Staff Paper

SAHELIAN INPUT MARKETS:
Recent Progress and Remaining Challenges

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1. BACKGROUND AND OBJECTIVES

The Sahel vision statement for agriculture in the 21st century focuses on modernization through the intensification of production using improved inputs; improved management of the natural resource base (soils, forests, water); better integration of crop, livestock, and forestry activities; and a transition from government-run markets to markets run by economic operators who are supported by governments that provide the institutional, legal, and policy support necessary for the private sector to compete effectively in national, regional, and international markets. Moving toward the realization of this vision statement requires that governments take stock of where they are at present and what needs to be done in the future.

The objective of this paper is to review progress made and challenges remaining as Sahelian governments and entrepreneurs work together to develop the input markets that are so essential to the modernization of Sahelian agriculture. The paper is designed to inform Sahelian decision makers. Because the most important purchased input in the Sahel is currently inorganic fertilizer, the paper focuses on fertilizer markets. In an effort to provide Sahelian decision makers with information on a broad range of options, we have drawn on experiences throughout W. Africa rather than focusing only on the Sahel. Numerous references to experiences in the Coastal countries of W. Africa not only provide Sahelians with some perspective on how their experience compares to that of other W. African countries, but also contribute to an understanding of the opportunities and constraints to developing regional input markets. Developing input markets is a major challenge throughout Africa, not just in the Sahel.

Although the topic of this paper is input market development, both economic theory and past experience are clear about the link between input and output markets–the former cannot be developed without substantial progress in the latter; farmers must be able to market their production profitably if they are to have the incentive and the resources to pay for modern inputs. This creates a dilemma for the many Sahelian farmers whose production remains focused on traditional cereals that are grown primarily for home consumption and forces us to look closely at the links between input and output markets as we review progress made to date and challenges remaining.

The review is divided into three principal sections:

Incentives for and Trends in W. African Input Use;
A Critical Review of Recent Input Market Developments in W. Africa;
Key Challenges for Sahelian Governments.

2. INCENTIVES FOR AND TRENDS IN W. AFRICAN INPUT USE

2.1 Incentives and the Productivity Gap

The conventional wisdom is that there is a productivity gap–large differences in average returns to labor and yields per hectare–between farmers in Sub-Saharan Africa (SSA) and those in the rest of the developing world. Some believe it is due to the low productivity of the technologies currently available while others argue that high performing technologies are available but not being used because of inadequate financial incentives and access. There is a tendency for Sahelians to think that these yield gaps are greater in their countries than elsewhere in SSA, because of the region's past history with repeated droughts and its heavy reliance on millet and sorghum (food crops that do not respond as well to improved technologies as maize, rice, and export crops).

A recent compilation of fertilizer response data from research and demonstration trials shows that there are many situations where the technologies available in SSA (including the Sahel) perform as well (and sometimes better) than technologies available in Asia and Latin America (Yanggen et al.). Table 1 is a comparison of key indicators of fertilizer response and profitability for W. Africa, East and Southern Africa, and non-African regions of the developing world taken from Yanggen et.al. Three ratios are used in the table:

(1) Output/nutrient (O/N) ratios showing the number of kgs. of additional output a farmer obtains from a kg. of fertilizing nutrient;
(2) Input/output price (I/O) ratios showing the number of kgs. of output required to purchase one kg. of fertilizer;
(3) Value/cost (V/C) ratios showing the value of additional output attributable to fertilizer divided by the cost of the fertilizer (a rudimentary indicator of profitability).

There are some rules of thumb for interpreting these ratios. An O/N ratio ≥ 10 for cereals is considered a strong incentive for fertilizer use. An I/O ratio <2 is generally attractive to farmers; the lower the ratio the greater then incentive for fertilizer use. Conventional wisdom holds that the V/C ratio must be greater than 2 for farmers to adopt a technology; in risky environments, the minimum acceptable V/C is thought to be 3 or even 4.

Among the cereal crops covered in Table 1, maize (SSA's largest fertilizer consumer) and irrigated rice exhibit the strongest incentives. O/N and V/C ratios exceed those for Latin America, while the rice ratios are comparable to the Asian examples. Yields per hectare are high: 2-4 tons for maize and 4-6 tons for rice. On the down side, maize profitability is threatened by high yield variability (across sites and seasons) and by unfavorable I/O price ratios. The existence of high performing maize and rice technologies for SSA suggests that producers of these crops should make a substantial contribution to the growth in African fertilizer demand, yet a substantial share of African maize and rice continues to be grown without fertilizer.

Sorghum and millet exhibit poor incentives compared to maize and rice. Research data show that using fertilizer in combination with crop residues, manure, or water and erosion control considerably increases the yield response, but aggregate output is usually <1 ton/ha. Without some major breakthroughs in technology performance, it is unlikely that millet and sorghum producers will provide much stimulus for increased fertilizer demand.

Among the export crops covered, only tea–a crop whose production is limited to a few areas in SSA–exhibits good indicators. Cotton has highly variable yield response and mediocre profitability (V/C ratios) despite extremely favorable I/O ratios. Nevertheless, cotton is the second largest consumer of fertilizer in SSA and the largest in W. Africa. As will be discussed in Section 3, mediocre price and response incentives for cotton are compensated for by other benefits associated with the closed nature of the input distribution system and the interlinking of the credit and output markets.

Across all crops covered in Table 1, the I/O price ratios for SSA tend to be higher than those in other parts of the world. This is due both to low output prices and to very high fertilizer prices. Fertilizer price comparisons from the early 1990s reported SSA prices in the $232-487 range compared to $68-201 for equivalent fertilizers in Asia (Bumb and Baanante).

Turning to more specific country-level examples from W. Africa, Tables 2-4 present trends in average annual yields and inter-annual variability in yields (coefficient of variation or CV), for three of the most important fertilizer using crops in the region: cotton, maize, and rice. This information is paired with country-specific information on yield potential (based on research trial results) and O/N ratios when available. The tables are completed with a few illustrations of comparable information from maize, rice, and cotton producing countries in Asia.

For rice we note that although average yields in W. Africa lag behind yield potential and Asian yields, O/N ratios for W. Africa are frequently >10 and as good or better than those in Asia. The hypothesis that yield variability is greater in the Sahel than the Coast is not supported by the data presented (the three lowest W. African CVs are for Sahelian countries), but the CVs for W. Africa are substantially higher than those for Asia.

For maize the average yields in W. Africa lag behind the yield potential and Asian yields. The W. African O/Ns for maize are generally stronger than those for Asia, suggesting that the incentives to use fertilizer on maize in W. Africa would be greater than in Asia if price ratios were similar. Although the best O/N are found in Ghana, we note that the O/Ns for the Sahelian countries of Mali and Gambia are higher than the O/N for the Côte d'Ivoire, suggesting that fertilizer response is not necessarily better in Coastal climates. Coastal countries also do not appear to have consistently higher average yields or lower variability.

For cotton, W. African yields lag behind Asian yields for all countries but India and yield variability is generally greater in W. Africa than in the Asian examples. Within W. Africa, the CV ranges from 66 to 191 for Coastal countries and from 88-273 for Sahelian countries, suggesting that production risk for cotton may be a greater problem in the Sahel than on the

coast. Information on cotton yield potential and O/N ratios is too incomplete to draw any inferences.

The key lessons that we draw from information presented in Tables 1-4 is that (1) there is a yield gap when average annual Sahelian and Coastal W. African yields are compared to potential yields and to Asian yields, (2) in the case of rice and maize, this yield gap cannot be explained by lower O/N ratios (i.e., poor fertilizer response), (3) there is no clear pattern of Sahelian countries facing greater production risk (higher CVs for average annual yields) than their Coastal neighbors, but the W. African yield variability is generally greater than the Asian. Given the low aggregate fertilizer use in SSA, the high production risk coupled with the unfavorable I/O ratios (Table 1) appear to weigh more heavily in farmers decisions about fertilizer use than the relatively good fertilizer response. The challenge is for W. African countries to develop policies and institutions that encourage farmers to use more fertilizer on these fertilizer-responsive crops.

2.2 Trends in Input Use

Many SSA countries–including those in the Sahel–experienced growth in the use of modern inputs during the1970s and early 1980s. However, the government-financed structures supporting the adoption of these technologies proved to be inefficient and financially unsustainable, contributing to huge government deficits that led to extensive economic reform programs. During and immediately following the reform period both input use and agricultural productivity were down in many countries. There has been substantial debate in the development literature concerning the extent to which economic reforms–many implemented only partially–aided or hindered development in the agricultural sector (Donovan, Donovan and Casy, Husain and Faruqee, Jayne et al.).

As we enter the 21st century–almost 20 years after the earliest reforms were initiated–there are signs that input use is returning to pre-reform levels. In West Africa, some of the best growth in fertilizer use (in terms of annual rates of growth and consistency of the growth over time) has been in Sahelian countries (Mali and Burkina Faso, in particular); however, SSA input use (9 kg./ha.) continues to lag far behind levels used in Asian (80 kg./ha.) and Latin America (54 kg./ha.) and progress remains slow given the urgent need to close the productivity gap described above.

Table 5 presents data on fertilizer consumption trends for 16 W. African countries. We contrast average consumption and growth rates for 1980-1989 with those for 1990-1997. As indicated in the 'trend' column of the table, 63% of the countries experienced increased growth rates from the 1980s to the 1990s and 69% increased absolute levels of consumption. Thirty-eight percent have exhibited what we would call sustained growth since 1980 (i.e., positive growth rates in both periods and consumption levels in the late 1990s that exceeded earlier levels): Benin, Burkina Faso, Chad, Togo, Guinea (Conakry) and Mali. An important point made by Table 5 is that there is no obvious distinction between the input market performance of Sahelian countries versus the Coastal countries of W. Africa. This suggests that the agroecological characteristics that unite

the Sahelian countries may not be as important factors in the develoment of input and output markets as the policies and investments used to promote market development. In other words, the constraints to input market development may not be the same in Coastal and Sahelian countries, but the mix of performance results presented in Table 5 suggests that neither set of constraints poses an absolute barrier to input market growth.

The discussion below will show that although recent input use trends are particularly favorable in Benin, Burkina Faso, and Mali, the recent trends are highly dependent on a few factors that may not be adequate to ensure long term sustainable growth of input markets.

3. CRITICAL REVIEW OF INPUT MARKET DEVELOPMENTS IN W. AFRICA

3.1 Cotton Is Driving Input Demand Throughout W. Africa

3.1.1 The cotton subsector stimulates fertilizer use

The most salient characteristic of the fertilizer markets that have achieved high levels of consumption (20,000 tons or more) and relatively sustained growth during the 1990s is their location in the CFA franc zone and their dependence on the cotton sector. The 1994 devaluation of the CFA franc, coupled with an increase in world market prices for cotton, stimulated a cotton boom that resulted in rapid expansion of cotton area and demand for cotton fertilizers and pesticides (Tefft 1998). Rough estimates suggest that cotton production accounted for 80% or more of fertilizers used in Mali, Burkina Faso, and Benin during the 1990s, so continued growth in these input markets remains heavily dependent on what happens in the cotton sector. The importance of cotton goes beyond these countries because cotton is also among the top fertilizer users in countries such as Ghana, Côte d'Ivoire, Chad, Cameroon and Guinea.

Why is cotton production such an important stimulus for input demand?

1. Output price risk is low because (a) there is a guaranteed market for cotton, (b) producer prices are generally announced at planting time, and (c) producers are protected from extreme fluctuations in world prices by price stabilization schemes;
2. Credit is generally available to cotton producers for both inputs and animal traction equipment;
3. Some cotton schemes provide extension and inputs for cereal crops.

How can the cotton companies provide all these services and continue to remain profitable?

1. Credit and output marketing activities are tied together in a closed system that minimizes farmers' ability to default on credit;
2. Large quantities of inputs are ordered in bulk and vertical integration of many subsector functions provide economies of scale;

3. Cost reductions have been realized as producers associations assumed some of the transport, input distribution and cotton collection activities formerly performed by the cotton company;
4. The monopoly position of cotton companies permits them to pass through to farmers a smaller share of the world market price than would be the case with competitive out-grower schemes and, therefore, to cover costs of services delivered plus profits.

3.1.2 Pros and Cons of Stand-Alone Cotton Input Systems

Despite some efforts to liberalize the cotton input supply systems in Francophone W. Africa,[1] documents reviewed and personal communications from individuals knowledgeable about the cotton sector confirm that the cotton companies continue to control most aspects of input acquisition and distribution.

Mali provides an example of private sector fertilizer dealers having made an unsuccessful attempt to provide inputs to cotton farmers in the OHVN zone. Because cotton is not produced as extensively in the OHVN zone as it is in the CMDT zone, fertilizer demand was smaller and the private sector was unable to benefit from the economies of scale realized by the CMDT. The high level of vertical coordination across functional categories also helps the CMDT to keep costs down. The net result was that fertilizer sold by private dealers was more expensive than that sold by CMDT in their zone of operation (southeastern Mali). OHVN officials were ultimately pressured into supplying their cotton farmers with fertilizers obtained through the CMDT system. This put the private traders out of business and forced the OHVN (a government entity) back into the input business (OHVN 1999). Farmers are better served by the current arrangements but these arrangements merit careful monitoring to ensure that the prices offered OHVN farmers are not being maintained by hidden subsidies that will be unsustainable as the demand for cotton inputs grows in the OHVN zone.[2]

In Benin, liberalization of fertilizer imports began in 1991 but according to Badiane et al. (1997), SONAPRA (the cotton company) and the Ministry of Agriculture maintained a heavy regulatory role, controlling who could import and how much could be imported, specifying the distribution of each importer's fertilizer quota to specific regions, and fixing prices. In June 2000, the GOB agreed to lift the monopoly of SONAPRA on seed cotton marketing. Currently, discussions are underway to define a new credit mechanism that will ensure adequate seed cotton

[1]For example, opening up imports to competing suppliers and permitting farmers'associations to reduce costs by assuming responsibility for some distribution functions (transport, placement, etc.).

[2]The extent to which OHVN administrative personnel and resources are being used to support the supply of CMDT inputs was not discussed in documents reviewed, but OHVN is providing credit guarantees for farmers who are unable to obtain input credit through farmers associations.

marketing with timely payment to cotton producers and input credit recovery (Ahouissoussi, personal communication).

Another way in which the cotton companies might be constraining the development of national input supply systems is by keeping their procurement completely separate from fertilizer procurement for other production systems. To date there has been inadequate analysis of this issue. The question is: Do the benefits of the current stand-alone systems outweigh potential benefits that could be realized by consolidating imports of cotton inputs with those for other sectors? For example, could consolidation of urea orders at the national level for cotton and other crops (rice and maize in particular) lead to some economies at the import and distribution level that are presently not possible given the current structure of the cotton company input systems. Theoretically, this is something that importers or an importers' association could attempt if there were some effort on the part of input users (cotton companies, rice producers' associations, maize farmers) to coordinate the timing of their bidding procedures.

Some question has also been raised about the specifications for the NPK fertilizers ordered by the cotton companies, suggesting that lower-cost specifications might be adequate (Diouf et al.) The issue is not only the fertilizer cost but also the decision process which doesn't promote consultation between the cotton company and others having an interest in fertilizer procurement and use.

A final concern about the cotton sector is the manner in which the inputs are being used. The underlying argument for promoting fertilizer is to improve land productivity and reverse the secular decline in soil fertility throughout Sub-Saharan Africa. It appears that although the CFA devaluation stimulated rapid expansion of cotton area and aggregate growth in production and input use, fertilizer doses per hectare have declined (Tefft 2000). The consequence has been declining cotton yields–a worrisome scenario from both a soil fertility and a productivity perspective (see Table 6 for W. African cotton yield and production trends).

There is no simple answer to the question of whether the benefits of stand-alone cotton input systems outweigh the costs. It appears that Benin will be serving as a test case for a transition from a closed, monopolistic cotton system to a more open competitive system with respect to both input and output marketing–a transition that the Sahelian countries should follow closely. A less drastic approach than the Benin case might be one of developing tools to better discipline the existing monopolies while developing the institutions necessary to enforce credit reimbursement in open systems without monopolistic output markets. The main constraint to disciplining both monopolies and farmers who fail to reimburse credit is the lack of a reliable regulatory system (i.e., an honest, non-corrupted judiciary and bureacratic/administrative system). Sahelian governments need to develop institutions to ensure that cotton company benefits are being shared equitably by all participants in the subsector and that all participants are able to participate in decisions that affect them. At the same time, systems need to be put into place to ensure that farmers are adequately sanctioned when they fail to meet their contractual obligations (see section 3.2.2 for further discussion of this issue).

3.2 Closed Input Distribution Systems Provide Important Benefits

3.2.1 General characteristics and selected examples

Closed input distribution systems are characterized by a set of linked procedures that (1) centralize demand for a large group of farmers, (2) purchase the entire quantity demanded through an international bidding process, and (3) distribute the inputs to the farmers. Most, but not all, closed systems also provide seasonal credit to farmers purchasing inputs (Debrah 1999). The most common examples of closed input distribution systems are the cotton schemes discussed above, but there are many other closed systems supported by government development projects, NGOs, and the private sector.

Following the 1994 CFA devaluation, horticultural production grew in many countries as import/export firms became involved in setting up out-grower schemes. Farmers in the OHVN zone of Mali entered into green bean contracts with firms providing inputs and guaranteeing output markets in France. Senegal expanded horticultural production and exports in a similar manner. Potato farmers in the Sikasso Region of Mali benefitted from contracts offered by a firm supplying inputs and marking output in Bamako. Prior to devaluation, a Burkinabé cooperative working in a closed system had cornered a large share of West Africa's green bean exports to France. In the Senegalese Peanut Basin the closed system used by the confectionery peanut program was the only source of input credit during most of the 1990s because the traditional input/credit program for oil peanuts was abandoned following massive and repeated defaults.

Although these closed systems have had a positive impact on input use and generally exhibit higher rates of credit repayment than open systems, all of the systems mentioned above have run into difficulties in the recent past. We find no consistent pattern to explain the problems encountered. Malian green bean producers were left with warehouses full of beans this year because the exporter never came to collect the output (apparently a problem of inadequate supply of the type of packaging required for export to France) (personal communication, Djiré). Potato farmers in Sikasso complain of exhorbitant input prices and extremely low producer prices–both set by the same company which has a monopoly position in the zone (Kergna and Koné). After many years of expanded production and high rates of credit repayment, the confectionery peanut program in Senegal has fallen on hard times. Most analysts attribute the current problems to a failure to maintain seed quality for the most profitable variety (GH 119-20); the result has been that production now fails to meet export standards for the "hand pick selected" category. Efforts to continue exports for lower quality confectionery peanuts are not succeeding; more than 3/4 of the recent production had to be redirected to the oil processing plants (Gaye, personal communication). Following the devaluation, Burkina Faso's share of the green been market in France declined dramatically, due in large part to inefficiencies in the management of the farmers' cooperative and an Air Afrique monopoly on air freight (many management shortcomings appear to have been associated with government intervention)(Illy). In sum, we have several examples of 'successful' closed programs for fertilizer inputs that have become unsuccessful because of problems with other input markets, output markets, or contract

enforcement.

A recent evaluation of the relative efficiency of the closed versus the open systems in Guinea concluded that the closed systems were more efficient because they supplied appropriate inputs in a timely manner while providing both credit and a guaranteed output market. Although the closed systems received high marks for serving farmers, they are also providing clients with direct or indirect subsidies, making it difficult for the open systems to compete. For example, the SG 2000 program subsidizes the fertilizer transport costs and the HCR program distributes fertilizer gifts which are often resold well below cost in local markets. In Guinea, we are left with the same dilemma presented by the cotton companies discussed earlier–the closed systems appear to serve specific groups of farmers more effectively at present than alternatives, but they have characteristics that are constraining the development of input markets for other farmers and crops.

3.2.2 Interlocking credit arrangements are substituting for social, political, and legal institutions needed for market development

Many analysts believe that rapid expansion of input use in SSA can only take place if farmers have access to credit. The common argument is that rural incomes are so low that farmers are unable to accumulate the money required for input purchases and leave that money tied up for a period of 6 to 9 months.[3]

Interlocking credit arrangements have two important characteristics: (1) they provide farmers with input credit and guaranteed output markets at prices generally announced at planting time and (2) they provide the contracting institution (usually a processor and/or an exporter) with the desired quantities of production and a high probability of credit repayment. In other words, several of the major risks facing producers and processors/exporters are reduced when interlocking credit arrangements are used.

Unfortunately, interlocking credit does not work for all types of crops. In our opinion, the key characteristic of successful interlocking credit systems in SSA is the absence of a parallel market for the output. At present, cotton is one of the few subsectors in W. Africa where farmers are unable to side market their production and thereby avoid repayment of the credit provided. Similar conclusions are drawn from studies of cotton and sugar cane systems in East and Southern Africa (Strasberg et al.). Even with cotton, there are examples of system failures when side-markets developed (e.g., the case of cotton producers in Niger who sold their output across the border in Nigeria).

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[3]There is evidence that wealthier farmers owning larger farms do purchase fertilizer without credit as do well-organized farmers who are able to reduce costs through collective actions (e.g., some village associations in the OHVN area of Mali), but the low aggregate levels of fertilizer use in SSA are testimony to the fact that the typical farmer is unlikely to use fertilizer without substantially lower prices and/or access to credit.

With nascent horticultural export markets, it is also common to have interlocked credit arrangements exhibiting high rates of repayment because there is usually a monopoly exporter and prices in the domestic market are significantly lower than in the export market (e.g., green beans in Mali and Burkina Faso). Evidence from East Africa suggests, however, that as demand increases for horticultural niche crops, side-selling by farmers and side-purchasing by exporters also increases, putting the entire system in jeopardy (personal communication from Ron Philips, CLUSA, regarding paprika markets in Zambia).

Again we are left with a dilemma : Economic theory tells us that monopolies are generally inefficient, but experience to date suggests that without monopoly output markets we are unlikely to have financially sound input credit systems. It is our opinion that the missing element here is the lack of social, political, and legal institutions that instill confidence in and respect for contractual marketing arrangements–in the absence of these institutions, monopoly is the only vehicle by which contractual arrangements can be enforced.

Many defaults can legitimately be tied to crop failures, but far too many are associated with moral hazard or situations where farmers are simply taking advantage of the system because there are no serious penalties for doing so. When input credit is considered a debt to the government (as it is in most countries because private banks are unwilling to get involved), politics play a prominent role in both government and farmer decision making. Governments are likely to 'forgive' debts or to provide credit to *all* farmers (rather than to *credit-worthy* farmers) when they think it will win them votes in an upcoming election. Farmers, on the other hand, are likely to default on input debts as a way of compensating themselves for the government's (or the marketing firm's) failure to provide adequate supporting services (e.g., output price stabilization, basic extension services and infrastructure). It has been observed that ...

> Institutions, or rules of the 'economic game', consist of the generally accepted codes of conduct and customs, as well as formal laws and regulations. Custom in Africa puts great emphasis on behavior consistent with the support and preservation of the extended family and clan....Customs well adapted to dealing with short-run problems of household and village security are not always well adapted to modern industry and commerce....Transactions costs are increased and investments are avoided because of uncertain property rights and uncertain enforcement of contracts, and a general ambiguity about existing policies, regulations and their enforcement. (Shaffer and Wen, 1994).

3.3 Progress in Promoting Inputs for Non-cotton Crops

3.3.1. The cotton/coarse grain link

Although W. African cotton schemes have often been portrayed as 'cotton-centric'–doing little to promote food security–there is mounting empirical evidence to the contrary. One of the earliest documented examples of a cotton company promoting cotton/maize complementarities in production and input use began in the mid-1970s with the CMDT in the Sikasso Region of Mali. Farmers were first encouraged to use rotations of cotton and maize so that the maize crop could

benefit from the residual fertilizer carried over from the cotton crop. Maize fertilizer (urea) was later made available on credit and for many years the cotton company purchased maize at guaranteed prices from farmers producing surpluses (Dioné).

In Guinea, most fertilizer (60-70%) is used on cotton, but the estimated 12% that is used on maize, millet, and sorghum is used by farmers who have access to fertilizer through the cotton companies (Debrah 1999).

In the OHVN zone of Mali cotton production has been integrated with a strong program promoting natural resource management practices. Farmers are trained in anti-erosion techniques and methods of producing improved organic matter. This has enabled them to increase production on fixed plots of land by rotating cotton, produced with inorganic fertilizers, and maize or sorghum, produced with improved organic fertilizers. Many villages in the zone have become surplus cereal producers during the last several years (Kelly).

3.3.2 Diversification into other fertilizer-responsive commercial crops

Sustained growth in W. African agriculture will require diversification to reduce the region's heavy dependence on cotton for both farm income and government revenues. To the extent possible, this diversification needs to include high value, fertilizer-responsive crops that stimulate the level of demand for improved inputs needed to build competitive, sustainable input markets. To date, efforts to diversify have been timid.
Irrigated and rainfed rice in Mali have the potential to help build input markets, but in both cases it will be a constant battle to keep Malian rice competitive vis à vis Asian imports (Mariko, Chohin, and Kelly; Dimithé). There are serious questions about the competitiveness of rice in the Senegal River Valley where research is underway to find more profitable crops. Horticultural production can also make a contribution to incomes (both rural and peri-urban) and input demand. However, even in countries such as Senegal and Burkina with relatively strong exports to European markets, and in Guinea and Mali where regional exports are important, horticultural fertilizers represent a very small share of total fertilizer consumption.

3.3.3 Increasing demand via improvements in fertilizer efficiency

There has been a substantial amount of research in the Sahel on ways to improve fertilizer efficiency by combining fertilizers with natural resource management practices that improve soil organic matter, reduce erosion, and improve soil moisture. Although many of these techniques produce promising results in research trials and closely supervised demonstration plots, farmers have been slow to adopt the practices. An encouraging example of NRM adoption that has had positive impacts on farm incomes and subsequent investment in productive assets is the NRM program in the OHVN zone of Mali. The key to success was that NRM techniques were introduced in a zone with a profitable cash crop (cotton) and in combination with extremely successful CLUSA literacy and management training programs for farmers. Following an initial period of literacy training, village technical teams are trained in NRM techniques, general agronomic management practices, and financial management. In exchange for the training, members of the teams agree to allocate one day per week to community activities (training other

farmers in NRM techniques, organizing community work groups to build anti-erosion barriers, managing village association credit programs, etc.) (Kelly).

3.4 Rationalizing Fertilizer Procurement to Reduce Costs

3.4.1 Consolidating Orders

The SSA fertilizer literature is replete with references to the high fertilizer prices associated with very small volume imports. In Ghana, for example, the landed cost of sulphate of ammonia is 9% higher when ordered in a small 1,200 ton lot rather than in a 10,000 ton lot (Debrah 2000). There is a need to examine economies that can be realized by consolidating both national and regional fertilizer imports. Although the legal and political obstacles to regional coordination are great, the benefits could be important for countries such as Niger and Burkina Faso whose imports are already transiting ports in Ghana or for Mali whose imports come through Côte d'Ivoire. A prerequisite for realizing economies of size and scale through consolidation of orders is improving the market information system for inputs and providing training for importers so they can better research cost-cutting options. There have been some timid efforts in this direction, but more focused attention is needed .

3.4.2 Finding the appropriate role for in-kind input aid (e.g., KR2)

Many countries in W. Africa continue to receive in-kind input aid. Japan and the Dutch are two of the principal donors. Inappropriate distribution systems for fertilizer aid can have negative impacts on the development of local input markets. There is a consensus that the preferred method of distribution is to discover prices through auctions, yet many countries continue to set prices based on some assumptions about acceptable markups and margins. This often results in prices less than the costs incurred by private sector operators. Another frequent recommendation for reform of KR2 is that the government use the receipts from KR2 sales to establish working capital for an import credit fund that would be used by private sector suppliers.

3.5 Analyzing the Potential for Fertilizer Production Facilities

The proposed solution to high fertilizer costs in W. African is frequently some type of domestic production, but analyses of the costs and benefits of establishing domestic fertilizer industries are not very common.

3.5.1 Bulk blending

A bulk blending facility is already operating in Côte d'Ivoire and its products are being delivered to other countries in the region (e.g., Mali, Guinea). The issue of building bulk-blending facilities in other countries is frequently raised. It would be useful if some general guidelines for making decisions about investing in bulk blending facilities or other types of fertilizer

production facilities were developed (perhaps with assistance from the Soil Fertility Initiative[4]) so governments could know if this were a feasible option.

3.5.2 Promotion of Phosphate Rock

The most researched and discussed option for reducing fertilizer costs has been the use of locally produced rock phosphates. Studies on the costs and benefits of using rock phosphates have been done in Mali and Burkina Faso. Results have led to ambivalent conclusions about the proper course for governments to take. Although there is evidence of both private and social profitability for rock phosphates, profits are generally greater for imported sources of phosphates (DAP, TSP, etc.) (Phosphate Rock Support and Supervision Team; Henao and Baanante).

Efforts to promote rock phosphates at the farm level have not met with strong success. Most reports of phosphate rock programs indicate that farmers find the product too difficult to use. A major national program of distributing rock phosphates at virtually no cost to farmers in Senegal was introduced in 1997/98 and subject to a mid-term evaluation in 1999. The evalutation (Sonko) notes that the first two years of the program suffered from a variety of design and implementation problems related to technical, financial, and general administrative issues. The report leaves the reader with the impression that very little was accomplished despite the high costs of the program. Promotion of rock phosphates figures prominently in the soil fertility action plan developed for Burkina Faso, but implementation is pending because donors have been reluctant to take on the $25 million estimated costs of developing the production site, purchasing 90,000 metric tons of rock phosphate and conducting 3,000 demonstration plots. There are some who believe that all the attention that has been given to the promotion of rock phosphates has kept governments from pursuing investments and policies that could redress soil fertility problems more effectively and more efficiently (Sanders and Ahmed).

3.6 Finding the Appropriate Role for Farmers Associations

Farmers' associations in W. Africa range from government created cooperatives to freely associating groups of individuals. Farmers' associations have a role to play in the development of input markets that will be serving them, but opinions vary as to what that role should be. A report prepared as part of the Soil Fertility Initiative (SFI) for Ghana argues for replacing all middlemen in the input sector with farmers' associations (Bonsu). A Niger report argues that the functions now carried out by the government run "central d'approivissionment" should be transferred to a cooperative of rice growers (the principal users of fertilizer). The role of farmers' associations is variable across different cotton schemes, but in Mali farmers began managing the collection and transport of cotton seed back in the 1970s; since then they have taken on additional tasks related to input distribution and credit. In the irrigated rice zones of Senegal and

[4]The Soil Fertility Initiative (SFI) was launched in 1996 by the World Bank and FAO in collaboration with ICRAF, IFDC, IFA, IFPRI, and USAID. The objective is to assist countries in SSA to develop and implement country-specific strategies, action plans, and pilot projects to restore and enhance soil fertility.

Mali, farmers' associations have been the principal institution through which farmers access credit and inputs; they have also played an important role in rice marketing.

The contribution that farmers' associations can make to both extension and input market development is apparent in the OHVN. In sharp contrast to some earlier programs, the OHVN does not impose associations on farmers but offers highly prized literacy and management training programs to groups of farmers who voluntarily form associations with a clear set of goals and objectives. OHVN villages where associations have been formed and members trained are generally far ahead of others with respect to credit management (good access and high repayment), crop management skills, use of NRM practices, crop yields and income (Kelly).

4. KEY CHALLENGES FOR SAHELIAN GOVERNMENTS

4.1 Limiting negative impacts of monopolies

There are a number of situations in W. Africa where public or private monopolies continue to play an important role in input markets or in output markets that have linked input credit arrangements. The cotton sectors are the most pervasive example, but others have been noted (the SENCHIM monopoly on fertilizer imports and distribution in Senegal, NOVASEN monopoly on confectionery peanuts in Senegal, Sikassoise monopoly on potato inputs and output marketing in the Sikasso Region of Mali, the monopoly on green bean input/export market in the OHVN zone.).

Given the small size of fertilizer markets in most W. African countries, monopolies for fertilizer production and imports could theoretically result in lower farm gate prices if the cost savings from economies of size and scale were passed on to consumers. The evidence on where and when this is happening is thin. In Mali, we know that the cotton company was able to provide OHVN farmers with cheaper fertilizer than small independent traders but it is not clear if this is due to economies of size/scale or to indirect subsidies. In Senegal, SENCHIM appears to be charging unusually high import margins resulting in farm gate prices 20-30% higher than they should be. In Ghana we have an example of cost savings from bulk imports (10,000 tons versus 1,200 tons) being passed on to farmers. In Guinea we have evidence of large price disparities between the open and closed systems, but again much of the price difference appears to be due to subsidies. In addition, there is evidence that the current system of multiple importers/dealers in the very small open market sector is not efficient (poor timing of deliveries, inappropriate products, poor geographic coverage, few provisions for credit). Niger presents a similar picture–a plethora of small traders taking advantage of profitable opportunities that arise because of policy changes (exchange rate, subsidy) in neighboring countries; the result is a chaotic market that fails to meet the needs of Nigerien farmers. In 1998 the customs service registered 66 separate fertilizer imports; only 5 shipments were more than1,000 tons, 59% were less than 100 tons and 38% of the transactions were listed as "importateur occasionnel", suggesting that many of the importers are not interested in building a stable, sustainable fertilizer import.

There is no easy answer to what level of competition is appropriate in emerging fertilizer

markets. A common suggestion is to focus on developing competition at the wholesale and retail levels first and then address the question of competition at the importation level once a market is large enough to support several importers (Gregory, personal communication). This is probably the most feasible approach, but it needs to be coupled with efforts on the part of the government to limit rent seeking by the existing monopolies and to encourage the formation of larger firms in countries where the current system is inefficient and costly.

With respect to the cotton monopolies, care must be taken to avoid the collapse in service delivery experienced when structural adjustment programs moved rapidly to dismantle government parastatals. Cotton is the most important single source of income for farmers throughout much of W. Africa. It is also the most import single source of government revenue for many countries (e.g., 50% of Malian government receipts come from the cotton sector). Finally, it is the only subsector that has been able to develop an input credit system with consistently high repayment rates. Apparently, Benin is poised to lead the way. The experience needs to be carefully monitored so others can learn from it.

4.2 Limiting the negative impact of various types of subsidies and taxes

There continue to be both direct and indirect fertilizer subsidies in W. Africa–the government-supported farmers' associations (FASCOMs) in Ghana and Nigeria that compete unfairly with private sector input dealers; the refugee and tree crop programs in Guinea that distribute free inputs which are resold at prices well below the costs of private importers and distributors; the rock phosphates distributed virtually free of change by the Senegalese Government; and fertilizer aid (KR2) which is sold at government-determined rather than market-determined prices in Niger and elsewhere.

If a vibrant, competitive private sector is to be promoted, many of these practices need to be better targeted or stopped entirely. Farmers' associations can play an important role in input distribution and the management of input credit. The role of the government should be to provide training that enables the associations to perform these functions but it should not be to subsidize their storage and transport costs–a common practice at present.

Free distribution of fertilizer to disadvantaged groups can rarely be done without interfering with existing markets; alternative methods of helping the disadvantaged need to be examined. Free distribution of rock phosphates in Senegal has resulted in a very costly government program that has been difficult to implement and shown few positive impacts. Rock phosphates could have a role to play in restoring soil fertility in many regions of SSA, but without major progress being made in farmers' annual use of both organic and inorganic fertilizers following a basal dose of rock phosphates there is little hope that either the private or the social returns to national phosphate programs will justify the costs (Sonko).

Fertilizer aid needs to enter markets at competitive prices. The use of auctions will be a step in the right direct if the auctions are conducted in an efficient and transparent manner.

Taxes are the flip side of subsidies. Substantial progress has been made in reducing input costs

by reducing or eliminating various taxes, but from 5-10% of the retail price of fertilizer is still a result of taxes. The percent changes from year to year and is influenced by international agreements (e.g., ECOWAS, UEMOA) as well as domestic considerations. Although there is room for further reductions in this area, documents reviewed suggested that most governments are already using tax reductions as a way of reducing input costs.

4.3 Regulating to stimulate rather than to constrain

In March 2000 the World Bank hosted a workshop on Agricultural Inputs Reglations: Issues and Options for Sustainable Growth. The workshop addressed regulatory issues concerning both the seed and fertilizer sectors. The focus was on designing regulations that avoid losses from both over- and under-regulation. Table 8 summarizes some of the key issues and dangers associated with input market regulation.

Among the more important recommendations concerning the fertilizer sector were the need for quality control, truth in labeling, and the removal of restrictions on types of fertilizers that can be imported (with the exception of products containing heavy metals capable of contaminating the environment). Implementation of such regulations would require better fertilizer testing facilities and investment in farmer education to increase the benefits from improvements in labeling and access to a broader range of products.

A common theme for both the fertilizer and seed sectors was the need to liberalize national markets and harmonize regulations across national borders so that entrepreneurs will be able to develop regional markets capable of realizing economies of size and scale. It was noted, however, that harmonization without liberalization could leave regional and national markets more closed than before if the harmonization were based on countries accepting the most restrictive of the existing sets of regulations.

Another common theme was the issue of enforcement and what can realistically be done in situations where the judicial system for contract enforcement is weak. Weak judicial systems, as noted above, is also a problem faced by contract farmers (when the contractor defaults as in the OHVN green bean situation) and for credit institutions (unable to enforce repayment or collection of collateral).

4.4 Promoting regional collaboration/coordination

Numerous references to the potential benefits of moving toward regional rather than nation markets were found in the documents reviewed, yet there is little concrete analysis of the cost savings to be gained by regional markets and the legal and political barriers that would need to be overcome. This seems like a task that could be effectively undertaken by the SFI support group in collaboration with some of the major stakeholders (e.g., governments, national and international input suppliers, the cotton companies, and farmers). Existing country assessments and action plans contain a large share of the information needed for doing some preliminary analyses of the possibilities for and constraints to developing regional markets. The proceedings

(forthcoming) for the input regulation workshop mentioned above will provide some guidelines for identifying constraints that need to be lifted.

This is a topic that needs more focused attention and analysis.

4.6 Reducing risk and uncertainty

Much of the discussion presented in earlier sections made references to the constraints imposed on technology adoption and input market development by both price and production risks. We also mentioned additional risks faced by lenders due to inadequate capacity to assess the creditworthiness of potential borrowers. The relative importance of these risks varies across sectors (e.g., price risk is greater than production risk for producers of irrigated rice but the reverse is true for cotton producers). There is also variability across countries as price risk is a much greater factor for countries with volatile exchange rates and/or continued changes in input subsidy policies (e.g., Nigeria, Ghana, Gambia) and for their neighbors (e.g., Benin, Togo, Niger) whose input and output markets are influenced by price changes across the border.

Some of the most fundamental ways of reducing these risks are government investments in basic services (infrastructure, basic education and agricultural extension, price information services, etc.), macro-economic policies that stabilize exchange rates and tax/subsidy policies, and judicial institutions that promote contract enforcement (Brooks). Another way government can assist is to be transparent and consistent in the design and implementation of sectoral policies–inconsistent or poorly understood policies increase uncertainty and discourage investment by farmers and traders.

Our review identified some examples of risk-reducing programs that merit more attention. The farmers' associations evolving in the OHVN zone appear to be reducing some of the risks associated with managing agricultural credit as does the collaborative effort by the BNDA and the FDV to build a joint data base on lenders in the Office du Niger. On the other hand, we encountered numerous examples of credit risks rising when links between input, output, and credit markets are severed. Learning how to reduce credit risks when input credit is no longer linked to output marketing is probably the greatest challenge to input market development in W. Africa.

Although not likely to provide any short run remedies for SSA, there is emerging interest in the use of hedging through commodity markets and rainfall insurance to reduce price risk and help spread production risk over a larger group of individuals (Skees, Hazell, and Miranda; Larson, Varangis and Yabuki). At present both insurance and hedging appear to have more relevance for middle income countries in Latin America and Asia, but it would be imprudent to discount them entirely for SSA. Some small-scale efforts to examine alternative designs for these risk instruments and test them would be appropriate BUT it should not be pursued as an alternative to reducing risks through the more standard list of government actions noted above.

5. MOVING FORWARD

5.1 The major challenge

The greatest input market challenge in W. Africa appears to be promoting an environment that encourages private sector operators to realize the potential economies of scale so characteristic of input markets (fertilizer in particular) while discouraging the development of monopolies that do not pass on these economies to end users.

For the cotton companies, we have seen small steps taken in various countries to liberalize and or privatize some of the functions previously performed by the cotton company, but more needs to be done to ensure that cotton farmers benefit from both the lowest possible input prices and fair output prices. This must be done in a manner that does not put the credit system in jeopardy. Another issue is whether further input cost reductions could be obtained by consolidating the imports of cotton inputs with those for other sectors.

A different type of monopoly situation exists in Senegal where the fertilizer market continues to be controlled by a monopolistic fertilizer manufacturer despite legislation that has liberalized the import market. As in the cotton situation, it is important to break the monopoly without destroying the benefits of the current system (e.g., good credit arrangements for wholesalers and retailers).

For the many input markets that remain poorly developed and fragmented there is a need to increase the incentives for suppliers to develop reliable, low-cost supplies of inputs to farmers (versus the present system where costs are high and supplies erratic). One way of doing this is to reduce the risk associated with input markets. Many suppliers are unwilling to deal with the quantities required to realize economies of size and scale because of uncertainty about government policies (e.g., free input distribution, changes in subsidies or exchange rates, etc.) and uncertainty about demand, due largely to inadequate and changing input credit policies (the latter being largely a result of poor contract enforcement).

These poorly developed and fragmented markets are found in countries with overall weak effective demand for fertilizer as well as in the non-cotton sectors of countries with strong fertilizer demand. In countries with weak effective demand, some consideration of regional consolidation of imports organized by regional trade associations could reduce costs. A similar approach organized by national trade associations might be appropriate for getting prices down in the non-cotton sectors of countries with stronger aggregate demand. None of this will come about, however, if something is not done to redress the lack of a reliable regulatory system (i.e., an honest, non-corrupted judiciary and bureaucratic/administrative system). In addition, consistent input/subsidy policies could reduce the risk that keeps individual importers from moving to larger volumes. Also, some actions that are taken by governments as part of general macro-economic reforms (e.g., reductions in government debt or increased stability in exchange rates) might contribute to a more favorable environment for input market development if they freed up capital for private investment or reduced exchange rate risk for importers.

5.2 More Attention to Monitoring

Documents reviewed have done a good job of looking at aggregate numbers and subsector level issues BUT there is still a lack of reliable information about why farmers are/are not taking up improved inputs and why rural distributors are/are not stocking fertilizer, pesticides, and improved seeds. We need to find a low-cost way of improving our knowledge of what is happening at this level. One option is for the World Bank and major donors doing pilot projects to set up good monitoring systems that will provide insights for the design of future market development activities. Another that should not be overlooked is trying to help the many NGOs who are already in the field promoting agricultural intensification and market development to improve their reporting and monitoring so that information about their activities can be feed into the policy process.

5.3 Governments Should Take Advantage of the SFI

This report would not have been possible without the many reports prepared as part of the Soil Fertility Initiative. In countries that have already collaborated with SFI and completed the documentation of previous research and descriptions/evaluations of current distribution systems, governments need to take a proactive role to begin the implementation of their action plans. Donors have made it clear that there will not be large blocks of funding allocated for SFI (SFI, 1998), so the challenge is for governments to find creative ways of mobilizing their own resources to move ahead while they continue, with the support of SFI facilitators, to seek donor support in the future. In countries that have not taken advantage of technical assistance and other resources made available by the SFI to develop a soil fertility action plan, it appears to be process that can contribute substantially to a country's understanding of the constraints and opportunities faced in developing fertilizer markets and protecting natural resources.

Table 1. Fertilizer Incentives: Summary of Key Indicators by Crop and Region

		Yield Response (O/N Ratio)			Price Incentives (I/O Price Ratio)			Profit Incentives (V/C Ratio)		Observations on patterns and incentives
Crop	Region	Typical	Min	Max	Typical	Min	Max	Min	Max	
Maize	E/S Af.	17	2	52	5-7	3.9	13.9	1	15	Maize consumes about 25% of fertilizer used in SSA but a high percent of maize production receives no fertilizer at all.
	W. Af.	15	0	54	2-4	1.9	5.1	.69	26	
	L.A.	10	5	18	1-3	.01	7.1	1.2	5.3	
Cotton	E/S Af.	5.8	0	7	1.8	.07	4.6	.00	3.1	Accounts for about 17% of SSA fertilizer use; a very large percent of cultivated cotton area is fertilized.
	W. Af.	5	2	12	1.9	.09	3.7	.61	3.7	
Rice (irr.)	W. Af.	12	7	16	2	.2	4.5	1.6	3.97	Accounts for only 4% of SSA fertilizer consumption. Total SSA area in rice is small % of total cultivated area.
	Asia	11	7.7	33.6	2.5	1.4	5	1.5	3.1	
Sorghum	E/S Af.	10	4	21	6	3.2	9.3	1.5	2.6	Accounts for 8% of fertilizer used in SSA; very small portion of total sorghum area is fertilized.
	W. Af.	7	3	14	2-4	1.4	4.9	1	18	
	Asia	7	2.8	21	2	1.7	2.6			
Millet	W. Af.	7	2.8	21				.5	39	Accounts for 3% of fertilizer used in SSA; very small portion of total millet area is fertilized.
	Asia	20	3	27				<1		
Ground-nuts	W. Af	9	4	21	3	.3	4.2	1.5	5.8	Accounts for 1% of fertilizer used in SSA although a major cash crop in many countries.
	Asia	6.5	6	17	1	.7	1.2			
Coffee	E. Af	8.5	5	10						Accounts for <1% of fertilizer used.
	W. Af	4	2	6						
Tea	E. Af	14	8	35						Accounts for <1% of fertilizer used.

Source: Yanggen et al.

Notes: Information on V/C ratios was sparse and costs used in calculating ratios poorly documented, hence no attempt was made to generalize about 'typical' V/C ratios.

Table 2. Rice: Yields, Variability, and Potential for Selected Countries

Location	National yields 1990-99		Potential yields from research results	Output-nutrient ratio for trials
W. Africa	**Mean (kg/ha)**	**Coef. of Var (%)**	**(kg/ha)**	**(range)**
Burkina	1984	65	4-5000	7-11
Côte d'Ivoire	1434	164		
Mali	1669	80	5-5700	12-16
Niger	2390	246		
Senegal	2362	83	4800-5600	9-16
Non-African				
India	2777	43	3800-4900	9-10
Philippines	2919	4	5300-6800	13-14

Source: Yanggen et al. (appendix tables) and FAOSTAT yield data.

Table 3. Maize:Yields, Variability, and Potential for Selected Countries

Location	National yields 1990-99		Potential yields from research results	Output-nutrient ratio for trials
W. Africa	**Mean (kg/ha)**	**Coef. of Var (%)**		
Benin	1070	118	2700	
Burkina Faso	1436	77		
Cameroon	1485	239		
Côte d'Ivoire	791	42	2726	9
Gambia	1335	114	2739	10
Ghana	1440	86	4220 7520 misc. results	42 54 6.9-18.5
Mali	1333	177	2296 4603	n.a.. 18
Senegal	1056	102	1025	2
Non-African				
Columbia	1593	55	2505	10
India	1607	75	2190	8.5
Indonesia	2355	88	2111	8

Source: Yanggen et al. (appendix tables), FAOSTAT yield data.

Table 4. Cotton: Yields, Variability and Potential for Selected Countries

Location	**National Yields 1990-99**		**Potential yields from research results**	**Output-nutrient ratio for trials**
W. Africa	Mean (kg/ha)	Coef. of Var. (%)		
Ghana	895	88		3-6.6 depending on region
Côte d'Ivoire	1127	87		
Gambia	568	273		
Mali	1188	88	1445 1668	5 7
Togo	1262	87		
Burkina Faso	988	112		
Benin	1224	191		
Cameroon	1192	89		
Senegal	961	179	960	5
Guinea	1240	66		
Non-African				
China	2608	34		
Turkey	2754	60		
Pakistan	1689	140		
India	713	78		

Source: Yanggen et al. (appendix tables), FAOSTAT yield data, and Bonsu.

Table 5. Recent Trends in Fertilizer Consumption

Country	Fertilizer Consumption					
	Growth Rate (%)			Average Consumption ('000 nutrient tons)		
	1980s	1990s	Trend	1980s	1990s	Trend
Benin	18	21	+	6.1	19.6	+
Burkina Faso	13	8	-	13.1	21.9	+
Cameroon	0	12	+	42.0	22.6	-
Chad	9	8	-	5.0	7.7	+
Côte d'Ivoire	-3	14	+	39.9	55.6	+
Gambia	0	5	+	2.4	0.7	-
Ghana	-9	9	+	15.0	10.5	-
Guinea (C)	6	23	+	0.5	2.3	+
Guinea (B)	-1	-8	-	0.5	0.3	-
Mali	4	15	+	17.6	22.8	+
Mauritania	24	-3	-	1.2	4.2	+
Niger	-4	45	+	2.8	4.5	+
Nigeria	7	-17	-	266.7	291.3	+
Senegal	-2	8	+	20.8	17.3	-
Sierra Leone	-5	22	+	1.8	2.0	+
Togo	25	5	-	7.4	11.6	+

Source: FAOSTAT, 6/24/00.

Notes: **Bold** type indicates countries that appear to be moving to stage 3; Underline indicates countries in stage 1 with very small, rapidly growing markets; *Italics* indicate countries that have not regained pre-reform levels of fertilizer use (Nigeria and Mauritania are in this category because they reached high consumption levels in the early 1990s that were followed by sharp reductions).

Table 6. Growth in W. African Cotton Yields and Production

Location	**Exponential growth 1990-99**	
W. Africa	Yields	Production
Ghana	-2.47	11.68
Côte d'Ivoire	-1.15	1.43
Gambia	-5.04	-5.01
Mali	-2.57	9.69
Togo	1.65	10.27
Burkina Faso	-0.11	9.37
Benin	-3.19	13.61
Cameroon	-1.85	7.61
Senegal	-4.19	-5.94
Guinea	0.68	18.95

Source: FAOSTAT.

Table 7. Examples of Issues and Risks in Designing Inputs Regulations

Issue	Danger from weak regulations	Danger from excessive and/or unfocused regulation
Fraud	Traders may deliberately mislabel inputs or otherwise provid false or misleading information; this increases risk fro farmers as they may act on the basis of false and incomplete information and thereby lose money.	Government may interfere with private trade in ways that cut competition or raise trading costs. Officials may use excess controls and authority to sustain employment in publid sector agencies, or even extort bribes. In all of these cases, controls boost farm-level input prices.
Externalities	Private decisions about what to trade, plant, or apply on crops may have impacts on neighboring fields, the environment, public health and the sustainability of infrastructure.	Government controls on what people import, plant, or apply might go beyond real risks of externalities, and might block farmers' choices that do not create substantial risks for others.
Asymmetric information	Traders may know that some inputs do not work well (low quality or poor technology) but may nevertheless sell them to unknowing farmers.	Government controls on what private traders are allowed to sell can reduce farmer options, hurting farmers as well as traders.
Introduction of new technology	Farmers may lose money when trying (or using) new technology that does not perform well.	Farmers may lose income from not being allowed to use productive new technology and/or technology necessary to get products into specialized markets (foregone income).
Public accountability rules for fair competition	Public funds may be used to compete for activities that can be done more cost-effectively by the private sector.	Excessive bureaucratic controls.

Source: Gisselquist, Nash, van der Meer (2000).

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