398.86	368.00	255.60

We conclude that greater use of cost structure analyses should be encouraged and local capacity to conduct such analyses developed. At present, most of these analyses are being supported by externally funded projects, often based at research institutes or universities rather than in government ministries. Future efforts should build analytical capacity within the government, involve potential decision makers (including private sector operators) in the research, and report on the budgetary as well as economic impacts of potential cost reductions. These types of improvements will increase the chance of research findings being acted upon by decision makers.

Harmonization of seed laws and regulations across countries is another avenue being pursued to reduce input costs (Rohrbach et al. 2003). Efforts are underway in several countries to harmonize seed regulations; this is expected to reduce the costs of trading seed and encourage scale economies in seed production. As a result, commercial seed production is expected to expand, providing farmers with improved access to new varieties and stimulating productivity growth. The East African countries are farthest ahead in achieving harmonization agreements and implementing them. This process has benefitted from the coordination of discussions by a respected regional organization, ASARECA, and from ongoing engagement with the private sector. Perhaps, more importantly, the heads of the East African Community endorsed the need for harmonization at an early stage of these discussions. The level of political support for harmonization has been less certain in West and Southern Africa where efforts are more dependent on a shifting array of donor initiatives.

Less attention has been given to the development of regional fertilizer markets than to seed markets, yet the potential for realizing economies of scale in fertilizer imports is substantial for countries with relatively low levels of consumption (Gisselquist, Nash, and VanDerMeer 2000). Larger import orders (i.e., 10,000 tons or more) often benefit from lower purchase and transport prices as well as lower transactions cost. In the case of fertilizer, regulations and types of fertilizer should be harmonized and higher analysis fertilizers (such as urea and DAP) used, since they tend to be less expensive per kilogram of nutrient than complex NPK fertilizers and are easily combined in different ratios.

PROMOTING INPUT DEMAND AND SUPPLY IN HIGH RISK ENVIRONMENTS: Many smallholders relying primarily on food crop production and many in remote areas that are poorly served by roads and markets are still in need of alternatives to the

benefits they lost when market reform eliminated unsustainable pan-territorial pricing policies, input subsidies and government-subsidized credit programs. The budgetary costs of these policies pushed governments to find alternative strategies to reach smallholder farmers (e.g., promoting private input supply channels while maintaining more modest government-run credit or targeted input distribution programs). The challenge with this type of program is to improve input use in the target population without interfering with emerging input markets. Two types of programs that appear to be meeting this challenge are those promoting the sale of mini-packs and those reducing the risks associated with developing private sector retail supply networks (Kelly, Adesina, and Gordon 2003).

The sale of mini-packs appeals to many smallholders because it reduces their financial exposure, permitting them to experiment with small quantities of new inputs or to make small, incremental input purchases as cash becomes available or the rainfall pattern becomes established. SCODP (a local NGO supported by donor funding) was particularly successful in promoting mini-pack sales of seed and fertilizer in areas of Kenya where these inputs had not been available commercially. SCODP's mini-pack fertilizer sales became possible following Kenyan policy reforms that made it legal for traders to sell fertilizer in units smaller than the standard 50-kg sack. Fertilizer available in each of the 14 SCODP shops ranged from two to 15 tons after three years of operation. SCODP promoted their mini-packs through awareness-raising campaigns at local markets, churches and schools, and through on-farm demonstration plots.

In Zimbabwe, a local seed company with experience in marketing 5-kg packages of hybrid maize seed agreed to test-market improved ICRISAT varieties of millet, sorghum, peanuts, and sunflower in packages as small as 0.5 kg. The company learned that there was effective demand for open-pollinated seed when sold in these small packages (Kelly, Adesina, and Gordon 2003).

Donor-supported agro-dealer programs are helping to expand input supply beyond the high-demand, low-risk agricultural zones where the private sector rapidly invested following policy reforms. These programs train general merchandise retailers so they are knowledgeable about inputs and capable of managing a line of input credit offered by wholesalers. The risk of providing credit to retailers is reduced by a credit guarantee program jointly funded by donors and participating wholesalers. After three years of program operation in Zimbabwe, 18 seed and fertilizer companies were involved and 503 agro-dealers had been certified, of which 127 were supported with credit guarantees. A similar program in Manica Province of Mozambique stimulated a 15% increase in seed sales in one year (Kelly, Adesina, and Gordon 2003).

DEVELOPING FARMER KNOWLEDGE AND SKILLS FOR COLLECTIVE ACTION: Development of community-level management skills and human capacity can contribute to reduced input procurement and output marketing costs. Empirical data on the cost savings realized by farmers' associations that have internalized some of the administrative, distribution, and transaction's costs of input procurement is limited, but many such efforts are underway. In the irrigated rice production areas of Mali, farmers' associations are reducing costs for members by consolidating input orders, using transparent bidding procedures, and securing bank loans to ensure rapid payment of suppliers. NGOs (e.g., CLUSA in Zambia) are helping farmers form associations to reduce the marketing costs of obtaining production inputs and organizing marketing for niche export crops such as paprika and chillies.

Bingen, Serrano, and Howard (2003) review the characteristics, strengths and weaknesses of three types of programs currently promoting collective action. Contract/Business programs such as out-grower and cash-crop schemes facilitate farmer access to goods and services required for production and marketing of a target commodity. Project/Technology programs, often mediated by NGOs, focus on promoting improved technology. Process/Human Capacity investments facilitate technology adoption and marketing, but focus initially on developing foundation skills and social capital. The latter programs tend to be slower to produce tangible results, but provide skills that are critical to the ability of a community to access inputs and market production beyond the life of a project.

MONITORING THE IMPACTS OF POLICY REFORM ON INPUT USE AND MARKET DEVELOPMENT: After nearly two decades of market reforms in SSA it is increasingly evident that market development is a long-term, continuous process of institutional innovation and organizational strengthening to meet the needs of a heterogeneous smallholder farmer population. When the process began, the basket of recommendations was similar across countries—stop input subsidies, open input markets to private sector competition, curtail marketing board activities, and invest in public goods such as roads and market information systems. Over time, the extent of reforms and the manner in which they were implemented varied, as did the response to reforms. The variability stems from (1) governments placing different priorities on long-term market development and poverty alleviation objectives and short-term political interests, and (2) different sets of initial conditions with respect to agro ecology, access to ports and export markets, existence of a commercial agricultural sector and entrepreneurial class, input profitability, and institutions for agricultural credit and contract enforcement. Also important in explaining the variability in response to reforms were variations in the level of public investments made to improve on these initial conditions (e.g., transport, irrigation infrastructure, extension services).

Countries that have given high priority to market development have undertaken various combinations of policy reform and supporting investments. However, no one path stands out as "the best." For example, Mali, Ethiopia, and Kenya have all increased fertilizer consumption substantially during the last decade, yet they have taken very different approaches with respect to input market competition and direct government involvement in distribution and credit programs.

Declining input use over time has been witnessed in a few countries such as Nigeria, Malawi and Zambia. In countries such as Nigeria, where the fertilizer subsidy rate of 80% throughout the 1980s became financially unsustainable, a decline in use due to price increases following subsidy removal was to be expected. Malawi and Zambia have continued to intervene heavily in all aspects of input credit and distribution through programs designed to reduce food insecurity and/or reward political supporters. The continued high costs of the programs make it difficult for governments to fund them at the same level over time. Variability in government involvement increases the risks for private traders and has limited their willingness to invest in the market.

WHERE DO WE GO FROM HERE? Despite major differences among analysts on the way forward in promoting cost-effective agricultural input use and market development in Africa, we feel there is a general consensus on at least the following. First, there is a need to assess the farm-level profitability of using inputs (and possible reasons for lack of profitability) before concluding that the problem is market failure and that governments need to reinstitute their own distribution programs for inputs to reach smallholder farmers. Input profitability analyses can make a major contribution to policy design and implementation.

Second, there is a need to concentrate resources on reducing the costs of input marketing. The public sector has a major role to play by driving down transport and port costs, which typically account for a major share of the farm-gate cost of fertilizer. Stable government policy in input markets can also indirectly reduce costs that private traders incur to reduce their risks – costs that are ultimately passed on to farmers.

Third, while it is possible to design targeted programs to promote input use by smallholders who could benefit from start-up assistance, such programs have proven difficult to implement and have often become the focus of patronage activities. Effective targeting requires the strengthening of implementing organizations and overall systems of governance and accountability. Donors and governments could invest in strengthening activities over the long run, but that use of scarce resources would have an opportunity cost. Unless targeted programs can be effectively implemented, their potential negative impacts on the development of private sector trading networks will remain a major drawback.

Fourth, promoting agricultural input use and market development requires simultaneous attention to output

market development and effective agricultural research and extension systems. Promoting input use requires a market-oriented and holistic approach that considers the full range of factors affecting farmers' willingness to pay for inputs and the costs of providing them.

Fifth, we believe that one of the most important contributions to the long-term development of sustainable input markets and patterns of input use lies in helping SSA governments improve their policy analysis, design, and implementation capability. This will be a formidable challenge given that much agricultural policy analysis is still conducted by externally funded projects with weak links to government ministries. Key approaches for accomplishing this include:

- Human resource development for policy analysts and decision makers, on-the-job training, policy analysis courses taught through distance learning programs, and graduate degree training;
- More frequent and systematic *ex ante* analysis of policy/investment options, incorporating lessons learned from *ex post* studies;
- Better links between decision makers and analysts, and encouragement for agricultural decision makers to become more active advocates for policies and investments that favor agriculture;
- Support for development of sustainable systems for the collection of basic agricultural census data (area, production, yields) which are required for any policy analysis.

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