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Input use and market development in Sub-Saharan Africa: an overview

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Abstract

This paper sets forth the background and objectives of this special issue. Trends in input use since 1980 are reviewed and a conceptual framework is presented for analyzing problems of input use and formulating strategies for resolving them. Reasons for low levels of fertilizer use by smallholder farmers are summarized briefly. The essential points of the papers in the special issue, and their implications for further expansion of input use in Sub-Saharan Africa, are then outlined.

Keywords: Inputs; Fertilizer; Market development; Sub-Saharan Africa

Background

Inspired by the high-yielding seed/fertilizer technologies credited with bringing about the Asian Green Revolution, many African governments have been promoting increased use of similar agricultural inputs in their own countries for more than three decades. There is a consensus that increased use of quality seed and fertilizers is an essential ingredient in any plan for African economic development and food security (Rosegrant et al., 2001). However, a close look at the diverse literature on input promotion in Sub-Saharan Africa (SSA) reveals that while most agree on the objective of increasing input use, opinions differ on why low input use is a problem, what its causes and effects are, and what to do about it. Some define the problem in terms of declining soil fertility, while others focus on slow growth in agricultural output, low farmer incomes, or low productivity in real economic terms. Moreover, the last forty years have seen fundamental paradigm shifts as to

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the nature of the low-input-use problem and how best to solve it. The evolution of perspectives can be characterized roughly as follows:

Government can solve the problem. In the 1960s and 1970s, donors and SSA governments alike focused on increasing agricultural production by attempting to copy Asia's Green Revolution. This led to heavy reliance on input subsidies, government-provided services (marketing, infrastructure, extension, research), and the establishment of input and commodity marketing parastatals. Donors paid for much of this.

Government is the problem. During the 1980s, it became apparent that government subsidies and parastatals were financially unsustainable, often contributing to macroeconomic crises. Moreover, political economy studies showed that input subsidies were often more effective in meeting governments' patronage objectives than in raising poor farmers' access to inputs (e.g. Bates, 1981). The dismantling of parastatals and the end of commodity and input subsidies was intended to create a more economically sound basis for stimulating agricultural productivity and economic development. While some analysts argued strongly that getting prices right through market liberalization was the key to economic growth (Lal, 1985), most recognized both the importance and limits of price policy (Timmer, 1986, 1989; Delgado and Mellor, 1984). Major proponents of structural adjustment recommended investment in public goods as well as policy reform (World Bank, 1981, 1984). Some development practitioners, however, tended to expect that after withdrawal of government agencies from input and output marketing the private sector would rapidly jump in, and that more efficient private sector marketing would provide inputs at lower cost and thereby stimulate input use beyond previous levels.

Trying to fill the gap. By the 1990s, many perceived that the private sector had not jumped in to fill the void left by government, except in situations where there was clear effective demand for inputs (Shepherd, 1989; Donovan, 1996; FAO, 1994). Interpretations of, and responses to, this observation varied considerably, depending on the time period and country being observed, and the observer's disciplinary speciality and research/policy focus. Many perceived that elimination of state-led input promotion programs and limited entry of private input dealers had caused a decline in the use of inputs, particularly fertilizers (Gordon, 2000; Bumb and Baanante, 1996). This raised concerns, especially among agronomists, about the negative impact of structural adjustment on soil fertility and agricultural productivity, and led to recommendations for renewed government support of input promotion programs. Some analysts argued that the issue of subsidies should not be 'off-limits' (Lele et al., 1989; Reardon et al., 1999; World Bank, 1994) while others proposed a wide range of interventions capable of increasing supply, reducing costs and increasing demand without resorting to subsidies (FAO, 1994; Larson and Frisvold, 1996; Donovan, 1996; IFDC, 2001; Kherallah et al., 2002). Others have pointed to 'market failures,' especially in the supply of credit, as requiring alternative systems for delivering inputs and credit to small farmers (Dorward et al., 1998). To fill the gap left by government withdrawal and lack of private sector interest in developing markets where input supply was perceived as unprofitable, non-governmental organizations (NGOs) and decentralized units of local government were called on to carry out functions that had been performed by central

governments in the 1960s and 1970s. The flaws in this approach (high costs, lack of coordination and continuity, problems of scaling up) started to manifest themselves by the late 1990s (White and Eicher, 1999).

Objectives of the special issue

One objective of this issue of *Food Policy* is to examine the nature and validity of perceptions about the post-structural adjustment evolution of agricultural input use, based partly on reviewing trends in fertilizer use in Africa during the 1990s. A second objective is to argue for taking a context-specific multi-dimensional approach to promoting agricultural inputs that starts from an assessment of the economic and financial profitability of the inputs being promoted. The papers show that the relative importance of different actors (e.g. government, donors, NGOs, private sector) and different types of technologies will vary according to the commodity, prospects for commercialization, characteristics of farmers being targeted, and the stage of both input and output market development. A third objective is to provide concrete examples, from a wide range of empirical cases, of promising components of such a multi-dimensional approach.

Review of trends in input use

There is a widespread notion that consumption of fertilizer, which represents the major purchased input used by SSA farmers, has declined in the 1990s due to structural adjustment and associated reductions in fertilizer subsidies and input credit. To examine recent trends in fertilizer consumption, we used FAO data for SSA (which does not include South Africa) to compute mean use rates for 1980–89, 1990–95, and 1996–2000, the most recent five-year period displayed (FAOSTAT, 2003).[1]

Mean fertilizer consumption in SSA was roughly 16% higher in the 1996–2000 period than during the 1980–89 period (Table 1). Use per hectare of arable land and permanent crops rose by only 5% over the same period, from 7.54 to 7.92 kg. Most of the increase in fertilizer consumption over the levels achieved in the 1980s occurred in the first half of the 1990s.

However, there is great variability across countries in the growth of fertilizer use. Of the 17 African countries that consumed at least 10,000 t/yr in the 1996–2000 period,[2] we find eight countries where fertilizer consumption per hectare cultivated has risen by 45% or more, on average, between 1980–89 and 1996–2000. These eight countries are Benin, Burkina Faso, Chad, Côte d'Ivoire, Kenya, Ethiopia, Togo, and Senegal. In most of these countries, the growth rates in absolute fertilizer consumption were greater than for fertilizer consumption per hectare, because

[1] See Jayne et al. (2003b) for a more detailed discussion of fertilizer use trends in Sub-Saharan Africa.

[2] The 17 countries are Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mali, Nigeria, Senegal, Tanzania, Togo, Zambia, and Zimbabwe. We excluded South Africa to maintain focus on trends in small-scale African agriculture as much as possible.

Table 1
Mean fertilizer consumption in Sub-Saharan Africa[a]

	1980–89	1990–95	1996–2000
Fertilizer consumption ('000 t):			
Sub-Saharan Africa	1088	1238	1264
Sub-Saharan Africa minus Nigeria and Zimbabwe	677	716	922
Fertilizer consumption per hectare (kg)[b]			
Sub-Saharan Africa	7.54	8.14	7.92
Sub-Saharan Africa minus Nigeria and Zimbabwe	6.14	6.14	7.35

Source: FAOStat web site (http://apps.fao.org).
[a] FAO data for Sub-Saharan Africa exclude South Africa.
[b] The denominator used was the FAO data on arable land and land in permanent crops.

of crop area expansion. In certain regions of these countries where agro-ecological and market conditions are suitable (e.g. parts of western Kenya) fertilizer is widely used and dose rates on maize are commonly close to mean levels achieved in South and Southeast Asia. In five of these countries (Benin, Burkina Faso, Chad, Côte d'Ivoire, and Togo), the increased fertilizer consumption appears to be related to the expansion of the cotton sector, although rice and horticultural crops were also important recipients of the additional fertilizer use in a few countries. Only in Ethiopia was there a major increase in fertilizer use on food grains.

Fertilizer consumption per cultivated hectare declined or stagnated (less than a 10% increase) between the 1980s and the 1996–2000 period in another eight countries: Cameroon, Ghana, Madagascar, Malawi, Nigeria, Tanzania, Zambia, and Zimbabwe. In countries such as Nigeria, Tanzania, and Ghana, where the fertilizer subsidy rate throughout the 1980s was 50% or higher, the decline in fertilizer use after these subsidies were reduced was to be expected. In some cases (e.g. Ghana and Cameroon), absolute fertilizer use in the 1996–2000 period has recovered to pre-reform levels after incurring initial sharp drops after the elimination of subsidies. Malawi, Zambia, and Zimbabwe 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. Input use in these countries is very erratic or declining because government is not able, and donors are increasingly unwilling, to support the programs in a sustained manner and private traders are unwilling to invest in the market given the unpredictable nature of government intervention.

In the last of the 17 countries examined, Mali, mean fertilizer consumption increased from 17,582 t in 1980–89 to 44,560 t between 1996 and 2000, but because of a large expansion in cultivated area over the same period, consumption per hectare rose only 12% between the two periods.

Aggregate SSA trends in fertilizer use are highly influenced by several large consumers. For example, Nigeria and Zimbabwe accounted for 38% of SSA's fertilizer consumption during the 1980s. If these two countries (which experienced slow or negative growth during the 1990s) are excluded, then overall fertilizer use has risen 36% in the remaining countries of SSA between the 1980–89 and 1996–2000 periods, and use per hectare has increased by 20%. While some sizable percentage

increases in fertilizer use have been achieved in many countries over the 1990s, such progress in no way implies cause for complacency. Average fertilizer use for SSA in absolute terms (less than 10 kg/ha) remains far below mean levels in all other parts of the developing world, and the intensification of African agriculture remains a crucial development challenge.

Overall conceptual framework

Defining the problem(s) associated with agricultural input use and formulating strategies to resolve them depend on the objectives being addressed, implicitly or explicitly. We believe that much of the debate about impacts of the reform process on input use and market development stems from a failure to clarify the full range of objectives and outcomes being considered. Typical objectives of input promotion strategies include the following:

1. To boost agricultural productivity by reducing the cost of inputs and/or increasing the quantities of inputs used.
2. To arrest or reverse the decline in soil fertility caused by low fertilizer use and infrequent fallowing.
3. To alleviate poverty, or to raise productivity and incomes in particular regions.
4. To improve nutrition.
5. To address social or political objectives, such as national food self-sufficiency.
6. To maintain political power, e.g. by channeling benefits to politically important groups.
7. To complement other parts of an emergency or disaster relief program.
8. To replace government-run programs by programs managed by NGOs or farmer groups, or managed implicitly by private actors.

These objectives can be grouped into four categories:

1. *Financial*: increases in the net income of farmers, traders, or other participants in the agricultural economy;
2. *Economic*: increases in real income for the economy or society overall, taking into account (at least in principle) positive and negative externalities and linkage or multiplier effects,[3] and valuing costs and benefits in terms of opportunity cost rather than financial prices (which may be affected by taxes or subsidies).

[3] Examples of externalities, in the classical sense of effects on others' productivity or utility that do not work through the price system, are negative pollution effects of fertilizer manufacture or intensive use, or positive contributions of fertilizer use to reduced rates of deforestation or encroachment onto marginal lands. Agricultural intensification could generate backward or forward production linkages or consumption linkages, e.g. expenditure multiplier effects associated with the real income increases created by increased demand for wage labor or reduced food prices. These dynamic linkage effects, which do work through the price system, are appropriately viewed as general equilibrium effects that should ideally be taken into account when evaluating the costs and benefits of alternative agricultural development strategies.

3. *Social*: improvements in indicators of welfare that are difficult to quantify and value in monetary terms. Examples are objectives (4)–(7) above. Another common social objective focuses on equity, i.e. the distribution of benefits and costs, as distinct from the magnitude of net benefits. Thus, the objective of an inputs program might be poverty alleviation or improving incomes in certain geographical regions.[4]
4. *Political*: while the political balance is potentially affected by any change in the level or distribution of benefits as a result of government intervention, some programs may be designed deliberately (if not explicitly) to build political support. Often this involves benefitting some group(s) at the expense of others.

The distinction between financial and economic objectives is critical. The history of agricultural development is replete with examples of programs that achieve rapid increases in input use and production by subsidizing input costs or output prices. Evaluating such programs in financial terms and in a partial equilibrium context presents a misleading picture of the profitability of input use, to the extent that one does not count the direct and opportunity costs of mobilizing and transferring the subsidy payments, or the benefits of linkage effects. Given that resources are always scarce, the question is which combination of limited public and donor resources would most cost-effectively maximize general equilibrium benefits.

How one evaluates an input use program will therefore depend on the objectives that one is targeting. If multiple objectives are being addressed, e.g. some mix of economic and social objectives, then the assessment of overall effectiveness will depend on how the different objectives are weighted by decision makers.

Other issues in evaluating input promotion programs include (a) whether the evaluation takes a short-run or long-run perspective; and (b) the assumption one makes about the 'counterfactual,' i.e. what would have happened in the absence of the input program, since that determines the baseline against which to measure the incremental impact of the input program. The counterfactual may embody a rising or falling trend rather than the common assumption of no change over time.

It is our view that evaluating the financial returns to input use at the farm level must be the point of departure for understanding current input use. Relatedly, making input use profitable for farmers must be the foundation of sustainable input intensification strategies. Fig. 1 shows that the key variables affecting net returns to input use (yield, output prices and input costs) are influenced by many factors such as the environment, infrastructure, government tax and price policies, credit, and agricultural research. If financial analysis shows input use to be unprofitable, opportunities for increasing profitability can be found by examining the various factors influencing yields, prices, and costs. If financial profitability at the

[4] In a standard benefit–cost analysis, benefits gained by poor households from increased wage earnings or lower food prices would be assigned the same weight as benefits realized by other groups. If poverty alleviation had a high social priority, however, a weight greater than one could be assigned to benefits obtained by poor households.

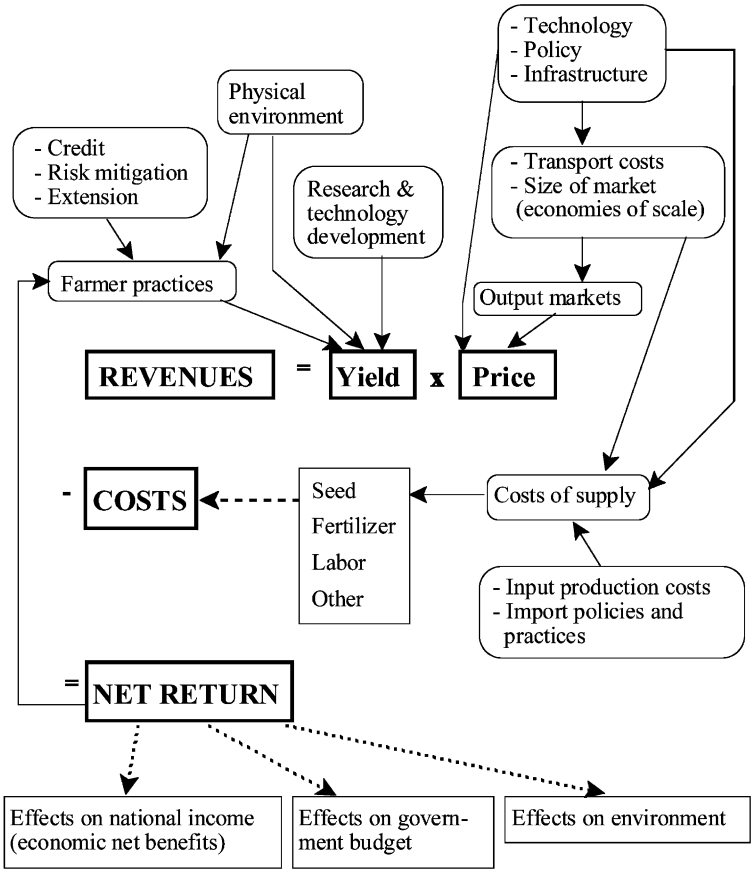

Fig. 1. Farm-level net returns from improved technology: components, determinants, and aggregate impacts.

farm level is affected by price distortions (e.g. taxes or subsidies), or the government is concerned about environmental impacts of the use or non-use of inputs, or there is an interest in using input promotion policies to reduce poverty or improve income distribution, it will be important to examine the economic profitability of input use. The types of impacts to be considered will depend on the objectives of the program which, in Fig. 1, are assumed to be economic, budgetary, and environmental.

Following IFDC (2001), input sectors evolve through four stages of development characterized by changes in the types of inputs used, the manner in which they are acquired by farmers, and the relative roles of the government and the commercial sector in supplying both inputs and credit (see Box 1). It is common for seed,

fertilizer, and pesticide markets to be at different stages of development depending on the region (e.g. high/low agricultural potential or good/poor access to roads and markets) or the crop sector (export or domestic food crops). Understanding the stage of development of an input subsector provides guidance on how to time and sequence interventions.

Box 1. Stages of Agricultural Input Supply System Development

Stage I: Subsistence

Improved varieties, chemical fertilizer and pesticides are generally not available. Farmers retain their own seed or exchange seed of poor quality and low yield. They rely on manure, crop residues and burning to maintain soil fertility.

Stage II: Emergence

Improved varieties, chemical fertilizer and pesticides emerge, especially for export crops. Both public and private sectors start input distribution, but farmer-retained seeds represent the bulk of seed used, especially for food crops. Formalized costly and inefficient government-controlled credit systems are often introduced.

Stage III: Growth

Food crops are increasingly commercialized. Modern seed, chemical fertilizer and pesticide use spread with both the private and the public sectors involved in procurement/production and distribution. Resources are increasingly available, but informal financial arrangements remain dominant.

Stage IV: Maturity

The food and cash crop markets are globally integrated. Vibrant seed, fertilizer and pesticide industries develop as the private sector takes the leading role with ancillary support from the public sector in specified tasks. Farmers use higher levels of fertilizers and pesticides, and are very knowledgeable about fertilizer attributes and requirements, timing and methods of application. Requirements are refined and dealers provide informal extension services. The financial sector deepens and broadens its asset base and lending capacity. Financial links with foreign countries are strengthened, and the importance of informal financial arrangements decreases.

Source: IFDC (2001).

Going back to the farm-level perspective, expenditures on production inputs such as fertilizer and seed can be viewed as a function of incentives and capacity to purchase (Reardon et al., 1995). Incentives to purchase inputs are determined by the net returns of the input expenditure (shaped, in turn, by the factors illustrated in Fig. 1), by relative returns, i.e., the profitability of the expenditure relative to the returns expected from alternative farm and nonfarm opportunities, and the riskiness of the expenditure, both in absolute terms and relative to the riskiness of alternative opportunities.

Capacity to purchase inputs depends on the household's land holdings; physical, financial, and human capital; and labor availability. Both incentives and capacity are affected by broader factors such as technologies, institutions, and policies, by trends such as globalization, and by extension and demonstration programs that

are designed to improve crop husbandry knowledge and induce farmers to purchase inputs and/or make more effective use of them.

Causes of low input use can also be categorized as demand- versus supply-side factors. On the *demand side*, fertilizer use may not be perceived as profitable on average by farmers, or it may be perceived as profitable but too risky in financial terms. Lack of profitability may result from low crop response, which may reflect agro-ecological conditions, use of seed varieties that are unresponsive to fertilizer, or inappropriate application rates or crop husbandry practices. Lack of profitability may also be due to high input prices or low output prices, which may reflect high transport costs, transaction costs, policy interventions, or in some cases, non-competitive behavior of marketing agents. Or the problem may not be profitability but rather ability to pay; the farmer may want to acquire fertilizer, but lack the cash or access to credit necessary to finance fertilizer purchase.

On the *supply side*, access to fertilizer may be limited by high costs at the source (importer or local manufacturer), inadequate arrangements for financing the purchase of fertilizer by importers and traders, poor port, rail and road infrastructure, transaction costs, non-competitive behavior of suppliers, and policies, institutions, or programs (e.g. subsidized or free input distribution) that undercut private markets and increase the uncertainty of input marketing, or that restrict competition and increase marketing costs. Supply in some areas can also be limited by traders' perceptions of low farmer demand, which implies high costs and risks in building a supply network.

During the 1980s and 1990s, most analysts emphasized supply constraints (Lele et al., 1989; Larson and Frisvold, 1996). Articles in this issue illustrate, however, a growing realization that much needs to be done to stimulate input demand (in part by making inputs more profitable), particularly among the small, resource-poor farmers who are not yet using improved technologies.

Articles in this issue

The articles in this issue were selected to provide a flavor for the multi-dimensional nature of recent efforts to promote input demand and supply in SSA. Jayne et al. (2003b) focus on the policy reform process itself as they describe how differences in the way that reforms were implemented in Kenya, Ethiopia, and Zambia have influenced private sector fertilizer supply and farmer demand. The authors also compare and contrast fertilizer cost structures for the three countries in an effort to identify policies and investments that could further reduce fertilizer costs (e.g. improved efficiency at ports, road improvements, better coordination of inland transport). Although there is no 'one-size-fits-all' reform process recommended by the authors, they do argue that in many cases the private sector's apparently weak response to input market liberalization may not reflect a 'failure' of the private sector or of markets per se, but may reflect an under-investment in traditional public goods (infrastructure, appropriate extension messages, R&D investments) that limit the profitability of using purchased inputs. In other cases, weak private sector response reflects government behavior that reduces incentives for marketing agents to invest in the system.

Rohrbach et al. (2003) use an analysis of the seed sector to examine the theoretical and practical issues involved in the promotion of regional input markets in West, East, and Southern Africa. Given the small size of national input markets, regional markets have been proposed as a means of realizing economies of size and scale, yet existing seed laws and regulations act as barriers to the development of regional markets. Rohrbach et al. (2003) review progress to date in regional harmonization of seed markets across the continent and lay out the challenges ahead. The authors point out that it is too soon to tell if current efforts will result in interlinked, but still largely separate, national markets or true regional markets free of non-tariff barriers where seed can be readily produced and marketed across national borders.

Howard et al. (2003) examine the financial (private) and economic (social) returns to high-external input technologies (HEIT) such as those promoted by the Sasakawa-Global 2000 (SG) program. Using data from country case studies conducted in Ethiopia and Mozambique during the late 1990s, the authors demonstrate the situation-specific profitability of HEIT maize packages promoted by SG and the need to develop more disaggregated maize production recommendations. This article reinforces observations made by Jayne et al. (2003b) that profitability of input use is reduced by poor transport systems, but also calls attention to the need to develop output markets in tandem with the promotion of HEIT packages and the need for improvements in on-farm storage permitting farmers to take advantage of inter-seasonal price variability.

Snapp et al. (2003) argue strongly against continued investments in research and extension for HEIT packages, calling for approaches that teach farmers how to maximize returns from smaller, more affordable input purchases. The authors present examples of what has been accomplished by various private and public actors to develop technologies that take into account farmers' resource constraints and risks. The authors conclude that developing recommendations for small, affordable quantities of inputs and training farmers so they can adapt recommendations to their particular circumstances is as much an institutional challenge as a technology challenge given the existing structure and culture of key organizations (e.g. government, universities, and NGOs) currently involved in technology research and extension.

Place et al. (2003) look at many of the same types of technologies discussed by Snapp et al. (2003), but rather than asking what needs to be done to encourage research and extension for such technologies the authors look at the impact that the promotion of integrated soil fertility management (ISFM) practices might have on input market development for both organic and inorganic inputs. The article describes the range of organic and ISFM technologies available, what is known about their yield impacts, and recent use by farmers. The authors examine six possible pathways through which the promotion of ISFM could stimulate growth in markets for organic and traditional inputs, concluding that these links are potentially important but not yet widely realized in practice.

Kelly et al. (2003) argue that there is a 'strategic dilemma' between food security and market development proponents that affects the design and evaluation of input

promotion programs. The authors show that programs aimed at developing markets (e.g. support for traders or investment in infrastructure) may not have an immediate impact on poverty alleviation and food security, while programs using inputs directly to alleviate poverty and improve food security (e.g. input subsidies) may hamper input market development, particularly when government is heavily involved in credit or distribution activities. The authors conclude that governments have an obligation to speed up the process of making inputs available to and affordable by all farmers. This can best be accomplished when governments (with donor support) focus on providing the public goods needed to stimulate farmer demand (e.g. technology development and extension) and encourage expansion of the promising commercial input supply initiatives reviewed (e.g. improved transport infrastructure).

Bingen et al. (2003) argue that farmers will not benefit fully from market participation until they develop the human capital required for creating and managing associations capable of collective action. Three project approaches to capacity building currently found in SSA are examined: contract/business, project/technology, and process/human capacity. Case studies from Mali, Mozambique, and Cameroon illustrate how the different approaches work and how they contribute to human capital development. Although process/human capacity approaches tend to be slower to produce tangible results, the skills emphasized often determine the ability of a community to access inputs and market production beyond the life of the project. Consequently, there is a need to improve on current project evaluation methods, which seldom account for the broader developmental impacts of process/human capacity programs.

Recurrent themes

A number of recurrent themes emerge from this collection of papers regarding constraints and potential solutions. Reforms, when implemented as intended, have generally enhanced the private sector's capacity to serve the agricultural sector, but progress has been concentrated in areas where agriculture is most profitable and export driven. Poor farmers located in these higher productivity zones have generally benefitted from improved availability of inputs provided by the private sector, but financial access remains a problem for farmers with limited income from cash crops or nonfarm activities. Implementing some of the many opportunities identified by Jayne et al. (2003a) for reducing costs of input distribution could reduce farm-gate input prices, making inputs more accessible to poor farmers in these areas.

Reforms have generally not improved input availability or financial access for farmers located in remote areas. Food crop producers have been especially slow to increase input use. Removal of subsidies and pan-territorial pricing has made input use less profitable for these farmers. While subsidy elimination freed up public resources for alternative uses, higher input prices immediately drove down effective demand. In some cases, input marketing may be potentially profitable but private traders do not consider it profitable enough (given alternative investment options)

to outweigh the costs and risks of developing the market. In such cases the public sector may need to increase incentives to draw the private sector into the markets. Various public/private partnerships such as the agro-dealership programs described in Kelly et al. (2003) are making progress in developing risk-sharing institutions and stimulating the private sector to be more responsive to farmers in areas where inputs can be used profitably. At the same time, funding to NGOs or extension services that can teach farmers how to use small, affordable quantities of inputs efficiently, can increase demand and complement market-building efforts.

In yet other cases, the private sector response is weak because the profitable use and marketing of agricultural inputs is constrained by under-investment in supporting infrastructure and services. Inadequate transportation and/or market information systems keep input distribution costs high; these are areas where Jayne et al. (2003b) and Howard et al. (2003) recommend increased public investment. In numerous cases, laws and regulations (Rohrbach et al., 2003; Jayne et al., 2003b) or weak contract enforcement institutions (Kelly et al., 2003) impede market development. Place et al. (2003) note that declining farm size acts as a constraint to the production of organic inputs that can improve the profitability of purchased inputs; this suggests that population and land tenure policies may also have a role to play in promoting input use. Inadequate or inappropriate investments in agricultural research and extension (Snapp et al., 2003; Place et al., 2003; Howard et al., 2003) and inadequate investment in human capital development (Bingen et al., 2003; Snapp et al., 2003; Kelly et al., 2003) limit the range of profitable input options available, the capacity of farmers to use inputs, and the capacity of farmers to access inputs through collective action. These are the areas that will require substantial policy and project attention during the next decade if the vast majority of SSA's smallholders are to have access to profitable, productivity-enhancing inputs.

In some situations, input use could be profitable but the private sector is not developing markets because of government credit and distribution programs which, as noted earlier, can increase marketing costs and uncertainty for private traders. While some of these programs serve mainly political patronage objectives, others are legitimate efforts to address food security and poverty reduction objectives (Jayne et al., 2003b; Kelly et al., 2003). In the latter case, more ex post and ex ante policy analysis is needed to identify effective food security and poverty initiatives that are the least likely to interfere with market development. Developing African capacity to conduct this type of policy analysis, rather than relying on donors and external experts, should increase the likelihood of SSA governments acting on the recommendations. It will also be important to support the creation of stakeholder groups capable of lobbying the government for improvements in policies and institutions affecting the sector, or better representing local interests in multilateral fora where trade policies and market-distorting subsidies in high-income countries are on the agenda.

Table 2
Matrix of typical input sector problems, causes, and potential solutions

Problem	Probable market stages[a]	Likely causes	Potential solutions	Key actors[b]
Low input use by farmers in remote areas	I. Subsistence	High input prices and low output prices due to high transport costs	Invest in roads	G/D
			Reduce transport taxes	G
			Temporary subsidy while reducing transport costs	D
Low input use by farmers specializing in food crops	I. Subsistence	Low profitability	Technology research	G/D
			Food crop market development	G
		Poor diffusion of information on profitable technologies	Temporary subsidy or demonstration programs	D/NGO
Low input use by farmers in zones with high production risk	I. Subsistence or II. Emergence	Low profitability	ISFM research	G/D
		High risk	Credit/insurance programs; water management investments	D
		Poor diffusion of ISFM technology	ISFM extension	G
Low input use by poor farmers in high potential zones	II. Emergence or III. Growth	Financing problems	Improve credit and contract enforcement	G
		Inability to bear risk	Promote rural employment	G/D
			Promote small pack sales	C
Lack of supply when input use is potentially profitable	II. Emergence or III. Growth	Suppliers have poor knowledge of potential demand	Supplier training or market testing programs	C/D
		Laws/regulations or policies hamper supply	Improve regulations and policies	G
		Supplier credit not available	Improve credit institutions and contract enforcement	G
High costs reduce aggregate demand for profitable inputs	III. Growth	Poor roads and ports	Invest in infrastructure	G/D
		Taxes	Evaluate/change tax system	G
		Policy uncertainty	Reduce policy uncertainty	G
		Poor economies of scale	Encourage consolidated imports, trader associations, farmer cooperatives, trader management training	All

[a] See Box 1 for definitions of market stages using IFDC terminology.
[b] G = government; D = donors; C = commercial sector; NGO = non-governmental organizations.

Moving forward

Table 2 organizes some of the key points made in the previous section by listing seven of the most common input use problems encountered in SSA, identifying the likely stage of development and causes of the problem, proposing potential solutions drawn from the experiences reported in this issue, and indicating the actors best placed to take a lead in implementing the solutions. The salient point brought to light by the table is the numerous situations where the solution includes government investment in public goods (e.g. infrastructure, contracting institutions and enforcement, basic education) that must be provided by government. The very important role that these public goods played in Asia's Green Revolution (Gabre-Madhin et al., 2003; Johnson et al., 2003) underscores the need for African governments and donors to make a major commitment to improving the provision of these goods. It is becoming increasingly clear that the dearth of investment in public goods during the last two decades is now constraining the expansion of agricultural intensification beyond the high potential zones and export sectors.

For example, a country with a well-capitalized commercial input sector (e.g. stage III) already serving crop sectors with high input demands will be able to draw on the resources of the commercial sector for market expansion (e.g. the case of SeedCo in Zimbabwe and the agro-dealer programs in East and Southern Africa reported in Kelly et al., 2003). For Stage I or II input sectors, however, it is unlikely that private traders will have the resources to invest in market development activities. Instead, donor and government programs will be needed to stimulate input demand and reduce the risks and costs of commercial market development. Stimulating commercial actors to be effective collaborators in the quest for agricultural intensification calls for a high level of coordination between governments and donors to ensure that the basic conditions needed for commercial actors to function efficiently are in place. This includes developing a strategy for each country to set priorities in terms of public goods investments, policy reforms, and the types of interim programs that will be needed to support vulnerable groups before the positive impacts of these investments and reforms can be realized. IFDC (2000), which includes an input sector assessment and an action plan for Malawi, is an example of a step in this direction. Coordination among donors working in the same country will be essential to avoid implementation of programs that tend to cancel each other out, such as the Starter Pack and agro-dealer programs in Malawi. Coordination across countries will be required in the many situations where regional rather than national procurement of inputs makes sense given the very small size of existing markets.

SSA does have some coordination success stories to draw on such as the PRMC (*Programme de restructuration du marché céréalière*) in Mali where cereal market reforms were successfully implemented as a result of excellent coordination among donors and between donors and the government (Egg, 1999; Dembele and Staatz, 1999). Two essential elements to successful coordination of input sector development will be agreement among all the partners on the strategic importance of inputs for rural economic growth and the need to be pragmatic in the implemen-

tation of agreed upon programs, using empirical research during the implementation process to evaluate progress and revise programs as indicated.

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