IFDC

Input Subsidies and Agricultural Development

Issues and Options for Developing and Transitional Economies

An International Center for Soil Fertility and Agricultural Development

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Issues and Options for Developing and Transitional Economies

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Foreword

In spite of the significant progress made during the last half of the 20th century, food security remains a challenge for over 800 million persons who suffer from hunger and malnutrition and for over a billion people who earn less than one dollar per day. To confront this challenge, the United Nations has adopted the goal of reducing hunger and poverty by one-half by 2015. It is also recognized that while promoting food security, care must be taken to protect the environment.

In achieving both food security and environmental protection, the judicious application of science and technology embodied in improved seed, mineral fertilizers and other associated inputs, and an enabling policy environment are essential. With this perspective in mind and in the context of the World Trade Organization (WTO) agreements about agricultural subsidies, IFDC decided to assess the role of input subsidies in agricultural development in developing and transitional economies. Detailed discussions were held on this subject at the IFDC Retreat in October 2002. It was decided that IFDC should prepare a position paper on this subject to help donors, policymakers, researchers, and project field staff in making informed decisions.

A panel was appointed to prepare the position paper. The panel consisted of the following members:

B. L. Bumb, Program Leader, Economic and Policy Development Program, Market Development Division, IFDC

S. K. Debrah, Program Leader, Policy and Market Program, Africa Division

L. Maene, Director General, International Fertilizer Industry Association (IFA) and Member, IFDC Board of Directors

The draft paper prepared by the panel was circulated among IFDC staff members and the comments received were incorporated. The paper provides an assessment of arguments for and against input subsidies (especially mineral fertilizers), reflects IFDC experiences in dealing with fertilizer subsidies in a dynamic context, proposes market-friendly alternatives to input subsidies, and identifies areas where input subsidies may be socially desirable but cautions that, even in such cases, input subsidies should be administered in a market-friendly manner so that market development efforts are not jeopardized and input subsidies are sustainable.

I hope that donors, policymakers, and other stakeholders will find the paper insightful and constructive in dealing with input subsidies in their endeavors for food security and environmental protection.

A. H. Roy
President and CEO

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Acronyms and Abbreviations

ACDI	Agricultural Cooperative Development International
AFADA	Albanian Fertilizer and Agro-Input Dealers Association
AIMS	agricultural input markets
AMS	aggregate measure of support
BADC	Bangladesh Agricultural Development Corporation
CARE	Cooperative for Assistance and Relief Everywhere
CLUSA	Cooperative League of the United States of America
CPEs	centrally planned economies
DAI	Development Alternatives, Incorporated
DAP	diammonium phosphate
DDCs	developed countries
DfID	Department for International Development (UK)
DVCs	developing countries
EU	European Union
FADINAP	Fertilizer Advisory Development and Information Network for Asia and the Pacific
FAI	Fertilizer Association of India
FAO	Food and Agriculture Organization of the United Nations
GATT	General Agreement on Tariffs and Trade
GOB	Government of Bangladesh
ICARDA	International Center for Agricultural Research in the Dry Areas
IFA	International Fertilizer Industry Association
IFDC	An International Center for Soil Fertility and Agricultural Development
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
K_2O	potash
KR II	Second Kennedy Round
LDCs	least developed countries
LOC	letter of credit
MADIA	Managing Agricultural Development in Africa
MAI	Ministry of Agriculture and Irrigation
MIS	market information system
mnt	million nutrient tonnes
MOP	muriate of potash
MTL	Masdar Technology Limited
N	nitrogen
NAFTA	North American Free Trade Agreement
NCR	nutrient-crop price ratio
NGOs	non-governmental organizations
NTBs	nontariff barriers
OECD	Organization for Economic Cooperation and Development
P_2O_5	phosphate
SADAOC	Network of Sustainable Food Security in Central West Africa
SAIS	School of Advanced International Studies
SAPs	structural adjustment programs

SOEs	state-owned enterprises
SSA	sub-Saharan Africa
SSCR	shifting the supply curve to the right
SSG	special safeguards
TSP	triple superphosphate
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
URAA	Uruguay Round Agreement on Agriculture
USAID	United States Agency for International Development
VCR	value/cost ratio
VOCA	Volunteers in Overseas Cooperative Assistance
WTO	World Trade Organization

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Abstract

World population is projected to reach over 8 billion in 2025 and over 9 billion in 2050. Over 90% of the projected increase will occur in the developing and transitional economies where food insecurity and environmental degradation are serious challenges. In confronting these challenges, the use of mineral fertilizer and associated inputs will continue to play a critical role, as it has done in the past.

Environmentally sound use of modern inputs depends on technology, agronomy, and policy-related factors. Once the agronomic practices are known and suitably engineered products are available in the market, it is the policy-related factors that carry the burden of moving the cart forward. Through a conducive and stable policy environment, many countries, especially in Asia, have recorded high growth in fertilizer use and other inputs, and input subsidies played a central role in such policy environments. Nevertheless, driven by policy and market reforms, many countries have phased out input subsidies during the 1990s.

In the context of market reforms and the Uruguay Round Agreement on Agriculture (URAA), this paper provides an assessment of arguments for and against input subsidies, especially fertilizer subsidies, and discusses various alternatives to subsidies and IFDC experiences in dealing with fertilizer subsidies. The assessment of various arguments and experiences indicates that arguments in favor of fertilizer subsidy are no longer as strong as those that are against it; and the sustainable alternatives to subsidy are even stronger, given the universal moves towards market-based developments. The alternatives include efforts to reduce the cost of fertilizers through a number of strategies that will shift the supply curve to the right and promote public investment in marketing infrastructures, improve profitability of fertilizer use through investment in soil fertility restoration, and provide support under the Green Box measures of the URAA. Situations are also identified in which direct subsidies could be considered, but even in those cases, accompanying measures should be taken to avoid misuse of resources and the distortionary impact on the market. However, national governments should continue to take the lead in investing in public goods through public-private partnerships, in internalizing the externality (leading to market failure), and in providing necessary support for soil fertility and natural resource management in a market-friendly way. Where the concern is poverty alleviation, a voucher system of support is preferred because it addresses the twin objectives of poverty alleviation and market development.

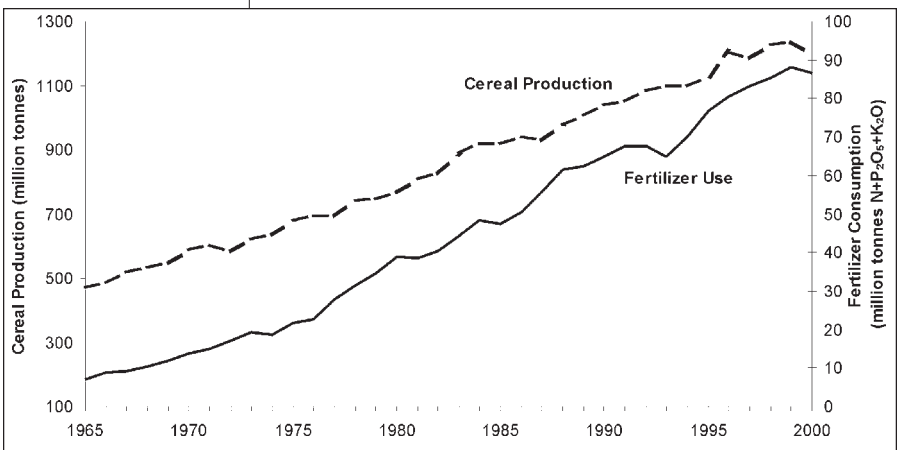
Input Subsidies and Agricultural Development
Issues and Options for Developing and Transitional Economies

I. Introduction

World population is projected to reach over 8 billion in 2025 and over 9 billion persons in 2050 (United Nations [UN], 2001). Over 90% of the increase in population will occur in developing and transitional economies where food insecurity and environmental degradation are serious challenges. Over 800 million people suffer from hunger and malnutrition and over a billion people earn less than one dollar per day. Feeding the additional 3 billion persons and providing adequate food and nutrition for existing malnourished people will require nearly doubling of food production by 2050. The challenge of doubling food production must be confronted in an environmentally friendly way. Natural resources, including forests, wildlife, and soils, must be managed in such a way that the future generations are not deprived of these natural capitals. Increasing soil degradation and deforestation in some parts of the world, especially in Africa, are already constraining the human ability to produce enough food. As a result, in sub-Saharan Africa (SSA), one out of every three persons suffers from hunger and malnutrition (Partnership to Cut Hunger and Poverty in Africa, 2002).

In confronting these challenges, the use of mineral fertilizers[1] will play a critical role as it has done in the past. During the 1960-90 period, world population increased by over 3 billion, although world cereal production more than doubled from 846 million tonnes to 1,947 million tonnes (Food and Agriculture Organization of the United Nations [FAO], 2003). The increased use of mineral fertilizers played a key role in realizing this growth in global cereal production, especially in developing countries (Baanante et al., 1989) (Figure 1). Global fertilizer use increased from 27 million nutrient tonnes (mnt) in 1960 to 142 mnt in 1990; in developing countries it increased from 4 mnt to 62 mnt (Bumb and Berry, 2002).

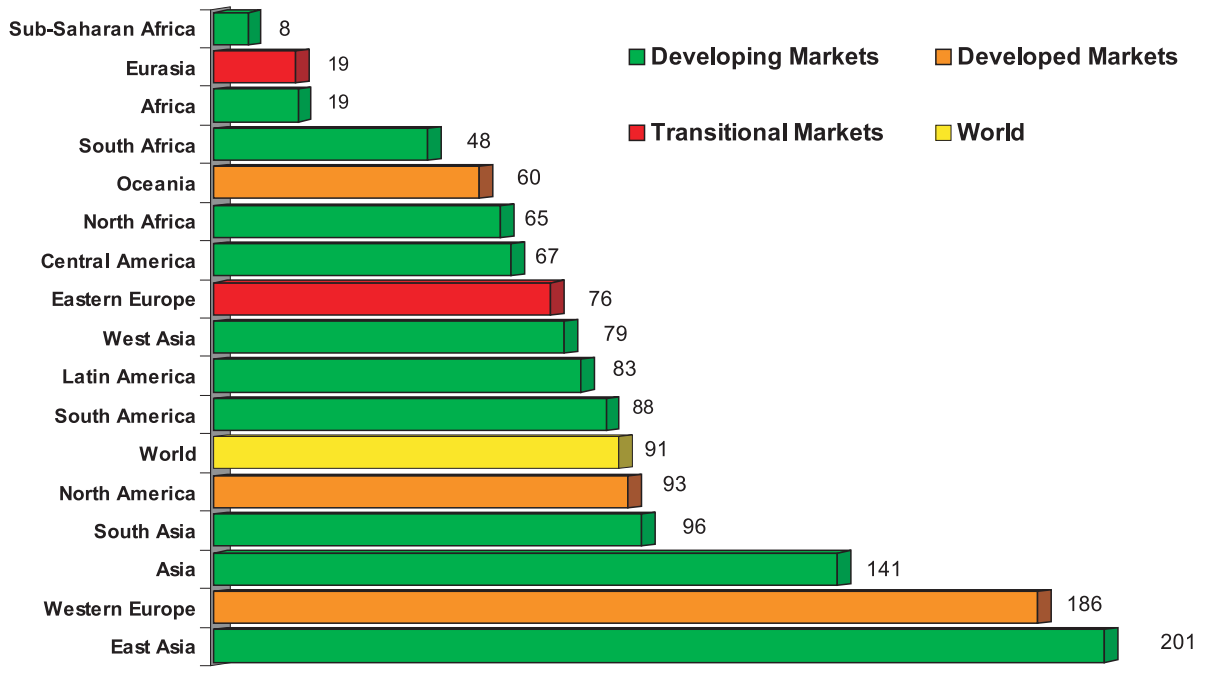
Increasing soil degradation, especially in SSA, is a result of nutrient depletion. In SSA, fertilizer use averages 8 kg/ha whereas nutrient depletion reaches over 60 kg/ha (Figures 2-3). Without adequate replenishment, nutrient removal leads to degraded soils and degraded soils force farmers to clear forests for subsistence farming. Only through increased use of fertilizers and other complementary inputs,



Source: Derived from data in FAO (2003).

Figure 1. Developing Countries: Cereal Production and Fertilizer Consumption, 1965-2000

1. In this paper, mineral fertilizers refer to nitrogen (N), phosphate (P_2O_5), and potash (K_2O) fertilizer products derived from mineral resources (direct application of phosphate rock) or chemical industry processes—urea, triple superphosphate (TSP), diammonium phosphate (DAP), muriate of potash (MOP), and others. Hereinafter, mineral fertilizers are referred to as fertilizers.



Source: Derived from data in FAO (2003).

Figure 2. Per Hectare Fertilizer Use by Markets, 2000/01 (kg/ha)

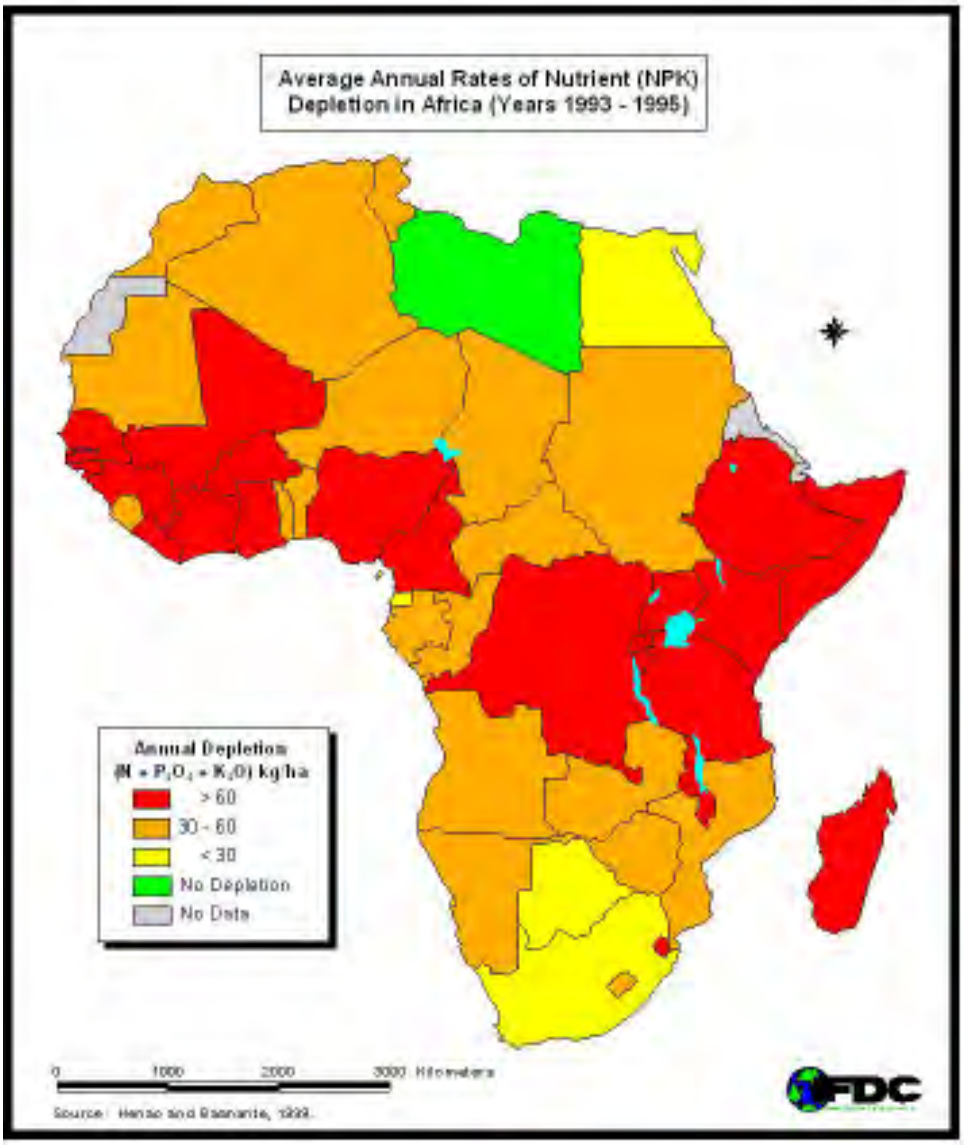
including water and organic matter, can the process of soil degradation and deforestation be halted.

While increased fertilizer use can help to prevent nutrient depletion and associated soil degradation, it can also contribute to increased food production and agricultural productivity by facilitating the adoption of fertilizer-intensive improved seeds and other agronomic practices. With judicious use of fertilizers, crop yields can be increased two- to threefold. During the 1965-2000 period, through only the adoption of improved seeds, fertilizers, and related agronomic practices, China and India could nearly triple[2] their food production to feed over 2 billion persons in 2000.

In promoting fertilizer use, agronomy, technology, and policy-related factors have played a critical role (IFDC, 1991). However, once the agronomic practices are known and suitable fertilizer products are available in the market, it is the policy-related factors that carry the burden of moving the cart forward. Through a conducive and stable policy environment, many countries have recorded high growth in fertilizer use. An enabling policy environment consists of macroeconomic stability, price incentives, effective organizational arrangements, and improved access to finance and information (Bumb et al., 1994; Narayan and Bumb, 1995; Bumb et al., 1996; IFDC, 2002a). Among all these factors, input subsidies, especially fertilizer subsidies, have occupied a central place in the policy agenda because of their profound influence on incentives to use fertilizers. In general, the countries that have used fertilizer subsidies have recorded relatively higher annual growth in fertilizer use. In Africa, fertilizer use grew at 16.2% per annum in countries with subsidy and at 8.9% per annum in countries without subsidy during the period 1971/72 and 1979/80 (Table 1). Similar trends are shown for Asia, the Near East and Latin America. On the other hand, the countries that removed fertilizer subsidies in a sudden manner have recorded a significant fall in fertilizer use (Bumb, 1995; Bumb and Baanante, 1996; IFDC, 2001a).

Although subsidies are applicable to all agricultural inputs, this paper's primary focus is on fertilizer subsidies because fertilizer products are capital intensive and account for a large share (over 60%)

2. India's cereal production increased from 80 million tonnes in 1965 to 235 million tonnes in 2000 while China's increased from 162 million tonnes to 455 during the same period (FAO, 2003).



Source: Henao and Baanante (1999).

Figure 3. Average Annual Rates of Nutrient (NPK) Depletion in Africa (Years 1993-95)

Table 1. Fertilizer Use in Countries With and Without Subsidies During the 1971/72 – 1979/81 Period

	Percentage Growth Per Year			
	Africa	**Asia**	**Near East**	**Latin America**
With Subsidy	16.2	19.6	11.0	13.2
Without Subsidy	8.9	10.2	6.9	7.8

Source: Couston and Narayan (1987).

of the cash expenditures incurred by farmers in developing economies. After assessing the arguments for and against fertilizer subsidies, the paper discusses IFDC experiences in dealing with fertilizer subsidies under different socioeconomic circumstances. Thereafter, market-friendly alternatives to subsidies are elaborated. Such alternatives include options available for reducing transaction costs, public investment in the development of marketing (physical and financial) infrastructures, and support for soil fertility restoration. The paper also identifies the conditions under which temporary direct subsidies may be desirable and the safeguards to minimize their distortionary impact on input markets and national budgets.

It is hoped that the issues and options discussed in this paper would help policymakers, donors, and other stakeholders in making informed decisions about input subsidies under various socioeconomic settings.

II. History of Agricultural Subsidies

Agricultural subsidies have dominated the agricultural policy agenda in all economies—developed, developing, and transitional (formerly centrally planned economies [CPEs]). In the developed economies, agricultural subsidies have been mostly in the form of price support for both domestic production and exports (Maene, 2000). In 2001 agricultural subsidies amounted to over $350 billion in Organization for Economic Cooperation and Development (OECD) countries (International Monetary Fund [IMF], 2002; OECD, 2002). Because these subsidies distort global crop prices, developed countries have agreed to reduce domestic support and export subsidies under the Uruguay Round Agreement on Agriculture (URAA) (World Trade Organization [WTO], 1995; FAO, 1994, 1998; Bumb et al., 2001). However, the progress remains slow and some countries like the United States have reversed the course by increasing the amount of subsidies available to farmers under the new U.S. Farm Bill. Likewise, the European Union (EU) and Japan have reduced farm subsidies only marginally. To the extent the developed countries continue to subsidize their farm produce, developing country farmers, especially farmers in grain-exporting countries, will continue to face lower prices for their produce, feel discouraged to produce for global markets, and lose potential income which could help in reducing poverty.

Unlike the developed countries, developing countries have relied more heavily on input subsidies, especially fertilizer subsidies (Gregory et al., 2000; Debrah and Breman, 2002). Fertilizer subsidies were prevalent in the 1950s and 1960s, but such subsidies were concentrated mostly on export crops and were geared to educate farmers in the proper use of fertilizers. However, as the population explosion took place, food security became a serious challenge and the fertilizer-intensive Green Revolution technologies became popular, fertilizer subsidies started receiving serious consideration. The 1974 energy crisis leading to a skyrocketing increase in fertilizer prices (urea price increased from $48/tonne in 1970 to over $300/tonne in 1974) forced many developing countries to introduce fertilizer subsidies. In 1980 all primary fertilizer-using developing countries, including India, China, Indonesia, Egypt, Turkey, Nigeria, Kenya, Tanzania, Zambia, Brazil, Mexico, and Venezuela, were subsidizing fertilizer products. Many of these countries also subsidized the production of fertilizers (Segura et al., 1986; World Bank, 1989).

Fertilizer subsidies became popular for both political and economic reasons. Politically, they became an instrument of pleasing farmers in the rural sector, and economically, benefits outweighed the costs of fertilizer subsidies in terms of foreign exchange savings resulting from import substitution. While implementing the structural adjustment programs (SAPs) in the 1980s, many developing countries started the process of phasing out subsidies for two reasons: failure of the subsidy scheme to "mature" into efficient behavior and unsustainable budgetary cost of subsidies. Nevertheless, such countries as India, Indonesia, and Nigeria still subsidize fertilizer and other inputs. Economic and political reforms leading to market-based development in the former CPEs also resulted in the removal of subsidies. Thus, in the early 21st century, only a few developing or transitional economies were subsidizing agricultural inputs, including fertilizer products.

Resurgence of the Subsidy Debate

The issues of agricultural input subsidies and support mechanisms are complex, and more than ever, stakeholders (policymakers, private sector input dealers, farmers, and donors) need guidance on how to resolve the possible conflict between the need to encourage farmers to use greater amounts of fertilizer to increase agricultural production and the need to limit the impact of input subsidies on national treasuries and on the development and growth of the nascent private sector-driven input markets. Moreover, the socioeconomic and political situation in many developing and transitional economies has changed following the introduction of economic and market reforms. Input supply systems are not operating as efficiently as was expected before the introduction of market reforms and thereby making it difficult for poor farmers to access inputs in a cost-effective and timely manner.

There are two main forces driving the demand for the reintroduction of subsidies: farmers and politicians. First, farmers are feeling the impact of the changing and harsh socioeconomic environment, including the widening food gap between supply and demand caused by a rate of population growth that is higher than the rate of growth of food production. Rising population is increasing the demand for food while reducing the per capita available arable land. On the other hand, the declining fertility of the soil due to low use of external inputs and nutrient mining is leading to low productivity. Although farmers are feeling the need to intensify their agriculture, unfortunately, they have to face high costs and difficult access to external inputs. Meanwhile the market reforms have led to the government withdrawal from procurement and distribution, removal of subsidies, and abolition of guaranteed prices. Since the private sector was not well prepared and the conditions under which they participated in the market were unfavorable, they were unable to fill in the gap, thereby leading to high cost and unreliable supply. The inefficiency and misuse that prevailed during subsidy regimes prevalent in the pre-reform period have now been replaced by low profitability and high risk of fertilizer use. Hence, farmers want subsidies to minimize risk and improve profitability.

Politicians argue that equity and food security are prerogatives of government and as such they consider fertilizer strategic to meeting equity and food security objectives. Because of this, promoting the widespread use of fertilizer is synonymous to promoting equity and food security. Politicians are also under pressure to respond to the pressure of the powerful urban consumers for cheaper food because they spend up to 80% of their disposable incomes on food. Politicians are becoming frustrated, now more than ever, by the apparent double standards of the developed world in the unfair manner subsidies and support for farmers are treated. Developed countries spend over $300 billion a year subsidizing their agriculture and, in doing so, hurt the agriculture of developing countries. For example, agricultural protection in the OECD countries is estimated to cost developing countries US $100 billion a year in lost revenue from processed agricultural products (Maene, 2000). The United Nations Conference on Trade and Development (UNCTAD) estimates that by 2005 developing countries could export US $700 billion more goods each year if rich countries opened their markets.[3] American cotton producers are important beneficiaries of the recent U.S. Farm Bill of which $2.5 billion is allocated to cotton farmers. As a result, for every acre of cotton grown, they are subsidized $210 although the same acre grown by African cotton producers results in earnings of $45 to $52. It is not surprising, therefore, that the African cotton producers' association formally sent a protest to the WTO to support Brazil, who officially complained about the unfair trade costing them some $640 million last year alone.[4] For politicians the issues of equity and food security, low food prices and the concern for the domestic production to be competitive in the face of subsidies from developed countries need to be addressed. Politicians consider input subsidies as a possible solution for dealing with most of these issues and winning popular political support.

3. "Trade and Development: White Man's Shame," *The Economist*, September 25, 1999, p. 89.

4. "West African Farmers Support Brazil's Protest, *Ghanaian Times*, October 6, 2002, and Oxfam (2002).

III. Arguments for Fertilizer Subsidies

Several arguments have been used to subsidize[5] inputs, but the most common ones include the following arguments.[6]

Accelerating the Learning Process

Because most farmers, especially in the developing countries, were not familiar with modern inputs they were hesitant to use fertilizer, especially when its cost was high. By reducing the cost of the input, fertilizer subsidies aid in accelerating the learning process and thereby promoting its use. This "subsidy-push" strategy for inducing fertilizer use is generally recommended during the introductory stage of development. Once the fertilizer use reaches take-off stage, there is little need for input subsidies (Gregory et al., 2000).

Compensating for Taxation of Agriculture

The agricultural sector was taxed heavily in the past, and fertilizer subsidies were considered desirable to compensate farmers for agricultural taxes. They were also used to address equity concerns through income transfer to small farmers when there is implicit or explicit farmer taxation.[7]

Reducing Credit Needs

Where credit availability is a problem for small farmers, subsidies have been used for both fertilizers and credit (cash and in-kind) as compensatory mechanisms. The lack of credit and high cost of finance generally made it difficult for poor farmers to borrow funds to purchase inputs. Besides, the seasonal nature of crop production also made it difficult to borrow funds because commercial banks considered agricultural loans as risky and avoided this sector.

Improving Value/Cost Ratios

To compensate for low output prices due in large part to explicit or implicit taxes (e.g., Nigeria and Tanzania), subsidies have been used to reduce input prices and improve fertilizer/crop price ratio and value/cost ratio (VCR). It is now well recognized that adequate returns are required to induce small farmers to commence and maintain fertilizer use. Maintaining a reasonable ratio between fertilizer cost and output prices is essential (Debrah and Breman, 2002). This is usually measured as either the VCR or the nutrient-crop price ratio (NCR). A minimum VCR of 2 is required to promote early fertilizer use adoption.[8] There have been substantial historical differences in these ratios among different regions. The NCRs in SSA vary between 6 and 11, in contrast to 2 and 3 in Asia. In large part this is due to the small volumes of imported fertilizers and high distribution costs (twice as high as in Asia). The high distribution costs are a result of high transportation costs because of long distances, poor road and rail infrastructure, small volumes handled, high storage costs, and inefficient public sector distribution systems.

Shielding From the Volatility of International Prices

Fertilizer subsidies (and crop price supports) shelter farmers and consumers from the full impact of the inherent volatility of international commodity prices. This can be extremely important in reducing risk for poor farmers and consumers in the introduction phase, but in the long term, it prevents prices from acting as resource allocation signals.

Stimulating Domestic Production of Fertilizers

Subsidies have been used to stimulate domestic fertilizer production to ensure adequate and timely supply, save foreign exchange, and promote economic development, especially in countries with high energy cost or dependence on imported raw materials. Nitrogen production has been subsidized in India, Bangladesh, Indonesia, Mexico, and Egypt whereas phosphate production has been subsidized in India, Indonesia, China, Morocco, and Pakistan (Segura et al., 1986).

5. Refers to the direct price subsidy, which lowers the market-determined price of the subsidized input.

6. See Gregory, Roy, and Bumb (2000) for details.

7. In Nigeria, fertilizer subsidies were used in the 1970s to transfer a part of the oil wealth to rural areas.

8. Some researchers argue that VCR should be 3 or more for African smallholders. See Yanggen et al. (1998) for details.

Validity of Arguments for Fertilizer Subsidies

A close scrutiny of these arguments reveals that these defenses may not be tenable. First, the learning curve argument used to stimulate fertilizer use through a subsidy-push strategy: during the 1960s and 1970s, when fertilizer use was heavily subsidized, many farmers used fertilizers and became familiar with its use. For them, non-availability and non-accessibility of inputs may be more binding constraints. Evidence shows that subsidy schemes fail to mature into efficient behavior. For example, in spite of subsidies fertilizer use in SSA has lagged behind that of other regions even when the slow learning effect is considered.

Second, the use of subsidies to compensate for taxes and redistribute incomes is not the most efficient way to achieve this objective because evidence shows that larger and more prosperous farmers, who use more fertilizer, usually benefit the most. Besides, during economic reforms and SAPs, taxes on the agricultural sector were drastically reduced, and therefore there is little need to compensate farmers through input subsidies.

Third, the lack of credit is a serious constraint, but input subsidy is not the solution because input subsidies introduce other distortions in the functioning of input markets. The solution lies in making the credit system work by developing financial infrastructures and increasing the supply of funds in rural areas. In SSA, the shift from the failed subsidized agricultural credit schemes to micro-finance institutions has generally not been successful because these institutions lend predominantly for non-agricultural purposes, leaving the credit needs of small-scale farmers and input traders unsatisfied. Nevertheless, in some areas input dealers are providing credit within institutional arrangements that fit the specific requirements of agriculture and the circumstances of small-scale farmers. These arrangements are based on trust often nurtured through business dealings facilitated by social contacts or credible organizations such as non-governmental organizations (NGOs) (e.g., Cooperative for Assistance and Relief Everywhere [CARE] in Zimbabwe, Cooperative League of the United States of America [CLUSA] in Mali and Niger, Africare in Senegal, and Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance [ACDI/VOCA] in Ethiopia [IFDC, 2001b]). These arrangements seem to reduce transaction costs and minimize risks.

Fourth, the use of subsidies to maintain adequate VCRs and NCRs or their use to lower food costs are poor alternatives to dealing with the underlying problems that keep input-output price ratios or food costs high.

Fifth, subsidy use to stimulate domestic fertilizer production is inefficient because often the subsidies have been a direct benefit to the manufacturing companies and not to farmers while promoting inefficient use of domestic resources.

Thus these arguments no longer support the case for the reintroduction of subsidies in developing and transitional economies. Besides, from the perspective of market development, there are several arguments against subsidies, as explained in Section IV.

IV. Arguments Against Fertilizer Subsidies

In the 1960s and 1970s, fertilizer subsidies and state-owned enterprises (SOEs) were preferred instruments to promote fertilizer use. However, during the 1980s and the early 1990s, fiscal costs of such policies became unsustainable and liberalization or removal of subsidies became the norm. The main arguments against fertilizer subsidies, in addition to those discussed in the previous section, are elaborated below.

Market Distortions

Policy regimes and organizational arrangements that favor the successful implementation of fertilizer subsidies distort the functioning of the fertilizer market and inhibit the development of private sector-based competitive input markets. Such regimes include, among others, price control, rationing, and SOEs.

Price Control and Rationing—Because the main purpose of fertilizer subsidies is to reduce price below the market-determined level, price control is necessary. Moreover, because the subsidized price is below the market-determined level, there is always an excess demand and, therefore, to allocate the limited supply of products among many users, the government agency has to introduce some scheme for rationing supply and distribute the subsidized inputs among all farmers. Consequently, every farmer or farm family receives a preselected quantity of inputs. Both price control and rationing interfere in the functioning of free markets and create parallel markets. They also encourage rent-seeking behavior among administrators. As a result, intended beneficiaries do not get the full benefit of the subsidy schemes.

State-Owned Enterprises—To implement price control and rationing the government has to create SOEs or other similar organizational arrangements to ensure that prices remain controlled and every farmer receives his or her allocated share of inputs. For example, in 1998/99 in Malawi, every farm family received one starter pack under the government-sponsored Starter Pack Program. Likewise, the Food Reserve Agency in Zambia allocates fertilizers to cooperatives, which, in turn, distribute fertilizers to their members in a prespecified manner. In the past, the performance of parastatals has been unsatisfactory. More significantly, such organizations are governed by non-market based rules, and their performance remains less than optimum because they are not required to respond to market signals.

Budgetary Implications

To keep the prices below the market-determined level, the government has to allocate funds to pay for subsidies. However, because of limited funds, especially in African countries where 40%-60% of the national budget is financed by donor contributions, the availability of funds becomes a serious constraint, and the delay in the availability of funds leads to all sorts of problems downstream, such as delay in procurement and distribution of inputs and untimely supply of fertilizers at the farm level. Because the demand for fertilizers is a seasonal demand, **fertilizers delayed are basically fertilizers denied.** Such delays also result in unnecessary costs for procurement agencies because they cannot recover their costs until the next season. Furthermore, with increase in fertilizer use over time, the fiscal burden of subsidy becomes unsustainable. Such unsustainable fiscal burden of subsidies made them a prime target of SAPs in the 1980s in Ghana, Gambia, Tanzania, Zambia, and other African countries. Because these subsidies accounted for a lion's share of resources going to agriculture, limited resources were left for other agricultural development activities.

India, with its long history of fertilizer market intervention, has seen its complicated subsidy scheme spiral out of control in the past few years, and total subsidy cost increased from less than Rs 5,000 crores in 1990 to an estimated Rs 14,000 crores (approximately US $3 billion) in 2000. Several factors explain the explosion in costs. First, subsidies are paid on more tonnage each year due to demand growth. Second, the reluctance of the government to raise retail prices to match increases in domestic production costs and international prices widens the per unit subsidy cost. Finally, the steady depreciation

of the rupee since the mid-1990s has increased the rupee cost of imported raw materials, intermediates, and final products.[9] While fertilizer subsidies cost India about 3% of its national budget, the average was 7% in Africa (Table 2). In Nigeria, subsidies were estimated to represent about 42% of the national agricultural budget during the 1990s.

Political Interference

Sustainability of subsidies depends on political commitments. Changes in such commitments can introduce unnecessary uncertainty for farmers, dealers, and manufacturers, as is evident from the administration of subsidy policy in Turkey, Venezuela and Nigeria. In Turkey the fertilizer subsidy enactment changed in 1980, 1986, 1988, 1994, and 1997. During the period from 1986 to 1994, some of the subsidy benefited producers because trade liberalization was incomplete and the oligopoly of producers and distributors was able to control prices. This situation resulted in domestic prices being 10%-20% above the import parity price. As a consequence, approximately 15%-30% of the subsidy benefited producers and importers and not farmers (Gregory, 1997). In Venezuela there was a sudden removal of fertilizer subsidies with a change in government in 1981 that drastically reduced fertilizer use by some 30%. In 1984 a change in government and improved oil revenues allowed reintroduction of fertilizer subsidies, and consumption doubled in 2 years. Subsidies were then progressively removed between 1989 and 1994 with a subsequent fall in consumption from almost 700,000 nutrient tonnes in 1989 to 250,000 nutrient tonnes in 1994. Only at this stage were other changes made to remove non-price constraints to fertilizer use, and consumption started to increase but fell again in 1998 due to cost increases associated with depreciating exchange rates. In 2000 a subsidy was reintroduced at 20% for domestic production only effectively protecting the state-owned domestic industry from import competition while stimulating demand (Gregory et al., 2000).

In Nigeria fertilizer subsidies were introduced by the Obasanjo government in 1976 and the modus operandi changed frequently between 1980 and 1990 (IFDC, 1995, 2001a). Following massive abuse of the system, the government procurement monopoly was abolished in 1997. In 1999 when Obasanjo was elected President, his government reintroduced fertilizer subsidies. Once again because of administrative failures and abuse, the Federal Government abolished fertilizer subsidies in May 2000, but the state governments continued to subsidize fertilizers (Debrah, 2000; IFDC, 2001a; Nagy and Edun, 2002). In January 2003 the Nigerian House of Representatives passed a bill authorizing 50% subsidies on inputs. Such frequent changes have been detrimental to the development of a competitive fertilizer market in Nigeria.

9. See *Cargill Fertilizer*, Fall 2000, for details.

Table 2. Fertilizer Subsidies and Budgetary Costs in Some African Countries for Selected Years

Country	Year Range	Fertilizer Subsidy Rate Range (%)	Subsidy Cost as % of National Budget
Cameroon	1982 to 1987	48 to 65	0.5 to 1.0
Ghana	1980 to 1992	15 to 80	2.5 to 12
Senegal	1977 to 1982	46 to 63	1.2 to 2.4
Nigeria	1981 to 1999	28 to 85	12 to 42[a]
Malawi	1983 to 1987	22 to 28	0.7 to 3.2
Tanzania	1978 to 1983	50 to 60	2.0 to 3.4

a. Refers to agricultural budget.

Source: Derived from data in Lele (1988), IFDC (2001a), and Nagy and Edun (2002).

Administrative Difficulties

In administering subsidies fertilizer producers, input dealers, or farmers may be paid directly. When paid to producers, the subsidy is not always transferred to farmers and tends to erode producers' incentives to reduce production costs. Price increases by producers not subject to import competition or the threat of import competition should be justified to the government. Pricing controls and delays in approving price increases defeat the purpose of market pricing and are administratively burdensome. This negates the administrative efficiency of dealing with only a few producers rather than numerous farmers. In addition, the subsidy should be paid in advance to avoid cost increases for producers. When subsidy is paid to both importers and producers, some distortions may occur due to cost differences between imported and domestic products. A fixed-value subsidy per tonne of product can distort subsidized product prices in favor of the lower-cost competing product. This disadvantage can be overcome with a fixed-percentage subsidy. Direct reimbursement to distributors and dealers is an administrative compromise between paying subsidy to producers or paying directly to farmers. However, verification of sales by private dealers is administratively cumbersome and increases costs for the private sector that are passed on to farmers.

Direct reimbursement to farmers is the most transparent but administratively the most cumbersome method of paying fertilizer subsidies. Transparency in direct reimbursement of farmers can only occur when the reimbursement is timely. The cost of open-ended fertilizer subsidies to government is dependent on an annual basis on the amount of fertilizer used which, in turn, depends on prices of fertilizers and crops as well as weather conditions each year. Since all these factors are subject to change, it is not possible for treasuries to predict with any certainty the amount of financial support needed each year. This can lead to underestimation and then delays in payment that are not predictable by farmers, manufacturers, or dealers/importers.

Resource Misallocation

When used excessively or for a prolonged time, subsidies may cause resource use inefficiency at both the farm level and the factory level, including excessive use, inefficient substitution of scarce fertilizer for other inputs such as farmyard manure that may be in abundance, inefficient substitution of crops that use much of the subsidized fertilizer for those that use little and diversion of fertilizer from targeted crops to other crops (from cotton to maize in Mali) or diversion from intended to unintended beneficiaries of fertilizer subsidies. Hence, the choice of input mix and output produced is distorted, and the effectiveness of such intervention in raising farm incomes is not guaranteed.

The level of support is directly dependent on the level of input use and not on farm income. Consequently, large farmers receive the bulk of the support distributed while farm incomes among smaller farms do not necessarily improve. Farmers growing crops that require higher fertilizer rates than other crops receive a disproportionate quantity of subsidy. This in turn can distort farmers' economic decisions by encouraging the planting of high fertilizer-using crops that may not have a comparative advantage. These resource misallocation effects apply equally to other forms of agricultural support. Calculations made by the World Bank for Turkey illustrated that over one-half the total support to agriculture was captured by the higher income regions of the country and only 20% by the relatively poor east and southeast Anatolia regions (World Bank, 1998). Agricultural support policies in Turkey were having the effect of widening income disparities among various regions, especially since the poorest regions were relatively non-intensive users of subsidized inputs.

At the factory level, subsidies have promoted the excessive use of costly raw materials, including energy resources. In many countries, subsidized fertilizer plants use 20%-30% more energy than non-subsidized plants in a market-based economy. Subsidies also reduce the incentive to minimize costs and improve efficiency (Segura et al., 1986; World Bank, 1989; and Bumb and Baanante, 1996).

Thus, the market-distorting effects, political and administrative difficulties, fiscal non-sustainability, and misuse of resources are primary arguments against the reintroduction of subsidies.

V. IFDC Experiences in Dealing With Fertilizer Subsidies

In dealing with fertilizer subsidies, IFDC has followed a pragmatic approach and used various methods in a dynamic context, but all of them were geared to build private sector-based competitive fertilizer markets. IFDC experiences resulted from both implementing market development projects in Asia and Eastern Europe and preparing Action Plans for developing agricultural input markets (AIMs) in Africa. Some of these experiences are elaborated below.

The Bangladesh Experience

Realizing that fertilizer subsidies were preventing the development of private sector-based fertilizer marketing in Bangladesh, IFDC developed and implemented a program that aimed at the gradual withdrawal of subsidies in a phased manner (IFDC, 1994). In the initial phase, IFDC focused on the liberalization of fertilizer prices and removal of subsidies at the retail level. That means, at the wholesale level prices remained uniform and controlled, and the Bangladesh Agricultural Development Corporation (BADC) maintained its monopoly in supplying fertilizers. However, retailers were free to purchase any quantity from wholesalers at a fixed price and sell it at any price they deemed desirable or the market would bear. Once the retailers were fully active all over the country, IFDC convinced the Government of Bangladesh (GOB) to liberalize price and marketing at the wholesale level and remove BADC's monopoly. While this phase was implemented, prices remained fixed at the factory-gate and at the port level and BADC remained the sole importer. In the final phase, BADC's monopoly on imports was removed and import prices were liberalized. Such a phased program of subsidy removal not only reduced fertilizer prices and saved millions of takas in subsidies for the GOB but also sustained the tempo of rapid growth in fertilizer use (Sidhu, 1992; IFDC, 1994). During the reform period, fertilizer use increased at 8% per annum. This experience is in stark contrast to the experiences of other countries including Ghana, Nigeria, Poland, Russia, Venezuela, and Zambia where fertilizer use decreased significantly during the subsidy removal period. Based on this experience, IFDC continued to propose phased withdrawal of fertilizer subsidies to improve market efficiency and reduce fiscal burdens.

The Albania Experience

Unlike Bangladesh, which had a parastatal (BADC) actively, though inefficiently, involved in fertilizer import and distribution, Albania was at a crossroads between communism and democracy. The collapse of the communist government had resulted in dysfunctional parastatals involved in input distribution, and fertilizer use decreased from 100,000 nutrient tonnes in the late 1980s to near zero in the early 1990s (IFDC and Albanian Fertilizer and Agro-Input Dealers Association [AFADA], 1997; IFDC, 1998). Such a drastic reduction in input use threatened the food security situation in the country. The United States Agency for International Development (USAID) considered direct food aid or fertilizer aid as possible alternatives and opted for fertilizer aid because fertilizer aid would allow the farmers to grow more food in the country. However, with fertilizer aid, the question of free distribution or subsidized distribution of fertilizers arose. Rather than giving a direct price subsidy, IFDC advised USAID to use the opportunity to develop a competitive fertilizer market system by training dealers in auctioning and business management and allowing the market to determine the price. USAID agreed with the IFDC proposal. Initially a few lots of fertilizers (urea) were sold at 30%-40% of the cost price but gradually, as the dealers acquired experience in marketing and business development, fertilizer lots were auctioned at full cost price. Within 3-5 years, Albania had a well-functioning fertilizer market. Thus, without subsidy, IFDC was able to restore fertilizer use and marketing in Albania, which had little history of private sector-based fertilizer marketing during the communist rule (1945-90). By 1995 Albania was using over 100,000 tonnes of fertilizer products and over 200 dealers were involved in fertilizer import and marketing. By building a grassroots capacity for a free market system, IFDC was successful in promoting fertilizer use without subsidy.

Action Plans for Developing AIMs in Africa

IFDC's Bangladesh and Albania experiences continued to guide IFDC operations in dealing with input subsidies. While preparing *A Strategic Framework for African Agricultural Input Supply System Development*, IFDC (2001b) noted: "Explicit and implicit input subsidies should be removed for both production and marketing because these represent inefficient market interventions" (p. 7). This position came under scrutiny while preparing *An Action Plan for Developing Sustainable Input Supply Systems in Malawi* in February-May 2000. The high incidence of poverty in Malawi, where 50% of the population earned less than 50 cents/day and 80% earned less than $1/day, forced IFDC to address simultaneously the challenges of developing private sector-based input markets and alleviating poverty. It was recognized that without some sort of support, poor people would not be able to purchase inputs to grow food crops for household food security. The conventional alternative was to introduce subsidies through state-owned enterprises, price controls, and rationing. However, such an approach was counterproductive to the development of a free market system because of many distortions that would be introduced if subsidies were implemented. The study team[10] developed a new approach that could promote both the development of free markets and the support for poor farmers. The approach embodies a voucher system under which the poor farmer is endowed with a voucher having a face value of subsidy-equivalent. The farmer presents the voucher to the dealer, who sells the indicated product to the farmer at the market price less the value of the voucher and recovers the value of the voucher from the authorized bank, whereas the bank is reimbursed by the national government. This was the first proposal which "linked private sector development with poverty alleviation"[11] in Malawi and was endorsed by all donors at a national stakeholders' workshop in May 2000. In April 2001 IFDC proposed a similar voucher system to the Government of Nigeria, which reintroduced fertilizer subsidies in 1999 without much success, and the private sector was frustrated with unnecessary government interventions (Bumb, 2001). The Nigerian government liked the idea, but it could not implement the concept due to political difficulties. Nevertheless, IFDC continued to recommend this approach in place of direct input subsidies in other countries, such as Ghana and Uganda (IFDC, 2002b, 2002c). IFDC had an opportunity to implement the voucher system in Afghanistan.

The Afghanistan Experience

After two decades of internal conflict and wars, Afghanistan did not have sufficient resources to meet its domestic needs. The country faced a serious challenge in meeting its food requirements. Farmers were extremely poor and could not pay for inputs.

It should be mentioned that even during the Taliban period distributors could get fertilizer from Pakistan and sell it to retailers on a cash basis. The IFDC reconnaissance survey indicated that there were several retailers in the market selling white (urea) and black (DAP) fertilizers in small quantities. Admittedly these dealers had limited technical knowledge about various aspects of fertilizer products, but they and their large-scale distributors/importers indicated that they could not sell more fertilizers because farmers had no money to pay for fertilizers. Thus the lack of purchasing power with farmers became the main constraint to be addressed. Support was needed to jump-start the rural economy from the ruins of war.

The issue of subsidies was raised again by various donors, NGOs, and other stakeholders. The proponents of subsidy argued that as Afghanistan is facing a humanitarian crisis, seed and fertilizers should be freely distributed on an emergency basis. IFDC also realized the need to empower farmers with means to purchase inputs, but rather than giving free inputs, IFDC suggested and USAID agreed to use the opportunity to develop input markets and train farmers in the "market psychology" rather than promote the "dependency syndrome." To test this system on a pilot basis, vouchers having a face value of Pakistani Rs 460 (at the rate of Rs 60/US $1) were distributed to farmers. The voucher allowed farmers to receive one 50-kg bag of urea. The farmer would get the bag of urea from the dealer who, in

10. The study team consisted of professionals from IFDC, Development Alternatives, Incorporated (DAI), Masdar Technology Limited (MTL), Ministry of Agriculture and Irrigation, Malawi (MAI), and the private sector. The study was funded by the World Bank, EU, the Department for International Development (DFID), and USAID. See IFDC 2002a for details.

11. Observation made by H. Potter, DFID, at the workshop.

turn, would be reimbursed Rs 530.00[12] by an authorized NGO. The NGOs involved in this operation were paid by the IFDC project, called Afghanistan Fertilizer Distribution Project, because there were no well-functioning banks in the country and Afghan currency was in a free fall at the end of the war. To ensure that farmers did not treat these inputs as a grant, farmers were required, and agreed, to pay the equivalent of one bag of wheat at the harvest time to the *shura* (village council). The *shura* would use the funds thus obtained for improvements in the local agricultural infrastructure. This pilot phase was expanded to cover 12 provinces in September 2002.[13] The voucher scheme helped poor farmers to obtain subsidized inputs in a market-friendly manner.

Other Experiences

In those cases where no direct subsidy was involved but donors and NGOs provided aid-in-kind in the form of seed or fertilizers, IFDC has recommended that such aid be *marketized* through proper auctioning and tendering. The classic example of such efforts is the integration of the Japanese aid under the Second Kennedy Round (KR II). IFDC has worked with Japan International Cooperation Agency (JICA) in Albania, Burkina Faso, and Mozambique, and has developed mechanisms to integrate such aid with commercial imports by auctioning the commodity in a transparent manner.

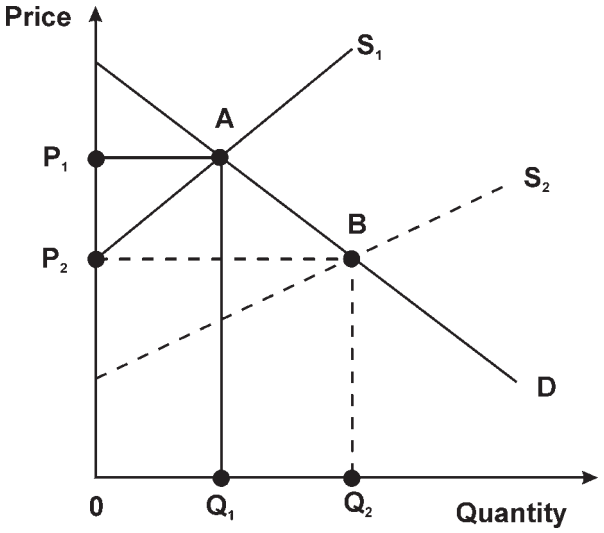
12. The dealer's commission for handling transactions was Rs 70.
13. See p. 18.

VI. Market-Friendly Alternatives to Input Subsidies

The analysis in the earlier sections focused on issues resulting from direct price subsidy on inputs in general and fertilizer products in particular. The main purpose of a subsidy is to minimize the risk and increase the profitability of input use by reducing the cost of inputs. These objectives could, however, be achieved through reducing transaction cost by shifting the supply curve to the right (SSCR) and by developing physical and financial infrastructure in rural areas. On the demand side, risks can be minimized and profitability of fertilizer use could be enhanced by improving the "agronomic environment" through investment in soil fertility restoration and by improving the knowledge base of farmers. These options are described below.

Reducing Transaction Cost by Shifting the Supply Curve to the Right

Direct input subsidies are generally used to reduce costs to farmers. Input prices can be lowered as well by SSCR by focusing on key components in a holistic manner. The approach is based on the premise that AIMs remain underdeveloped and fragmented in many developing and transitional economies, and the underdeveloped nature of these markets keep input prices high, inspiring policymakers to argue for subsidies. Such recommendation results from one-sided focus of analysts on the demand-side of the market equation. However, by making improvements on the supply-side of the market equation, the supply curve would be shifted to the right (SSCR), and fertilizer prices can be reduced significantly (Figure 4). The figure portrays the supply and demand situation at two levels of fertilizer supply. The first level illustrated by the supply curve S_1 depicts a relatively inefficient fertilizer subsector delivery system that delivers small quantities Q_1 at relatively high price P_1. Supply curve S_2 depicts a relatively efficient fertilizer subsector supply system that delivers relatively larger quantities Q_2 at a lower price P_2. The main difference between the two delivery systems is the overall cost structure and particularly the transaction costs represented by the difference between points A and B. While preparing action plans for developing AIMs in Malawi, Nigeria, Ghana, and Uganda, IFDC estimated that fertilizer prices could be reduced by 20%-30% in these countries by shifting the supply curve to the right[14] through the implementation of the proposed measures. The SSCR approach requires making improvements and strengthening capacity in five critical areas—dealing with policy environment, human capital development, access to finance, market information and transparency, and enforcement of regulatory frameworks in a holistic manner. These components of the SSCR approach will vary in scope and focus from one country to another but will include the following generic issues.



Source: IFDC (2002a).

Figure 4. Reducing Fertilizer Price by Shifting the Supply Curve to the Right (SSCR)

Policy Environment—A conducive and stable policy environment is essential for promoting the development of private sector-based input markets. This will require the removal of all price and nonprice distortions introduced by the government, donors, NGOs, or other stakeholders. A distorted policy environment sends the wrong signals, discourages private sector investments in market development, and keeps transaction costs high. Additionally, the

14. See IFDC (2001a, 2002a, 2002b, and 2002c) for details.

national government should also work on ensuring macroeconomic stability and developing infrastructures in rural areas.

Human Capital Development—Over the last quarter of a century, input supply systems were a public sector monopoly in most developing and transitional economies. Such monopolistic arrangements have deprived the private sector of the opportunity to learn about input marketing and risk-sharing arrangements. Therefore, the private sector is equally underdeveloped and needs help to master business, marketing and technical skills to operate a successful inputs business. In this area, large-scale technical assistance efforts will be needed to build the necessary human capital.

Access to Finance—Finance is the life blood of business development, but limited access to finance resulting from high interest rates, underdeveloped financial infrastructures, stringent collateral requirements, and risk-averse attitude of commercial banks toward agriculture and agribusiness make it difficult to obtain the necessary funds for business development. Equally difficult is to get a letter of credit (LOC) for importing inputs. Innovative approaches are needed to alleviate the financial constraint to business development.

Market Information—For a well-functioning market, the flow of information should be smooth and timely. Every player should have access to information about prices, stocks, and deliveries in various segments of the national, regional, and global markets. Yet, many dealers in Africa and Eurasia have little information about domestic markets. The transparency in market transactions is necessary. Such market transparency should be promoted by establishing and operating a market information system (MIS) and by disseminating information to dealers, farmers, and policymakers about market conditions.

Regulatory Frameworks—The enactment and enforcement of regulations dealing with quality, quantity, nutrient contents, and truth-in-labeling are critical for a private sector-based free market system. Yet in many African countries, such regulatory systems are non-existent or ineffective, and poor quality and outdated products are not uncommon. There was little need for such regulation when the government was the supplier of inputs. But now when government is no longer a supplier of inputs, it has to assume the responsibility of protecting consumers' interests. This responsibility is a public sector responsibility and should be discharged by the government by building the necessary capacity in the country.

Improvements in all these five areas can go a long way in reducing input prices in developing and transitional economies, thereby making the need for subsidies unnecessary. However, it should be stressed that efforts in these areas should be planned and implemented in a holistic way because fragmented and piecemeal efforts will not create the synergy needed to improve supply systems and reduce transaction costs (Figure 5).

Government Investment in Public Goods

Poor road conditions, inefficiencies at ports, and lack of financial infrastructures in rural areas add significantly to transaction costs. In many African countries, inadequate transportation networks can add 15%-30% to the product price. Because of the free rider's problem, the private sector would not usually make investments in such public goods and services as transportation and communication networks, irrigation development, and regulatory and judicial systems, although improvements in these

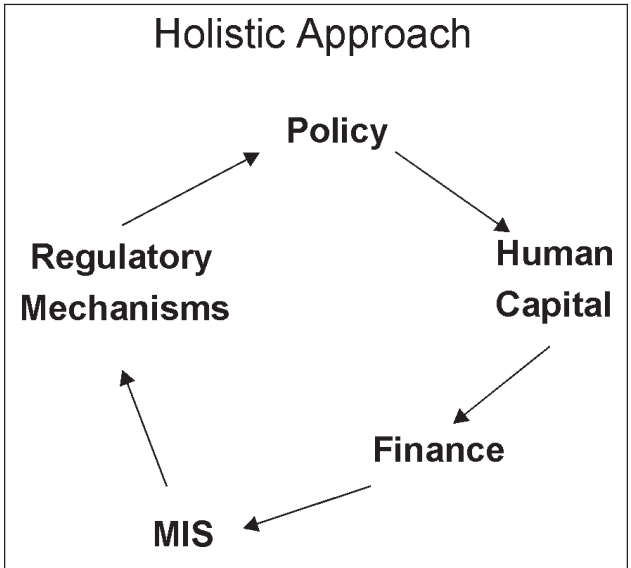


Figure 5. The Market Development Process

areas can reduce input prices significantly. In these areas, the government should make the necessary investments because infrastructures and institutions are public goods falling clearly in the public domain. The creation of market information systems and enforcement of regulatory systems could also be considered as public goods because improvements in these areas help in reducing transaction costs for all stakeholders. However, to the extent possible, the government should harness public-private partnership in these areas.

Investment in Soil Fertility Restoration and Improvement

As discussed earlier, increasing soil degradation and deforestation is one of the reasons for the low productivity of agriculture and why one-third of SSA's population suffers from hunger and malnutrition. Although increased use of mineral fertilizers would be necessary to overcome the problem, other alternatives to direct subsidies for fertilizer should be considered. This is very critical to SSA, where the soils are exhausted of nutrients and where millions of farmers are forced to "mine" soil nutrients in their harvests of food and fiber, creating a vicious cycle of poverty and resource degradation (IFDC, 1999). Another peculiarity of SSA is that the resource base is so poor that overpopulation occurs at low absolute population densities and the natural resource is quickly overexploited. The region therefore requires particular attention and support in the restoration and improvement of soil fertility (Breman and Debrah, 2003).

In the section dealing with the resurgence of the subsidy debate, the key issues identified were the low profitability and high risk of fertilizer use and the rising demand of the urban population for cheap food as a substantial proportion of their income is spent on food. By UN estimates, the world's urban populations would exceed rural populations for the first time in history and by 2007, 55% of the African population will live in urban areas.[15] Therefore, the profitability of using mineral fertilizers in food production and the reduction of the risk associated with it must be addressed to meet the demands for food and fiber into the future. Investments in soil fertility will create the environment for fertilizer to be efficiently used and would translate into the reduction in the overall cost of production (i.e., will make production profitable assuming the product price does not fall).

Based on the definition of the VCR,[16] the profitability of fertilizer use can be increased by improving either the "agronomic environment" or the "economic environment" or by improvements in both environments. Unfortunately, because of the natural low fertility of SSA soils, crop responses to inputs are generally low, and unless investments are made in the restoration of the fertility of the soil, mineral fertilizer use would remain unprofitable in the short term. Examples of such investment support are in the production and distribution of organic matter, phosphate rock, lime and other naturally occurring minerals that could be used as soil amendments.

Long-term investment for restoring soil fertility may require a subsidy on soil amendments (Breman, 2000). If one compares investments in soil amendments with investments in small-scale irrigation facilities (tube-wells), which generate a stream of benefits over a long term, then such an investment should yield a positive net present value (at the existing rate of interest); otherwise it is not socially desirable. In high P-fixing acidic soils (such as Cerrados in Brazil), a critical minimum investment in lime and phosphate rock or phosphate fertilizers may be necessary to restore soils to a level that annual application of P fertilizers yields a positive crop response. Since such investments become a dead investment, one can make a case for social support (by the government); poor individual farmers are unlikely to take risks because they cannot recover their outlay. Nevertheless, the selection of sites for such investment should be carefully done because not all soils are P thirsty like Cerrados soils.

A special attention for long-term investment in SSA is justified because of the peculiarity of its soils

15. United Nations Press Release POP/757, March 2000.

16. VCR = $(Y/X)/(P_x/P_y) > 2$ where Y= crop output, X= fertilizer use, P_x is price of fertilizer, and P_y is crop price. In this equation, Y/X is the "agronomic environment" and is a function of a number of factors including the genetic material, the fertility status of the soil, water availability, and agronomic practices. The expression, P_x/P_y represents the "economic environment" and is a function of the fertilizer cost and the crop price.

mentioned above, and because of the complex nature of re-capitalization of the soil resources and the long time horizon involved, investments should not be left to farmers alone. Governments also have a vested interest in investing in the long-term re-capitalization because of the benefits of improved food security, increased environmental stability, economic development, and control of rural-urban migration that the government derives from soil fertility restoration.

VII. Subsidies Under Special Circumstances

There are specific circumstances where direct subsidies could be used provided precautions are taken to prevent their distortionary impact on the private sector input market. Such situations include a transition from an emergency situation, early stages of fertilizer use, externality, landlocked food-deficit countries, and poverty alleviation.

Transition From Emergency Relief to Development

Markets in transition where the need for emergency relief is being replaced with the need for support to develop dealer capacity, achieve market transparency, and develop a private sector-led input market may be considered for input subsidies. As explained earlier, IFDC is collaborating with the International Center for Agricultural Research in the Dry Areas (ICARDA) in Afghanistan to support farmers reestablishing wheat production while developing competitive input markets. The program involves the distribution of approximately 4,573 tonnes of wheat seed, 4,573 tonnes of urea, and 2,286.5 tonnes of DAP to selected farmers in 12 targeted provinces. The inputs are channeled through the private sector where farmers procure inputs as packages (50-kg bag of wheat seed, 50-kg bag of urea, and 25-kg bag of DAP) via a voucher system. The "fair" voucher value (i.e., value of the inputs provided), as estimated by IFDC, ICARDA, and NGOs involved in the project, is three bags of wheat.[17] Thus, within 1 month following harvest, the farmer's repayment will be equivalent to three bags of wheat made to *shuras*, which will use the funds from the sale of wheat for agriculturally related village development projects. While ICARDA provides the wheat seed based upon purchase from Afghan farmers, the private sector dealers/importers make their own arrangements to ensure that the needed quantity of fertilizer is available.

17. In contrast to the pilot phase (p. 12), farmers were required to pay three bags of wheat because they received larger quantities of inputs in this phase.

Encouraging the Use of Modern Inputs in the Early Stage of Agricultural Development

During the early stages of modernization of agriculture, farmers are generally not familiar with such modern inputs as improved seed and fertilizers. To familiarize farmers with their use and to reduce learning costs, input subsidies may be used. In many countries in SSA, farmers practice slash and burn or shifting cultivation. Under such conditions, input subsidies may be used to accelerate the process of agricultural development. However, even under such circumstances, input subsidies should be administered through the voucher system so that the development of a private sector-based input delivery system is not jeopardized.

Internalizing the Externality

Like public goods, externality is another condition where public sector intervention is considered desirable. Externality is a condition where one entity's actions create negative or positive consequences for another entity. Pollution resulting from fertilizer production or use will be considered a negative externality. For example, the unsafe disposal of phosphogypsum can produce radon emissions and adversely affect people's health in the nearby community. To remedy the situation, the polluting entity should either pay tax or take corrective measures. In either case, the cost of production of the product generating phosphogypsum increases. This is equivalent to imposing a tax on the polluting agent under the "polluter pays" principle. On the other hand, an entity's actions can produce beneficial effects on others. For example, fertilizer-based intensive cultivation can save forests and wildlife by sparing land from cultivation. Likewise, increased biomass resulting from fertilizer-based intensive cultivation can absorb carbon from the atmosphere and reduce global warming. In such cases, a subsidy can be justified on fertilizer use. However, a subsidy for such purposes should be based on a proper estimation of societal value of saved forests and wildlife or reduced global warming. Because of different values people may place on such assets, a comprehensive analysis should be done of resulting benefits before a subsidy is introduced. More-

over, because a direct price subsidy will interfere in the functioning of the fertilizer market, market-friendly mechanisms should be used to administer such a subsidy.

Landlocked Food-Deficit Countries

Landlocked food-deficit countries are doubly disadvantaged. Their isolation from global and regional markets makes their agricultural products low priced while the cost of imported inputs, especially fertilizers, is very high. For example, even when urea is sold for US $100/tonne in the global market, delivered prices of urea become over US $300/tonne in Uganda because of high transportation costs (transportation cost from the port [Mombasa, Kenya] to Kampala, Uganda, is over US $100/tonne) and associated inefficiencies. Poor rural infrastructure within the country further adds to input costs. One solution is to build better infrastructures. However, infrastructure projects are costly and time consuming and are a social responsibility. Waiting for all infrastructures to be put in place to reduce transportation cost may require a long time and thereby delay the development of agriculture and food security for years, if not decades. Should farmers alone be forced to bear this cost, when society-at-large benefits from increased food production, lower food prices, and a sustainable natural resource base (soils, forests, wildlife, and biodiversity)? Hence to reduce the impact of high transportation costs resulting from poor infrastructure, one can justifiably argue for public support and subsidy on transportation costs.[18] However, as in other cases, such subsidy should be administered in a market-friendly manner.

Poverty Alleviation and Input Subsidy

As indicated earlier, there are over a billion people who are poor (earning less than a dollar a day), and there are another two billion people who earn more than one dollar but less than two dollars a day. Most of these poor people, especially in Africa, live in rural areas where the agricultural sector is the primary source of employment. Nevertheless, due to low soil fertility and poor agronomic practices, land and labor productivity is low in rural Africa. It is rightly argued that to break the spiral of poverty in Africa productivity should be increased by promoting the use of modern inputs, including fertilizers. However, poverty prevents people from purchasing mineral fertilizers for nutrient replenishments and forces them to clear additional forests for subsistence cultivation. If fertilizer products are made cheaper by subsidizing, then resource-poor farmers can afford to purchase fertilizers to increase agricultural productivity and earn additional income that can be reinvested in agriculture.

There are two options to confront the challenge of poverty and inadequate fertilizer use. The first option is to subsidize the fertilizer price and make it affordable to poor farmers. A direct fertilizer price subsidy will require significant interventions, create distortions in the market, and produce suboptimal results.[19] Also, it will strain the limited governance capacity of African governments. Past experience of subsidy administration is not very encouraging. Moreover, alternative non-market distorting mechanisms have been developed to help the poor and have been tested on a pilot basis in Afghanistan as explained earlier. Rather than giving direct fertilizer subsidy, which distorts the functioning of the market, farmers are empowered with additional purchasing power in the form of vouchers. Such vouchers are targeted to poor farmers and carry a face value. The farmer gives the voucher to the dealer who in turn collects its money from the authorized bank. The face value of the voucher can indicate the amount of subsidy, or alternatively, if farmers are too poor to pay anything in the case of a natural disaster or other emergencies such as war, the voucher can entitle the farmer to a free delivery of inputs. Of course, the implementation of the voucher scheme will require administrative and monitoring mechanisms to target the poor farmers. But the main advantage of the voucher scheme is that it does not distort the functioning of the market; rather it strengthens it by injecting additional purchasing power in the hands of the poor people who would otherwise be *excluded* from the marketplace. Thus, the twin objectives of poverty alleviation and market development could be achieved through this scheme.

18. See "An Assessment of Strategic Opportunities for Sustainable Agricutural Intensification in Sub-Saharan Africa: A Survey Team Report Commissioned by the Carter Center and USAID," Winrock International, Morrillton, Arkansas, U.S.A., 1997 for details.

19. See pp. 8-10 for details.

Safeguards for a Successful Subsidy Administration

While introducing direct subsidies or other support programs to facilitate access to inputs, certain precautionary measures are necessary to avoid misuse or market distortion. Some of the approaches for supporting agriculture and some exceptions allowed under the URAA compromise the discipline needed to make world agriculture distortion free and promote free trade in agricultural commodities. Nevertheless, it must be recognized that many countries have agreed to subject their agricultural policies to WTO discipline, and this is a positive step forward in the globalization of agricultural trade. However, attention must be paid to the following key elements.

- **Clear Political Decision and Commitment** on the part of the government that ensures that the program is well understood by all parties involved (farmers, input suppliers, and the public) with clear operational rules (purpose, duration of program, financing resources, coverage).
- **Institutional Capacity to Deliver the Program—**Some of the support programs can be difficult to implement. These programs require proper design and preparation and the introduction of sophisticated information systems. The more comprehensive and well targeted the scheme, the more sophisticated is the required implementation capacity.
- **Logistical Arrangements—**Appropriate logistical arrangements are key for program success. The logistical system must facilitate access to a large number of beneficiaries throughout the country.
- **Targeting of Beneficiaries—**A registry of beneficiaries is a critical element in the logistics to prevent unintended beneficiaries to be reached.
- **Exit Strategy—**A clear exit strategy should be designed and disseminated so that all stakeholders are aware of the transient nature of subsidy and are prepared to cope with the situation developing after the removal of subsidy.

VIII. Other Forms of Support to Agriculture

Given the problems associated with fertilizer subsidies, consideration should be given to alternative policy instruments for supporting agriculture where governments desire to provide support. With globalization and trade liberalization, these are now subject to URAA rules and the policies of the WTO. The Uruguay Round was the eighth round of the General Agreement on Tariffs and Trade (GATT) initiated in 1947 and included agriculture for the first time. Negotiations were concluded in 1994. The commitments for reducing tariffs, export subsidies, and domestic support to agriculture for various country groups are presented in Table 3.

Direct Domestic Support

Under the URAA, developed and developing countries have agreed to reduce domestic support by 20% and 13.3%, respectively, during the implementation period. There are several other features that should be noted here about the reduction commitments on domestic support. First, domestic support is aggregated over all commodities and, therefore, it is referred to as an aggregate measure of support (AMS). That means a country can provide high support to a few selected commodities and no support to other commodities and yet can meet the reduction obligations. For example, a country

Table 3. Uruguay Round Agreement on Agriculture (URAA): Basic Provisions

Provisions	Developed Countries (DDCs)	Developing Countries (DVCs)	Least Developed Countries (LDCs)
I. Market Access Commitments			
Convert all NTBs (nontariff barriers) into tariff-tariffication	Yes	Yes	Yes
Bind all tariffs	Yes	Yes	Yes
Reduce all tariffs (existing and NTB-related)	Average 36% over 1995-2000 with a minimum of 15% for each tariff line	Average 24% over 1995-2004 with a minimum of 10% for each tariff line	Exempt
Increase share of imports in domestic consumption (1986-88 base)	3%-5% (1995-2000)	3%-5% (1995-2004)	3%-5% (1995-2004)
Special Safe Guards (SSG)	Yes	Yes	Yes
II. Export Subsidies			
Ban on new export subsidies and increase in existing subsidies	Yes	Yes	Yes
Reduce volume of subsidized exports (base: 1986-90)	21% (1995-2000)	14% (1995-2004)	Exempt
Reduced expenditure on export subsidies (base: 1986-90)	36% (1995-2000)	24%[a] (1995-2004)	Exempt
III. Domestic Support			
Reduce aggregate measure of support (AMS) (base: 1986-88)	20% (1995-2000)	13.3%[b] (1995-2004)	Freeze at 1986-88 level
IV. Green Box Provisions	Applicable	Applicable	Applicable
V. Blue Box Provisions	Applicable	Applicable	Applicable

a. Subsidies on marketing and transportation costs are excluded.

b. Input subsidy for poor farmers, investment subsidies, and diversification subsidies are exempt.

Source: WTO (1995).

could provide high levels of support to rice or wheat and yet have lower overall AMS. This lacuna in the Agreement definitely reduces the overall impact of the provision on world trade. Ideally, domestic support to each commodity should have been targeted for reduction. Second, non-price distorting support is excluded from AMS.

An exception has been made for the least developed countries (LDCs), which are exempted from reduction commitments, but have had to freeze the level of support to agriculture at the 1986-88 level. The main implication of this provision is that, if an LDC such as Bangladesh did not provide support to agriculture in the 1986-88 period, it cannot introduce support during the 1995-2004 period. Because many developing countries and LDCs were not well prepared for the UR negotiations and had already significantly liberalized their economies under SAPs, these countries, especially food-deficit countries, could be at a disadvantage now because their agricultural production has to compete with subsidized imports from the developed countries in the near future. However, several exceptions have been allowed under the Green Box, the Blue Box, and the "de minimis" provisions of the URAAs (FAO, 1998, WTO, 1995). These provisions provide enough flexibility to create genuine support to agriculture if such support is absolutely essential and fiscally sustainable.

Support Under the Green Box Provisions

Under this provision, countries can provide support to agriculture, which is non-price distorting and environment protecting such as research and extension, training, pest management, land and forest conservation, infrastructure development, input subsidies for poor farmers, investment subsidies, and crop diversification for reducing narcotic traffic.

Support Under the Blue Box Provisions

Under the Blue Box provisions, countries are allowed to provide support based on acreage and animal heads under set-aside programs.

***de Minimis* Provisions**

Under the "de minimis" clause, when estimating AMS a developed-country member is allowed to exclude product-specific support if such support does not exceed 5% of the total value of the product and non-product specific support up to 5% of the total value of agricultural production. A developing-country member is allowed to exclude support up to 10% for each category.

Direct Income Support Schemes

A direct income support program provides a specified sum of money to farmers as a full or partial compensation for elimination (or reduction) of other subsidies given to them in the form of rebates, lower than market prices for inputs, subsidized credit rates, and higher than market prices for the products they sell. This type of program is a critical instrument to prevent an overly rapid, socially disruptive withdrawal of people from rural areas that might occur with rapid elimination of support prices and input subsidies to agriculture. These programs are being used in a number of countries that have removed or reduced other farm subsides—including the European Union, the United States, Mexico, and Romania—to provide some support for farmers although still meeting international commitments (WTO, North American Free Trade Agreement [NAFTA]), and improving economic efficiency.

IX. Conclusion

Many countries have pursued input subsidy and price support policies, but in the past few years a large number of countries have embarked on reforms driven by the recognition that these policies are not the most effective means of supporting farmers and by fiscal pressures and the need to comply with obligations under international agreements such as the URAA. In countries that have reformed agricultural policies, governments have recognized that the objectives for which the inefficient policy tools were designed can be better met by using other policy instruments.

This paper provides an assessment of arguments for and against input subsidies, especially fertilizer subsidies, and discusses various alternatives to subsidies and IFDC experiences in dealing with fertilizer subsidies. The assessment of various arguments and experiences indicates that arguments in favor of fertilizer subsidy are no longer as strong as those that are against it, and the sustainable alternatives to subsidy are even stronger, given the universal moves towards market-based developments. The alternatives include efforts to reduce the cost of fertilizers through a number of strategies that will shift the supply curve to the right and promote public investment in marketing infrastructures, improve profitability of fertilizer use through investment in soil fertility restoration, and provide support under the Green Box measures of the URAA. Situations are also identified in which direct subsidies could be given but even in those cases, accompanying measures should be taken to avoid misuse of resources and the distortionary impact on the market. However, national governments should continue to take the lead in investing in public goods through public-private partnership, in internalizing the externality (leading to market failure), and in providing necessary support for soil fertility and natural resource management in a market-friendly way. Where the concern is poverty alleviation, a voucher system of support is preferred because it addresses the twin objectives of poverty alleviation and market development.

References

Baanante, C. A., B. L. Bumb, and T. P. Thompson. 1989. *The Benefits of Fertilizer Use in Developing Countries*, P-8, IFDC, Muscle Shoals, Alabama, U.S.A.

Breman, H. 2000. "Sustainable Agricultural Intensification in Africa: The Role of Capital." Paper presented at the African Development Bank, Abidjan, Côte d'Ivoire.

Breman, H., and S. K. Debrah. 2003. "Improving African Food Security," *School of Advanced International Studies (SAIS) Review*, Vol. XXIII, No. 1, pp. 153-170, Johns Hopkins University Press, Baltimore, Maryland, U.S.A.

Bumb, B. L. 1995. *Global Fertilizer Perspective, 1980-2000. The Challenges in Structural Transformation*, T-42, IFDC, Muscle Shoals, Alabama, U.S.A.

____. 2001. "Fertilizer Situation in Nigeria: Recent Developments," Draft, IFDC, April 30.

Bumb, B. L., and C. A. Baanante. 1996. *Policies to Promote Environmentally Sustainable Fertilizer Use and Supply to 2020*, 2020 Vision Brief 40, International Food Policy Research Institute (IFPRI).

____. 1996. *The Role of Fertilizer in Sustaining Food Security and Protecting the Environment to 2020*, Food, Agriculture, and the Environment Discussion Paper 17, IFPRI.

Bumb, B. L., and J. Berry. 2002. Global and Regional Data on Fertilizer Production and Consumption, 1961/62 – 1999/2000, IFDC, Muscle Shoals, Alabama, U.S.A.

Bumb, B. L., D. I. Gregory, A. Rab, and M. Abdullah. 2001. *Implications of the Uruguay Round Agreements for Agriculture and Agribusiness Development in Bangladesh*, T-64, IFDC, Muscle Shoals, Alabama, U.S.A.

Bumb, B. L., T. H. Foster, and R. P. Black. 1996. "Fertilizer Markets After Subsidy: Creating a Market-Friendly Policy Environment," IN *Agro-Chemicals News in Brief: Highlights of the FADINAP Regional Workshop on Fertilizer Policies and Subsidies*, Fertilizer Advisory Development and Information Network for Asia and the Pacific (FADINAP), Bangkok, Thailand, Special Issue, September 1996.

Bumb, B. L., J. F. Teboh, J. K. Atta, and W. K. Asenso-Okyere. 1994. *Ghana: Policy Environment and Fertilizer Sector Development*, T-41, IFDC, Muscle Shoals, Alabama, U.S.A.

Couston, J. W., and P. Narayan. 1987. *Role of Fertilizer Pricing Policies and Subsidies in Agricultural Development*, FAO, Rome, Italy.

Debrah, S. K. 2000. "From State Monopoly to Private Sector Oligopoly: African Agricultural Input Markets in Crisis." Paper presented at the Round Table Conference on Agricultural Inputs, Sécurité Alimentaire Durable en Afrique de l'Ouest Centrale (Network for Sustainable Food Security in Central West Africa) (SADAOC) Foundation, Ouagadougou, Burkina Faso, September.

Debrah, S. K., and H. Breman. 2002. "To Subsidize or Not to Subsidize: The Subsidy Issue Revisited," Draft, IFDC, October.

FAO. 1994. *A Preliminary Assessment of the Uruguay Round Agreement on Agriculture*, Rome Italy.

____. 1998. *The Implications of the Uruguay Round Agreement on Agriculture for Developing Countries: A Training Manual*, Rome, Italy.

____. 2003. FAOSTAT: Agricultural Data. <http://apps.fao.org/default.htm>.

Gregory, D. I. 1997. "Turkey: Fertilizer Policy Issues—Support Paper for Policy Notes for the Government of Turkey on Its Agricultural Support Policies," Draft, The World Bank, Washington, DC, U.S.A.

Gregory, D. I., A. H. Roy, and B. L. Bumb. 2000. "Agricultural Subsidies in Developing Countries with a Particular Focus on Fertilizers," Paper presented at the Fertilizer Association of India (FAI) Annual Conference, New Delhi, India, December 11-13.

Henao, J., and C. A. Baanante. 1999. *Estimating Rates of Nutrient Depletion in Soils of Agricultural Lands of Africa,* T-48, IFDC, Muscle Shoals, Alabama, U.S.A.

IFDC. 1991. "Training Workshop on Policy Issues Affecting Fertilizer Development and Sustainable Agriculture: Executive Summary," Muscle Shoals, Alabama, U.S.A.

IFDC. 1994. "Fertilizer Distribution Improvement Project II: End of the Project Report," Muscle Shoals, Alabama, U.S.A.

IFDC. 1995. "Liberalization of the Fertilizer Market in Nigeria," Lomé, Togo.

IFDC. 1998. *If It Can Happen in Albania…Lessons of the IFDC Program*, Muscle Shoals, Alabama, U.S.A.

IFDC. 1999. "To Inherit the Earth: A Question of Survival" Video, Muscle Shoals, Alabama, U.S.A.

IFDC, International Institute for Tropical Agriculture, and West Africa Rice Development Association. 2001a. *Agricultural Input Markets in Nigeria: An Assessment and a Strategy for Development*, P-23, Muscle Shoals, Alabama, U.S.A.

IFDC. 2001b. *A Strategic Framework for African Agricultural Input Supply System Development*, T-63, Muscle Shoals, Alabama, U.S.A.

IFDC, Development Alternatives Incorporated, and Masdar Technology Limited. 2002a. *An Action Plan for Developing Sustainable Agricultural Input Supply Systems in Malawi*, P-25, Muscle Shoals, Alabama, U.S.A.

IFDC. 2002b. *An Action Plan for Developing Agricultural Input Markets in Ghana*, P-24, Muscle Shoals, Alabama, U.S.A.

IFDC, Sasakawa-Global 2000, and Investment in Developing Export Agriculture Project. 2002c. "An Action Plan for Developing Agricultural Input Markets in Uganda." Draft. Muscle Shoals, Alabama, U.S.A.

IFDC and AFADA. 1997. "The Work of International Fertilizer Development Center in Albania: 1991 through March 1996," Hamit Sijiaku Printers, Tirana, Albania.

IMF. 2002. *World Economic Outlook: Trade and Finance*. September. www.IMF.org.

Lele, U. 1988. *Agricultural Growth, Domestic Policies, the External Environment, and Assistance to Africa: Lessons of a Quarter of a Century*, Managing Agricultural Development in Africa (MADIA) Discussion Paper, The World Bank, Washington DC.

Maene, L. 2000. "Agricultural Subsidies in Developed Countries—An Overview," Paper presented at the FAI Annual Conference, New Delhi, India, December 11-13.

Nagy, J., and O. Edun. 2002. "Assessment of Nigerian Government's Fertilizer Policy and Suggested Alternative Market-Friendly Policies," Draft, IFDC.

Narayan, P., and B. L. Bumb. 1995. "Policy Environment Conducive to the Growth of the Fertilizer Industry in the Developing Countries: A Discussion Paper," United Nations Industrial Development Organization (UNIDO), Vienna, Austria.

OECD. 2002. *Agricultural Policies in OECD Countries: Monitoring and Evaluation*, Paris, France.

Oxfam. 2002. "Cultivating Poverty: The Impact of US Cotton Subsidies on Africa," Briefing Paper, September.

Partnership to Cut Hunger and Poverty in Africa. 2002. *Now is the Time: A Plan to Cut Hunger and Poverty in Africa*, Washington, DC, U.S.A.

Segura E. L., Y. L. Shetty, and M. Nishimizu (Eds.). 1986. Fertilizer Producer Pricing in Developing Countries: Issues and Approaches," The World Bank, Washington, DC, U.S.A.

Sidhu, S. S. 1992. "Development of a Competitive Free Market Structure for Fertilizers in Bangladesh: IFDC Experience in Policy Reform," IFDC, Muscle Shoals, Alabama, U.S.A.

United Nations. 2001. *The World Population Prospects: The 2000 Revision*, Population Division, New York, New York, U.S.A.

World Bank. 1989. *Improving the Supply of Fertilizers to Developing Countries: A Summary of the World Bank's Experience*, Washington, DC, U.S.A.

____. 1998. "Agricultural Support Policy Proposals: A Blue Print for Reform," Draft, Washington, DC, U.S.A.

WTO. 1995. *The Results of the Uruguay Round of Multilateral Trade Negotiations: The Legal Texts*, Geneva, Switzerland.

Yanggen, D., V. Kelly, T. Reardon, and A. Naseem. 1998. "Incentives for Fertilizer Use in Sub-Saharan Africa: A Review of Empirical Evidence on Fertilizer Response and Profitability," MSU International Development Working Paper No. 70, Michigan State University, East Lansing, Michigan, U.S.A.

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