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Policy Options for Improving Regional Fertilizer Markets in West Africa

Balu L. Bumb

Michael E. Johnson

Porfirio A. Fuentes

Development Strategy and Governance Division

Research and Development Division, IFDC

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AUTHORS

Balu L. Bumb, IFDC
Consultant, Policy and Trade Specialist
bbumb@ifdc.org

Michael E. Johnson, International Food Policy Research Institute
Research Fellow, Development Strategy and Governance Division
m.johnson@cgiar.org

Porfirio A. Fuentes, IFDC
Senior Scientist, Economics & Trade, Research and Development Division
pfuentes@ifdc.org

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ABSTRACT

A primary motivation for this study is to identify a key set of policy options for improving fertilizer markets in West Africa (among Economic Community of West African States member countries) in ways that ultimately will help improve the efficiency of regional markets and lower the transaction costs and fiscal burdens of increasing fertilizer use in the region. Guided by the 2008 fertilizer crisis, many governments are tempted to impose fertilizer subsidies to reduce fertilizer prices. Yet, in an environment riddled with inefficiencies that contribute to the high costs of using fertilizers, the introduction of subsidies only adds more fiscal burden.

To carry out the study, we undertook four country case studies to review the key constraints and bottlenecks along the fertilizer supply chain. The countries were Ghana, Mali, Nigeria, and Senegal, and the research included field visits in 2009 and 2010. The current paper is based on the country case study results, complemented by a literature review and analysis of secondary data sources.

Keywords: fertilizer use and supply, regional market integration, supply chain, improved technology, policy environment, structure and performance of markets, harmonization of products and regulations, common fertilizer market

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The opinions expressed in this paper are those of the authors only and not of IFPRI or IFDC.

ABBREVIATIONS AND ACRONYMS

AGRA	Alliance for a Green Revolution in Africa
AGRIS	Agricultural Information Systems
AMITSA	Agricultural Input Market Information and Transparency System for Africa
AU-NEPAD	African Union's New Partnership for Africa's Development
BNDA	Banque Nationale pour le Développement Agricole
CAADP	Comprehensive Africa Agriculture Development Programme
CCAE	Commission Centrale pour l'Acquisition d'Engrais
CIF	Cost Insurance and Freight (incoterm)
CMDT	Compagnie Malienne pour le Developpement des Textiles
CNCA	Cassie Nationale de Credit Agricole
COCOBOD	Cocoa Board of Ghana
COMESA	Common Market for Eastern and Southern Africa
COTECNA	An international trade inspection, security and certification company
CORAF/WECARD	West and Central African Council for Agricultural Research and Development
DAP	Di-Ammonium Phosphate
DNA	Directeur National d'Agriculture
DRA	Directeur Régional d'Agriculture
EAC	East African Community
ECOWAS	Economic Community of West African States
EPA	Economic Partnership Agreement
FAO	Food and Agriculture Organization of the United Nations
FGN	Federal Government of Nigeria
FOB	Free on Board (Incoterm)
GoG	Government of Ghana
GIE	Groupement d'Intérêt Economique
IAC	InterAcademy Council
ICS	Industries Chimiques du *Senegal*
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
KRII	Kennedy Round II
LoC	Letter of Credit
MIR+	Marketing Inputs Regionally Plus
MDG	Millennium Development Goal
MOA	Ministry of Agriculture
MOP	Muriate of Potash
NAFCON	National Fertilizer Company of *Nigeria*
NPK	Nitrogen, Phosphate and Potash
ON	Office du Niger
ORIAM	Opérateurs d'Intrants Agricoles du *Mali*
R&D	Research and Development
SENCHIM	Senegal Chimie (Marketing Subsidiary of ICS)
SGS	An international trade inspection, verification, testing and certification company
SODEFITEX	Société de Développement des Fibres Textile
SOA	Sulfate of Ammonia (also Ammonium Sulfate-- AS)
SSP	Single Supper Phosphate
TSP	Triple Super Phosphate
UEMOA	West African Economic and Monetary Union
UN-SCPC	Union Nationale d'Approuve Producteurs Sociétés Coopératives du Mali
VAT	Value Added Tax
WA	West Africa
WAMIN	West-African Market Information Network

1. INTRODUCTION

As countries in West Africa strive to achieve annual growth rates of 6 percent in their agricultural sectors' Gross Domestic Product (GDP) as part of their commitment to the Comprehensive Africa Agriculture Development Programme (CAADP) of the African Union's New Partnership for Africa's Development, the enormous task is going to be raising agricultural productivity in order to meet these targets, especially with growing population and urbanization. Productivity gains will depend on the extent to which countries can increase crop yields each year at much faster rates than they have in the past.

Increasing crop yields in West Africa is a daunting task considering the diversity of agroecologies and the numerous constraints that affect agricultural performance, including soil nutrient depletion. Much of West African agriculture remains heavily reliant on traditional production systems and natural methods for soil fertility maintenance. The lack of agricultural intensification or enhancing crop production by raising crop yields rather than expanding cultivated area in West Africa, as in most other regions of Sub-Saharan Africa, is generally explained by poor access to extension, risks associated with adopting an improved technology, the high cost of inputs, poor access to finance, and seasonal labor constraints (Feder, Just, and Zilberman 1985). Among the many reasons why resource-poor farmers do not purchase fertilizer, for example, are high fertilizer prices, poor access to rural finance and extension services, rainfall uncertainty, poor infrastructure, and underdeveloped input and output markets. Such conditions affect millions in the smallholder farming sector, resulting in thin fertilizer markets in West Africa.

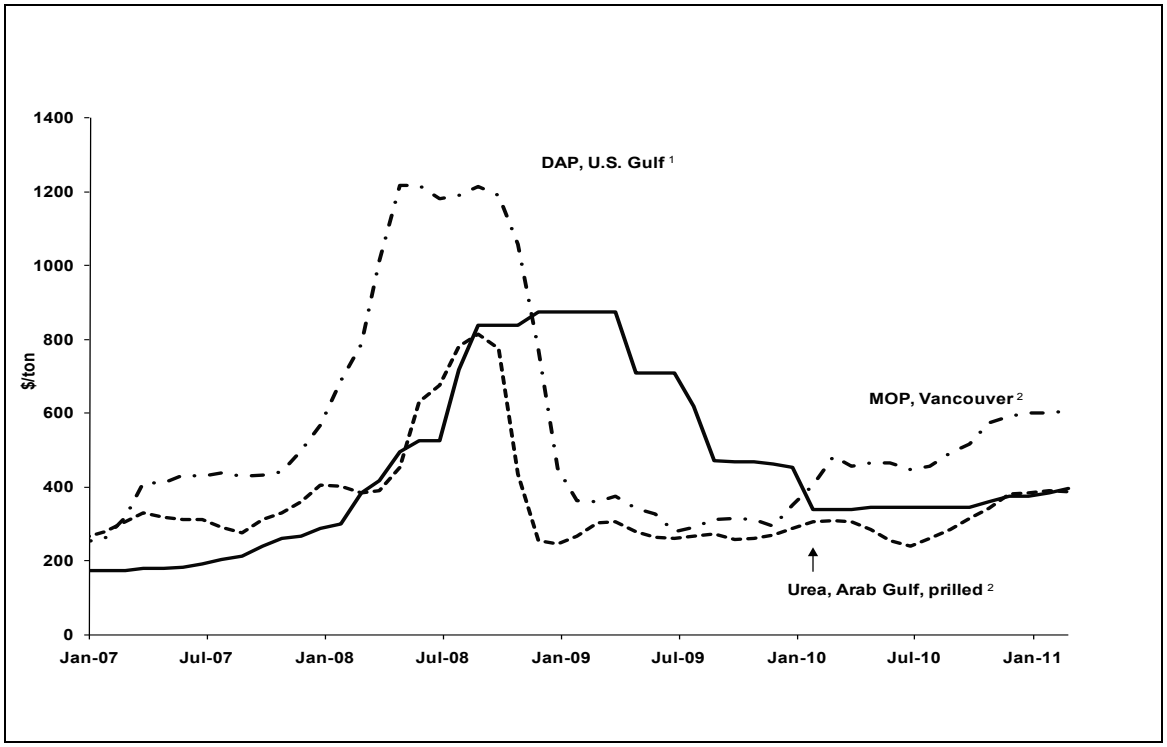
The situation of thin fertilizer markets and low fertilizer use in West Africa was exacerbated by the 2008 fertilizer crisis, when fertilizer prices increased as much as fourfold over a relatively short time span (Figure 1.1). The crisis affected fertilizer-sector operations at both the macro and micro levels. At the macro level, it increased the amount of foreign exchange needed to import the same basket of fertilizers. At the micro level, it threatened to dramatically reduce access to fertilizer by smallholder farmers. To prevent a drop in fertilizer use and food production, and thus the threat of food insecurity, many countries introduced fertilizer subsidies to reduce fertilizer prices at the farm level. From a policy perspective, the potential decline in fertilizer use also threatened the Abuja Declaration's goal of achieving fertilizer use levels of 50 kilograms/hectare (kg/ha) by 2015 from average levels of 8 kg/ha in 2006.[1]

Although subsidies can help increase fertilizer demand, they come at a great fiscal cost to national budgets, a cost many countries in the region can ill afford as they divert scarce public resources from much needed longer-term investments (such as market development, research and extension, infrastructure improvement, technology transfer, and rural services).[2] To make matters worse, as long as inefficiencies persist in fertilizer markets and distribution systems, introducing a price subsidy ultimately subsidizes those inefficiencies.

[1] These target goals were set in June 2006, when the African Union Special Summit of the Heads of State and Government adopted the 12-point Abuja Declaration on Fertilizer for an African Green Revolution. To achieve the target, fertilizer use would have to grow by about 30 percent per year to 2015.

[2] Our purpose is not to review the pros and cons of subsidies; a substantial amount of literature exists on that topic (see Morris et al. 2007, IFDC 2003, and associated background papers).

Figure 1.1— Global fertilizer prices (FOB, bulk), monthly averages (January 2007 – January 2011)



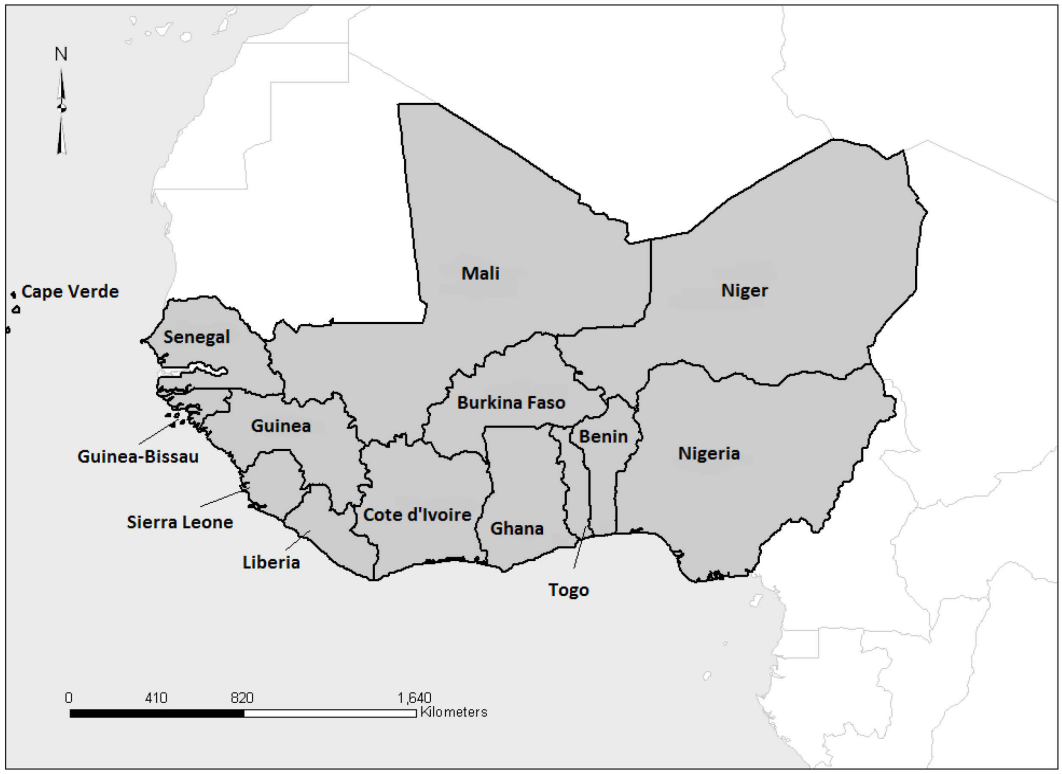
Source: [1.] Derived from *Green Markets (http://greenmarkets.pf.com)*. [2]. Derived from Fertilizer Market Bulletin (FMB) Weekly Fertilizer Reports.
Notes: World fertilizer prices doubled in 2007 and reached all-time highs in April 2008. But prices began dropping dramatically in October and November, 2008. FOB = free on board (average price, with buyer paying freight and insurance, to destination port). DAP = diammonium phosphate. MOP = muriate of potash.

Nature and Scope of the Study

The primary goal of the paper, therefore, is to determine to what extent such inefficiencies and bottlenecks exist, identify areas where fertilizer supply chain costs can be reduced, and given this analysis and review, offer a number of policy options to improve the functioning of fertilizer markets in West Africa. In this context, we hope the identification of such cost-reduction measures will ultimately contribute to policy actions that not only increase the demand for fertilizers but also lower the fiscal burden of smart subsidy (purchasing power support) for vulnerable groups wherever it is needed.

For the purposes of the study, West Africa is defined as the geographical area covering the 15 member states of the Economic Community of West African States (ECOWAS): Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo (Figure 1.2). The study is based on secondary data available from different sources (the Food and Agriculture Organization of the United Nations [FAO], the International Fertilizer Development Center [IFDC], and the International Food Policy Research Institute [IFPRI]) as well as on data collected during field visits to four countries—two francophone countries (Mali and Senegal) and two anglophone countries (Ghana and Nigeria). This sample also reflects issues faced by landlocked (Mali) and coastal (Senegal, Ghana, and Nigeria) countries. These four countries represent almost 70 percent of the fertilizer market in West Africa, according to a three-year average between 2006 and 2008 [FAO 2010. However, results and findings drawn from this sample are used as indicative of broader issues affecting the development of regional or multi-country fertilizer markets in West Africa. Country-specific issues are covered in separate country reports.

Figure 1.2—ECOWAS member states



Source: Author's creation.

Outline of the Report

First we review the performance of the agricultural sector and the role of fertilizer to highlight some of the key constraints to agricultural intensification and productivity growth in explaining the critical role of fertilizer (Section 2). In Section 3 we present overall trends associated with fertilizer markets in the region in terms of consumption, production, and trade patterns, as well as an overview of their performance. We delve deeper, in Section 4, into evaluating the markets along the entire supply chain for Ghana, Mali, Nigeria, and Senegal. The functioning of fertilizer markets, using the structure, conduct, and performance (S-C-F) approach is analyzed in Section 5. Section 6 then identifies the key constraints affecting the supply chain and is followed in Section 7 by a range of policy, institutional, and infrastructural considerations for improving both domestic and regional markets. Finally, Section 8 concludes with a key recommendation for the way forward—the promotion of a common regional fertilizer market in West Africa.

2. ROLE OF FERTILIZER IN WEST AFRICAN AGRICULTURE

Although a general consensus exists on the need to improve agricultural performance in West Africa to achieve economic growth, poverty reduction, and food security, the challenge at hand has been about how to do it (ECOWAS 2009). We review some of the challenges here from both a goal perspective and an agronomic and economic perspective, especially in terms of achieving a rapid uptake of agricultural intensification methods and use of fertilizer. This is intended to help set the context for understanding the underlying goals and challenges facing West African agriculture, in general, and the factors affecting the demand for fertilizer, in particular. After all, the underlying demand for fertilizer is *derived* not only by its own price but also by other factors that affect farm profitability: yield response, output prices, other production costs, policy and institutional environment, and production and market risks. The rest of the paper then pays more attention to the fertilizer supply chain to arrive at some explicit policy recommendations for removing key constraints and bottlenecks along the supply chain (from port to farmgate), and thus lowering fertilizer's price and inducing its demand.

The Importance of Agriculture in West Africa

The population in the ECOWAS region of West Africa is projected to almost double over the next 15 years, from 230 million in 2010 to 430 million by 2025 (FAO 2010). Of this number, more than 60 percent are projected to reside in urban areas, with an increased number of towns and cities exceeding 100,000 persons (Johnson et al. 2008). Such growth is expected to put immense pressure on the ability of West African agriculture to meet the growing demand for food staples and maintain stability in domestic and regional food security systems. At the same time, production of food staples plays equally important roles in reducing hunger and poverty and contributing to overall economic growth in the region (Diao, Headey, and Johnson 2008). This is because foodcrop production in West Africa is dominated by millions of smallholder farmers, many of whom are resource poor, who stand to benefit from increased output both for their own consumption and for earning income. Similarly, the majority of the poor in the nonfarm sector (both rural and urban areas) typically spend a large portion of their income on food, and they therefore also stand to benefit from lower food prices. Finally, the contribution of food staple production to overall economic growth in many countries in the region is driven by the sector's strong production and consumption linkages with other sectors in the economy (Delgado, Hopkins, and Kelly 1998; Diao et al. 2007).

The key challenges for agriculture in West Africa are the continued heavy reliance on traditional rainfed production systems and practices of soil fertility maintenance, as well as poor access to markets. Consequently, the presence of high production and marketing risks and limited access to rural services and institutions (credit and extension, market information) invariably contribute to limited adoption of modern inputs, such as fertilizer, improved seeds, and machinery (Crawford et al. 2006).

West African policymakers are well aware of the important role food staples, and agriculture in general, play in driving future growth and food security in the region as evident in their commitments to raising productivity and growth in the sector. For example, in aligning their own sector strategies to the CAADP agenda of the African Union/New Partnership for Africa's Development, many countries in the region have committed to an agricultural growth target of 6 percent per annum, against a historical growth rate of more than 3 percent (Table 2.1 below), in order to achieve the UN's Millennium Development Goal (MDG) of halving hunger and poverty by 2015 (vis-à-vis 1990). Additionally, at the African Union level, member states have also set a shared target of increasing fertilizer nutrient use from 8 kg/ha in 2006 (and 2008 as well) to 50 kg/ha by 2015. The key challenge now is how to make all this happen.

According to estimates by Johnson et al. (2008), to achieve the MDG of halving poverty by 2015, agriculture in West Africa will need to grow by 6.8 percent annually; and for that to happen, spending in agriculture will need to increase from $6.6 billion[3] in 2004 to $31.8 billion by 2015, translating into an

[3] All dollars ($) are in US dollars.

annual growth in spending of 20 percent or more per year. Particular attention will need to focus on increasing productivity through the adoption of yield-enhancing technologies (for example, fertilizer and improved seeds) and promoting greater integration of regional food staple markets. Simply expanding the area under cultivation is no longer a viable option in much of the region. Without replenishing the soils on current cultivated lands with nutrients, crop yields and sector growth will decline, increasing the likelihood that more people will fall into poverty. This is evident in the lackluster performance of crop yields in the region on aggregate.

Table 2.1—Average annual agricultural GDP growth rates, 1980–2009 (%)

Country	1980–1989	1990–1999	2000–2009
Cote d'Ivoire	-0.4	3.2	1.4
Cape Verde	2.7	4.2	1.6
Senegal	2.5	2.1	1.7
Togo	5.7	4.5	2.9
Niger	1.8	3.6	2.9
Gambia, The	1.2	2.2	3.0
Ghana	0.9	3.3	3.7
Guinea-Bissau	5.0	4.3	4.4
Benin	5.2	5.8	4.6
Mali	2.6	3.1	4.6
Burkina Faso	3.6	6.4	6.0
Guinea	3.7	4.4	9.3
West Africa	1.8	3.7	3.7

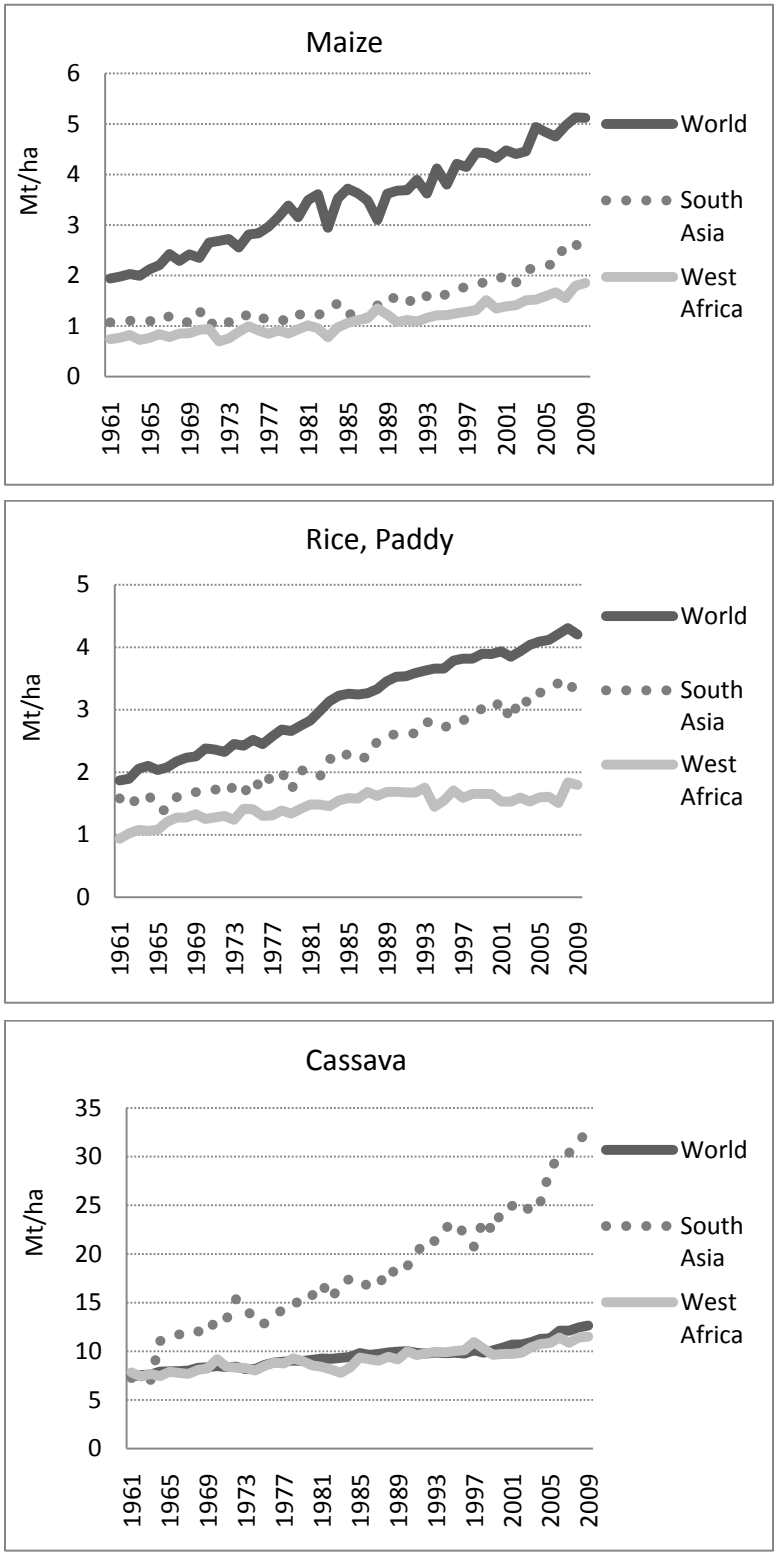
Source: Regional Strategic Analysis and Knowledge Support System (ReSAKSS), using *World Development Indicators* database.

Crop Yield Performance and Unrealized Potential

Average crop yields in West Africa are significantly lower than global averages—over one third for paddy rice and two-fifths for maize and cassava (Figure 2.1). Additionally, their rate of growth over time has barely kept up with population growth. Cereal production in West Africa increased from 14.3 million tons[4] in 1980 to 51.5 million tons in 2009, an annual growth of 4.4 percent (Table 2.2). That growth rate is marginally above the rate of population growth. However, growth in cereal production during the 1990s was lower than that of population, thereby adding to hunger and poverty. In 2000, more than 50 percent of people lived below the international poverty line ($1 per day) in West Africa.

[4] All tons are metric tons.

Figure 2.1—Crop yields by major region (maize, rice, and cassava)



Source: Author's creation based on data from FAO 2010.
Note: Mt = metric tons.

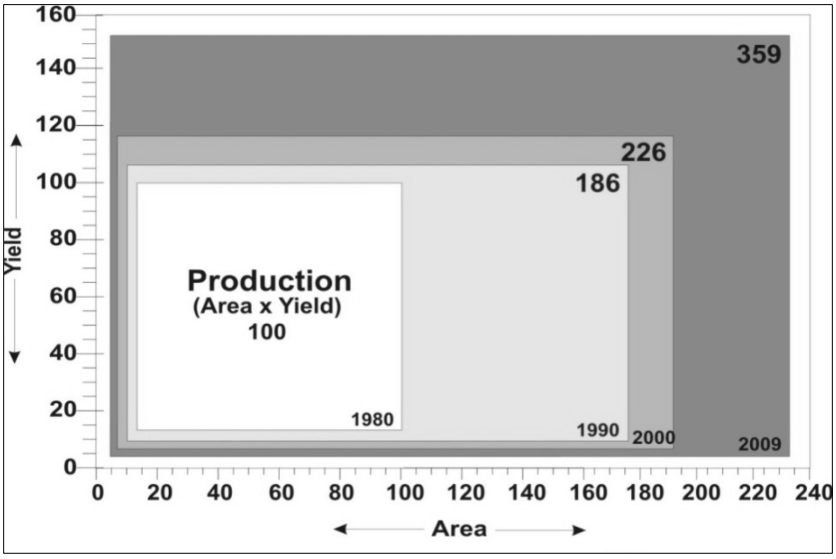
Table 2.2—Average annual growth in cereal production in West Africa, 1980–2009 (%)

	Cereals			*Cassava*		
Period	**Area**	**Yield**	**Production**	**Area**	**Yield**	**Production**
1980–1990	5.8	0.6	6.4	3.1	1.5	4.6
1990–2000	0.9	1.0	1.9	6.3	(0.2)	6.1
2000–2009	2.1	3.0	5.1	2.1	2.0	4.1
1980–2009	2.9	1.5	4.4	4.0	1.0	5.0

Source: Authors' calculations based on data in FAO 2010.

Most of the growth in cereal production has occurred from the expansion of cultivated area (Figure 2.2 below) and reduced fallow. Approximately two-thirds of production growth was accounted for by area growth and a third by yield growth. During the 1990s, growth in both area and yield was modest—1 percent or less per annum. Slow growth in production was a result of decreased input use due to high input prices resulting from devaluation, subsidy removal, and divesture of state-owned enterprises (SOEs) involved in input distribution. However, during 2000–2009, the contribution of yield (3 percent per year) was higher than that of area (2.1 percent per year). After 2000, the establishment of private-sector-based input supply systems, policy reforms in the 1990s, and incentives from rising crop prices may have contributed to efficient use of inputs and yield increases, but that has not been fully substantiated except for overall sector productivity more generally. Nevertheless, the use of improved seed and mineral fertilizer per hectare remains relatively modest. Fertilizer use in 2008 was only 8 kilograms of nutrients per hectare, and area planted under improved seed amounted to less than 25 percent. At the same time, with increasing population pressure, traditional fallow systems are becoming obsolete and organic nutrient sources (for example, crop residues) are used for other purposes, such as fuel, fodder, and roofing material.

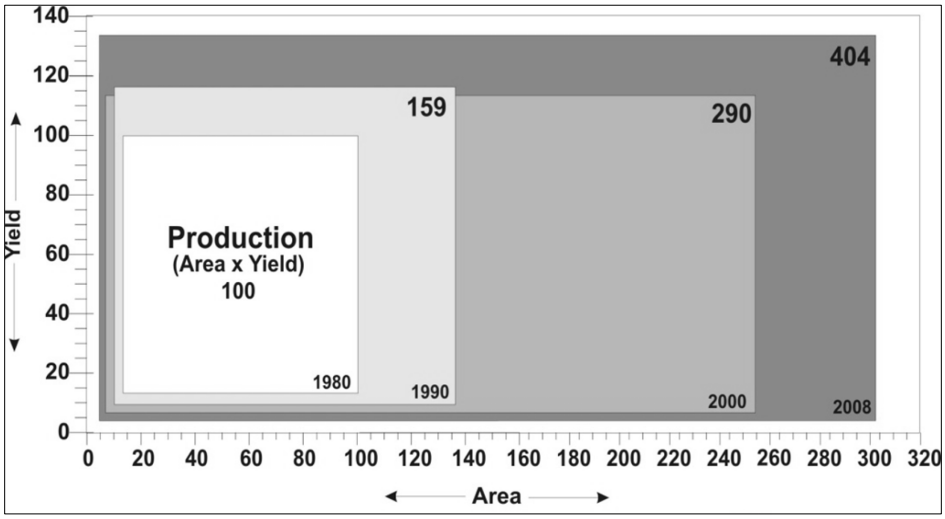
Figure 2.2—Contribution of area and yield growth to cereal production in West Africa, 1980–2009



Source: Author's creation based on data in FAO 2010.
Note: Index Numbers with 1980 = 100.

During the same period, cassava production increased fourfold—from 15.9 million tons in 1980 to 64.5 million tons in 2008—growing at an average rate of 5 percent per annum, in sharp contrast with cereals. And during the 1990s, when cereal production was growing at 1 percent per year, cassava production grew faster, at 6 percent per year, and that was despite a general decline in cassava yields. In the more recent period, as in the past, growth in cassava cultivated area remains a principle source of output growth—explaining up to 80 percent of such growth (Figure 2.3 below). Cassava yields increased by only 1 percent per year compared with 4 percent per year in area cultivated. Faced by economic hardships and high input prices, farmers may have switched from cereals to cassava. In the case of Ghana and Nigeria, availability of improved varieties and mechanization also contributed to this process (Johnson, Masters, and Peckel 2006).

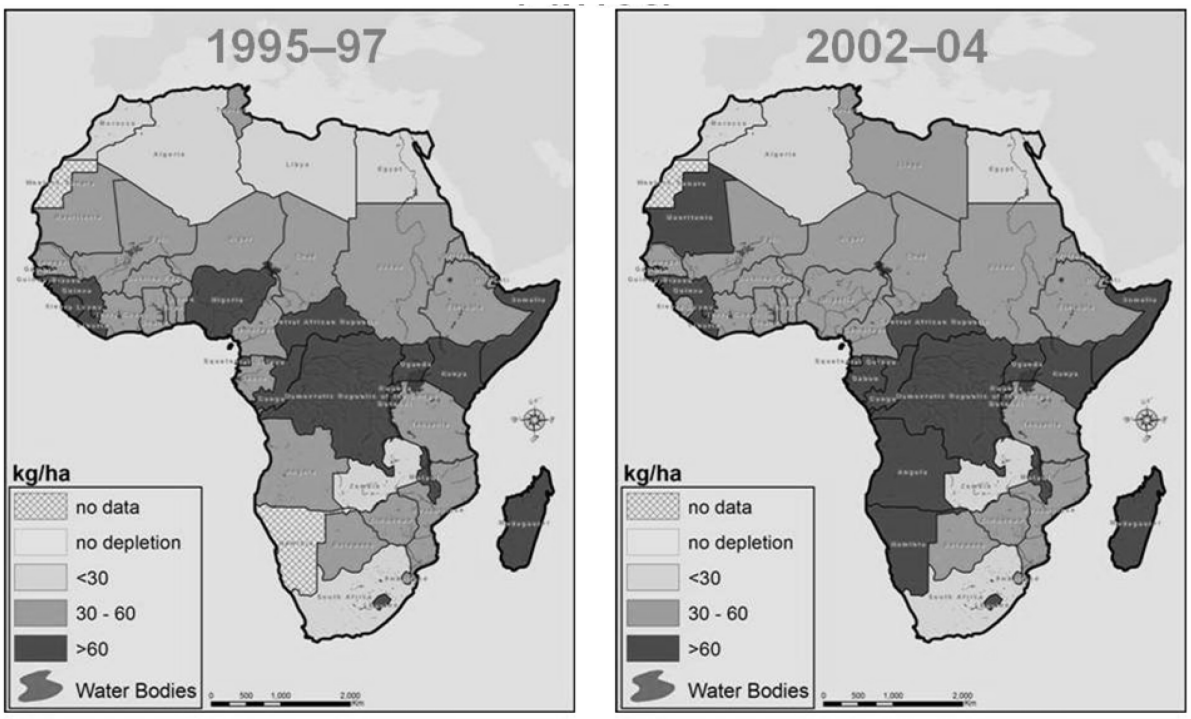
Figure 2.3—Contribution of area and yield growth to cassava production in West Africa, 1980–2009



Source: Authors' creation based on data in FAO 2010.
Note: Index Numbers with 1980 = 100.

When soils are unsuitable for cereal production, farmers generally switch to cassava production because it can be grown in low-moisture and semi-acidic soils and needs only a small quantity of phosphorus (IITA 1990). Cassava production in such marginal soils further degrades the soil: there are large exports of nutrients with the cassava tubers, and the soils become more prone to erosion. Because of limited use of nutrients supplied from external sources (mineral fertilizer), both cereal and cassava production rely heavily on nutrients supplied by the soil. Over time, nutrient depletion occurs if there is inadequate replenishment. As noted earlier, traditional fallow systems are becoming obsolete and organic sources of nutrients such as crop residues are being used for other purposes. So nutrient depletion is becoming a serious problem in West Africa and contributing to low crop yields. Estimates of nutrient depletion in the region vary, from 41 kg/ha in Senegal to 73 kg/ha in Guinea Bissau for the period 2002–2004 (Figure 2.4 and Table 2.3 below). Other estimates claim that at least half of West Africa's farmland exhibits some degree of soil erosion and nutrient mining (IFAD 2001; Drechsel et al. 2001; Koning and Smaling 2005;). As a result, the costs of nutrient depletion are high indeed, estimated to be about $4 billion per year for all of Sub-Saharan Africa (IAC 2004).

Figure 2.4—Nutrient depletion in Africa, 1995–1997 and 2002–2004



Source: Henao and Baanante (2006).

Table 2.3—Nutrient depletion in West Africa, 2002–2004

Country	Nutrient Depletion (kg per hectare)	Country	Nutrient Depletion (kg per hectare)
Benin	44	Liberia	66
Burkina Faso	43	Mali	49
Cape Verde	n.a.	Niger	56
Cote d'Ivoire	48	Nigeria	57
Gambia	71	Senegal	41
Ghana	58	Sierra Leone	46
Guinea	64	Togo	47
Guinea-Bissau	73	West Africa (average)	55

Source: Henao and Baanante 2006.

To sustain production growth for both cereals and root crops, therefore, nutrient use from both organic and inorganic sources will need to be increased. As the supply of nutrients from organic sources is limited and traditional fallow systems are no longer a viable option, nutrient supply from mineral fertilizers will need to increase severalfold, first, to sustain the soil fertility in the long run, and second, as an agricultural intensification strategy to facilitate the adoption of other yield-increasing technologies to achieve CAADP and MDG goals. The potential to realize higher yields under current available technologies exists.

If currently available technologies are adopted, there is sufficient evidence suggesting yields among all ECOWAS member countries would be well above current levels (Table 2.4 below). For many of these crops, known technologies are available on the shelf and may need only local adaptation. With the adoption of such technologies—such as improved seeds, fertilizer, water harvesting, and agronomic management practices—current crop yields have the potential to almost double for most crops. Although many research and development (R&D) efforts are ongoing in the region, more needs to be done to accelerate adoption and diffusion.

Improved seeds and better agronomic practices are essential for increasing crop productivity, but they alone will not yield significant results in nutrient-poor soils; if anything, the use of improved seeds alone will convert nutrient-poor soils into marginal soils prone to soil erosion. Although farmers should be encouraged to use all available organic sources of nutrients, relying exclusively on organic sources will not supply the nutrients needed for sustaining soil fertility and facilitating the adoption of improved seeds and other yield-enhancing technologies. Significant growth in the use of mineral fertilizers will be needed. To meet the Abuja Declaration target, fertilizer use in West Africa must increase more than sixfold (36 percent per year) during 2010–2015. Assuming that elasticity of crop production with respect to fertilizer use is 0.25, CAADP-targeted 6 percent annual growth in crop output will mandate 24 percent annual growth in fertilizer use. Achieving such growth in fertilizer use will necessitate action on both the demand side and the supply side of the market equation.

Factors Affecting Fertilizer Demand

The demand for fertilizer is a *derived* demand because it depends not only on the price of fertilizer itself but also on crop price and yield response to fertilizer, which in turn are affected by a host of underlying biophysical, socioeconomic, and policy/institutional factors that together ultimately determine fertilizer's profitability. A simple measure commonly used to determine fertilizer profitability is the value–cost ratio, defined as the ratio of output to fertilizer prices multiplied by the fertilizer response rate (that is, the amount of additional output from a unit increase in fertilizer nutrients). According to Morris et al. (2008, citing Kelly 2006), value–cost ratios in Sub-Saharan Africa typically have ranged between 1.5 for cotton and 3.4 for groundnut (Table 2.5). Ratios of 2 or greater are generally considered as the minimum required for fertilizer adoption to take place (Kelly 2006).

Table 2.4—Potential yields with improved technologies

Crop/Country	Ag. Potential (by AEZ)	Type of Technology	Without Tech. (kg/ha)[a] *(A)*	With Tech. (kg/ha) *(B)*	Yield Ratio *(B/A)*	Source
Cassava		*Average*	*12.30*	*20.95*	*1.70*	
Benin	High	Improved seed, with fertilizer	12.90	21.90	1.70	Carsky and Toukourou 2005
Nigeria	High	Improved seed	13.41	19.44	1.45	Nweke, Lynam, and Spencer 2002
Benin	High	Improved seed, with fertilizer	13.60	24.00	1.76	Zinsou et al. 2004
Benin	Med	Improved seed, with fertilizer	10.80	18.50	1.71	Zinsou et al. 2004
Rice		*Average*	*2.91*	*4.77*	*1.64*	
Cote D'Ivoire	Irrigated	Imp. weeding and irrigation, w/fert.	3.63	4.92	1.36	Becker et al. 2001
Senegal	Irrigated	Imp. weeding, irrig., w/fert. & tractor	3.85	5.69	1.48	Becker et al. 2001
Burkina Faso	Irrigated	Improved seed, with fertilizer	3.50	4.97	1.42	Yanggen et al. 1998 (c. Donovan et al. 1998)
Ghana	Irrigated	Improved seed, with fertilizer	3.29	4.98	1.52	Somado et al. 2008
Guinea	Med	Improved seed, with fertilizer	1.83	3.95	2.16	Somado et al. 2008
Mali	Med	Improved seed, with fertilizer	2.08	4.27	2.05	Somado et al. 2008
Maize		*Average*	*1.93*	*3.51*	*1.82*	
Togo	n.a.	Fertilizer	2.10	4.04	1.92	Wopereis et al. 2006
Ghana	High	Fertilizer	2.10	4.22	2.01	Yanggen et al. 1998 (c. Bonsu 1996)
Senegal	n.a.	Fertilizer	0.60	1.01	1.68	Yanggen et al. 1998 (c. Ndiaye and Sidibe 1992)
Mali	Med	Improved seed, with fertilizer	1.26	3.75	2.98	Yanggen et al. 1998 (c. Henao et al. 1992)
Sorghum		*Average*	*0.90*	*1.80*	*2.00*	
Mali	Low	Fertilizer	0.83	1.53	1.84	Aune et al. 2007
Mali	Med	Improved seed, with fertilizer	0.73	2.16	2.98	Yanggen et al. 1998 (c. Henao et al. 1992)
Senegal	Low	Fertilizer	1.14	1.71	1.50	Yanggen et al. 1998 (c. Kelly 1988)
Millet		*Average*	*0.46*	*0.81*	*1.76*	
Mali	Low	Fertilizer	0.21	0.47	2.23	Aune et al. 2007
Niger	n.a.	Improved seed, with fertilizer	0.92	1.23	1.35	Yanggen et al. 1998 (c. Bationo et al. 1994)
Burkina Faso	Low	Improved seed, with fertilizer	0.25	0.72	2.85	Yanggen et al. 1998 (c. Kambou et al. 1994)
Cotton		*Average*	*0.68*	*1.12*	*1.65*	
Mali	High	Improved seed, with fertilizer	0.82	1.31	1.59	Yanggen et al. 1998 (c. Henao et al. 1992)
Senegal	High	Fertilizer	0.87	1.00	1.15	Yanggen et al. 1998 (c. Fall and Sow 1996)
Mali	Med	Improved seed, with fertilizer	0.76	1.67	2.20	Yanggen et al. 1998 (c. Henao et al. 1992)

Source: Various sources as noted.
Note: [a] Some are local varieties, unless noted.

Table 2.5—Typical value–cost ratios of fertilizer use in West Africa

Crop	Typical	Minimum
Maize	2.8	1.5
Rice	2.4	1.6
Sorghum	1.9	1.1
Millet	2.9	0.6
Cotton	1.5	0.6
Groundnut	3.4	1.5

Source: Table 4.1 in Morris et al. 2006.

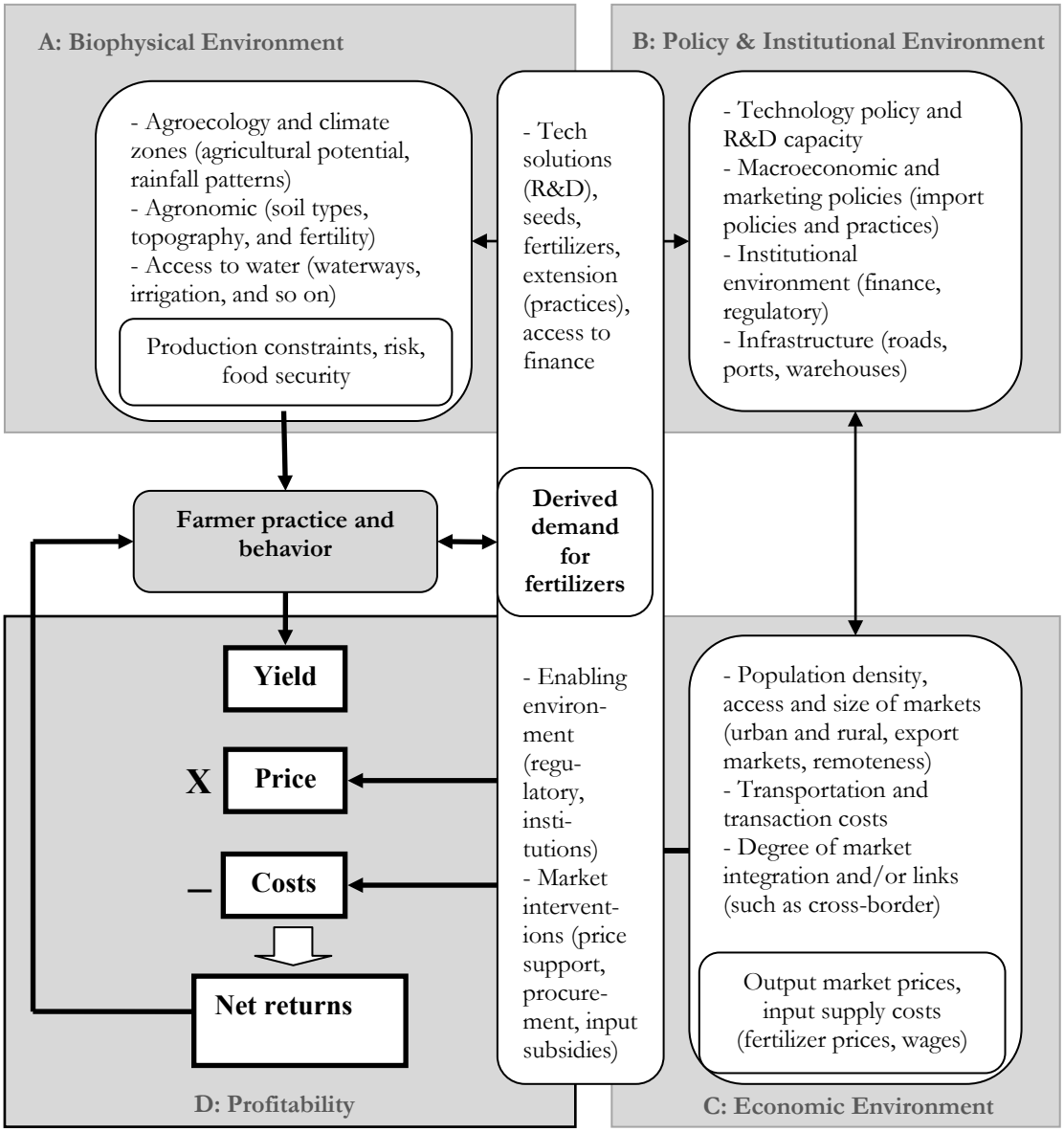
The value–cost ratio is ultimately affected by various biophysical, socioeconomic, and policy and institutional factors, as illustrated in Figure 2.5 below. First, Box D shows how the use of fertilizer is derived by on-farm profitability (yield response, output prices, and production costs), which in turn is affected by a number of broad environmental conditions: biophysical (Box A), socioeconomic (Box C), and the policy and institutional environment (Box B).

Biophysical Constraints

One important obstacle to promoting fertilizer demand, and improved technologies in general, in West Africa is the diversity of biophysical conditions (Box A, Figure 2.5) within and across countries, which in turn results in a wide range of distinctive farming systems, production constraints, and yield performance. For example, as one moves from the south to the north in much of the region, the amount of annual rainfall decreases while its variability and uncertainty increase, thereby contributing to higher production uncertainties and risks associated with using purchased inputs such as fertilizer. Plants need an adequate supply of moisture for nutrient uptake and crop growth. Technology uptake in the more semiarid areas, therefore, is likely to be more successful if it goes hand in hand with water harvesting and irrigation development (Shapiro and Sanders 1998). On the other hand, in the more humid and semihumid ecologies in the south—which have an adequate supply of moisture from rainfall and are thus often suitable for tree crops (such as cocoa, coffee, oil palm, and rubber) and mixed cropping systems (root and cereal crops)—protection against pests and insects is critical.

In all the agroecosystems, as fallow systems have shrunk in duration due to population pressures, the limited application of nutrients poses a serious constraint to crop productivity growth while threatening the sustainability of the natural resource base. As demonstrated in a study IFPRI undertook for the West and Central African Council for Agricultural Research and Development (CORAF/WECARD), overcoming many of the key biophysical constraints facing the region can dramatically increase yields (Johnson et al. 2008).

Figure 2.5—Conceptualizing the farmer's derived demand for fertilizer



Source: Adapted from Figure 1 of Crawford et al. 2003.

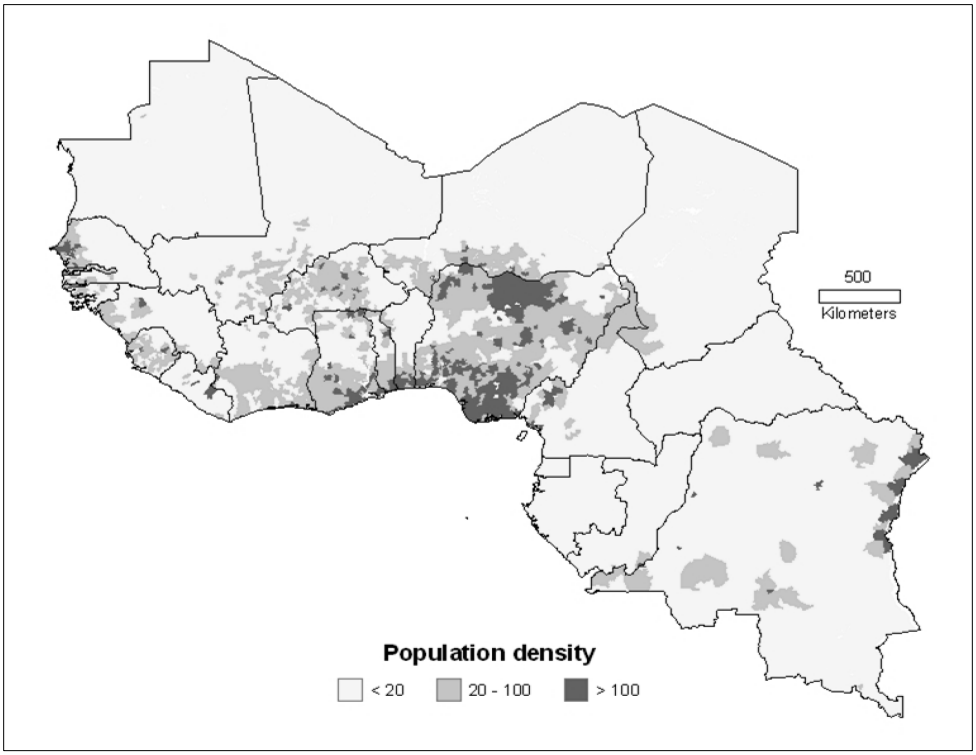
Socioeconomic Constraints

The biophysical conditions for agriculture in West Africa are only a strong indicator of the sector's absolute potential. It does not tell us the extent to which that potential can be realized by its economic comparative advantage (Johnson et al. 2008). Socioeconomic factors (both price and nonprice factors) affect the degree to which agriculture can become a viable commercial activity for generating income and employment (Box C, Figure 2.5). Expensive inputs are typically a primary constraint to intensive agriculture and fertilizer adoption. For example, a study by Abdoulaye and Sanders (2005) in Niger shows the fertilizer-to-millet price ratio as a key determinant of fertilizer adoption. However, nonprice factors can matter a great deal, too. In fact, a low response to fertilizer prices in some cases simply reflects a lack of access to fertilizer or to credit and cash (Larson and Frisvold 1996; Abrar, Morrissey, and Rayner 2004). In such cases, therefore, the binding constraint is simply access.

In seeking to explain the socioeconomic dynamics of transforming from a subsistence-oriented production system (one that relies heavily on traditional labor and land inputs) to a more intensified system (one that relies on improved technologies and purchased complementary inputs such as inorganic fertilizers), Hayami and Ruttan (1985) offer a useful theoretical framework referred to as the *induced innovation theory.* According to the theory, as land becomes scarce with population growth, farmers reduce soil-conserving land use practices such as fallow. Farmers may also adopt improved technologies, such as high-yield seed varieties, inorganic fertilizer, and irrigation methods. However, for this to occur, other factors also become relevant, including the cost and availability of capital, credit, fertilizer, and extension services (Feder, Just, and Zilberman 1985). These in turn are affected by the degree of access to markets, rural services, and basic infrastructure for selling their surplus, accessing information, and purchasing inputs (Binswanger and Pingali 1988).

As Figure 2.6 shows below, the most densely populated areas are found primarily in the coastal areas, particularly in Nigeria and clustered around major urban centers. Population densities are far lower in much of the Sahel except around major urban centers and along the Niger River. Building on Hayami and Ruttan's hypothesis, a general observation is that areas with higher population densities and higher agricultural potential are more likely to often have a higher concentration of agricultural commercial activities. These are areas in proximity to major population centers with stronger production-to-market linkages, and farmers here are therefore more likely to purchase inputs and use improved technologies.

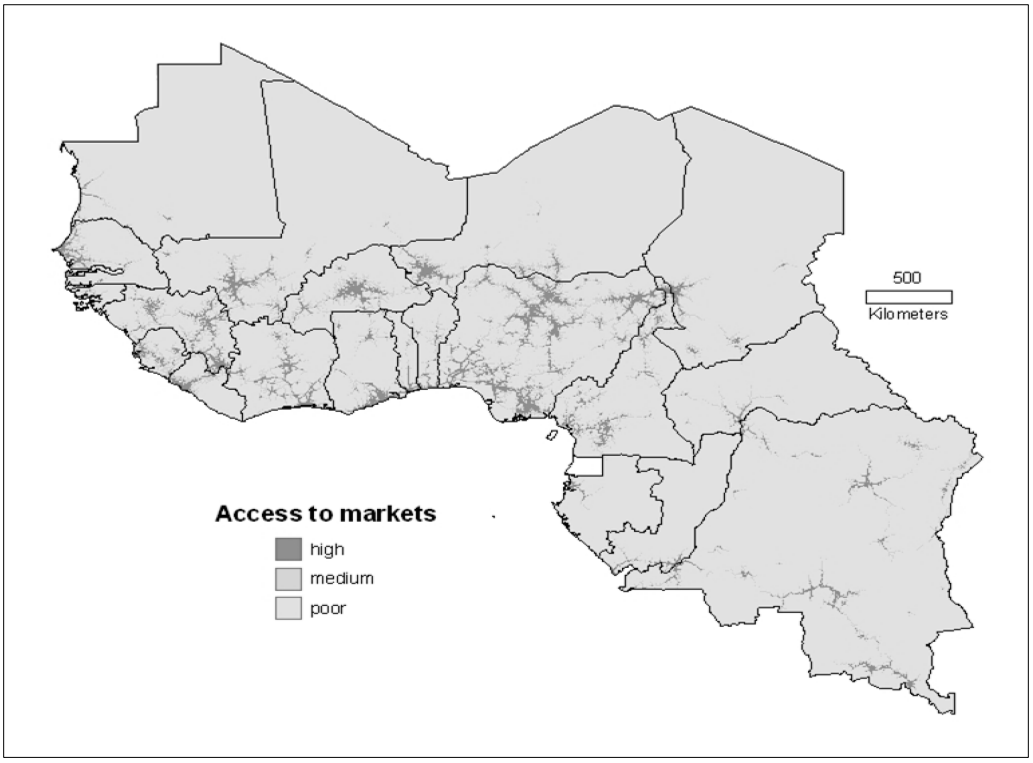
Figure 2.6—Population densities in western and central Africa



Source: Johnson et al. 2008.

For market access, measured as travel time, there is significant variation but a strong correlation with population density (Figure 2.7).[5] Not surprisingly, access to markets tends to be strong in densely populated areas—along major trade corridors and rivers, or near large urban centers where a significant scale of economic activity takes place.

Figure 2.7—Market access in western and central Africa



Source: Johnson et al. 2008.

All in all, removing constraints to expanded trade and access to input supplies will be fundamental for accelerating growth in food production, and ultimately, economic growth and poverty reduction. Already, the region as a whole has become a net importer of food over time (especially rice and livestock products). The growing demand for these products means there is a ready market for an increase in supply provided constraints separating and fragmenting country markets are removed to create a unified West Africa regional market for inputs and outputs. Some of the key constraints are low adoption of technology, underdeveloped rural infrastructure and financial markets, restricted trade policies, nonintegration of regional markets, and limited access to markets by smallholder farmers.
There is potential to reverse these trends. For example, as long as food imports expand rapidly with population growth and urbanization, domestic food production systems have the potential to tap into those growing markets (Diao and Hazell 2004). Fortunately, signs suggest the region is already moving in that direction. Intraregional trade in agricultural commodities is approaching 12 percent of total exports, and ECOWAS and the West African Economic and Monetary Union (UEMOA) have vigorously promoted greater regional economic integration among their member states.

[5] Based on Johnson et al. (2008). Travel times to targeted market locations were estimated using a model that jointly assesses information on road location and quality, slope, and off-road land cover. High market access was defined as a condition wherein rural inhabitants were found to be within four hours of travel from major seaports or large cities of 500,000 or more inhabitants (for international trade routes), within two hours of towns of 100,000 or more, or within one hour of towns of 10,000. Areas of medium access were defined as those within six hours of large cities, within four hours of large towns, or within two hours of smaller towns. All other locations were considered as low access.

Policy and Institutional Constraints

Finally, policies and institutions (Box B, Figure 2.5) are instrumental in helping to provide an enabling environment for increased productivity and market development, and in particular, incentives to use fertilizer and other improved technologies. For example, increased investments in agricultural R&D to offer higher-yielding seed varieties together with interventions to promote greater access to markets, extension, and finance can result in greater use of fertilizers.

An uncertain or inconsistent policy environment can give wrong signals to both farmers and traders in the market and thereby add to transaction costs. The presence of weak institutions also increases transaction costs due to coordination failures (Dorward et al. 2004). In cash crop production systems, for example, the use of interlocking contracts between farmers (or farmer groups) and buying firms has played an especially important role in improving market coordination mechanisms. The contracts provide farmers with access to credit, fertilizer, and seeds under the guarantee that they sell the output produced to the firm. Some good cropping examples are cocoa in Ghana, cotton in Mai, and groundnut in Senegal. For the majority of smallholders producing staple foodcrops such interlocking arrangements are nonexistent, and thus they face higher transaction costs in accessing fertilizer. Where improvements have been made in linking with better-integrated supply chains (such as through farmer organizations, producer associations, or cooperatives), they have been shown to increase farmer access to input and output markets (Haggblade and Hazell 2010).

Importance of Supply-Side Factors

As shown in the previous section, one factor undermining the derived demand for fertilizer and other improved technologies in West Africa is their limited affordability and farmers' poor access to markets and services. As we show in the next section, even where market access has been high, the use of purchased inputs such as fertilizer can be easily undermined by supply-side distortions that contribute to high fertilizer prices. As the primary focus of this paper, we will examine such distortions in more detail and suggest ways in which the supply of fertilizer may be improved through greater regional market development and integration, including the creation of a common fertilizer market for West Africa.

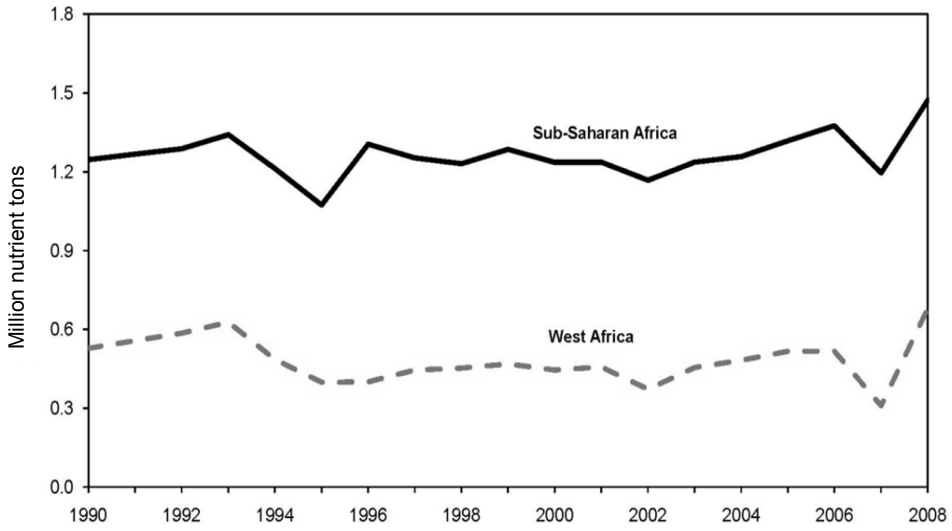
3. TRENDS IN FERTILIZER CONSUMPTION, PRODUCTION, AND TRADE

As noted in the previous section, the derived demand for fertilizer is interlinked with both biophysical and socioeconomic factors as well as policy environments. Many of these factors along with high prices have induced lower fertilizer demand in West Africa and affected market performance. In this section, we trace the trends of fertilizer consumption, production, and trade in order to gain an understanding of the size and growth potential of current fertilizer markets in the region.

Fertilizer Consumption

To begin with, fertilizer consumption in West Africa has changed little over the past two decades (Figure 3.1). During the 1990s, it actually decreased—from 525,000 nutrient tons in 1990 to 445,000 in 2000. Although consumption had rebounded by 2005 (reaching 516,000 nutrient tons), it eventually dropped again to a mere 309,000 tons by 2007. The dramatic reduction was a result of rising prices that culminated in record levels during the global food and fertilizer crisis of 2008. That crisis forced governments to quickly introduce support and subsidy measures to avert a food security crisis that could possibly lead to food riots and political instability. As a result fertilizer use actually increased to 678,000 tons in 2008—a 119 percent increase from the 2007 level and a 31 percent increase from the 2005 level.[6]

Figure 3.1—Total fertilizer (NPK) consumption trends in Sub-Saharan Africa, 1990-2008

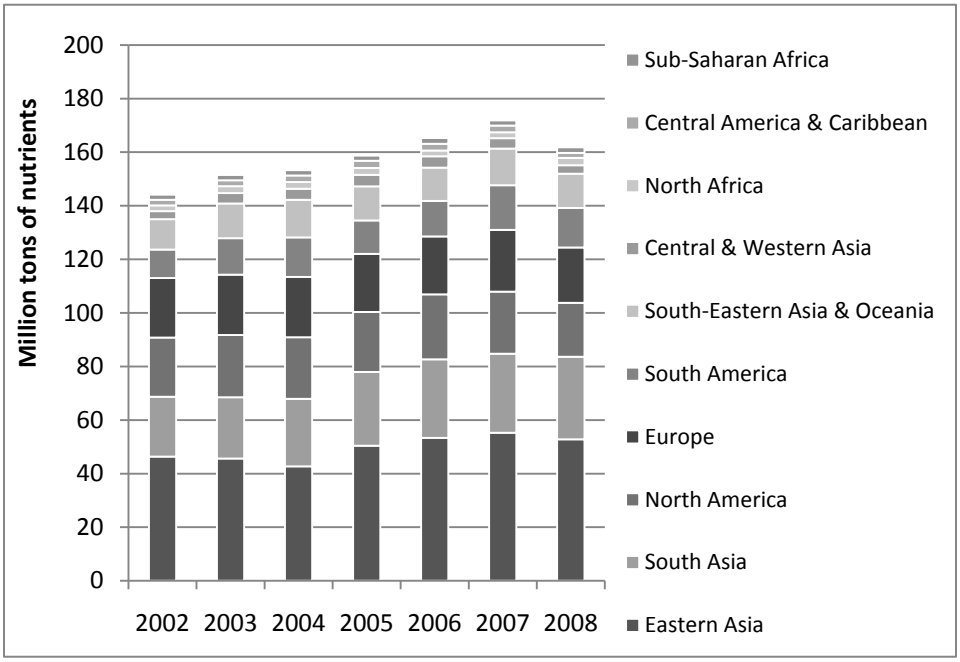


Source: Derived from FAO 2010.
Notes: NPK is Nitrogen, Phosphates and Potash. Tons are metric tons.

Altogether, West Africa accounts for a very small share of the global fertilizer market—a mere 0.4 percent in 2008. During the same year, it made up 14 percent of the African market but almost half of the Sub-Saharan African market (46 percent). Sub-Saharan Africa as a whole accounted for only 1 percent of the global fertilizer market (Figure 3.2). The countries of East and South Asia are responsible for almost 50 percent of global consumption—more than 80 million tons per year (dominated by China and India). The Americas and Europe consume another 30 percent.

[6] See Section 4 for details on fertilizer subsidies and their impact on fertilizer use.

Figure 3.2—Global fertilizer consumption by major region, 2002–2008



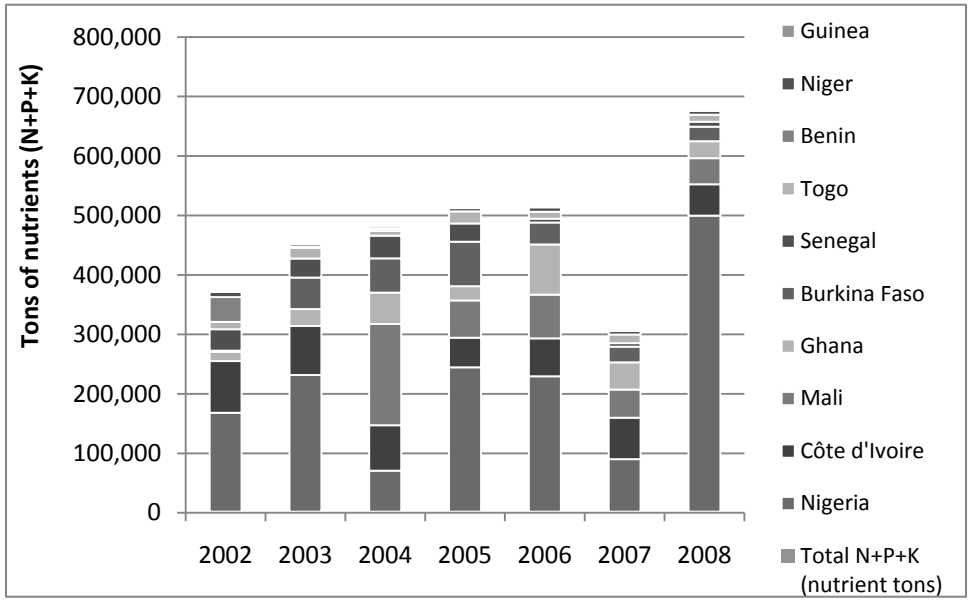
Source: Derived from FAO 2010.
Notes; Tons are metric tons.

At the country level, the size of the market becomes even smaller in the global context. Nigeria accounts for the bulk of fertilizer consumption in the region (more than half, 54 percent based on three year average between 2006 and 2008), but that is far below the levels seen in Brazil, Indonesia, or South Africa, not to mention India, China, or the United States. Cote d'Ivoire, Mali, and Ghana together account for another 34 percent (Figure 3.3). In 2008, Nigeria consumed 498,000 tons and Cote d'Ivoire 53,000 tons. The rest used less than 50,000 tons each—several of them less than 10,000 tons. Liberia and Sierra Leone may have used less than 1,000 tons each.[7]

Such small consumption levels translate into very low fertilizer use intensities in the region—in terms of the amount applied per hectare of cultivated land. The average in the West Africa region is about 8 kg/ha (which is similar to the rest of Sub-Saharan Africa). This is much lower than the global average of 107 kg/ha, and even more so when compared with South Asia and South America (Figure 3.4). Such low levels of fertilizer use are insufficient to replenish the nutrients removed by harvested crops, much less to promote the adoption of improved seeds.

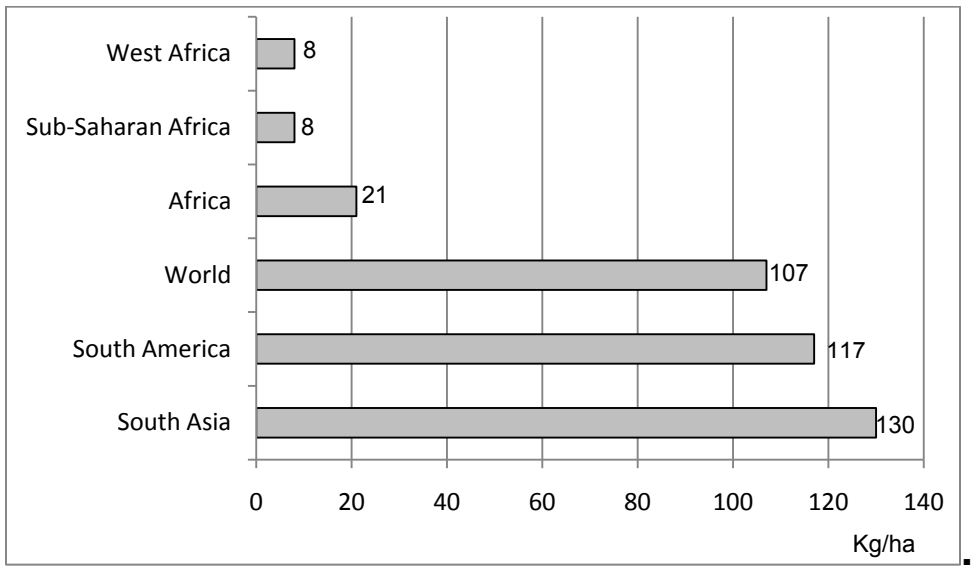
[7] No reliable data are available for these countries. An IFDC assessment of input markets in these countries reported small quantities of fertilizer used in 2007. During the periods of political instability and war, input markets were nearly destroyed.

Figure 3.3—Fertilizer consumption in West Africa, 2002–2008



Source: Derived from FAO 2010.
Notes: Tons are metric tons. NPK is Nitrogen, Phosphate and Potash.

Figure 3.4—Fertilizer use (kg/ha) in major regions of the world, 2008–2009



Source: Author's calculations based on data in FAO 2010.

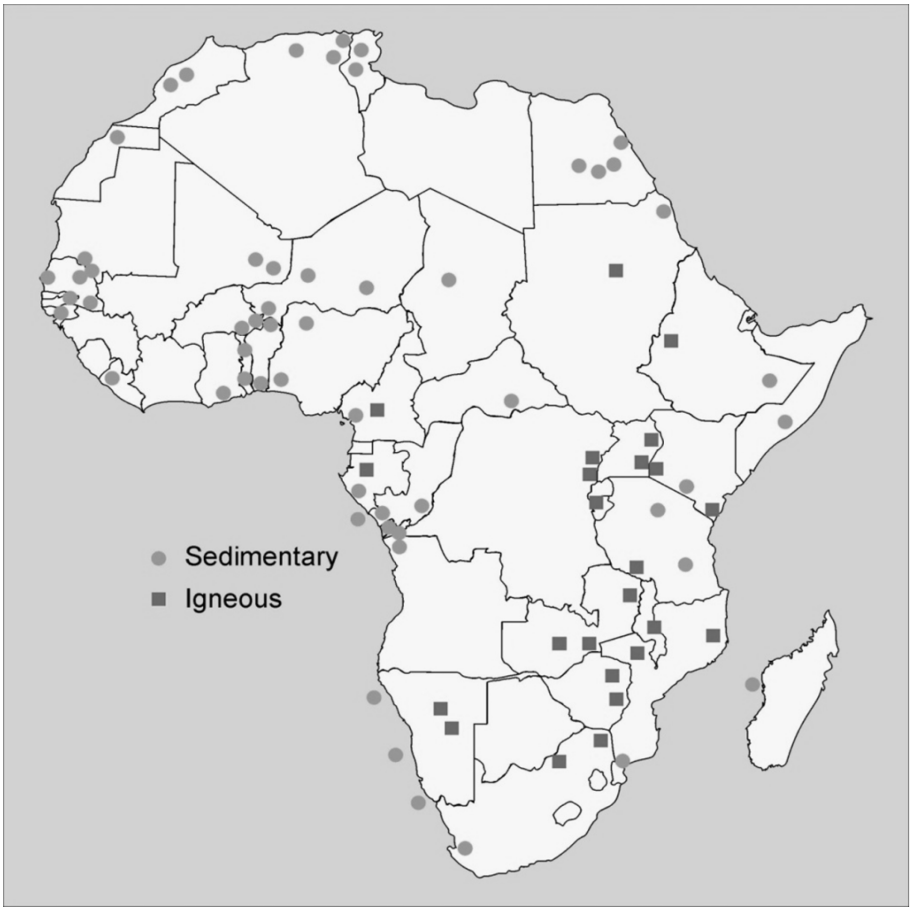
Complementary to the low intensity of fertilizer use in the region is the low rate of adoption of improved seeds and use of irrigation. Evenson and Gollin (2003) estimated adoption rates of improved seed on 24 percent of the cultivated area on average and way below the averages in South Asia, for example (about 45 percent). Irrigation use is limited to a mere 4 percent of cultivated area relative to almost 40 percent in South Asia (World Bank 2007). These observations stress the important link between fertilizer use and broader incentives associated with agricultural intensification discussed in Section 2.

Because the fertilizer industry is capital intensive and exhibits economies of scale in production and procurement, the small domestic fertilizer markets cannot take advantage of economies of scale other regions in the world enjoy. Indeed, there is potential to strive toward taking advantage of any economies of scale to be had from creating a common regional fertilizer market in West Africa. This becomes even more imperative if the region wishes to expand its own capacities to produce and procure fertilizer.

Fertilizer Production

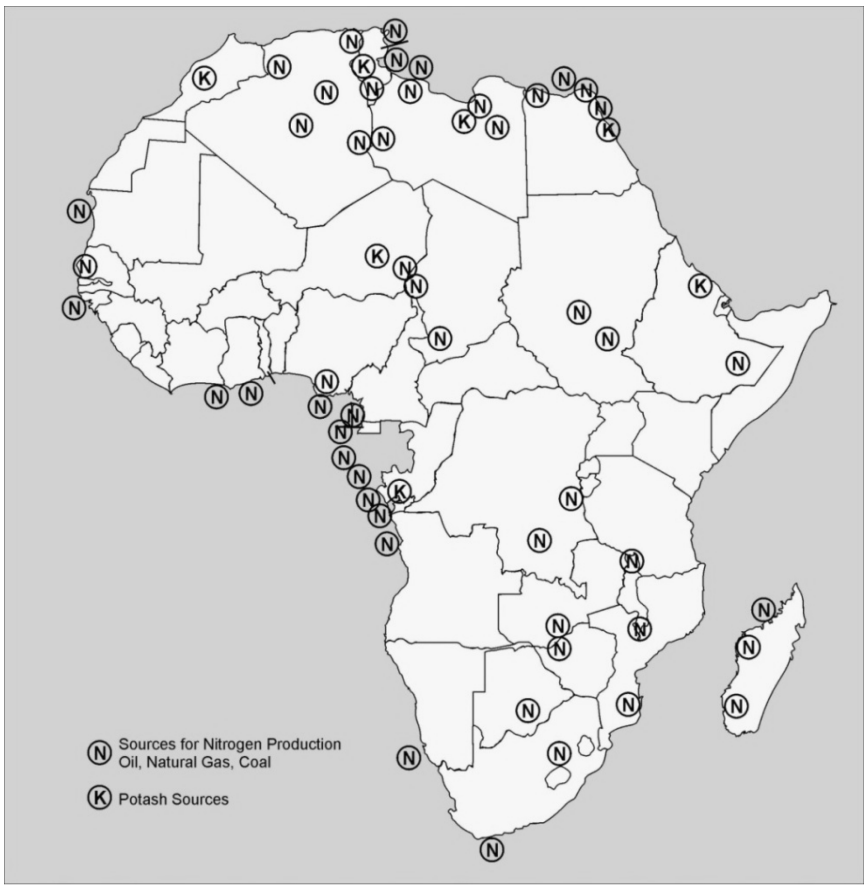
West Africa is endowed with natural gas and phosphate rock reserves (IFDC 2006). Mali, Senegal, Togo, Niger, and Burkina Faso have phosphate rock deposits, whereas Ghana, Nigeria, and Guinea have natural gas deposits (Figures 3.5 and 3.6). However, only two countries, namely Nigeria and Senegal, have developed these resources for fertilizer production, and only one, Togo, has developed its phosphate rock resources for export. Mali is developing Tilemsi phosphate rock for direct application as well as for fertilizer production, and Ghana is exploring the possibility of building ammonia urea plants based on its newly found natural gas reserves.

Figure 3.5—Phosphate deposits of Africa



Source: IFDC 2006.

Figure 3.6—Sources of nitrogen and potash in Africa



Source: IFDC 2006.

During the early 1990s, West Africa produced 394,000 tons of fertilizer nutrients per annum (Figure 3.7 below). Fertilizer plants in Nigeria (the Nitrogen Fertilizer Company of Nigeria, or NAFCON) and Senegal (Industries Chimique du Senegal, or ICS) contributed most to this production. However, a gradual decrease in capacity use (caused by financial and technical constraints) at both NAFCON and ICS plants induced a declining trend in fertilizer production. In 2000, only 52,000 tons were produced in the whole of West Africa, and by 2008, still less than 100,000 tons of nutrients were produced. If in 2011 both NAFCON and ICS plants run at full capacity, they can again potentially produce more than 300,000 tons of nutrients.

Figure 3.7—West Africa: Fertilizer Production, 1990/91-2008/09

Source: Based on data in FAO 2010.

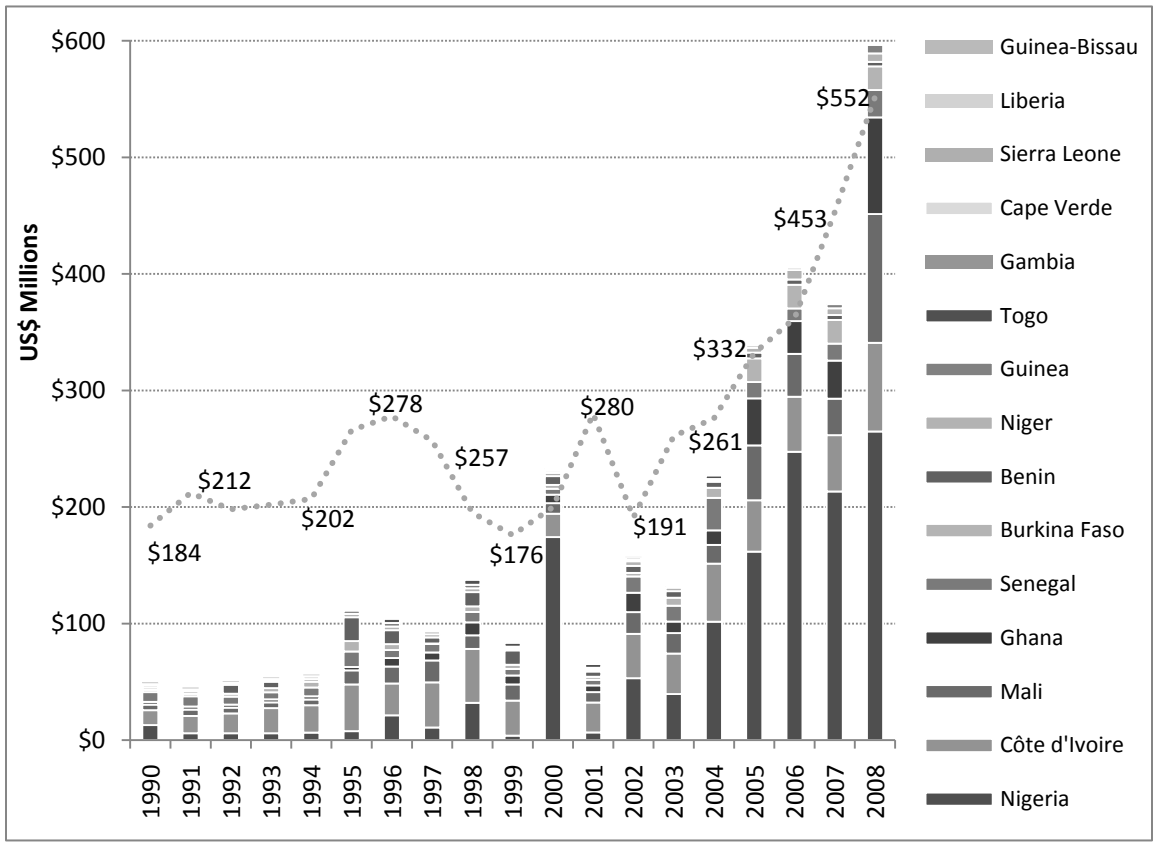
Although West Africa is endowed with natural gas and phosphate rock, it has not been able to convert these resources into production facilities due to the small size of the market, huge capital requirements, high energy and transportation costs, underdeveloped infrastructure, and management and operational inefficiencies. Nevertheless West Africa has invested in blending plants for producing blended NPK (nitrogen, phosphorus, and potassium) products based on imported straight fertilizers such as urea, diammonium phosphate (DAP), triple superphosphate (TSP), single superphosphate (SSP), and muriate of potash (MOP). Blending plants are available in Nigeria, Ghana, Mali, and other countries. However, because of limited growth in fertilizer consumption, even the blending capacity is not fully utilized. Approximately a third of the blending capacity was under utilized in Nigeria in 2009.

Fertilizer Trade

With limited production in the region, fertilizer trade plays an indispensable role in satisfying fertilizer requirements. Urea, DAP, MOP, TSP, and NPK (both granulated and blended) are imported in the region. Several specialized NPK products are imported or blended for cotton, cocoa, coffee, and horticultural crops. A plurality of NPK products have fragmented the market and added to costs of import and distribution. Trends in fertilizer imports, therefore, closely reflect the trends in fertilizer consumption. Very little fertilizer is re-exported from the region.

Overall, the trend in the value of imports over time has crept upward (Figure 3.8). All countries saw an increase in the value of fertilizer imports starting in 2002, when global fertilizer prices began to rise, and peaking in 2008. In 2002, imports of total NPK fertilizers were valued at about $150 million. By 2008, that had reached almost $600 million—a period when the world price of urea increased fourfold. Nigeria, for example, imported more than $250 million worth of fertilizers in 2008 compared with $50 million six years earlier. Increases in fertilizer use also contributed to this trend.

Figure 3.8—Value of NPK (total Nitrogen, Phosphate and Potash) imports in West Africa (1990–2008)

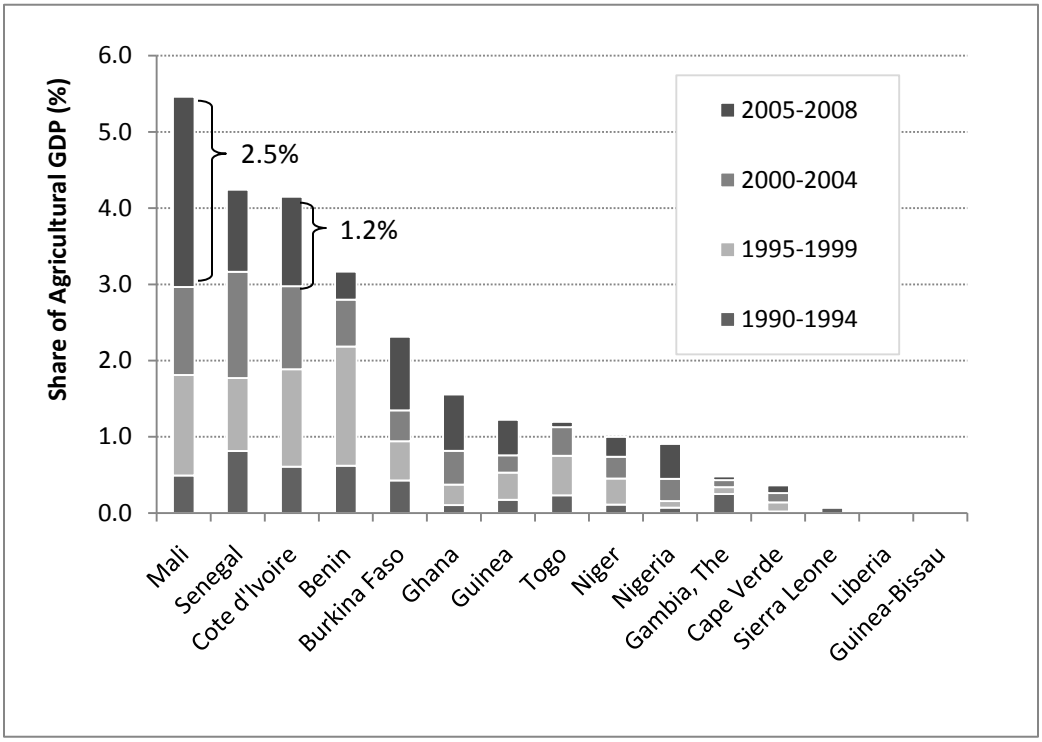


Source: Author's creation based on data from FAO 2010.

The share of fertilizer imports to the value of agricultural production can help paint a broad picture of the intensity of fertilizer use across countries in the region. Figure 3.9 shows Mali, Senegal, and Cote d'Ivoire consistently maintaining the highest shares, at 1% to 2%, between 1990 and 2008. In other words, on average these countries spend a higher proportion of their earnings from agricultural production on fertilizer imports.[8]

[8] Benin used 29,600 tons of nutrients during 2008/09 as per IFDC's MIR Plus project database. However, it was not reported in the FAO dataset, leading to a zero amount spent on imports.

Figure 3.9—Share of fertilizer imports to agricultural GDP, value of total imports of N+P+K



Source: Calculated from FAO 2010 and World Bank 2010.
Note: N = Nitrogen, P = Phosphates, and K = Potassium

Traditionally, export crops, such as cotton, cocoa, and groundnut, have dominated fertilizer use in West Africa. Over time, however, cereals (maize, sorghum/millet, and rice, in particular) have come to dominate. The expansion in horticulture crops has also contributed to increasing imports of specialty fertilizer products (as in cotton). Across Sub-Saharan Africa, maize accounts for 26 percent of fertilizer use (Table 3.1). In total, 64 percent of the region's fertilizer use is devoted to staple foodcrops.

Table 3.1—Fertilizer use by crop in Sub-Saharan Africa, 2002

	Fertilizer Use ('000 tons, $N + P_2O_5 + K_2O$)	Percent Share of Total (%)
Food staples		
Maize	160.5	26.0
Sorghum/millet	107.8	17.4
Rice	49.7	8.0
Cassava/taro/yam	32.3	5.2
Pulses	25.5	4.1
Potato	18.9	3.1
Subtotal	*394.7*	*63.9*

Table 3.1—Continued

	Fertilizer Use ('000 tons, N + P_2O_5 + K_2O)	Percent Share of Total (%)
High value (inc. export crops)		
Wheat and barley[a]	67.1	10.9
Cotton	35.1	5.7
Vegetables	26.4	4.3
Tobacco[a]	19.8	3.2
Coffee	17.8	2.9
Fruit crops	17.1	2.8
Groundnut	11	1.8
Tea[a]	9	1.5
Sugar cane[a]	7	1.1
Oil palm	2.8	0.5
Soybean	2.5	0.4
Others	7.6	1.2
Subtotal	*223.2*	*36.1*
Total	*617.9*	*100.0*

Source: Adapted from Table 7 in FAO 2006, which cites an earlier FAO (2002) study.
Note: [a] These high-value crops are mostly grown in southern and/or eastern Africa.

One of the critical challenges facing the region is the high degree of economic inefficiencies brought about by individual countries importing their own fertilizer blend specifications and specialty products. A well-known example is the cotton formula: Although cotton-producing areas of different countries are often contiguous and biophysically similar, due to country-based regulations, they use different cotton formulas (NPK products), with artificial product differentiation (Table 3.2). Harmonizing the cotton formula to the extent appropriate could potentially generate substantial savings in procurement and distribution (see Table 6.2 for details).

Table 3.2—Dominant cotton formulas used in West Africa

Country	Company	Formula N-P_2O_5-K_2O-S-B
Mali	CMDT	14-22-12-7-1
Benin	SONAPRA	14-23-14-5-1
Burkina Faso	SOFITEX	14-23-14-6-1
Togo	SOTOCO	12-20-18-5-1
Cameroon	SODECOTON	15-20-15-6-1
Cote d'Ivoire	CIDT	15-15-15-6-1

Source: Gregory and Bumb 2006.

4. FERTILIZER POLICIES AND SUPPLY CHAINS IN SELECTED COUNTRIES

In Section 3 we discussed trends in fertilizer consumption, production, and trade in West Africa and concluded that the market at the country level is too small to realize economies of scale in production and procurement and that fertilizer use levels are low, even to sustain soil fertility, much less to encourage the adoption of yield-enhancing technologies. We also suggested that policymakers and development partners should continue to strive to create a common fertilizer market in West Africa to promote increased and efficient use of fertilizers by reducing transaction costs and improving the efficiency and effectiveness of markets.

To set the stage for the creation of a wider regional market, and with the aim of identifying constraints and distortions affecting the functioning of the fertilizer markets and suggesting suitable measures for their removal, in this section we assess existing fertilizer policies and supply chains at the country level in selected countries.

As mentioned in Section 1, we selected four countries—namely, Ghana, Mali, Nigeria, and Senegal—for an in-depth analysis of issues affecting fertilizer demand and supply at the country level. The policy environment and the supply chain in each country are summarized in this section.[9] Table 4.1 below provides details on market size, key actors, and main constraints in each country.

Fertilizer Policy and Supply Chain in Ghana

Size of the Market

The fertilizer market in Ghana is the fourth largest in West Africa—after Nigeria, Cote d'Ivoire, and Mali. In 2009, Ghana imported and used 218,000 tons of fertilizer products; yet its fertilizer use intensity was very low at 4 kg/ha of nutrients in 2008, in contrast to 58 kg/ha of nutrients being removed by harvested crops. The main products imported and used were urea, ammonium sulfate (AS), DAP, NPK 15-15-15, and other NPK products and blends. More than 50 percent of fertilizer products are used on cash crops like cocoa, cotton, sugarcane, oil palm, pineapple, and horticultural products, and the remainder is used on foodcrops such as maize, rice, sorghum, millet, and beans.

In spite of a fourfold increase in global fertilizer prices during the food and fertilizer crisis of 2007–2008, fertilizer use decreased marginally in 2008 and registered more than a 50 percent increase in 2009, mostly attributable to a subsidy on various fertilizer products in the range of 32 to 52 percent (averaging 45 percent) of the price paid by farmers (Table 4.2). The Government of Ghana financed 107,000 tons of products under the subsidy program.

[9] See Fuentes, Bumb, and Johnson (2010a, 2010b, 2010c, 2010d) for details on each of the individual country case study reports.

Table 4.1—Key actors and constraints in the fertilizer markets in West Africa

Country/Actors	Ghana	Mali	Senegal	Nigeria
Key importers	Yara/Wienco, Chemico, Golden Stork, and Dizengoff	Yara/Hydrochem, Toguna Agro Industries, and La Cigogne/SCPA-SSI	La Cigogne, Bolton, TSE, and AGROPHYTEX	Golden Fertilizers, Notore, and Tak Continental; plus 10–12 small importers
Main ports	Tema and Takoradi	Dakar (Senegal) and Abidjan (Cote d'Ivoire)	Dakar	Lagos
Wholesalers	15–20	10–15	5–7	20–30
Retailers/stockists	2,700	300 co-ops/producer orgs. (POs)	Small number	4,000
Market size (2008/09)	218,000 product tons	150,00 product tons	73,000 product tons	600,000–800,000 product tons
Fertilizer use intensity (kg/ha)	4	7	7	12
Market structure	Oligopolistic at import level, and competitive at wholesale and retail levels	Oligopolistic at import level; tendering by apex POs and distribution by co-ops in cotton/maize and rice sectors; a few retailers for farmers not served by POs	Tender-controlled oligopolistic; supplier-managed warehouse-based distribution; 85% government/SOE controlled for cereals and cotton smallholders; 15% private sector based for commercial crops	Tender-controlled, subsidy oriented—80% of the market; 20% private sector/large-scale farms. Policy-constrained at all levels—import, wholesale, and retail levels; state-controlled organizations like ADPs do distribution at the retail levels
Urea price (US$/ton)				
• **Import price (CIF)**	366.42	404.20[a]	391.12	371.30
• **Retail price**	685.96	620.112	612.52	648.30
• **Marketing margins**	84.20	52.20	52.80	56.00
Key constraints	• Poor implementation of subsidy policy • Limited access to finance; interest rates 30%–35% • Ineffective enforcement of quality regulation • Inefficient port operations • Limited human capital • Outdated fertilizer recommendations	• Long, overdrawn tendering system • Limited access to finance; interest rates 8%–15% • No labs for product testing and quality enforcement • In-transit transport cost and taxes • Underdeveloped retail networks • Outdated fertilizer recommendations	• Subsidized government-controlled market • Limited access to finance; interest rates 12%–20% • No quality control system • Underdeveloped retail networks	• Uncertain and inconsistent policy environment • Different subsidy regimes at federal, state, and local government levels • Ineffective regulatory system • Inefficiencies at the port • Underdeveloped agrodealer system

Source: Authors, from in-country surveys.
Notes: CIF = cost, insurance, and freight; ADPs = agricultural development projects;
[a] Includes $79.40 for in-land transportation from the port of entry in Dakar or Abidjan to Bamako.

Table 4.2—Fertilizer subsidy (coupon value) by product and regions in Ghana, 2009

Product /	Urea		SA		NPK 15-15-15		NPK 23-10-5	
Region	Coupon Value [a]	% of Total Price	Coupon Value	% of Total Price	Coupon Value	% of Total Price	Coupon Value	% of Total Price
Northern	$9.2	33%	$10.6	45%	$20.6	53%	$19.2	53%
Upper East	$9.9	35%	$11.4	47%	$21.4	53%	$19.9	54%
Upper West	$9.4	34%	$10.8	46%	$20.8	53%	$19.4	53%
Central	$8.3	31%	$9.8	43%	$19.8	52%	$18.3	52%
Eastern	$8.9	32%	$10.3	44%	$20.3	52%	$18.9	52%
Brong Ahafo	$8.9	32%	$10.3	44%	$20.3	52%	$18.9	52%
Western	$8.6	32%	$10.1	44%	$20.1	52%	$18.6	52%
Greater Accra	$7.9	30%	$9.4	42%	$19.4	51%	$17.9	51%
Volta	$8.9	32%	$10.4	45%	$20.4	52%	$18.9	52%
Ashanti	$8.4	31%	$9.9	43%	$19.9	52%	$18.4	52%
Averages	$8.8	32%	$10.3	44%	$20.3	52%	$18.8	52%

Source: Fuentes et al. 2010a.
Note: [a] The exchange rate considered for estimating the coupon value and the product price is 1.4 GHC to US$1.00.

Ghana phased out all subsidies on fertilizers in 1988, and there were no subsidies until 2008 when global fertilizer prices skyrocketed and threatened the gains in food production. To keep food production from falling, the government introduced fertilizer subsidies in July 2008, although that was a little late for the southern districts where the cropping season started in May (see Banful 2009). Nevertheless, fertilizer subsidies seem to have played an important role not only in arresting the possible decline in fertilizer use but also in increasing fertilizer use significantly at 218,000 product tons in 2009, in contrast to 137,000 tonsin 2006. The cost of the subsidy program in 2009 was GHC 44.0 million ($31.4 million).[10] However, the modus operandi of subsidy implementation introduced certain distortions in the market and adversely affected agrodealers' operations at the retail levels.

Key Players in the Supply Chain

Four key importers dominate the fertilizer supply chain: Yara/Wienco, Chemico, Golden Stork, and Dizengoff. They accounted for 95 percent of fertilizers imported in 2009. Among them, Yara/Wienco seems to have the longest and most dominant presence in the country in terms of market share. Yara and other importers (except Chemico) took part in negotiations with the Ghanaian government for pricing of subsidized fertilizers. These importers have good subsidiary linkages with international suppliers and can access capital and foreign exchange from international sources at interest rates of 8 to 10 percent. These importers are supported by 20 to 25 wholesalers (the distinction between importer and wholesaler is blurred as importers also act as wholesalers) and 2,700 retailers and stockists, spread across 107 districts. However, most retailers are concentrated in towns or near peri-urban areas, thereby making it difficult for smallholder farmers in remote areas to access fertilizers.

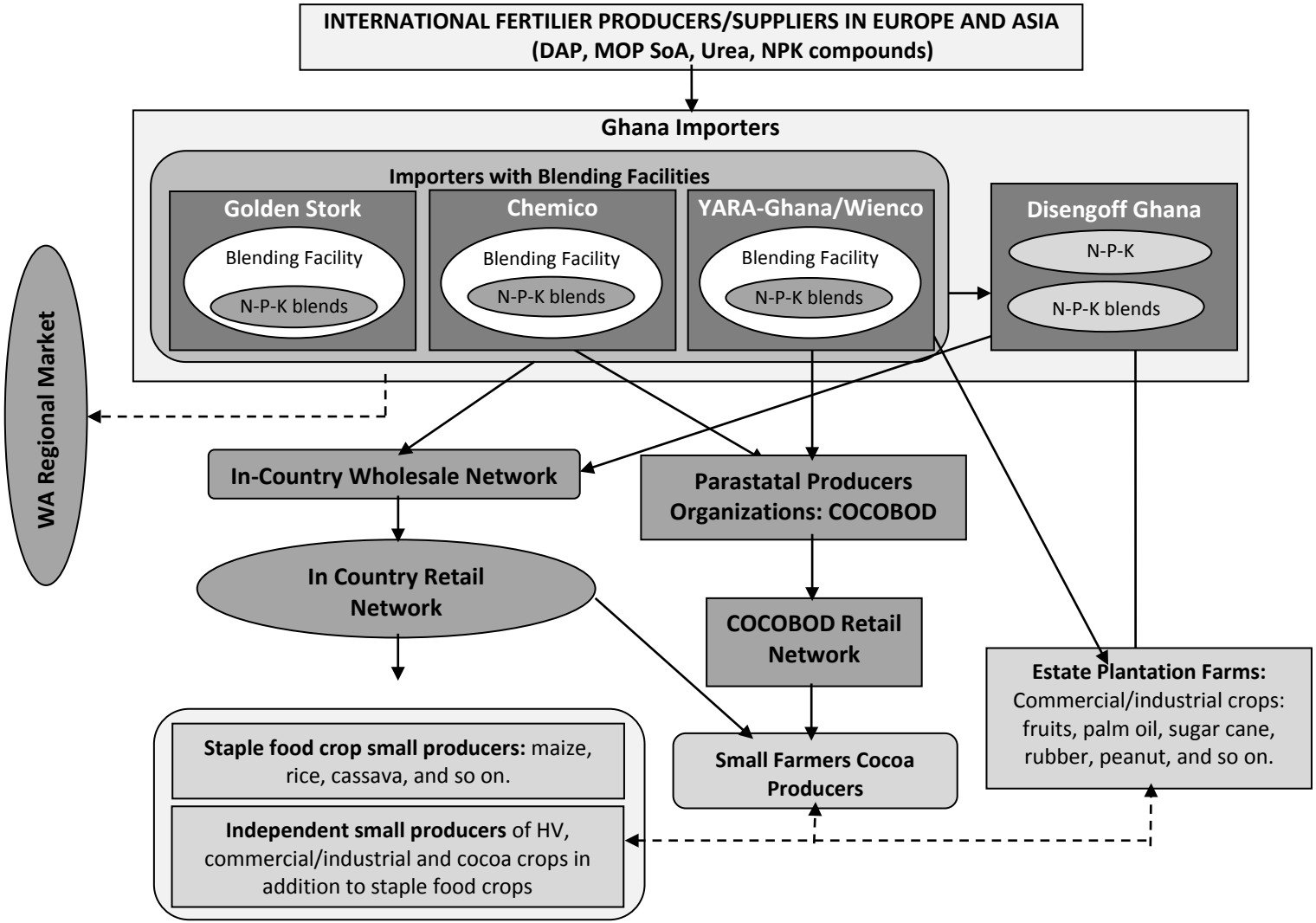
As Figure 4.1 below shows, three supply chains operate in Ghana. In the first, fertilizers are imported by key importers and sold to farmers via independent wholesalers and retailers. Although there is no vertical integration in this chain, different actors are generally well connected through normal

[10] Exchange rate: US$1.00 = GHC 1.4.

marketing processes. In a few cases, importers provide 30-day consignment credit to wholesalers, and wholesalers to retailers, but most wholesalers and retailers use their own resources to purchase and sell fertilizer. Institutional financing for business development and operations is not easily available in Ghana (see below). This supply chain dominates the country's fertilizer market. In the second chain, the parastatal COCOBOD depends on importers (Chemico and Yara/Wienco) to supply its fertilizer, but then it uses its own dealer network to distribute fertilizer to cocoa growers at a highly subsidized price (more than 60 percent subsidy). In this chain, COCOBOD bypasses the retailers. However, if cocoa growers need additional fertilizer, they rely on local retailers whose number is limited in cocoa-growing areas because COCOBOD dealers benefit from implicit subsidies in terms of capital, storage, and transportation facilities. The third supply chain consists of plantation estates—oil palm, pineapple, and other cash crops. These growers negotiate directly with importers over the price and quantity of fertilizers needed, and they get product delivered to their warehouses. From there, they distribute it to their smallholder growers. In this chain, also, retailers are bypassed. These two supply chains generally discourage the healthy development of retail networks in the rural areas.

In addition to these actors, supply chains also include port authorities, banking and financial institutions, transportation companies, and government authorities (providing regulation and extension advice and collecting tariffs and taxes). We discuss the impact of market structure on market performance (costs and margins) in Section 5.

Figure 4.1—Ghana fertilizer marketing structure



Source: Fuentes et al. 2010a.
Note: HV= High Value.

Main Constraints and Distortions

Nonconducive Policy Environment

Since 1992, the Government of Ghana (GOG) has not intervened in fertilizer market operations; importation and marketing of fertilizers have been done by private-sector organizations. However, in 2008, the government introduced fertilizer subsidies to protect smallholder farmers from the negative impact of high fertilizer prices. The program was implemented in a market-friendly manner through coupons to targeted farmers. However, to minimize the cost of the program to the treasury, the government invited tenders and negotiated the retail price at the district level. By inviting tenders, it introduced uncertainty in the market, and by not taking into account the concerns of the retailers in fixing the price, it adversely affected many retailers by allowing low margins. Moreover, as coupons were redeemed through importers, more than 60 percent of retailers not associated with importers could not easily participate in the program (Karusova and Banful 2010). At the import level, delays in redeeming vouchers created cash flow problems for importers. At the farmer level, getting the coupons signed by the director of agriculture at the district level introduced rent-seeking opportunities and irregularities. As the subsidy program accounted for nearly 50 percent of the market, importers were hesitant to import products outside of the subsidy program. Thus the implementation of the subsidy program created distortions and restricted the development of retail networks in rural areas.

Limited Access to Finance

At all levels of the supply chain, access to financing is highly constrained for two reasons. First, interest rates of 30 to 35 percent are prohibitively high. The treasury bill rate of 27 to 29 percent discourages banks to invest in agriculture—a more risky venture. Second, collateral requirements of 100 to 150 percent make it difficult for local importers and agrodealers to borrow funds for business development and operations. Thus, the limited access to financing has acted as a pseudo-barrier to business development and scale of operations. This forces agrodealers to use their own funds and operate at a small scale, thereby incurring higher transaction costs.

Regulatory Frameworks

Although Ghana has enacted the new fertilizer law, it has not strengthened the capacity to enforce quality control regulations at the point of sale. Farmers question the quality of blended products, and that coupled with old fertilizer recommendations seems to be creating a crisis of confidence among smallholders because they do not see the benefits of using fertilizer. For a competitive marketing system, effective enforcement of quality regulations is essential. Otherwise poor-quality products and their sellers can crowd out honest agrodealers selling quality products.

Fertilizer Recommendations

Limited financial resources and capacity with the Ministry of Agriculture (MOA) has resulted in inadequate extension and technology transfer to farmers. It has also prevented the Ghanaian government from conducting soil testing and fertilizer trials to develop new fertilizer recommendations. As a result, fertilizer recommendations are based on work done during the 1970s. Clearly, new research is needed, and farmers should be educated with new fertilizer recommendations.

Port Operations

At the port of Tema, where most import cargo is handled, the port authority's monopoly in providing labor for the unloading and bagging of fertilizers adds unnecessary additional cost for demurrage and stevedoring. The limited berth space and shallow depth also contribute to delays in handling cargoes. Various levies and taxes further compound the delays in moving fertilizers.

Transportation Bottlenecks

Although the Tema port provides good storage and blending facilities and transportation links to move fertilizers to districts in the central and northern part of the country, poor road conditions, old transportation equipment, and limited competition in the trucking industry add to transportation costs—averaging $0.14/ton kilometer ($0.21/ton mile). And the lack of all-weather roads helps isolate rural areas and prevents smallholder farmers in those areas from accessing inputs at cost-effective prices.

Fertilizer Policy and Supply Chain in Mali

Size of the Market

Historically, the Malian fertilizer market has been dominated by two crops: cotton and rice, managed by CMDT (Compagnie Malienne pour le Developpment des Texttile) and the Office du Niger (ON), respectively. These two crops accounted for more than 90 percent of fertilizer use, with cotton alone accounting for more than 70 percent during the 1990s. At its peak, Mali used more than 158,000 product tons of fertilizer in 1998; thereafter, use decreased slowly, reaching 125,000 tons in 2003. A crisis in the cotton sector resulting from low cotton prices in the global market and efforts that began in 2000 to privatize CMDT have led to the disintegration of input supply systems and caused a gradual decline in fertilizer use. During 2003 to 2007, the fertilizer market stagnated around 150,000 product tons. An increase in global fertilizer prices (Mali being an import-dependent country) affected fertilizer use adversely in 2008, and use remained at 93,000 tons. Such a steep decrease in fertilizer use forced the Government of Mali to introduce fertilizer subsidies. Fertilizer use intensity is still low at 7 kg/ha.

Cotton, rice, and maize are the dominant fertilized crops in Mali. Urea, DAP, NPK 15-15-15, and cotton formula 14-22-12-7S-1B are the main fertilizer products used in the country. Although Mali is endowed with good quality Tilemsi phosphate rock, several factors, including high transportation costs, the dusty nature of the product, and security risks in the mining area, have limited its use. The government gave a concession (mining and processing rights) to Toguna Agro-Industries in 2007 to promote its use through granulation and processed phosphates.

Like many other West African countries, Mali phased out fertilizer subsidies during the early 1990s and allowed the private sector to import fertilizers after 2000. However, as the privatization of CMDT took a long time, the private sector's role remained and still remains limited as most of the fertilizers are procured and distributed by producer organizations (POs) and cooperative societies operating under commodity zones created during the 1970s, namely CMDT and ON, known then as rural development authorities.

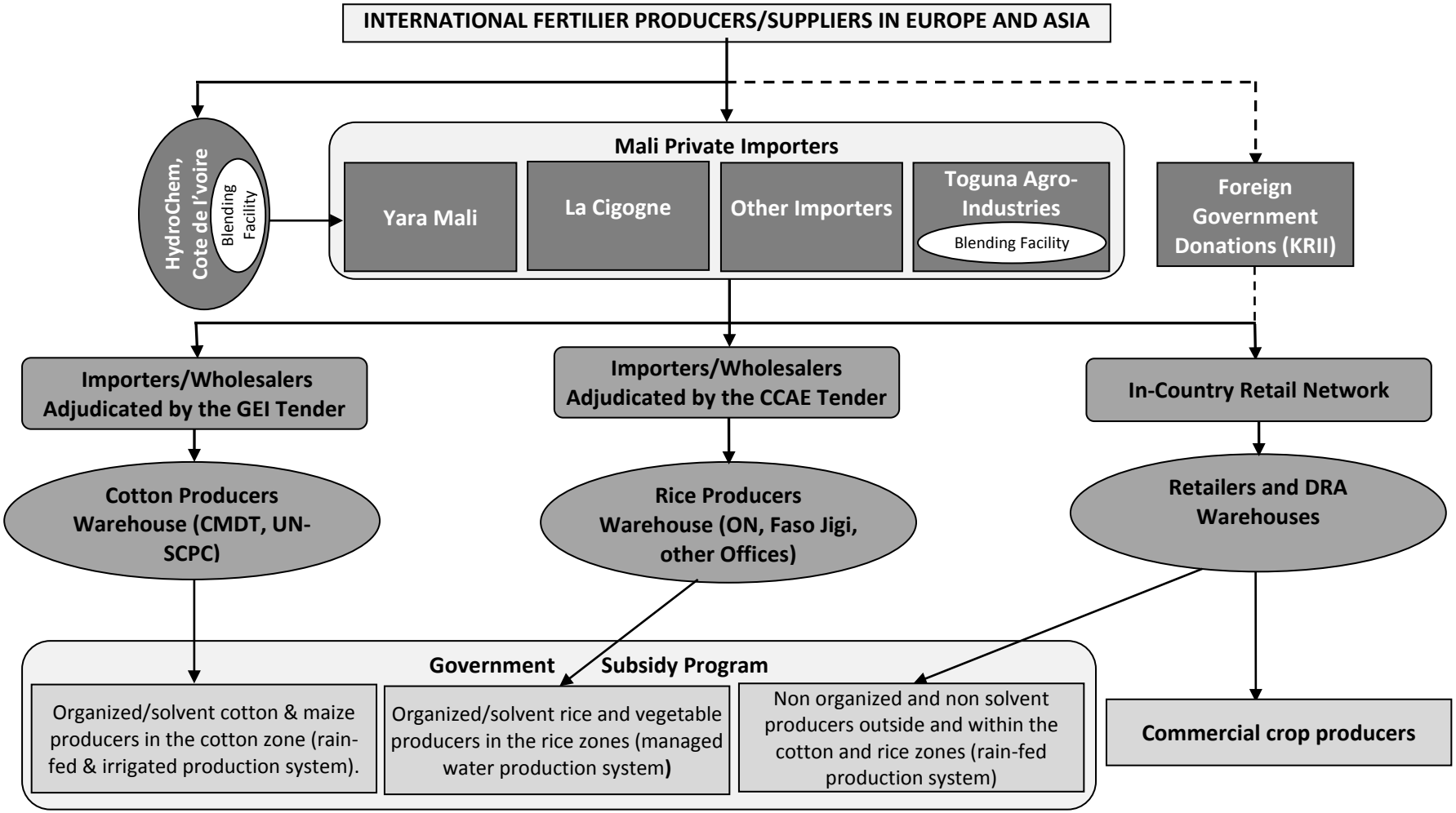
The Malian government implemented subsidies through vouchers (coupons) during 2008 but due to many problems including fraud and misuse of vouchers by rent-seeking groups, it decided to fix the uniform subsidized retail price at FCFA 12,500 ($27.11[11]) per 50 kg bag of urea, DAP, and NPK. Difference between subsidized price and market price was paid to the dealer. Based on 2009 prices, the average subsidy accounted for 29 percent of the price.

Key Players in the Supply Chain

In the past, SOEs, such as CMDT, had a monopoly in fertilizer import and distribution in an interlocked contracting system of input distribution and output procurement at a predetermined price. Inputs were supplied on credit and payments were deducted from the value of the crop delivered to CMDT. This system ceased to exist as efforts to privatize CMDT began in 2000.[12] Currently, three different systems (Figure 4.2 below) operate in CMDT's cotton/maize zone, ON's rice zone, and other areas monitored by DNA (Directeur National d' Agriculture).

[11] Exchange rate: CFA 461 = US$1.00.
[12] The privatization of CMDT has yet to occur.

Figure 4.2—Fertilizer distribution structure in Mali



Source: Fuentes et al. 2010b.

In the CMDT zone, POs are responsible for estimating and pooling demand from farmers based on the *caution technique*[13] issued by DNA and submitting the estimates to a higher-level council called GIE (Groupement d'Interet Economique [Economic Interest Council]), which is responsible for inviting tenders, arranging financing, and procuring fertilizers. There are three major importers: Toguna Agro-Industries, Yara/Hydrochem, and Le Cigogne, although Le Cigogne focuses mostly on crop protection products. Tenders are reviewed and approved by GIE. Importers, mainly Toguna and Yara, have to deposit funds with BNDA (Banque Nationale pour le Developpement Agricole) with tender bids. Based on the approved tenders, importers supply fertilizers to warehouses in the CMDT zones. From there, CMDT distributes fertilizers to POs, which distribute to cooperative societies, which in turn supply farmers based on their adjusted request under the caution technique. CMDT provides technical support to GIE and is expected to test the quality of supplied products before they are distributed to farmers. Fertilizers are supplied to farmers on credit issued by BNDA through local banks, guaranteed by the Government of Mali. GIE, through CMDT, is responsible for loan recovery from farmers. CMDT procures cotton and deducts the cost of inputs from the value of the cotton supplied by farmers. The farmers who do not repay loans are disqualified from participation in the system in the next season.

In the ON zone, a similar process is followed where CCAE (Commission Centrale pour l'Acquisition d'Engrais) is responsible for pooling fertilizer requirements and tendering fertilizers and arranging finance. However, once the tenders are awarded, importers supply fertilizers directly to POs, which are responsible for loan recovery. Unlike CMDT, ON is not involved in the distribution of inputs or procurement of rice; it is primarily responsible for rice production in irrigated areas but does tendering of inputs. In areas other than the CMDT and ON zones, DNA through its regional offices (DRAs) estimates demand from farmers through the caution technique and invites tenders for supplying fertilizers. Importers, mostly Toguna and Yara, deliver products to regional warehouses monitored by DRAs that in turn distribute fertilizers to farmers.

Based on the awarded tender, an importer or wholesaler can get a letter of credit from BNDA (or another commercial bank) with a guarantee from the Malian government. The interest rate for farmers is 12 percent. Once the product is supplied to regional warehouses, suppliers can submit their invoice to the bank for payment for the nonsubsidy component. For the subsidy component, they must submit the claim directly to the government. The process of tendering and payment to importers is long and adds to transaction costs and price.

Because the cooperative societies dominate the distribution of fertilizers, opportunities for a retail market are limited. Still rudimentary retail networks have developed to serve farmers outside the commodity zones or those who are not members of POs. The total number of such retailers/stockists is limited, but many belong to an association, ORIAM (Operateurs d'Intrants Agricoles du Mali), which is involved in disseminating market information and educating agrodealers.

Main Constraints and Distortions

The Tendering Process

The tendering and procurement system is long, tedious, and complicated—it can take four to seven months (Table 4.3). It introduces distortions and rent-seeking and inhibits the development of agrodealers in rural areas. The tendering system per se introduces risk and uncertainty in market development efforts by the private sector. One study estimated that in contrast to direct negotiations with suppliers, the CMDT-monitored tendering process added 50 percent to the cost of fertilizers (Chemonics and IFDC 2007). Considerable time and money could be saved if the POs were allowed to negotiate price directly with suppliers. Also, if the cooperative societies were allowed to deal directly with retailers in the area, it could reduce transaction costs and allow the development of retail networks. Importers and other

[13] The caution technique is a process by which farmers are requested to submit their fertilizer requirements based on area and crop cultivated.

suppliers are not interested in developing retail networks because they are not sure of winning the same tender every year.

Table 4.3—Chronogram for the provision of fertilizer in Mali

Phases/Activities	Cotton Zone: GEI	Office du Niger and Other Offices: CCAE	Rainfed and Natural Flooding Zones: DNA/DRA and Retail Network
Expression of needs	September (y - 1)	December (y - 1)/January, during assessment of previous agricultural season	November/December (y - 1)
Centralization, formulation, and validation of needs	October (y - 1)	January (y)/February (y)	January (y)
Search for financing and readjustment of orders	October (y - 1)	February (y)	February (y)
Launching calls to tender, analysis of offers, contracts elaboration, and so on	November/ December (y - 1)	March (y)	March/April (y)
Delivery and receipt of fertilizer, sampling, and quality control	March/April (y)	April/July (y)	June/July/August (y)
Distribution and placement of the fertilizer	April/May (y)	April/June (y)	July/August (y)
Payment to suppliers	March/April/May (y)	May/June/July (y)	June/July/August (y)

Source: Fuentes et al. 2010b.
Notes: "y - 1" is in reference to the agricultural season during the previous year; likewise "y" is in reference to the agriculture season in the current year. GEI = ; CCAE = Commission Centrale pour l'Acquisition d'Engrais; DNA = Directeur National d'Agriculture; DRA = Directeur Régional d'Agriculture.

Limited Access to Finance

Although interest rates are lower in Mali than in Ghana, getting financing is not easy for smallholder farmers (not members of POs) and agrodealers. Farmers who do not have cash at hand cannot benefit from the subsidy program.

Weak Regulatory System

Mali's quality control system is reactive rather than proactive. There are no arrangements for checking fertilizer quality at the point of sale; nor is there a laboratory to test the products. When someone complains, a sample is collected and sent to Ouagadougou, Burkina Faso, for testing. This process can take several weeks, if not months. The quality of blended NPK has become a serious issue, and farmers are losing confidence in fertilizer products sold in the market.

Underdeveloped Retail Networks

Because of the dominance of the tendering process guided by CMDT and ON, agrodealer networks have not developed in the rural areas. Also the skill set of agrodealers is limited, as is market information about prices and quantities in different market segments. ORIAM is trying to support the development of agrodealers and market information systems (MIS), but its resources are very limited.

Fertilizer Policy and Supply Chain in Senegal

Size of the Market

Before Senegal introduced structural adjustment programs in the 1990s, fertilizer use varied between 70,000 and 80,000 product tons per year. During the 1990s, it decreased to less than 40,000 product tons per year. In early 2000s, to ensure food security through increased fertilizer use, the Government of Senegal introduced a 50 percent fertilizer subsidy for smallholder farmers producing cereals, cotton, groundnut, and other crops. The government-subsidized fertilizers accounted for more than 80 percent of the market. The remainder is a free market for commercial growers who buy products from importers or retailers. The subsidized market is restrictive in that only government-approved and -registered importers/wholesalers can participate in the tendering process. Based on the funds available from the budget and estimated fertilizer demand, the government invites tenders for supply of fertilizer products. Each farmer gets 50 percent of his or her requirements. The remaining 50 percent he or she can buy from the open market. Foreign-owned companies are not allowed to participate in the tendering process. Once the tenders by product and lot are approved, suppliers procure fertilizer from the international or regional market and supply it to regional warehouses. Farmers are responsible for retrieving the fertilizer from warehouses.

The main fertilizer products used in Senegal are urea, DAP, NPK (cotton and groundnut formulas), and MOP. Cotton, groundnut, maize, sorghum/millet, vegetables, and sugarcane are the main crops fertilized in the country**.**

Key Players in the Supply Chain

In the past, SENCHIM, a marketing subsidiary of ICS (a fertilizer-producing company), had a monopoly in the import and distribution of fertilizers. SENCHIM had 10 or less licensed distributors. The economic situation of ICS and SENCHIM deteriorated during the 1990s, and in 2004 the Senegalese government opened the market to private importers.[14] The distributors who worked for SENCHIM became importers, but given the funding and logistic requirements, only a few of them succeeded in becoming sound and reliable importers. Figure 4.3 below shows the existing supply system in Senegal. In 2009, five importers were awarded tenders (Figure 4.4). Foreign suppliers supply bagged products to domestic importers as free-on-truck. From the port, importers arrange transportation to the regional warehouses.[15]

For the cotton sector, SODEFITEX used to import and distribute fertilizer at a subsidized price. Due to deteriorating finances caused by low cotton prices, SODEFITEX stopped importing fertilizer. In 2009, it awarded its tender to Toguna Agro-Industries of Mali, which supplies fertilizer directly to SODEFITEX warehouses. From there, the company supplies fertilizer to farmers during the cotton harvest. This helps the company reduce transportation costs because inputs are delivered when cotton is picked up, but it adds a storage cost and losses for the farmer.

For commercial crops, importers (Bolton and La Cigogne) import and sell fertilizer to commercial farmers at the market price through their marketing channels. There is no subsidy on such products.

Unlike Ghana and Mali, which introduced subsidies during the fertilizer crisis of 2007–2008, Senegal introduced fertilizer subsidies (50 percent) in early 2000s. Due to increased prices in the global market, Senegal's fertilizer subsidy bill increased by 60 percent from CFA 8.3 billion ($18.0 million) in 2007 to CFA 13.3 billion ($28.9 million) in 2008.

Financing of Fertilizer Import and Use

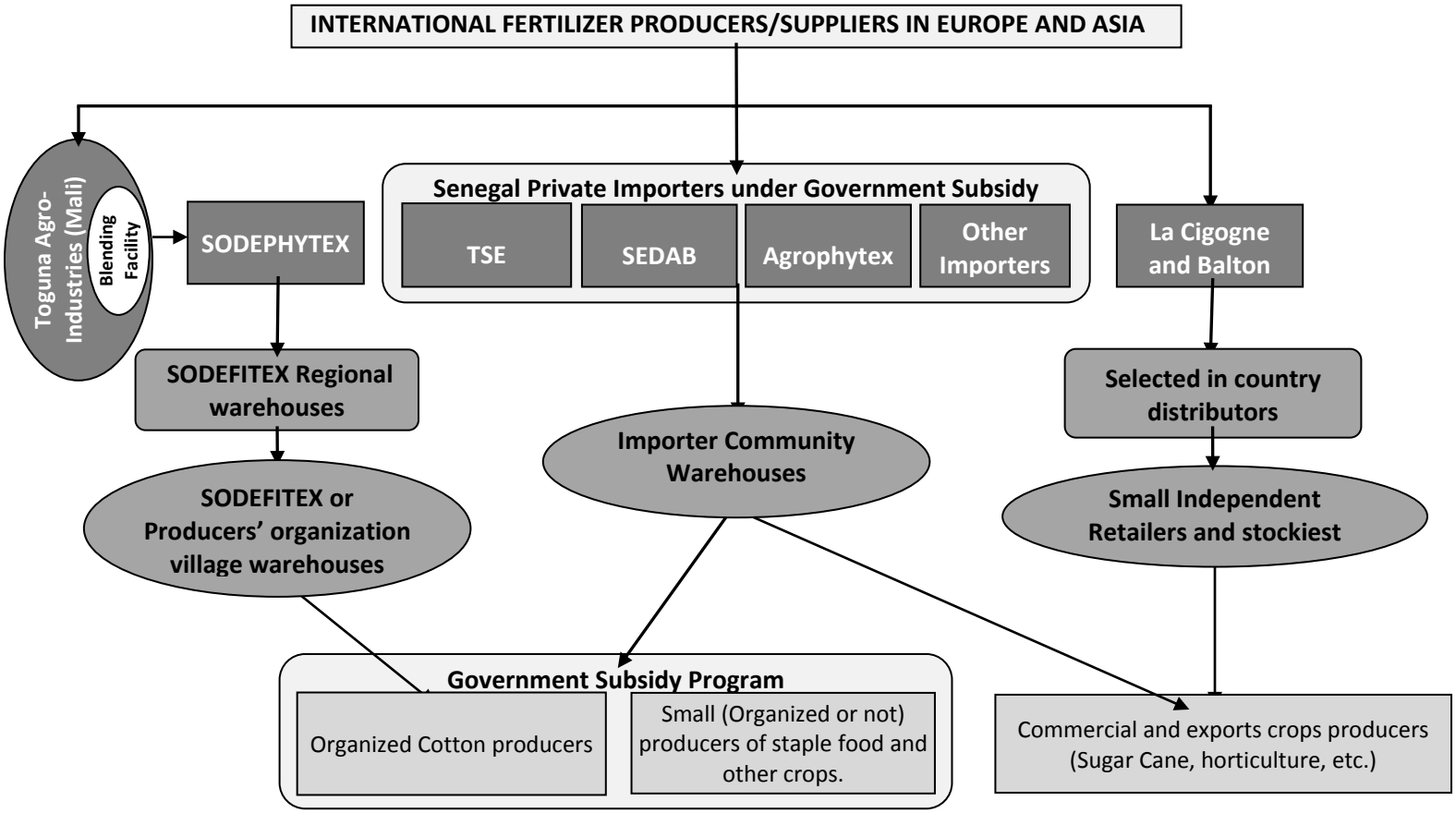
Finance for importers and creditworthy farmers is channeled through CNCA (Caisse Nationale de Credit Agricole), a national agricultural credit institution created by the Senegalese government in 1984. CNCA

[14] Although the market liberalization policy may have been introduced in 2004, it did not become effective until 2006.

[15] During 2008/09 ICS's blending plant produced only a small quantity of blended products and had insignificant impact on marketing operations.

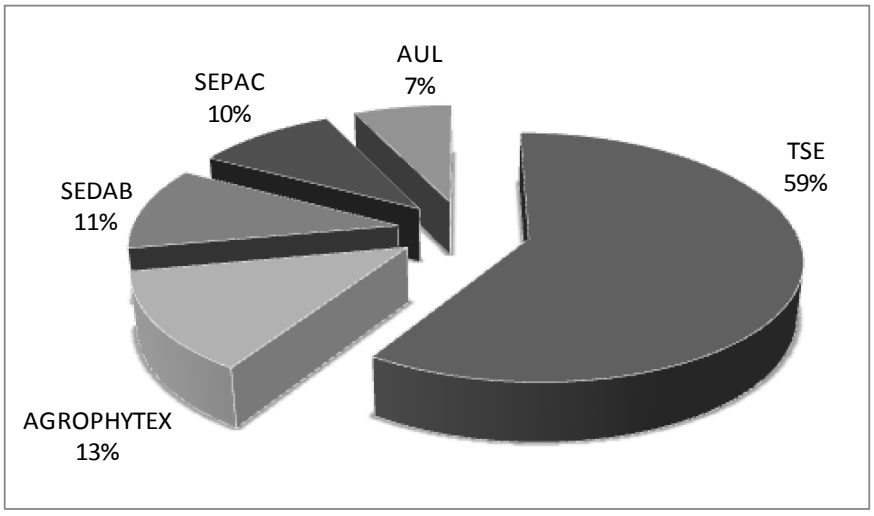
provides agricultural credit under a credit guarantee, for which the government deposits in the bank 75 percent of funds allocated for credit under the agricultural support program. Farmers eligible for credit receive a subsidized rate of 7.5 percent, with the government paying the rate differential of 5.5 percent to CNCA through the credit guarantee fund. But the private-sector fertilizer importers receive credit from CNCA at a rate of 12 percent per year, which can be up to 16 percent if credit comes from private banks.

Figure 4.3—Senegal fertilizer supply chain



Source: Fuentes et al. 2010c.

Figure 4.4—Fertilizer suppliers under the government subsidy program in 2008 (Senegal)



Source: Authors, from in-country surveys.

Warehouse Collateral

To finance importation, CNCA, in collaboration with the importer, sets up collateral managed by a collateral control service firm; imported fertilizer is used as collateral. The imported product is placed in a storage facility at the port of Dakar by the international supplier. The collateral control service firm releases the fertilizer based on a bank authorization once the importer has paid the international supplier, which owns the stored product until it is paid for.

Main Constraints and Distortions

Subsidy Program/Tendering Process

The Government of Senegal's subsidy program dominates the Senegalese fertilizer market, preventing the development of a well-functioning competitive market. Although farmers get only half of their requirements through the subsidy system, they are reluctant to purchase the remaining half hoping that the government would also pay for the remaining half and thus become victims of the dependency syndrome. As the participating suppliers have to be approved by the government, the process leads to rent-seeking opportunities. Furthermore, importers are reluctant to import products outside the subsidy domain because they do not see an opportunity for developing a market when the subsidy portion accounts for 80 percent of the market share. However, the payment of subsidy to importers takes a long time—almost a year. Such heavy government involvement constrains market development efforts and adds to transaction costs.

Regulatory Frameworks

Senegal has no systemic arrangement for monitoring and ensuring good-quality products. The government appoints an ad hoc committee, the National Committee on Importation of Fertilizers, which is responsible for testing the quality of imported fertilizers. However, without adequate resources, the committee has been unable to perform its responsibilities effectively. There is no arrangement for testing product quality at the point of sale, where most of the adulteration might be taking place.

Fertilizer Recommendations

Most fertilizer recommendations are based on fertilizer trials done during the 1970s. Continuous cultivation of soils has led to imbalances in nutrient stocks and micronutrient deficiency. Because of changing cropping patterns and soil profiles, the efficiency of applied fertilizer is decreasing. This situation, combined with adulterated products, has made farmers skeptical about fertilizers that are recommended and sold in the market. Additional research, soil testing, and fertilizer trials are needed to develop sound crop- and area-specific recommendations.

Underdeveloped Agrodealer Networks

Although Senegal has moved from SOE monopoly to a private-sector-based fertilizer import system, the government involvement in managing and directing the subsidy through tendering has constrained the development of private-sector-based retail networks. Not allowing foreign-owned companies in the tender process has created a dualistic market structure. The government should allow competitive market development by implementing subsidies through purchasing power support programs at the farmer level.

Fertilizer Policy and Supply Chain in Nigeria

Size of the Market

Nigeria's fertilizer market is the largest in the West Africa region, consuming approximately 600,000 to 800,000 product tons per year and accounting for more than 60 percent of the West African market. During the early 1990s, Nigeria produced ammonia-urea and NPK products and consumed more than 1 million tons of product. But with the deterioration of the NAFCON plant, the abrupt removal of subsidies, and the withdrawal of the Federal Government of Nigeria's (FGN's) Fertilizer Procurement and Distribution Division in 1997, fertilizer consumption dropped to around 200,000 product tons. With the introduction of subsidies in 1999, fertilizer use slowly increased as FGN purchased increasingly larger quantities of fertilizers and allocated them at a 25 percent subsidy to state governments for distribution to smallholder farmers. FGN targeted 600,000 tons in 2008 but procured only 464,000 tons due to budget constraints. FGN's direct intervention in the fertilizer market has created many problems including the development of a parallel market, round-tripping,[16] uncertainty for investment in market development, and delays in payment leading to higher transaction costs.

The main products Nigeria uses are urea, DAP, MOP, NPK, and specialty fertilizers. Maize is the dominant crop fertilized in the country. Other crops include sorghum, millet, cotton, cassava, soybean, and fruits and vegetables.

Key Players in the Supply Chain

During the early 1990s, the Fertilizer Procurement and Distribution Division had a full monopoly in the importation and distribution of fertilizer. In 1997, the fertilizer market was liberalized and subsidies were removed. Currently, all fertilizer products are imported by the private sector. The main importers are Golden Fertilizers, Tak Continental, and Notore (owner of the former NAFCON fertilizer plant). Additionally there are 10 to 12 small importers including fertilizer-blending plants (Figure 4.5).

The fertilizer marketing and distribution is done by the private sector, but FGN under its subsidy program guides a large share of the market, and that creates a big distortion in the market. Various studies conducted by IFDC and others have indicated that the fertilizer subsidy program is not benefiting the intended beneficiaries (smallholders) and is creating distortions in the market and opportunities for rent-seeking. Two supply chains dominate the Nigerian fertilizer market. The first is a standard private-sector-based chain in which importers import fertilizer and supply it to wholesalers and retailers to sell to the

[16] A condition when already subsidized fertilizer comes back to the market at a lower price through informal channels, crowding out the private-sector agrodealers.

farmer. Importers and wholesalers also supply fertilizer products to blending plants. The estimated numbers of retailers and wholesalers are approximately 40,000 and 30, respectively.

The second supply chain consists of fertilizer distributed by FGN through its subsidy program. FGN targeted 600,000 tons of products under its subsidy program but distributed 464,000 tons in 2008. It procures products from the domestic market through tendering. In 2007 more than 100 companies were awarded tenders for distributing fertilizer. Such a large number of suppliers created logistics and coordination problems so FGN decided in 2008 to award tenders to only three large importers—Golden, Tak Continental, and Notore. Because Notore's ammonia-urea plant started production only after midyear and production remained limited thereafter, the company was forced to import fertilizer to honor its commitment. Due to delays in payments from FGN, Tak Continental ran into a cash flow problem and was unable to fulfill its supply quota. Therefore tenders were awarded to more suppliers in 2009, but delays in budget approval delayed payments to suppliers. In 2010, the budget allocation for subsidies was not approved until May 2010. Such delays, though not uncommon in Nigeria, introduce uncertainty in fertilizer supply to smallholder farmers.

Fertilizer procured by FGN is distributed to various states on the basis of the needs of smallholder farmers, but political considerations generally outweigh the economic rationale. In any case, once the tenders are awarded, suppliers are required to supply the product to regional warehouses at the state level. From there, state governments distribute it plus fertilizer procured with their own funds to local governments, which distribute it to smallholder farmers. State and local governments often provide additional subsidies, making the total subsidy at times greater than 70 percent of the market price. Such generous subsidies crowd the private sector out of the market.

Subsidized fertilizer is distributed at a pan-territorial price all over the country. FGN contracts the quantity of fertilizer from the private sector and allocates it to various states at 75 percent of the price (25 percent of the subsidy is paid by FGN). In theory states are supposed to pay 75 percent of the cost of the fertilizer, but it rarely happens. So FGN deducts the remaining cost from allocated funds to states in the budget or from monthly payments to states from the oil funds. Delinquencies or delays on the part of states can cause considerable delays in payment to the private sector. Moreover, as the subsidized fertilizer program accounts for more than 70 percent of the fertilizer market, it leaves a limited share of the market for private-sector involvement.

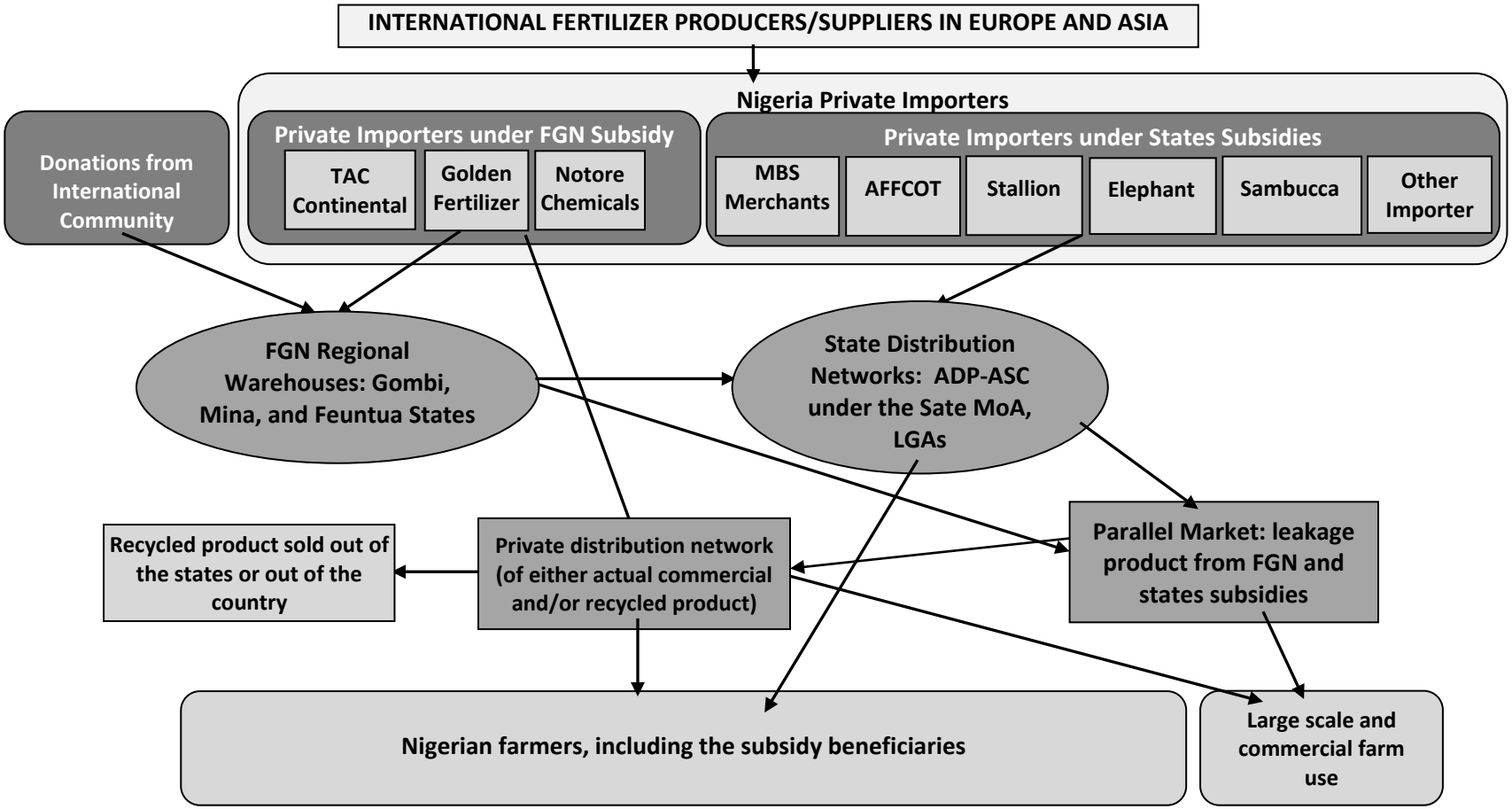
Rent-seeking is not uncommon in this process, but most disturbing is that a significant proportion of subsidized fertilizer comes to the open market (round-tripping) and is sold at below the market price. This creates unfair competition in the market, leading to uncertainty and losses for the market players and discouraging private-sector investment in the development of agrodealer networks.

Main Constraints and Distortions

Uncertain Policy Environment

FGN's interference in the market remains the biggest hurdle in the development of a competitive, efficient, and effective fertilizer supply chain. In addition to round-tripping, delays of almost a year in the payment of subsidy funds to suppliers create cash flow problems for importers and wholesalers and add to transaction costs. Furthermore, FGN's intentions about the quantity of fertilizer to be procured remain unpredictable because the government cannot issue tenders unless the budget is approved. Technically the budget is supposed to be approved in January but can be delayed until April or May. This prevents importers from forward planning about imports when the prices may be lower in the global market. Different subsidy regimes followed by state governments introduce further uncertainty in planning. Some states such as Kano and Taraba have moved from direct procurement of fertilizer to giving purchasing power support to farmers through vouchers. In this approach, eligible smallholder farmers are given vouchers to support the cost of fertilizer so that there is no direct intervention in the market. Yet because of uncertainty in FGN's programs, states are in no position to announce in advance the quantity of fertilizer supported by vouchers. This creates uncertainty in market development and sales planning.

Figure 4.5—Nigeria fertilizer supply chain



Source: Fuentes et al. 2010d.

Ineffective Regulatory System

The privatization of fertilizer importation and marketing was not accompanied by an effective regulatory system. This has led to adulteration and low-quality blended products. A fertilizer law was drafted , but FGN has not enacted the law and devoted adequate resources to develop the necessary legal instruments and to train a cadre of inspectors who can spot-check the product at the point of sale.

Inefficiencies at the Port

The shallow depth (8 to 10 meters) of Port Harcourt does not allow the berthing of ships carrying more than 15,000 tons cargo. A discharge rate of 1,000 product tons per day adds significant costs in demurrage and stevedoring. Although all three major importers have their storage facilities at the port, all bagging has to be done at the port because there is no facility for bulk movement. In a large market of almost 600,000 to 800,000 tons, transportation of product by road becomes very costly. Among domestic costs, transportation costs account for $80 to $100 a ton. If shipping costs are added to this, shipping and transportation alone accounts for nearly a third of the delivered cost of fertilizer. The main reason transportation costs are high in Nigeria is that more than 80 percent of its fertilizer use is concentrated in the northern part of the country, up to 1,600 kilometers from the ports located in the south. To reduce transportation costs, FGN should consider investing in railway transportation for the bulk movement of fertilizer products.

Underdeveloped Agrodealer Networks

Uncertainty and inconsistency in the government's policy (subsidy [1996], no subsidy [1997–1998], subsidy [1999], no subsidy [2000], and subsidy again [2001]) has discouraged the private sector from developing dealer networks in rural areas. After liberalization and privatization in 1997, the private sector invested in the development of dealer networks. But with the introduction of subsidies in 1999, importers were forced to deliver products at local farm service centers. In 2007, one company sold products on credit, but recovery was poor and it lost $3 million and stopped developing dealer networks. FGN has expended little effort in building human capital in the rural areas.

Comparative Summary

The brief analysis of fertilizer markets in selected West African countries reveals the following similarities and contrasts. First, Nigeria's fertilizer market dominates the other markets in the region, accounting for more than 60 percent of West Africa's fertilizer consumption. Urea, DAP, MOP, and NPK (granulated and blended) are commonly used. Foodcrops and export crops get fertilized. The markets in most countries except Nigeria are too small to benefit from economies of scale in procurement.

Second, each country has three to four major importers and 10 to 15 wholesalers. Nigeria has the most agrodealers, and Senegal the fewest. Supply chains operating in the countries include features of both private-sector-based competitive markets and SOE-managed or -directed distribution systems.

Third, among the key constraints facing the four countries, the presence of a nonconducive policy environment forms a bottleneck in the development of competitive fertilizer markets. Ghana and Mali introduced fertilizer subsidies in response to the 2007–2008 food and fertilizer crisis, whereas Nigeria and Senegal have been subsidizing fertilizer since 2000. The subsidy implementation arrangements in all countries have introduced distortions and fragmentations in the market. For example, procurement of fertilizers for subsidy programs is done through tendering, which introduces risk and uncertainty in market development. More market-friendly subsidy options, such as vouchers, are not as common.

Fourth, enforcement of quality regulations is weak in all the countries. Mali has no laboratories to test the quality of products; samples are sent to Burkina Faso for testing, which delays the whole process.

Finally, access to financing by fertilizer traders at all levels is limited in all the countries, although the national government provides limited credit guarantees in Senegal and Mali. Senegal provides another exception: a warehouse collateral system is practiced wherein global or regional suppliers deposit products in a warehouse managed by an agency that works in collaboration with the

national agricultural credit bank. This arrangement helps importers by reducing the funds needed for collateral for getting a letter of credit for imports from banks.

In the next section, we discuss how these features and constraints affect the performance of fertilizer markets in West Africa in general, drawing on some lessons to date, and considering the development of a common regional fertilizer market.

5. THE FUNCTIONING OF FERTILIZER MARKETS

From the discussion of fertilizer policies and supply chains in selected countries in Section 4, it is clear that distortions and bottlenecks contribute to inefficiencies of fertilizer markets in West Africa. Based on the evidence from country studies combined with secondary data sources, the current functioning of fertilizer markets in West Africa is evaluated in more detail here. To do this we apply the structure–conduct–performance (S–C–P) evaluation model along the different stages of the fertilizer supply chain.

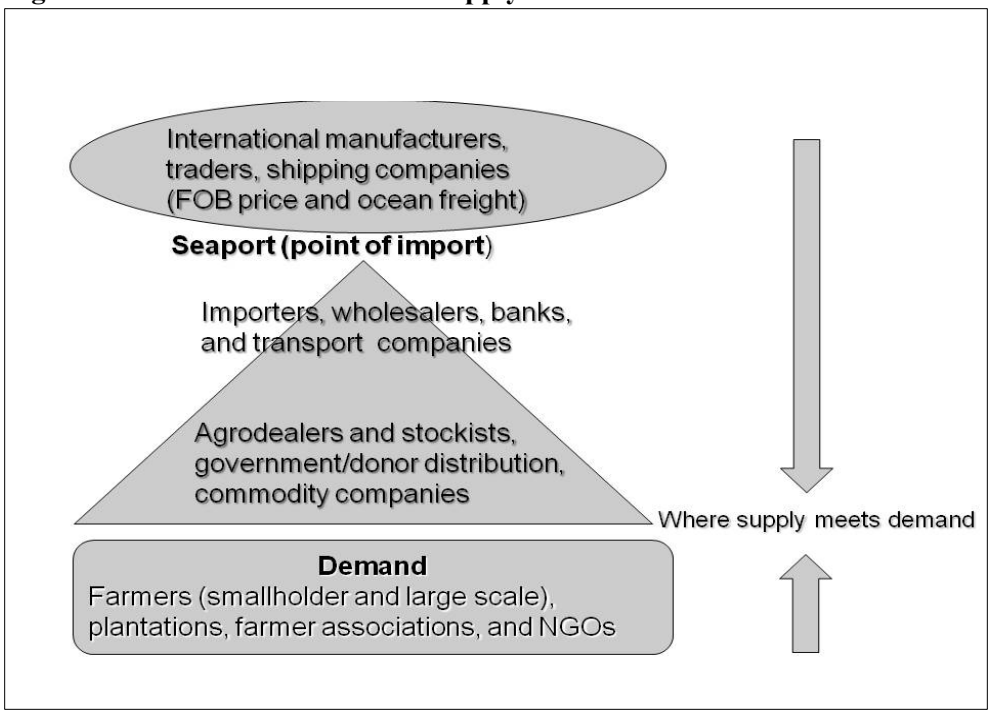
The S–C–P Approach

The S–C–P approach tries to understand how industrial markets function in the real world as opposed to in theory (for details on the approach see Holtzman 2002 and Wanzala, Bumb, and Groot 2009). The underlying rationale for this approach emanates from economic theory of competitive markets. It is generally believed that competitive markets (with large numbers of buyers and sellers in the market) produce efficient prices and quantities (traded). If one supplier (monopoly) or a few suppliers (oligopoly) dominate a market, the lack of competition yields higher prices and lower quantities traded. Therefore many researchers have studied the industrial markets by first examining the structure of the market (number of sellers) and then examining the performance of the market (prices and quantities traded). If the market structure is monopolistic or oligopolistic, then prevailing prices may be higher than what they would be in a competitive market. The S–C–P approach thus first looks at the structure of the market (number of actors involved), then their conduct (what services they perform), and how those two things lead to the performance of the market—in terms of prices, quantities traded, and costs of performing various functions. Based on this analysis, one can draw policy conclusions about the performance of the market and possible measures needed to improve it (measured in terms of price and accessibility). However, as we are going to show, in Africa in general and West Africa in particular, nonprice factors including policy and the institutional environment may have more influence on the performance of the fertilizer market than just the structure and conduct of the participants.

Structure of the Fertilizer Markets

Although some of the importers have multicountry operations (importing and distributing fertilizer in more than one country), there is no well-established regional fertilizer market. At the country level, the structure of the fertilizer market resembles a pyramid—with suppliers and shipping companies in the global market, importers and wholesalers (along with bankers, transporters, and port authorities) at the national level, and agrodealers and farmers at the local level (Figure 5.1). Whereas the global fertilizer market is highly competitive, national fertilizer markets are oligopolistic at the import level and generally competitive at the wholesale and retail levels. Typically, three to five importers, 5 to 30 wholesalers, and 300 to 4,000 retailers operate at the country level where the size of the market is more than 50,000 product tons. In smaller markets, these numbers are lower. For example, only two traders were importing and marketing fertilizer in Sierra Leone in 2007.

Figure 5.1—Structure of fertilizer supply chain



Source: Wanzala, Bumb, and Groot 2009.

Although this generalized market structure prevails in many markets, several variants of the fertilizer supply chain exist in West Africa. In some supply chains, estate crop owners, SOEs (CMDT in Mali and COCOBOD in Ghana), or government departments import fertilizer products directly from the global market or regional markets and distribute inputs to farmers (in exchange for crop produce—an interlocked arrangement), thereby bypassing importers, wholesalers, and retailers. In others, nongovernmental organizations and producer organizations deal directly with wholesalers and supply inputs to farmers, thereby bypassing retailers (Gregory and Bumb 2006). In some cases where subsidy has been reintroduced, government departments issue tenders or negotiate the delivered price at the farmgate (Ghana, Mali, Nigeria, and Senegal). All these interventions, especially the use of tenders, compromise market efficiency and introduce risk and uncertainty for private-sector investment in market development.

The fertilizer industry is capital intensive and logistically demanding; it requires a huge up-front investment for production (plants producing more than 500,000 tons of product generate substantial economies of scale in production). In procurement also, shipments of 25,000 to 50,000 tons generate economies in prices and shipping. The large amount of financing needed for production or large-size imports creates a *natural monopoly* in small markets. Therefore, importers having access to financing in the international markets tend to dominate the market. High interest rates, stringent collateral requirements, and limited access to financing make it difficult for traders to become fertilizer importers of significant size. Small importers import small shipments at high prices.

Nobel laureate Ronald Coase once mentioned that an economist who cannot fathom a business practice "looks for a monopoly explanation." (*The Economist* 2009: p68). Many researchers have a tendency to blame the monopoly or oligopoly in fertilizer procurement as a prime cause of high fertilizer prices in African countries. As we will show, many nonprice factors contribute to high prices in West Africa. As long as there is freedom of entry or exit and transparency in the market, the oligopolistic structure of the market per se should not be considered a disadvantage because a large number of importers importing in small shipments will end up raising fertilizer prices. The high prices and profits charged by monopolists or oligopolists may attract new importers and reduce prices and improve

accessibility, provided finance is not a constraint. The entry of new importers into the market in Malawi in 2004 and in Mali in 2007 significantly reduced the prices of fertilizer and crop protection products (CPPs)in those countries (Chemonics and IFDC 2007).

It should be recognized that because of economies of scale and logistic requirements, *the structure of the market per se does not indicate the performance of the market.* Transportation bottlenecks in rural areas and transportation costs for landlocked countries add significantly to the cost of fertilizer at the farmgate. Regulatory and policy constraints further affect the functioning and performance of the market. To judge the performance of the market, one should use a broader, holistic approach based on the five pillars of market development—policy, finance, human capital, market transparency, and regulatory systems—as well as trade regimes and transportation networks (IFDC 2003).

Conduct of the Main Players

Since West African countries satisfy most of their fertilizer requirements through imports, West African fertilizer importers are *pricetakers*[17] in the global market. The importers negotiate contracts (directly or indirectly) with global suppliers (manufacturers and traders) and import different fertilizer products. Global suppliers supply the product, and the shipping companies bring the product to the port of entry, where port authorities do inspection and charge tariffs and taxes. In some countries port authorities also bag the product. Forwarding and handling agents ensure that all paperwork is complete and that the product meets the specifications of the contract. International and national banks play a crucial role in supplying financing through a letter of credit for importers. Table 5.1 shows the main multicountry importers operating in West Africa.

From here, the importers sell the product to wholesalers who arrange for storage, transportation, and payment of local taxes. Wholesalers sell the product to agrodealers (retailers and small stockists) who sell it to farmers. Most agrodealers are finance constrained.

Table 5.1—Importers having multi-country presence

Importing Company	Multicountry Presence	Comments
Yara	Ghana, Mali, Cote d'Ivoire	Associated with Yara International
Golden Stork/La Cigogne	Ghana, Mali, Senegal	Subsidiary of Belgian-French corporation La Cigogne-SCPA SIVEX
Dizengoff	Ghana	Subsidiary of British-Israeli company Bolton
Bolton	Senegal	
Toguna Agro-Industries	Mali, Senegal, Burkina Faso	

Source: Authors, from in-country surveys.

The Alliance for a Green Revolution in Africa (AGRA) has introduced credit guarantee schemes in Mali, Nigeria, and Ghana to link agrodealers with commercial banks, but the scope of such programs is limited. The national governments in Mali and Senegal provide limited guarantees for smallholders and importers.

Given that many countries have small markets, the distinction between importers and wholesalers is blurred; importers act as wholesalers, and vice versa. In a new market model developed by IFDC and other organizations, many agrodealers also work as technology transfer agents.

[17] A single importer does not have influence on the market price; however, depending on the size of shipment, importers may get a price different from the market price.

Although West African importers are pricetakers in the global market, it should be stressed that not all importers have easy access to suppliers and shipping companies. Because of savings in transaction costs, most global suppliers like to deal with large buyers, and therefore small buyers may not get the product at the same price as large buyers do. Likewise, shipping companies prefer to ship full loads of 25,000 to 50,000 tons. Both of these characteristics of the global market add extra costs for small importers in African markets. For this reason, a common fertilizer market for West Africa would generate savings in procurement and shipping when large quantities are ordered for the whole regional market. From this brief description of the structure and conduct of the market, one sees that many constraints related to finance, human capital (knowledge and skill of actors involved), shipping and transportation, and the regulatory and policy environment can affect the performance of the fertilizer market. We elaborate on such constraints in Section 6.

Performance of the Fertilizer Markets

With the caveats mentioned earlier, market performance is assessed by looking at the various cost components of the supply chain in a comparative framework. First, we analyze the performance of fertilizer markets at the country level. That is followed by a comparative analysis of markets in the global context.

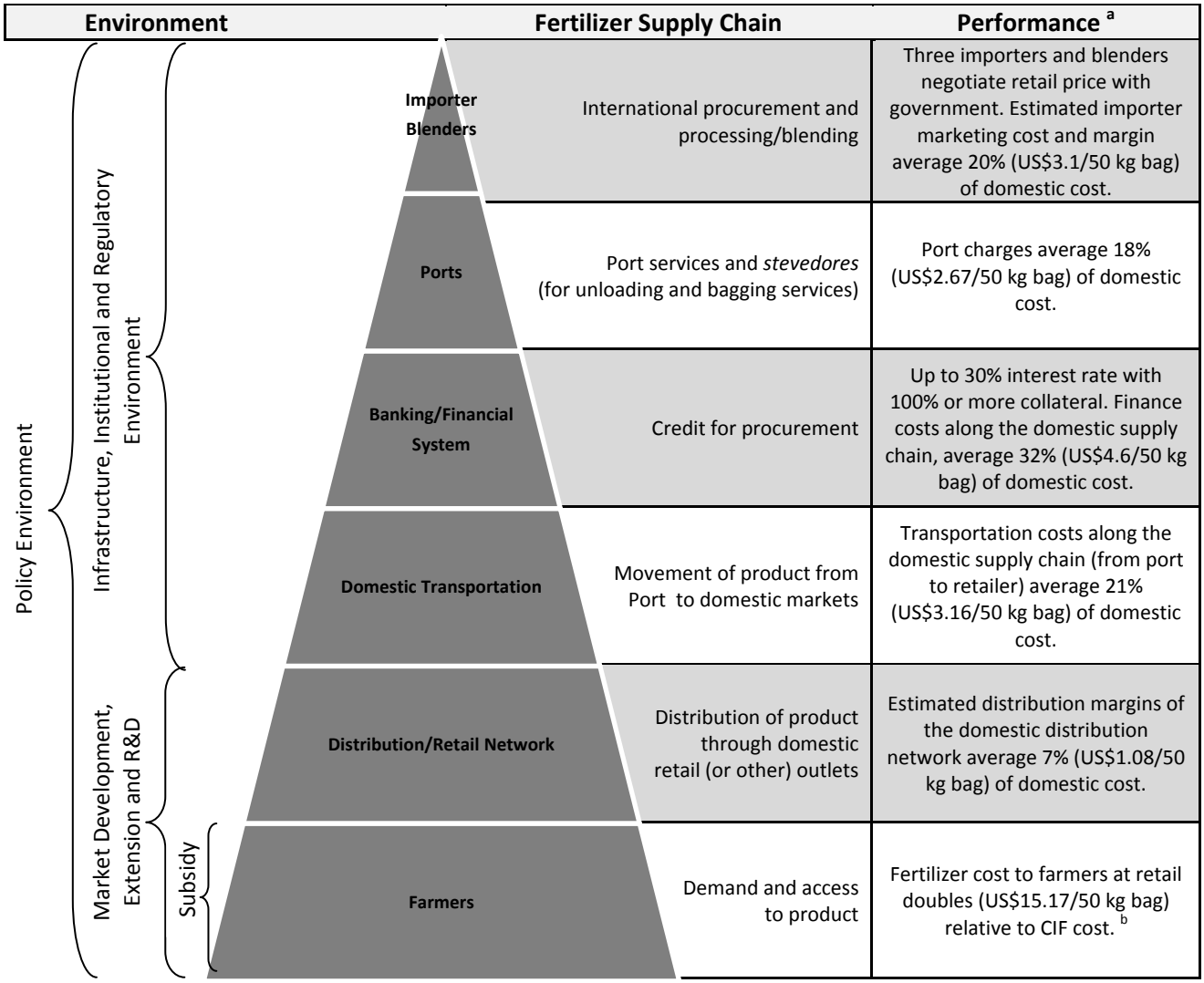
Performance of Country Markets

We looked at the main players in the Ghana, Mali, Nigeria, and Senegal supply chains in Section 4. Here, we analyze the performance of key players in the supply chain as reflected in different domestic cost elements. Figures 5.2 through 5.5 provide information about the structural pyramid of players, functions, and performance of the fertilizer markets in Ghana, Mali, Senegal, and Nigeria. These pyramids report information about various cost components related to domestic marketing and distribution of fertilizer. We provide a comparative analysis of each country's costs of procurement from international markets in the next subsection.

Domestic marketing and distribution costs add nearly 100 percent of the cost, insurance, and freight (CIF) import price in Ghana (Figure 5.2). Among the domestic costs, finance charges account for 32 percent, transportation costs make up approximately 21 percent, and marketing margins (by importers and retailers) constitute 27 percent. High interest charges of 30 to 35 percent add significantly to financial costs. Delays in subsidy payment and the risk of devaluation caution importers to charge a higher premium on the cost of selling fertilizer. Because the product is moved from Tema port in the south to fertilizer-consuming areas in the central and northern parts of the country, transportation charges account for a larger share than other components like port charges, and taxes and duties do.

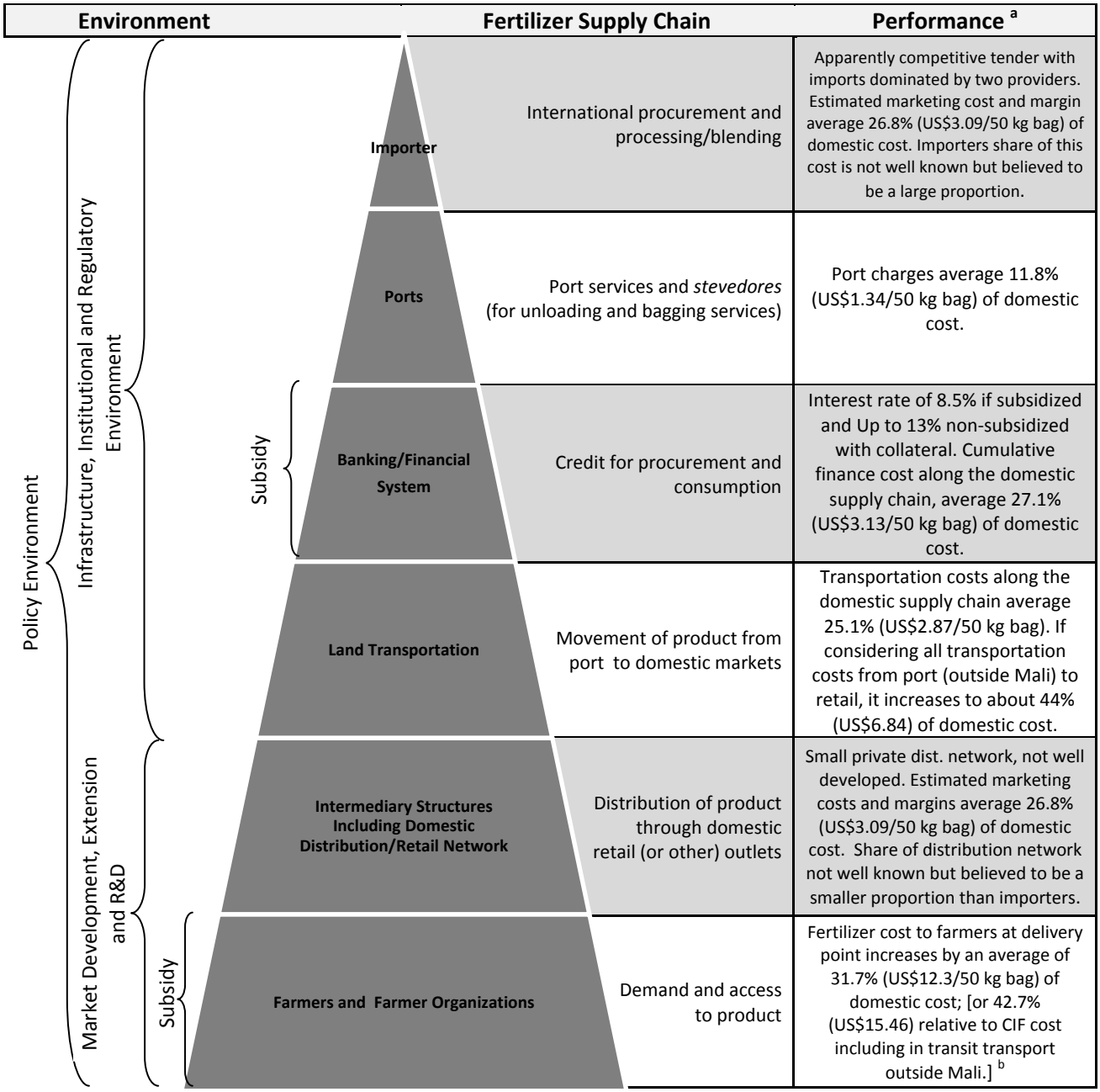
In contrast to Ghana, domestic marketing and distribution costs add only 32 percent to the CIF price in Mali (Figure 5.3). However the CIF price is higher in Mali than in Ghana because of in-transit transportation costs from Dakar or Abidjan to Bamako. Financing and transportation charges account for more than 50 percent of the total domestic cost. Because there are no facilities for bulk transportation from Dakar to Bamako, importers have to import fertilizer products in bags, open the bags to produce blended products, and then re-bag them. This process doubles the cost of bagging fertilizers in Mali. Marketing margins account for 27 percent of the domestic cost.

Figure 5.2—Performance of supply chain in Ghana



Source: Fuentes et al. 2010a.
Notes: [a] Performance indicators are average percentages and monetary values across different products on a 50 kilogram bag.
[b] Government charges account for 3.8% (US$0.62/50kg bag) of domestic cost.

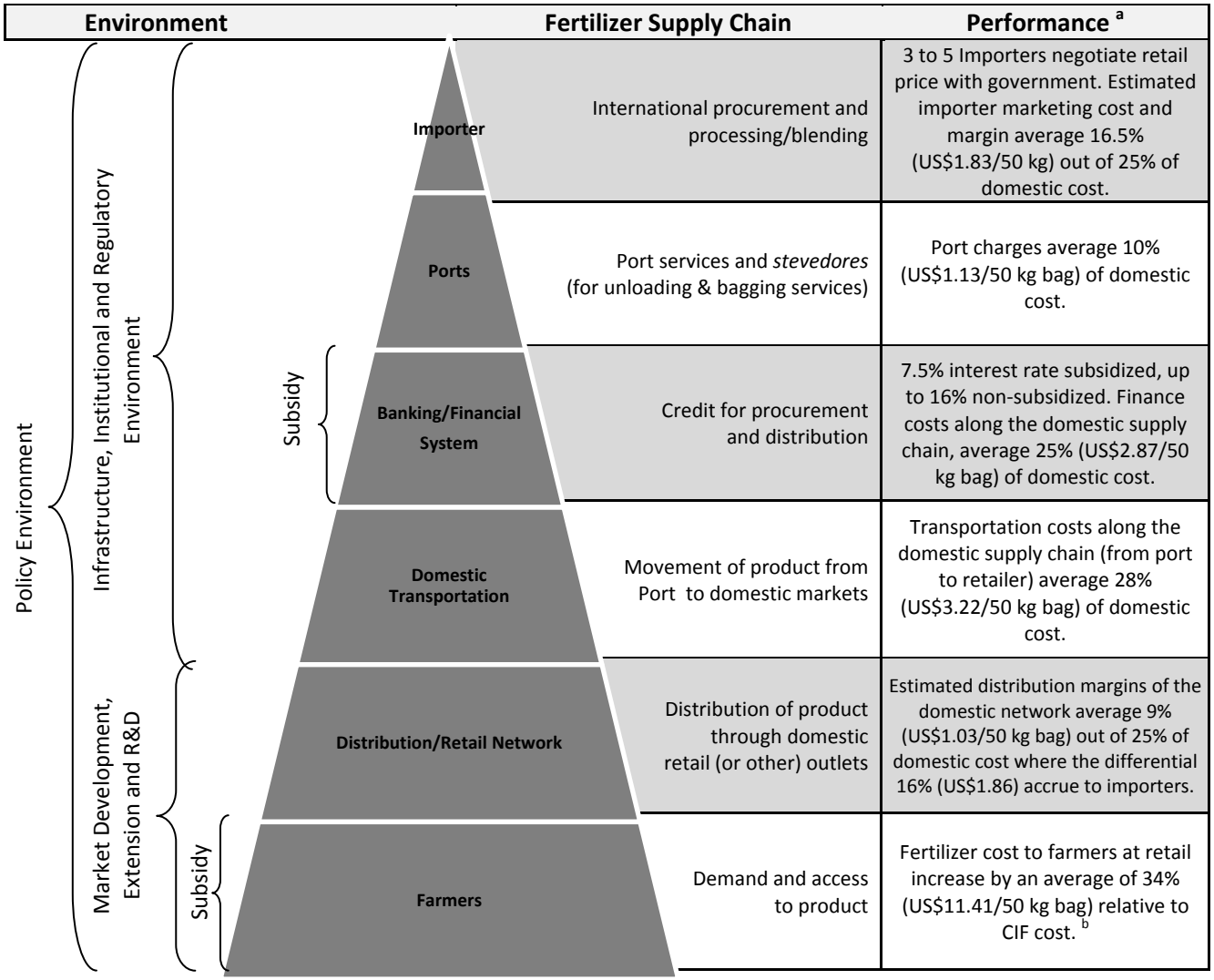
Figure 5.3—Performance of supply chain in Mali



Source: Fuentes et al. 2010b.
Notes: [a] Performance indicators are average percentages and monetary values across different products on a 50 kilogram bag.
[b] Government charges account for 9.2% of domestic cost.

As in Mali, domestic marketing and distribution costs add only a third to the CIF price in Senegal (Figure 5.4). Financing and transportation charges account for more than one-half of the domestic cost, and marketing margins by importers and retailers nearly one-fourth. Uncertainty introduced by government tendering adds significantly to marketing margins in Senegal. Unlike in Ghana, where government taxes and levies account for less than 4 percent, government taxes account for 12 percent of domestic costs.

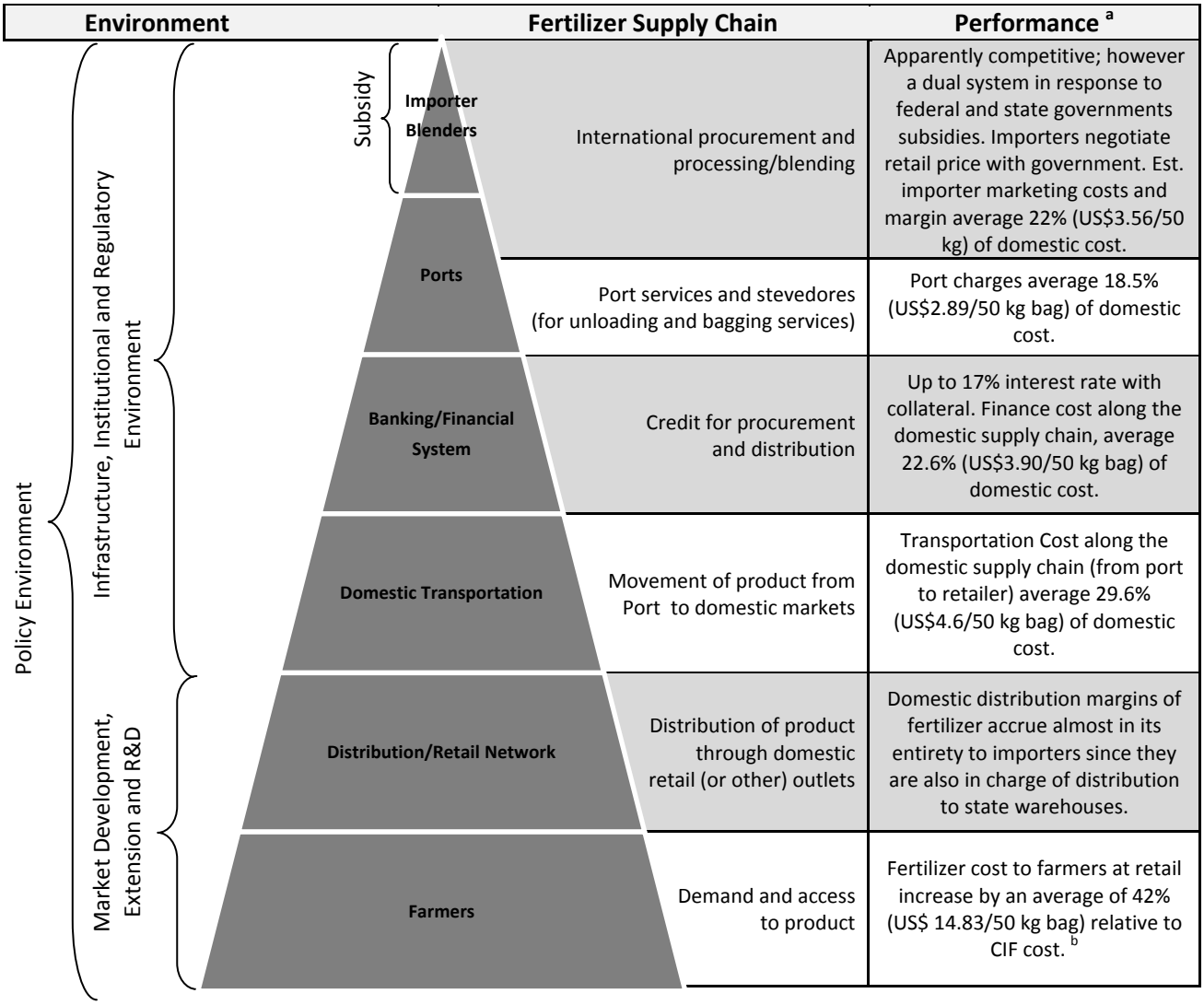
Figure 5.4—Senegal fertilizer supply chain structure and performance



Source: Fuentes et al. 2010c.
Notes: [a] Performance indicators are average percentages and monetary values across different products on a 50 kilogram bag.
[b] Government charges account for 11.7% (US$1. 34/50kg bag) of domestic cost.

In Nigeria, domestic marketing and distribution costs add 42 percent to the CIF price (Figure 5.5). However, transportation costs account for nearly 30 percent of the domestic costs—a result of both long distances (over 1,000 kilometers) between ports and consuming areas and inefficiencies in the transportation sector. More than a fifth of the domestic cost is for marketing margins by importers. Policy uncertainty and round-tripping create risk and uncertainty and force importers to allow for higher margins. Improvements in several of these areas could lead to lower transaction costs and reduced prices for farmers.

Figure 5.5—Performance of supply chain in Nigeria

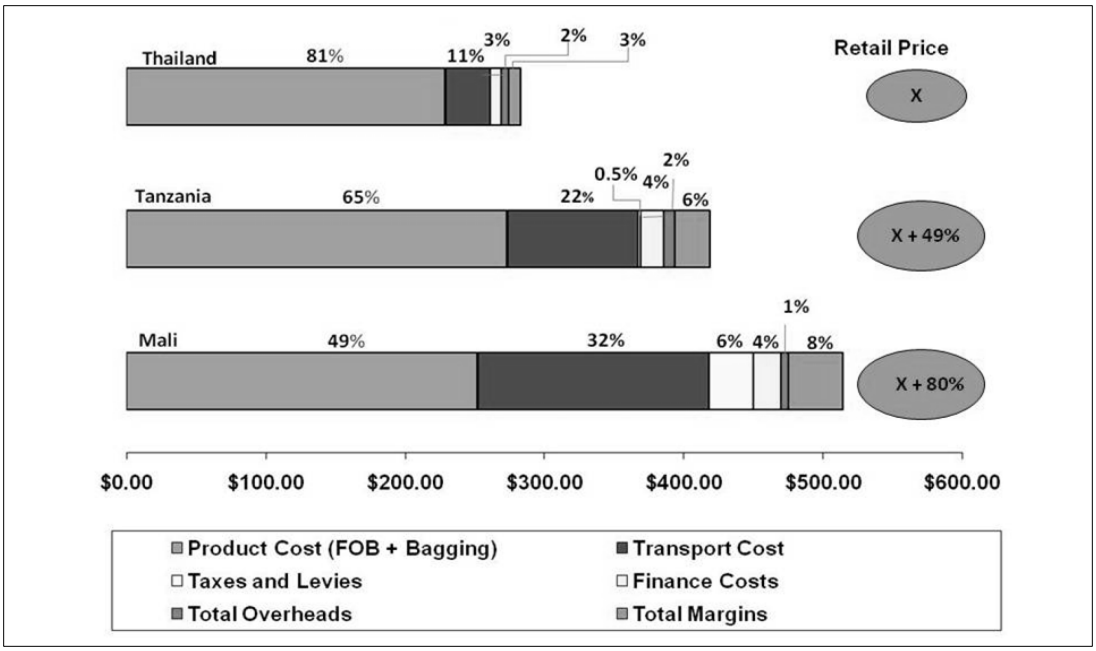


Source: Fuentes et al. 2010d.
Notes: [a] Performance indicators are average percentages and monetary values across different products on a 50 kilogram bag.
[b] Government charges account for 7.6% ((US$1.23/50kg bag) of domestic cost.

Comparative Analysis of Fertilizer Costs

Figure 5.6 compares supply cost components in the global context—a large fertilizer market in an Asian country (Thailand), a small fertilizer market in a coastal African country (Tanzania), and a small fertilizer market in a landlocked African country (Mali). The data refer to 2006. Although all three countries have similar, though not identical, FOB (free-on-board-- means the supplier will load the product on the ship free of charge, that is, the price includes handling charges from the factory to the ship; ex-factory price means the buyer has to pay for moving the product from the factory gate to the ship) prices for urea, transportation costs account for about a third of the retail price in Mali (landlocked) and a fifth in Tanzania (coastal), but only 11 percent in Thailand. Thus, long distances and inefficiencies in transportation add significantly to retail fertilizer prices in West Africa. All other costs (finance, marketing margins, overhead, and taxes) account for 8 percent of the retail price in Thailand but 19 percent in Mali, reflecting the inefficiencies of small markets.

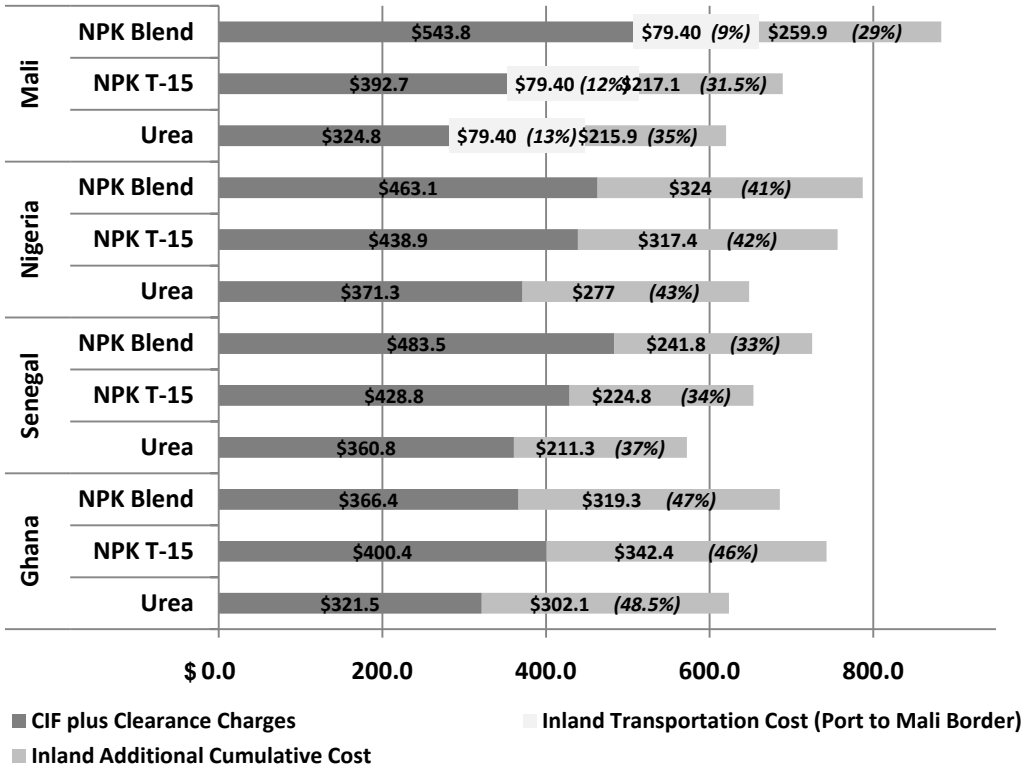
Figure 5.6—Supply chain cost components, 2006 (US$ and shares of total cost, %)



Source: Chemonics and IFDC 2007.
Note: FOB – Free on Board.

Because of the small market size and risky nature of operations, total margins are much higher in Mali (8 percent) than in Thailand (3 percent). Financing costs and taxes are also higher in Mali (10 percent) than in Thailand (5 percent). Although geographical distances are much longer in Africa countries than in Asian countries, such as India or Thailand, inefficiencies in transportation networks add significantly to the delivered price of fertilizers in Mali and other African countries. Such inefficiencies in transportation networks in Africa add to high transportation costs and serve as a trade barrier in general (Amjadi and Yeates 1995). Reducing transportation costs by improving the efficiency of transportation networks can have a significant impact on farmgate fertilizer prices in West Africa. Improving access to finance and reducing taxes are also critical to improving the performance of the fertilizer market.
Figure 5.7 provides data on the cost structure of different products in West Africa. The CIF cost of urea varies between $322/ton in Ghana to $371/ton in Nigeria. Both the size of the shipment and the source of procurement can affect urea price. Importers in Ghana are importing from Black Sea suppliers, where urea is generally cheaper than that from Arab Gulf sources.

Figure 5.7—Supply chain cost components by fertilizer products in select countries in 2009 (US$/metric ton)



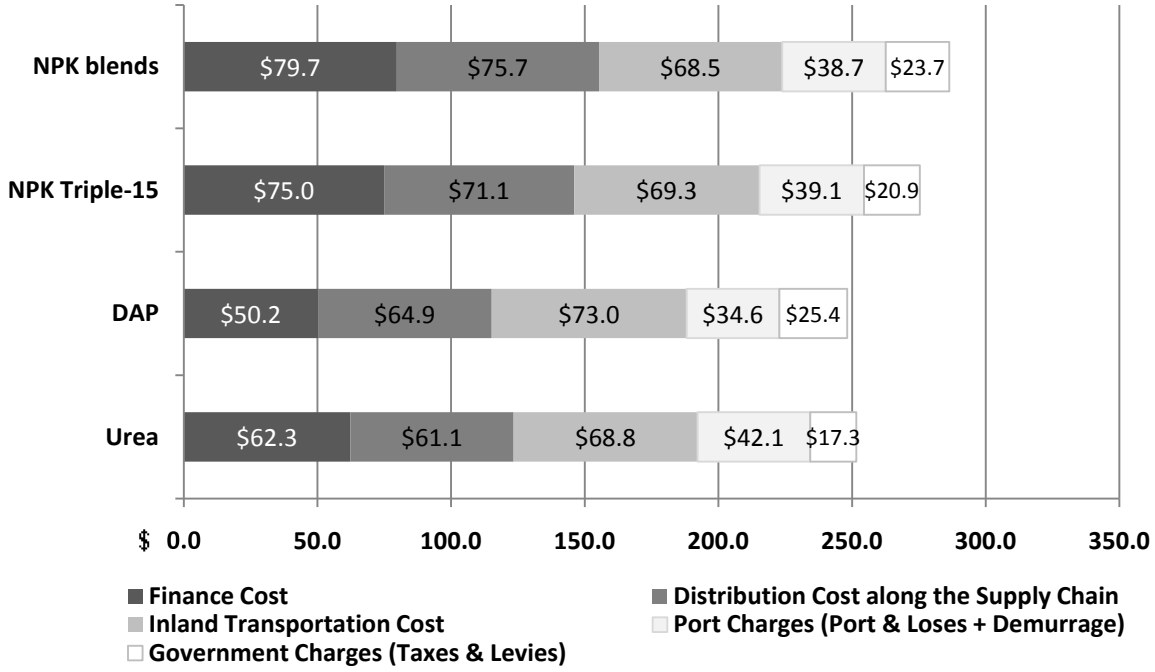
Source: Author's creation.

For blended NPK products, the price is much higher in Mali than it is in other countries. As mentioned earlier, Mali incurs an additional $79/ton for in-transit transportation from Dakar to Bamako or Abidjan to Bamako. In addition, custom NPK products for cotton crops cost more than standard NPK 15-15-15 produced for the global market. The CIF price for NPK 15-15-15 is $151/ton lower than that for blended NPK (especially the cotton formula). Even allowing for the cost of sulfur and boron in the cotton formula, the difference of $151/ton is on the high side. If the in-transit cost of transportation is added, the CIF cost at the Mali border for blended NPK is $623/ton—very high. This indicates that rationalization or the removal of artificial product differentiation of the cotton formula and its large-scale production in West Africa could yield significant savings.

It is rather surprising that for both urea and NPK 15-15-15, CIF prices are much higher in Senegal (a coastal country) than in Mali (landlocked country) or Ghana (coastal country). Inefficiency and uncertainty of tendering leading to rent-seeking may explain a part of this difference. However, this area needs further research. CIF prices account for 51 to 71 percent of the product prices in different countries. On the other hand, domestic marketing and transportation costs vary between 29 percent (blended NPK products in Mali) and 49 percent (urea in Ghana). Even with a large market (more than 500,000 tons product), Nigeria does not seem to enjoy the lowest prices for its products. This may be a result of distortions and informal charges introduced by Nigeria's nonconducive policy environment. The Federal Government of Nigeria targets to procure 400,000 to 600,000 tons of products for its subsidy program through tenders. Uncertainty of budget allocations, delays in payments, and parallel market operations (round-tripping) prevents the private sector from obtaining timely cost-effective price deals in the global markets, as mentioned in Section 4.

Among the domestic marketing and distribution components (Figure 5.8), financing, transportation, and marketing costs account for 70 to 80 percent of the total cost. NPK blends have the highest financing cost, and urea has the lowest marketing/distribution cost. Domestic transport cost varies between $69/ton and $73/ton. High transport costs reflect both long distances and inefficient transport services in West Africa. Taxes and government levies amount to $17 to $25 per ton, a charge that can be significantly reduced. Port charges vary between $35 and $42 a ton. Whereas taxes account for a smaller percentage of total cost, processing delays and rent-seeking opportunities add to transaction costs.

Figure 5.8—Supply chain cost components—domestic marketing costs (averaged across all four countries in the sample), (US$/metric ton) in 2009



Source: Author's creation.

6. CONSTRAINTS AFFECTING THE FUNCTIONING OF FERTILIZER MARKETS

We discussed the key constraints affecting the fertilizer supply chains in Ghana, Mali, Senegal, and Nigeria in Section 4. In this section we synthesize the country-specific constraints to develop a unified regional scenario highlighting common constraints.

Both supply-side and demand-side constraints affect the functioning and performance of West Africa's fertilizer markets. But it is the supply-side constraints that have a major impact on the supply price, which in turn affects fertilizer demand at the regional and national levels. These constraints affect both the accessibility and affordability of fertilizer in rural areas by increasing the transaction costs at each stage in the supply chain. Improving the efficiency of the supply chain not only improves the cost and accessibility of fertilizers for the farmer but also helps in reducing fiscal costs of providing fertilizer subsidies or purchasing power support to resource-poor farmers (as many countries did in 2008). Without improvements in the efficiency of the supply chain, national governments end up *subsidizing distortions* in the supply price. We therefore discuss the constraints affecting the supply side of the market equation first, followed by demand-side constraints.

Supply-Side Constraints

Nonconducive Policy Environment

In many countries, the fertilizer policy environment is not conducive to the development of competitive fertilizer markets at both the national and regional levels. Although the price support programs initiated in 2008 (following the global food price crisis) were well intentioned, the implementation modalities used have not been efficient. First, for example, tendering was introduced to procure fertilizer from local or international markets. But tendering adds risk and uncertainty to market development while also creating opportunities for rent-seeking. There is also a danger that resulting prices can turn out to be higher than those set through negotiations, as occurred in Mali in 2007 when the price for the CMDT tender was 50 percent higher than the price achieved through direct negotiations (Chemonics and IFDC 2007). Second, in most countries the government controlled the price for subsidized fertilizer without making adequate provisions for profit margins at the retail stage. Third, countries that introduced subsidy vouchers, such as Ghana, made inadequate arrangements for redemption of vouchers at the supplier level thereby blocking the supply chain and preventing many retailers from participating in the voucher market (Karusova and Banful 2010). In the end, this fragmented already thin markets. Finally, different countries follow different subsidy regimes, varying from 25 percent in Nigeria (at the federal level)18 to 50 percent in Senegal. Such variation in price between countries leads to smuggling and rent-seeking, thereby discouraging regional trade.

Tariffs, Taxes, and Trade Restrictions

Although fertilizer is exempt from a "common external tariff" of 5 percent on all imported goods in the ECOWAS region, some member states have not exempted fertilizer from this duty. Additionally, some countries impose a value-added tax in the range of 0 to 18 percent and other levies. For example, both Ghana and Mali impose an unnecessary and irrelevant shipper and council tax (Table 6.1 below). The taxes are small relative the final retail price, but they add unnecessary burdens in processing paperwork and opportunities for rent-seeking, which leads to delays in unloading and transporting fertilizer. Since fertilizer is a seasonal commodity, "fertilizer delayed is fertilizer denied." In addition to taxes, regulatory measures do not allow the movement of products from one country to another because they do not meet country-specific product specifications, such as the cotton formula (discussed further below).

[18] The final subsidies farmers receive can be as high as 70 percent if additional subsidies provided by local and state governments are included.

Poor Quality Regulation

Many countries in West Africa had a public-sector monopoly in input distribution before structural adjustment programs (SAPs) were introduced during the 1980s and the early 1990s. Under the SAPs, subsidies were removed, prices were decontrolled, imports were liberalized, and input distribution was privatized (Bumb and Baanabte 1996, Narayan and Bumb 1995). However, capacity for quality control, standards and measures, and truth-in-labeling was not strengthened, such that most countries still have inadequate regulatory systems. Although fertilizer laws exist in Nigeria, Ghana, Burkina Faso, and Mali, national regulatory services lack sufficient resources to implement them at the point of sale or enforce them. Different standards in various countries also prevent the movement of product from one country to another. In the framework of the implementation of its Common Agricultural Policy (including its fertilizer strategy following the Abuja Declaration), ECOWAS is trying to address these shortfalls. For example, it has embarked on a process to develop and adopt a regional regulatory framework on fertilizer quality control, as well as other necessary supporting regulations.

Table 6.1—Summary of various taxes each country faces

Country	Taxes	Comments
Ghana	ECOWAS statistical and community solidarity and withholding tax (2.5%);	The GSCT, introduced in the 1960s, serves no purpose as the GSCT institution does not exist.
	IRS and EPA processing fee;	
	Custom, excise, and preventive services fee;	
	Ghana Shipper and Council Tax (GSCT)	
Mali	ECOWAS statistical and community solidarity and withholding tax (2.5%);	The ADIT tax is an advance payment for tariffs but rarely gets returned to importer.
	ADIT tax, shipper and council tax, and transit tax (by Senegal)	
Nigeria	ECOWAS statistical and community solidarity and withholding tax (2.5%);	The 5% withholding tax should be removed.
	Nigerian withholding tax 5%;	
	Other taxes and levies (US$19.18/metric ton)	
Senegal	ECOWAS statistical and community solidarity and withholding tax (2.5%);	
	other taxes and levies (US$30.4/metric ton)	

Source: Fuentes et al. 2010a, 2010b, 2010c, and 2010d.
Notes**:** The Economic Community of West African States (ECOWAS) tax is levied on all imports to support the ECOWAS Commission's operations. In the long run, the ECOWAS Commission should find alternative sources of funding for its operations. EPA = Economic Partnership Agreement; IRS = Internal Revenue Service; ADIT = an advance payment for tariffs in Mali.

The presence of unnecessary government regulations at the import level can also add costly delays, such as quality control inspections that are unnecessary when international inspection companies like SGS, COTECNA, and others have already done so prior to shipping.[19] It should be underscored that quality is generally more of an issue for blended NPK than for straight products like urea and DAP that are imported and sold in 50 kg bags.

[19] The issue here is the mandatory inspections by the government.

Inadequate Market Information and Linkages

Although considerable effort has been devoted to the establishment of market information systems for key agricultural commodities, such as, maize, rice, coffee, cocoa, and cotton,[20] less effort has been put into establishing regional and national information systems for agricultural inputs. The lack of market information prevents traders in different countries from linking up with one another and benefiting from lower prices. It also hinders the integration of different segments of the market. Such a lack of information inflates prices and reduces accessibility. Also many small importers are not fully informed about prices in the global market and therefore end up paying higher than normal prices. *Market transparency* and *connectivity* are essential to promote well-functioning regional markets in West Africa. Recently, ECOWAS initiated efforts to establish market information links under its Agricultural Information Systems (AGRIS) program, and under the Marketing Inputs Regionally Plus (MIR Plus) program, it has started input data collection. However, such efforts need further strengthening at the country and interregional levels.

Limited Access to Financing

The capital-intensive nature of the fertilizer industry implies that fertilizer procurement and marketing requires large sums of money for investment. For example, to import, say, 20,000 tons of urea, an importer might need $6 to $8 million to buy the product in the global market at 2010 prices. For a local importer in Mali or Ghana to raise such funds is not possible because local banks charge high interest rates (20 to 30 percent) and require 150 percent collateral. As a result, local importers have relied on importing smaller lots—1,000 or 5,000 product ton thereby restricting the growth of fertilizer markets and rural-based agrodealers. Some promising opportunities may emerge from the Africa Fertilizer Financing Mechanism, UEMOA's Regional Agricultural Development Fund, and ECOWAS's Agricultural Development Fund. Another option would be to explore the use of Development Credit Authority[21] funds to provide loan guarantees to promote the development of large importers.

Product Differentiation

Different soils and crops need different amounts of nutrients for proper growth, but in West Africa product differentiation has taken place for nontechnical reasons. For example, as Table 3.2 shows, fertilizer product recommendations for cotton are different across countries despite their having similar soil and climate characteristics (for example, Mali's NPK ratios versus those of Cote d'Ivoire and Burkina Faso). Since these differentiated products are not produced for the global market, they have to be custom made at a small scale. This unnecessarily adds to production costs, and thus price. If the cotton formula were harmonized across countries, significant savings could be achieved, as high as $30 to $40 per ton (Table 6.2 below). Similar savings could also be generated by encouraging local blending capacities. Investment in a granulation plant for the region could also be justified because the market would be large enough to generate economies of scale.

Transportation Bottlenecks

After the CIF cost, transportation costs within and across countries make up the second biggest component of the fertilizer price, especially for landlocked countries such as Mali, Burkina Faso, and Niger. For large countries such as Nigeria, transportation costs can also account for a large share of

[20] Some examples: The West-African Market Information Network (WAMIN, or the French acronym, RESIMAO) mostly looks at output commodity prices. A new innovative market information exchange system, esoko at www.esoko.com, uses mobile phone technologies and the Internet (originally referred to as tradenet). Finally, among a smaller set of countries neighboring Mali, Michigan State University is proposing to set up a West Africa Market Information Project based on its Mali experience.

[21] The Development Credit Authority is an US government-funded agency providing credit guarantee to local commercial banks that provide finance to creditworthy but underserved private enterprises in developing countries (USAID 2011).

fertilizer prices. High transport costs result from several components: roadblocks (for inspection and clearance), an escort system for cross-border movement, a quota system for truckers, the lack of competition among truckers, taxes and levies, an old trucking fleet, and poor road conditions. A recent study (Annequin et al. 2010) analyzing the various hurdles estimated that on the Tema–Ouagadougou corridor transportation costs could be reduced by $77 a ton if a number of improvements were made (Table 6.3).

A World Bank study also provides stark evidence of high profit margins among trucking companies in West Africa (Teravaninthorn and Raballand 2009). The study estimated profit margins of up to 80 percent on the Tema–Ouagadougou and Tema–Bamako corridors. Additionally, it found that actual costs (fixed and variable costs) are not exceedingly higher than those found in Europe (here using the example of France).

Table 6.2—Potential savings from harmonization of cotton formula in West Africa, preliminary estimates (2000 prices, US$)

Activity/Element	Potential Savings
Nonspecialty product effect	30–40
Scale effect	
Production	20–25
Transportation	10–12
Local bagging (bulk imports)	8–12
Local blending [a] (bulk import of raw materials)	30–35
Improvements in marketing	15–20

Source: IFDC 2003.
Note: [a] Local blending of cotton formula should use boron-based material or use boron through foliar application (2000 prices).

Port Handling and Bagging

Inefficiencies at various ports in West Africa include limited berth space (causing delays in unloading cargo and increased stevedoring charges), the monopoly of the port authority in bagging or of unions in discharging and moving product to storage, and limited discharge rates. For example, at a discharge rate of 1,000 tons a day it takes 20 days to unload a cargo of 20,000 tons, adding demurrage charges. Such inefficiencies not only add to the cost of the product but also cause delays in moving the product. At the same time, inefficiencies of land-based transportation and distribution networks, which serve the port, can also lead to higher port handling and storage costs (also see Harding, Palsson, and Raballand 2007, a World Bank study on the state of maritime ports in West Africa).

Table 6.3—Potential cost savings on Tema–Ouagadougou transportation corridor

	Activity	Cost Saving (US$)
1.	Deregulation of West Africa trucking market	$25.20
2.	Removal of informal charges (corruption)	$13.69
3.	Speed up custom inspections at Ouagarinter	$11.16
4.	Create a single West Africa trucking market	$9.19
5.	Create more berth space for container operations at Tema port	$7.78
6.	Other improvements in port and in-transit operations and tax structure	$10.29
	Total	*$77.31*

Source: Annequin et al. 2010.

Limited Agrodealer Networks in Rural Areas

The capacity for well-functioning markets is restricted. Most of the agrodealers are concentrated in urban or peri-urban areas, so farmers in remote rural areas do not have access to inputs. Moreover, from the small importers and wholesalers to the table-top stockists who sell small quantities of such inputs as seed, chemicals, and fertilizer, few are well equipped with knowledge of business management, financial planning, and the technical aspects of inputs.

Demand-Side Considerations

Whereas supply-side constraints have affected fertilizer use in much of Africa through high fertilizer prices and limited physical availability and quality, demand-side constraints, especially those associated with the broader constraints affecting agricultural intensification in Africa as discussed earlier in Section 2, can prevent wider adoption of fertilizers.

Fertilizer Recommendations

In many countries, fertilizer recommendations are based on work done during the late 1960s and early 1970s, but crop and soil conditions have changed significantly. Farmers in Ghana say that fertilizer recommendations based on NPK 15-15-15 are not relevant to current soil conditions. Outdated fertilizer recommendations combined with poor-quality blended NPK fertilizers have created a lack of confidence among smallholder farmers (Fuentes, Bumb, and Johnson 2010a and 2010b). Here the role of research and extension is important, especially in developing appropriate fertilizer recommendations and farming practices suitable for different agro-ecological zones and farming systems, something ECOWAS, with the participation of CORAF/WECARD, is already pursuing.

Inadequate Research and Extension Support

Fertilizer is typically most effective when combined with improved seeds and farming practices. Therefore, efforts to increase fertilizer demand must be part of an overall agricultural intensification strategy—one that also involves R&D and the transfer of improved seeds, agronomic practices, and other technologies (for example, during postharvest). Unfortunately, investment in R&D has never returned to its highs in the 1970s and 1980s in many countries in West Africa. SAPs imposed soon after that effectively reduced the size of research and extension facilities in order to cut government fiscal spending. As a result, there is limited capacity to educate farmers about proper use of fertilizers and other necessary inputs. Although agrodealers have been trained in recent years to teach farmers about the right types of products, demand for such assistance is much greater than the available supply.

Inadequate Access to Financing or Credit

Access to credit and cash resources is a critical determinant for fertilizer use (Kelly 2006; Croppenstedt, Demeke, and Meschi 2003; Marinho 2004). Although export crop producers and large-scale commercial farmers face no problems borrowing funds from commercial banks, smallholder farmers, especially those growing staple foodcrops, often cannot get financing because of high interest rates and stringent collateral requirements. Moreover, the lack of financial institutions in rural areas also makes it difficult to access funds for inputs. Some countries have tried microfinance institutions, but the duration of the loan and the high interest rate do not suit the seasonal requirements of smallholder farmers.

Other types of institutions, such as producer associations and cooperatives, can play a key role at the farm level by helping reduce transaction costs (for example, in obtaining price information, knowledge and skills, and access to financing) and promoting trust and improved market coordination (Dorward et al. 2004; Fafchamps and Minten 1999; Gabre-Madhin 2001). Unfortunately, such institutions are weak in many rural areas in West Africa (as elsewhere in Sub-Saharan Africa).

Underdeveloped Output Markets

Studies done around the world have typically shown that farmers are far more responsive to changes in output prices than changes in input prices (Kelly 2006). Therefore, having access to a sufficiently large, stable market reduces the risks associated with output price variability. Smaller, underdeveloped output markets on the other hand exhibit higher price volatility. Bumper harvests can flood the market quickly, leading to a price collapse and the inability of farmers to sell their crop. This ultimately creates disincentives to use yield-enhancing technologies in future years. Therefore, linking smallholder farmers to larger domestic markets (for example, urban or high-population-density areas) and regional markets (such as through greater cross-border trade) is essential for increasing fertilizer demand.

Production Risk

As most smallholder farmers in West Africa depend on rainfed agriculture, adequate and consistent rainfall reduces the risk of applying productivity-enhancing inputs such as fertilizer. Because rainfall uncertainty is particularly high in the Sahel, investments in fertilizer are often unprofitable for many farmers (Marinho 2004). A recent study in Ethiopia (Alem et al. 2010) underscored the enormous importance attached to weather, especially as it relates to determining not only current productivity but also future investments.

Limited Purchasing Power

It is true that many viable smallholder farmers would use more fertilizer if they had access to seasonal finance and output markets to sell their crops at remunerative prices. However, there are many vulnerable farmers who produce for home consumption and do not sell in the market or sell only a fraction of their output. The risks associated with not having enough food to eat can be quite high, especially in locations with unpredictable rainfall, causing households to be less likely to adopt fertilizer (Dercon and Christiaensen 2010). Targeted poverty- and hunger-reduction measures, such providing purchasing power support for production inputs, can help lift some of the most resource-poor farmers out of their poverty trap and allow them to be included in the marketplace. An assessment of various poverty-reduction programs indicated that purchasing power support for inputs (seed and fertilizers) was the most cost-effective program in reducing hunger among vulnerable households in Malawi (Dorward et al. 2008, Brewin 2005).

7. POLICY AND INSTITUTIONAL OPTIONS AND RECOMMENDATIONS

We offer a number of options and recommendations to facilitate the improvement of fertilizer markets in West Africa with the goal of encouraging greater fertilizer use and productivity growth in the region. A key recommendation that comes out of this work is no different from past recommendations: improve the supply of fertilizer at both the macro and micro levels as a critical first step. This would help not only by lowering fertilizer prices at the farmgate but also by removing problems that emerge as a result of inadequate supplies to begin with, such as high fiscal costs and rent-seeking behavior from fertilizer subsidies (Larson and Frisvold 1996; Gregory and Bumb 2006; Morris et al. 2007). Because of the critical role fertilizer supply plays in improving fertilizer use and agricultural growth, we pay special attention to policy, institutional, and infrastructural issues affecting that supply at both the regional and national levels.

Increasing fertilizer availability, especially among a majority of the smallholder farm population, will require a range of both policy-related and institutional and infrastructure-type interventions (at both the national and regional levels). Based on recommendations and the results from our assessment of current conditions of fertilizer markets in the region, we propose a way forward that involves the strengthening of efforts by ECOWAS and its development partners in the establishment of a common fertilizer market in West Africa.

Creating a Policy Environment Conducive to Fertilizer Market Development

National governments, development partners, and ECOWAS should work together to create policy environments that promote the development of regional and national fertilizer markets, by considering the following actions:

- Do away with direct government procurement of fertilizers for fertilizer support programs.
- Implement targeted fertilizer subsidy programs by using voucher systems, with an adequate monitoring system in place, appropriate financial arrangements (for example, have agrodealers redeem vouchers at the local level to ensure the supply line is not choked by unnecessary delays as has occurred in Nigeria and Ghana), and exit plans.

Many countries introduced subsidies during the 2007–2008 fertilizer crisis. With the changing global fertilizer situation, we recommend that national governments consider revisiting the commitment to subsidies and instead convert them into targeted purchasing-power-support subsidies for the most *vulnerable but viable* smallholder farmers. Ideally, such support should be fiscally sustainable and have clear sunset clauses to avoid creating the dependency syndrome among beneficiaries. Ultimately, the goal for national governments should be to refrain from interfering in national and regional fertilizer markets in such a way that crowds out private importers and agro-dealers.

Improving Efficiencies along the Supply Chain

Removing Tariff and Nontariff Barriers

The presence of existing national tariffs, nontariff controls, and taxes at border crossings prevents the free flow of goods across national boundaries—adding to the costs of inputs, especially for landlocked countries. Therefore, at the regional level, input markets must become part of any overall liberalization and harmonization efforts being promoted under the Common Agricultural Policy in the ECOWAS region. More specific for fertilizer markets, this would involve

- harmonizing subsidy rate policies across member states so that fertilizer can be traded without borders;
- implementing zero duty on imported fertilizer; and
- convincing national governments to exempt fertilizer from other unnecessary taxes and levies at national levels.

Although removing tariffs and taxes will cause a loss of revenue for national governments, the losses in forgone crop output are likely to be far greater. For example, a simple calculation shows that *$1 collected in tariffs or taxes on fertilizer causes a loss of $3 to $4 in foregone crop output* (based on the authors' own calculations). Other sources of revenue (including a tariff on final products) may need to be explored to make up the loss of income from removing tariffs and taxes on fertilizer. Moreover, although ECOWAS member states have agreed to a common external tariff of zero percent on imported fertilizers, some countries have not yet implemented this rule. At the same time, many governments continue to impose other taxes, such as a value-added tax (VAT) of up to 18 percent on inputs (including fertilizers). Therefore, in addition to having no duty on imported fertilizers, other unnecessary taxes and levies, including VATs, should be discouraged among member states.

Improving Port Operations

Given the inefficiencies observed in the country case studies, we suggest the following policy actions. First, allow the private sector, to the extent possible, to make arrangements for bagging and transporting fertilizer from the port. Second, following a detailed assessment, make an investment to improve discharge rates (for example, from 1,000 to 3,000 tons per day) and demurrage and stevedoring charges. Finally, remove the burden of unnecessary inspections and paperwork at the port.

Removing Transportation Bottlenecks

As mentioned earlier, roadblocks on multicountry corridors add unnecessary costs and delays to the movement of fertilizer products. Given that the cost of transportation accounts for more than a third of the retail fertilizer price in landlocked countries, the improvement of transportation services and the liberalization of the trucking industry should receive priority (Annequin et al. 2010). Based on several of the country case studies, policy options include (a) remove the roadblocks and the escort systems; (b) explore the feasibility of treating the ECOWAS region as a single fertilizer market with one-stop inspections at major ports for multicountry haulage as the Common Market for Eastern and Southern Africa (COMESA) and the East African Community (EAC) are doing; (c) eliminate country quotas for trucking services and integrate the trucking sector among ECOWAS member states; and (d) improve efficiencies along some of the major trade corridors, such as the Dakar–Bamako railway line, to allow bulk movement of fertilizer products (we discuss this further in the next subsection).

Development of Efficient Trade Corridors

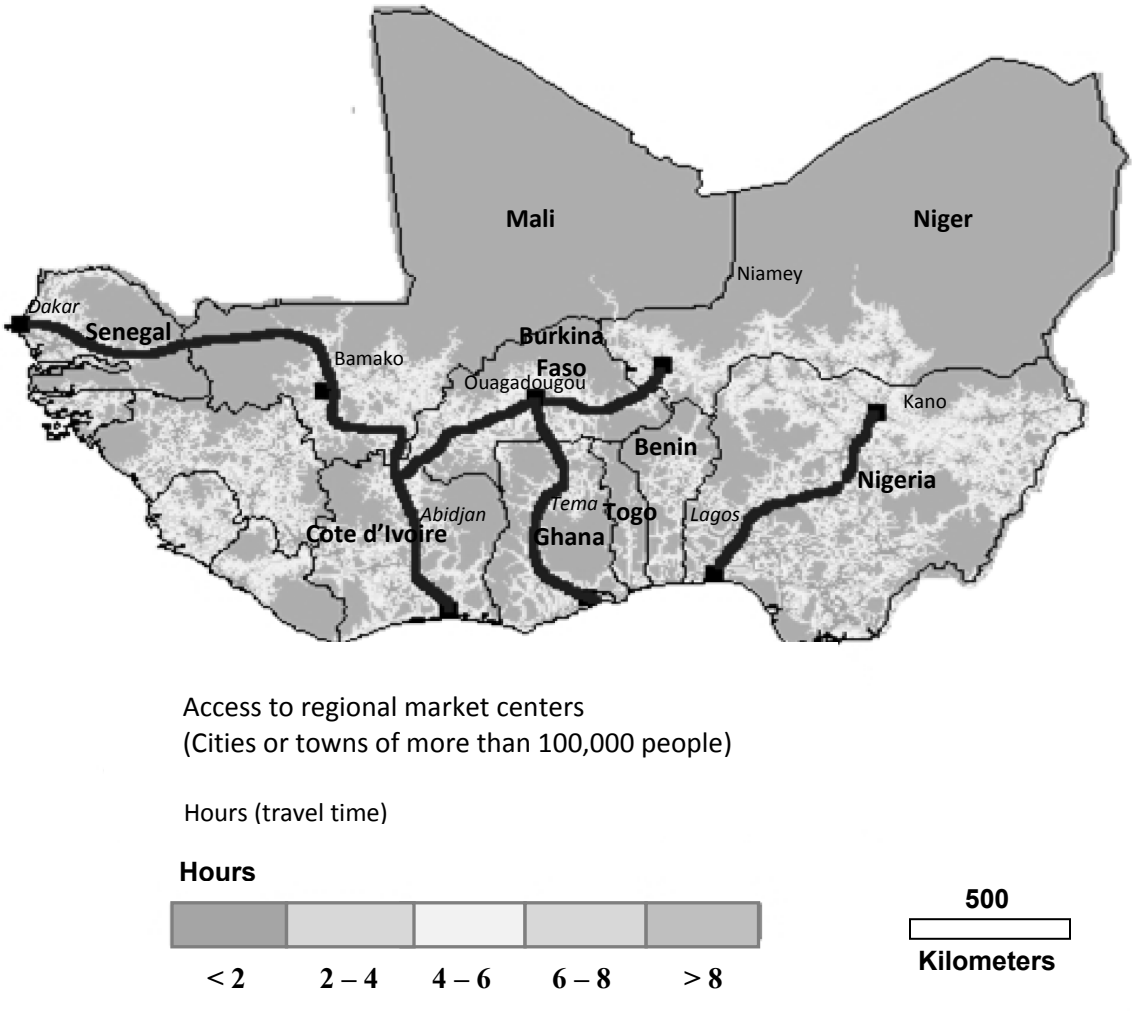
Although efforts would be needed on several fronts to create a common fertilizer market, priority should be given to removing critical distortions and roadblocks along the following four transport corridors: the Dakar–Bamako corridor; the Abidjan–Ouagadougou–Bamako corridor; the Tema–Ouagadougou–Niamey corridor; and the Lagos–Kano corridor. These corridors cover all of the landlocked countries and account for more than 90 percent of the fertilizer imported in the region. Improving efficiencies at ports and along transport routes along these corridors would help in creating a common market by reducing costs and delays in supplying fertilizer to member states.

Figure 7.1 illustrates how the trade corridors link the landlocked and coastal countries. Considering that market access and populations tend to be densely clustered along these corridors (in addition to others not shown), improving marketing and transportation efficiencies along the corridors not only would reduce input prices, but even more importantly would stabilize output prices through greater market penetration and integration (especially for food staples). A detailed feasibility study would identify pressure points along these routes and estimate the investments needed to usher in improvements. Such a study should also consider options for outlier markets, further from the corridors.

Exploring the Feasibility for Regional Fertilizer-Holding Warehouses

To benefit from economies of scale in procurement, and therefore reduced prices, international suppliers and national governments may wish to jointly explore the feasibility of establishing a few regional holding warehouses to be considered as free trade areas among the major ports of entry in West Africa, such as Dakar (already a free trade area), Abidjan, Tema, and Lagos. As free trade areas, such warehouses would enable small local importers in both landlocked and coastal countries to get fertilizer at competitive global prices. Typically, even though smaller importers face difficulties in accessing financing for large-scale imports from global suppliers, they could potentially benefit from such holding warehouses. However, further research and a pre-feasibility study would be required to explore this in more detail. The hypothesis is that expected benefits would include an expanded regional market, lower prices, and improved efficiencies in the timely supply of fertilizer among both coastal and landlocked countries. To avoid potential conflicts of interest, global or regional suppliers involved in the holding warehouse scheme should not be allowed to participate in the wholesale or retail business at the country level.

Figure 7.1—Access to regional markets along some select trade corridors in West Africa



Source: Corridors redrawn from Figure 4.3.1 in Johnson et al. (2008).

Pre-feasibility studies have been conducted in the other regions. For example, a recent study by IFDC on establishing a regional fertilizer-holding warehouse at the port of Beira in Mozambique recommended establishing such a warehouse in a public–private partnership mode (IFDC 2008). Key stakeholders endorsed that recommendation in Maputo, Mozambique, in March 2008 and during a Private Sector Round Table on Expanding Fertilizer Markets in Africa in Lusaka, Zambia, in June 2008. Based on the study, Yara International recently decided to build such warehouses in Beira and Dar es Salaam, Tanzania. The governments of Mozambique and Tanzania subsequently allocated lands to Yara for the construction. Although the Beira warehouse project is still under consideration, Yara has since committed $20 million to build the warehouse in Dar es Salaam (see Harding 2011 for details). Similar pre-feasibility studies would be needed to establish such warehouses in key ports in West Africa.

Rationalizing Fertilizer Policies, Products, and Institutional Arrangements

Rationalizing Fertilizer Recommendations

To improve on outdated and uniform fertilizer recommendations developed during the 1970s and 1980s, resources should be devoted to new trials and soil testing for developing area- and crop-specific recommendations. Special attention should be paid to nutrient depletion and changing the cropping mix over time. For the new fertilizer products, national governments should coordinate adequate seeding programs and educational efforts with regional R&D collaborative efforts, via, for example, CORAF/WECARD.

Rationalizing Fertilizer Products

A study should be commissioned to rationalize NPK fertilizer products across national boundaries, simplifying the number to a few key products that can be more easily traded across the region. First, areas in countries that share similar soils and agroecologies should agree to do away with artificial product differentiation, a phenomenon that exists in the region (see Table 3.2 for cotton, for example). A technical study would determine which specific products can benefit from greater rationalization. This would allow economies of scale in the production and procurement of specific blends and could even lead to investments in their production. In Mali, for example, the existence of high-quality Tilemsi phosphate rock may encourage bulk movement of complementary fertilizers from Dakar to Bamako, but only following improvements in the existing railway line.

Second, the production of granulated or blended products in the region would potentially allow for larger-scale imports of straight fertilizers such as urea, DAP, and MOP. This in turn would generate further savings in procurement prices and, more important, allow for the development of fertilizer markets for foodcrops. Foodcrop production has traditionally been neglected in receiving fertilizer treatments under custom-made fertilizer imports for export crops.

Strengthening Regulatory Systems

Finally, establishing uniform standards for the quality control of fertilizer products is going to be critical. As part of the implementation of the Common Agricultural Policy, ECOWAS has begun to develop the regional regulation of fertilizer quality and to establish the Regional Committee on Fertilizer Control and Labeling; both initiatives are intended to encourage the harmonization of regulatory systems across West Africa. However, to reiterate their importance, we recommend that the following areas receive priority attention:

- strengthening quality control systems at the national and regional levels, which will require the capacity to enforce the laws;
- investing in building the necessary cadre to enforce quality control standards and truth in labeling at the point of sale;
- investing in building regional laboratories for testing of fertilizers when and where needed; and
- establishing uniform standards for quality control of fertilizer products among countries.

Overall, because financial and human resource capacity gaps exist among countries in the region, implementing these priorities will require significant capacity-building efforts and adequate funding, especially for national regulatory services and self-monitoring. We further discuss the need to strengthen human and institutional capacities below.

Improving Access to Finance and Marketing Services

To improve access to finance, shown by the country case studies to be a serious constraint, we suggest the following actions: (a) establish risk management funds to encourage commercial banks to finance fertilizer imports and marketing, especially for small agrodealers (the Development Credit Authority loan guarantee system could be used to jump-start the process); (b) promote the use of credit insurance schemes to lower the risk of loan default for commercial banks; (c) promote the use of warehouse collateral for fertilizer imports as is done in Senegal; (d) encourage warehouse receipt systems to allow smallholder farmers to access credit from local banks; and (e) conduct training and capacity building for bank staff to learn about the fertilizer business.

The smooth flow of information about prices, stocks, sales, deliveries, and farmer demand among different markets is essential for improving the functioning, efficiency, and integration of regional markets. To improve market information and strengthen business linkages among importers, wholesalers, retailers, and farmers, the establishment and operation of market information and transparency systems should be strengthened at both national and regional levels. This would require training participating agrodealers to furnish information about prices, stocks, and sales and establishing the hardware and software for collecting and disseminating market information. In this vein several regional efforts are under way, including at the country level, and we should support or complement them. Creating broader Africa-wide linkages, such as with other regional economic communities, could provide important synergies in creating greater transparency of market information across regional markets. In this context, ongoing efforts under AGRIS by ECOWAS and AMITSA by EAC and COMESA should be strengthened and harmonized so that importers, agrodealers, farmers and policymakers have access to information on an Africa-wide scale and can benefit from each other's experiences.

Strengthening Human and Institutional Capacity

Capacity-building and training programs are needed in diverse areas, such as good management practices, market information, how to strengthen business and market linkages, and marketing and technical skills. The programs should include diverse actors, such as policymakers, extension agents, agrodealers, and farmers. Intercountry linkages for training purposes would be particularly beneficial, including those intended to encourage private-sector importers to pool their orders in order to benefit from economies of scale and develop multicountry markets. Programs designed to help link importers with global suppliers can strengthen ties and establish closer business linkages and solutions. Finally, periodic policy workshops, seminars, and study tours involving policymakers and other stakeholders would help improve policy dialogue.

Demand-Side Considerations

Encouraging farmers to use improved technologies and purchased inputs, such as fertilizer, should be integrated with efforts to improve supply-side efficiencies. To do this, we suggest a number of investments. First, improving linkages between farmers and input and output markets is critical. Institutions play a key role at the farm level by helping reduce transaction costs and promote trust, which helps expand production and marketing possibilities. Simply improving the link between smallholder farmers and increasingly integrated supply chains can dramatically increase a farmer's access to input and output markets. Improved links are possible through a variety of institutional arrangements such as producer associations, farmer groups, and cooperatives (Haggblade and Hazell 2010).[22] However, the

[22] It should be pointed out, however, that top-down interventions to encourage the formation of farmer groups have been relatively ineffective, whereas the few groups that have emerged from bottom-up initiatives have been more sustainable and more

type of institutions and market linkages will vary by crop—such as between high-value export crops and food staples. In cash crop production, for example, interlocking contracts between farmers (or farmer groups) and buying firms have played an especially important role in providing farmers access to credit and inputs (seed and fertilizer) and output markets, and especially in reducing market price risks. Care needs to be taken to ensure a strong producer role in the process.

Second, to strengthen R&D systems in the region while taking advantage of similar agroecological zones that stretch beyond national borders, resources should be provided for adaptive research and transfer of improved technologies across countries, including best farming practices and use of modern inputs. The technologies should be ones that have wider spillover potential and greater regional welfare implications. A study carried out for CORAF/WECARD's R&D priority-setting exercise offers a useful starting point (see Johnson et al. 2008).

Finally, here are some important considerations for improving extension and technology transfer: (a) support research and extension to educate farmers about new fertilizer products and recommendations; (b) develop "seeding" programs to demonstrate the use of new fertilizer products on a large scale; (c) train agrodealers to disseminate knowledge about new agricultural practices and link them with subject matter specialists to upgrade their skills on new technologies and agronomic practices; and (d) promote other proven natural resource management techniques (for example, integrated soil fertility management).

Exploring the Establishment of a Common Fertilizer Market

Critical among the many policy recommendations reviewed above are the market development elements of creating an enabling policy environment, developing human capital, improving access to finance, facilitating market information and business linkages, and enforcing quality regulations. The good news is that many efforts are already under way to solve some of these constraints. For example, ECOWAS (and UEMOA) are well aware of the policy issues, tariffs/taxes, quality issues, market information system needs, and transportation bottlenecks, among other things, that the region faces in the development of its agro-input markets. Efforts by them and others in the region—such as the West Africa Trade Hub, the Agribusiness and Trade Promotion (ATP) project, and the ECOWAS/UEMOA MIR Plus project—are taking place at the regional level. Some such efforts are by nature long term as they require consensus across member states (for example, for policy harmonization), while others are expensive and take a long time (for example, infrastructure and port development). However, more could be done by exploring further the extent to which the ECOWAS region can strive toward creating a common fertilizer market for West Africa in the future.

A common fertilizer market for West Africa will become more realizable if current efforts at promoting synergies across national and regional input markets can be maintained. How to go about establishing such a common market, nevertheless, is going to require more detailed assessments by ECOWAS, member states, and development partners. The goal of such assessments would be to explore the feasibility and appropriate courses of action. ECOWAS is already laying the groundwork, beginning with the adoption of a Common Agricultural Policy, coming to an agreement with UEMOA on a common protocol on seed testing and certification, and establishing a common external tariff regime. With subsequent measures, such as a regional legal framework for agro-input trade, such changes will even further strengthen the regional markets.

To help create and coordinate further synergies across various efforts, one option to consider would be the establishment of a regional fertilizer alliance[23] that can work directly with ECOWAS, national governments, the private sector, and other stakeholders to help (a) promote a policy environment conducive to national and regional fertilizer markets; (b) provide technical advice on business (for example, by helping small importers and agrodealers establish links with large importers and global suppliers to improve access); (c) link entrepreneurs to commercial and development banks to improve the

likely to engage in interlocking contracts (World Bank 2007).

[23] Similar efforts have been established in the past for seeds, for example. See the West Africa Seed Alliance at http://www.cnfa.org/our-work/our-programs/65-west-african-seed-alliance-wasa (accessed 2/3/2011).

supply of financing for fertilizer import, marketing, and distribution (for example, by exploring various risk management instruments to encourage commercial banks to lend to fertilizer entrepreneurs and link up with the Development Credit Authority credit guarantee system); (d) broaden and deepen ongoing efforts for collecting and disseminating market information and strengthening market linkages; (e) build and strengthen capacities through training, workshops, seminars, and study tours; and (f) foster policy dialogue among all public and private stakeholders.

8. CONCLUDING REMARKS

We must address many of the policy recommendations presented in the previous section if we are going to improve the efficiencies of fertilizer markets and boost the use of fertilizer in West Africa. Critical among those are the key market development elements—creating an enabling policy environment, developing human capital, improving access to finance, facilitating market information and business linkages, and enforcing quality regulations—and they need to be promoted in a holistic manner in order to create synergies across countries. Fragmented approaches in the past have focused on one or two tasks and did not produce significant lasting results.

If only one key recommendation is to emerge from this review, it is that ECOWAS, development partners, and national policymakers should strive to create a common fertilizer market for West Africa considering the small size of fertilizer markets at the country level (except Nigeria), especially if current efforts to promote synergies in market development can be maintained at both the national and regional levels. This is because the region can gain large economies of scale and efficiency improvements in marketing and distribution from promoting a common market. This is not to suggest that efforts to improve the functioning of fertilizer markets at the national level will no longer be needed. On the contrary, how well individual country markets integrate into a larger regional one will depend on the success of these national-level efforts. Ultimately, a successful integration at the regional level will yield larger potential benefits than the sum of the national ones. Therefore, efforts to improve the performance of national markets should complement the development of a regional common fertilizer market.

But doing this will require a concerted effort among the member states of ECOWAS and their development partners to undertake a more detailed feasibility study in order to decide on an appropriate course of action for a common regional fertilizer market. The good news is that policymakers, development partners, the private sector, and the farming community, in West Africa and other regions in Africa, recognize that creating regional common markets is essential for accelerating future economic growth, poverty reduction, and food security. On July 1, 2010, for example, the East African Community member states signed a protocol to create a common market for East Africa. COMESA is working on removing tariff and nontariff restrictions on the movement of goods to create larger markets for commodities. ECOWAS has already agreed to a zero external tariff on imported inputs and a Common Agricultural Policy and has initiated the process of establishing common norms for fertilizer regulation and labeling. UEMOA and ECOWAS have agreed to a common protocol on seed and CPP testing and certification. The foregoing are important building blocks for creating a common fertilizer market, one that can ultimately harness the benefits of lower fertilizer prices and improved accessibility by smallholder farmers.

Finally, we can expect the gains to be had from taking advantage of economies of scale in fertilizer production and procurement and removing cross-border hurdles and distortions, as a common fertilizer marker would strive to do, to be quite large. Market transaction costs would be reduced, while access to global fertilizer markets and good-quality fertilizer products would be expected to improve for small importers and wholesalers, as well as millions of smallholder farmers. This should lead to lower prices and higher growth rates in the derived demand for fertilizers and other complementary technologies in the region. This should then result in increased yields, sector and income growth, and food security. But whereas such an argument is compelling, further research is needed to substantiate the extent of these economic gains, including the short- and long-run priority interventions needed to develop a regional common fertilizer market. That should include assessing the investments and policy reforms needed to usher in improved transportation and marketing efficiencies along some of the major trade corridors, and it should explore the possibility of building regional fertilizer-holding warehouses at some of the major ports of entry (Dakar, Abidjan, Tema, and Lagos). Because not all countries within the region may derive full benefits from a common fertilizer market, further research is also recommended to explore how to improve linkages with smaller national markets, such as in Liberia and Sierra Leone, as well as to examine the likely distribution of impacts, especially among resource-poor smallholder farmers.

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Fax: +1-202-467-4439
Email: ifpri@cgiar.org

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P. O. Box 5689
Addis Ababa, Ethiopia
Tel.: + 251 (0) 11-617-2500
Fax: + 251 (0) 11-646-2927
Email: ifpri-addisababa@cgiar.org

IFPRI NEW DELHI

CG Block, NASC Complex, PUSA
New Delhi 110-012 India
Tel.: 91 11 2584-6565
Fax: 91 11 2584-8008 / 2584-6572
Email: ifpri-newdelhi@cgiar.org

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