Uganda Fertilizer Assessment

In Support of

The African Fertilizer and Agribusiness Partnership

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Acronyms

AU	Africa Union
CAADP	Comprehensive Africa Agriculture Development Program
CBO	Community-Based Organizations
CIP	Country Investment Plan
DAP	Diammonium Phosphate
DSIP	Agricultural Sector Development Strategy and Investment Plan
EAC	East African Community
EPRC	Economic Policy Research Center, Makerere University
EMU	External Monitoring Unit of Makerere University Department of Agricultural Economics
FAO	Food and Agriculture Organization of the United Nations
GHG	Greenhouse Gases
GDP	Gross Domestic Product
GoU	Government of Uganda
ha	hectare
IFDC	International Fertilizer Development Center
ISFM	Integrated Soil Fertility Management
K	Potassium
kg	kilograms
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
mt	metric ton
NAADS	National Agricultural Advisory Services
N	Nitrogen
NARO	National Agricultural Research Organization
NARS	National Agricultural Research System
NGO	Non-Governmental Organization
P	Phosphorus
REC	Regional Economic Community
SSA	Sub-Saharan Africa
UBOS	Uganda Bureau of Statistics

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Executive Summary

Improved agricultural technologies, including fertilizer, have played an important role in raising productivity in developed and developing countries. To date, however, fertilizers have not played a significant role in boosting agricultural production in Uganda due to very low adoption and consumption rates. It is therefore important to identify pathways through which agricultural productivity can be improved including the use of improved technologies, like fertilizers. The MAAIF's DSIP strategic goal of raising agricultural production is predicated on accessibility to the necessary resources and institutional capacity to achieve them. This study strives to support the MAAIF's DSIP strategic goal by first estimating the increase in fertilizers required to meet crop production targets and then analyzing options for reaching those levels.

The analysis shows that, under appropriate assumptions, Uganda fertilizer consumption will need to increase sixfold from the current estimated consumption of 50,000 metric tons (mt) to approximately 310,640 mt to meet the agricultural growth targets set in the DSIP. The significant increase is partly a function of the current low usage, which will increase substantially if constraints in fertilizer markets are alleviated. For this to occur, some changes to the current fertilizer market are required to address constraints and improve conditions to handle higher volumes of fertilizers to achieve the DSIP targets.

The study identifies a number of constraints in the value chain. Though Uganda has a relatively friendly environment for fertilizer businesses, the draft Fertilizer Regulations Act needs to be updated and signed into law to create an unambiguous framework for stakeholders. It is important that regional legislation and trade policy frameworks are harmonized, particularly on quality, taxes and tariffs for fertilizers at the regional economic community (REC) level in order to encourage increased private investment and low farm gate costs. The recently proposed 18 percent value-added tax on key agricultural inputs in Uganda is likely to substantially raise costs for farmers, reduce profitability and discourage use of improved technologies. In addition,

because Uganda is a signatory to the African Union's (AU) Comprehensive Africa Agriculture Development Program (CAADP) Compact, this tax is contrary to the 2006 *Abuja Declaration on Fertilizer*, which called for easing or eliminating tax on agricultural inputs in order to encourage use by smallholder farmers.

Other constraints emanate from Uganda's landlocked location and include poor port, road and rail infrastructure, which adds to high farm prices due to transport and related costs. These challenges make regional cooperation and harmonization of policies and strategies a priority item for Uganda. Expanding output markets domestically and regionally will create opportunity for economies of scale and reduce costs of inputs. A number of ongoing initiatives by various stakeholders in the EAC may play an important role in increasing regional trade and lowering input costs: (1) joint construction of a new rail system; (2) installation of one-stop windows at borders to reduce delays in clearance of transit cargo; and (3) reducing the number of cargo inspections along the regional transit routes. In addition, innovative financing mechanisms and investments in storage facilities are necessary to alleviate the challenges associated with high finance costs and harvest losses which reduce the profitability of fertilizer.

A major domestic constraint is poor knowledge at farm level on the benefits of fertilizer and agronomic practices required to achieve high productivity, which has led to low adoption rates. Increased use of fertilizer will require access to financing by smallholder farmers and a more developed agro-dealer network to reach farmers in remote locations. This is exacerbated by lack of soil testing services to help farmers choose the right fertilizer products for specific crops and agro-ecological zones.

Uganda has no national fertilizer subsidy program like most of its neighbors, though in the early 1990s there were some donor-driven fertilizer imports distributed by non-governmental organizations (NGOs) to various farmer groups. This environment augurs well for any efforts aimed at developing the market for fertilizers, since there are lessons to learn from other countries on what works or does not. The lack of state participation in import and distribution provides an opportunity for policy aimed at improving fertilizer markets based on experiences from other countries that have a mix of public and private sector participation in fertilizer

markets. The current efforts to enact a fertilizer regulatory policy will help to create a framework to ensure quality fertilizer gets to farmers. Therefore, it is important to adopt lessons learned from various policies in other countries and implement policies that have high chances of achieving success.

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1.0 Contribution of Agriculture to GDP

The average contribution of the Ugandan agriculture sector to national GDP varies around 23 percent (UBOS, 2011, 2013), and this is expected to decline relative to that of industry as the latter expands (Table 1). The agricultural sector employs approximately 66 percent of the working population and accounts for more than 48 percent of Uganda's exports (UBOS, 2008, 2011). Between 2007 and 2011, the average agricultural growth rate was 1.5 percent compared to a population growth rate of 3.2 percent, implying a declining per capita agricultural GDP. The population is projected to increase significantly from an estimated 30 million in 2011 to 130 million by 2050 (Population Secretariat, 2012). With limited land and other resources, this will put pressure on agricultural growth and the environment. Approximately 50 percent of Uganda's population was estimated to be food insecure in 2007 (ASDS, 2010).

Table 1. Percentage Change in GDP by Agricultural Subsector and Other Economic Activity by Fiscal Year at Constant (2002) Prices

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Total GDP at market prices	8.4	8.7	7.3	5.9	6.6	3.4	5.1
Agriculture, forestry & fishing	0.1	1.3	2.9	2.4	1.2	0.8	1.4
Cash crops	5.4	9.0	9.8	-1.1	-1.5	8.2	3.9
Food crop	-0.9	2.4	2.6	2.7	0.7	-1.7	0.2
Livestock	3.0	3.0	3.0	3.0	3.0	2.8	2.8
Forestry	2.0	2.8	6.3	2.9	2.8	3.3	2.8
Fishing	-3.0	-11.8	-7.0	2.6	1.8	1.9	1.9
Industry	9.6	8.8	5.8	6.5	7.9	2.5	6.8
Services	8.0	9.7	8.8	8.2	8.2	3.6	4.8
Adjustments*	27.9	17.5	10.2	-2.7	3.0	8.9	7.7

*Adjustments raise percentage to 100.

Source: UBOS, from MAAIF Statistical Abstract (2011, 2012, 2013).

Uganda's agriculture is characterized by low productivity partly resulting from soil nutrient loss and low adoption of improved technologies including fertilizers and seed (ASDS, 2010). The low productivity can also be attributed to other factors like changing weather patterns, poor soil

management, limited extension service and changes in domestic and international commodity prices. The increasing land degradation leading to nutrient loss is exacerbated by low fertilizer application rates estimated at only 4 kilograms (kg) per hectare (ha). In addition, access to improved seed varieties is constrained by insufficient research funding to develop and distribute appropriate seed technologies that optimally utilize available fertilizers.

1.1 Overview of Policy Framework

The Government of Uganda (GoU) became a signatory to the AU-CAADP Compact in 2010 with the goal of raising the average annual agricultural growth rate to 6 percent and the proportion of the national budget allocated to agriculture to 10 percent or more using both domestic and external support. The MAAIF launched the DSIP covering the period 2010/11 to 2014/15 with a vision of creating a competitive, profitable and sustainable agricultural sector. To build a single coherent plan, the DSIP was designed to consolidate and harmonize all policy frameworks in the agricultural sector. Through the implementation of the DSIP and enacting policies that encourage the development and adoption of new technologies by strengthening the National Agricultural Research Systems (NARS) and creating partnerships with the National Agricultural Advisory Services (NAADS) and other stakeholders, the GoU aims to increase agricultural productivity and incomes. The CAADP framework set the parameters for engagement by stakeholders toward fulfilling the goals set in a number of development plans covered under the DSIP.

The main objectives of the DSIP are to increase production and productivity, expand markets and encourage value addition, create an enabling policy environment for private sector investment and strengthen relevant institutions through capacity building with the ultimate goal of raising rural incomes and reducing food insecurity. To achieve the production and productivity agenda, the focus is on research capacity at the National Agricultural Research Organizations (NAROs), access to improved technologies and dissemination or access to relevant information through advisory services, along with improved soil and water management. The creation of an enabling environment encapsulates a predictable policy framework, harmonized rules and regulations, improved public education on relevant policy issues, good data management and building capacity in decision-making. Achieving the DSIP

objectives entails promoting private sector investment and raising farm level productivity. The primary role of the public sector is to remove constraints that limit private sector investments in the value chain.

In regard to agricultural financing, the thrust is to ensure legislation that fosters business innovation to ease barriers associated with accessing agricultural finance: using warehouse receipts, contract farming, credit bureaus, creation of farmer clusters to facilitate economies of scale and strengthening farmers' organizations. The DSIP also addresses ways to encourage the participation of women and youth in agricultural programs and generating the necessary data to inform on gender-related issues, diseases like HIV/AIDS which disproportionately affect women and environmental issues (erosion, land management, nutrient mining, climate change, and greenhouse gases).

1.2 Agricultural Investment Priorities and Targets

The DSIP has both quantitative and qualitative targets for each of the agricultural sub-sectors against which progress and performance will be measured and monitored. Table 2 shows major crops and growth targets extracted from the DSIP for the period 2010/11 - 2014/15 (MAAIF, 2010). Table 2 enumerates the production targets for key crops based on rates that meet the 6 percent overall agricultural sector growth target needed to reduce poverty by 2015. These growth rates are then applied to actual production for 2005 to get the targets for 2015, assuming constant annual growth rates. Individual crop growth rates are generated to collectively cumulate to the overall annual agricultural growth rate of 6 percent as per CAADP guidelines. For example, the annual growth rate for maize is 5.2 percent from a base of 1,185,000 mt in 2005. These growth estimates are meant to be revised as actual data becomes available through agricultural censuses and annual surveys by MAAIF in collaboration with UBOS (DSIP, 2010). Therefore, to update the estimated targets for 2015, we maintain the annual growth rates but use average area and yields for the 2005-2009 period as the base for projections.[1]

[1] Using a specific year's production as the basis for estimating the 2015 targets faces the risk of skewing the estimates from a particularly good or poor harvest depending on the weather conditions during that year relative to other years. Using averages may lessen the effect of production fluctuations resulting from changes in weather patterns on these estimates.

Table 2. Growth Targets for Some Crop Commodities for 2009/10-2014/15 Period

Crop	Target Growth Rate
Maize	5.2
Rice	5.4
Sorghum	5.7
Wheat	5.7
Millet	5.7
Irish Potatoes	5.8
Beans	5.5
Sunflower	6.1
Cassava	6.0
Cotton	7.0
Coffee	7.9
Other*	6.1

*Includes cow and pigeon peas, groundnuts, soybeans, and sesame seed.

Source: MAAIF (2010) and author's calculations.

This study's main objective is to estimate fertilizer requirements that will meet the agricultural growth targets in the DSIP under the CAADP compact agenda. These estimates will have implications for tackling existing challenges in fertilizer value chains that need to adapt to meet the increased volumes of fertilizer. The study also looks at the role of policy on private sector investments that are necessary for increased fertilizer use.

2.0 The Conceptual Framework

This study adopts a value chain framework as the core methodology to address the issue of procuring and distributing enough fertilizer to meet the agricultural growth targets. An analysis of the amount of fertilizer needed and the capacity of the existing fertilizer distribution system to meet those needs requires an assessment of the nodes in the value chain, associated stakeholders at each node and commodity flows along value chains.

To estimate the quantity of nutrients needed to meet the crop output targets and the measures required for the smooth flow of these volumes through the existing fertilizer distribution system,

the following assumptions are made: (1) crop production targets accurately reflect the quantities needed to achieve national food requirements; (2) markets will adapt and absorb the increased levels of crop production; and (3) fertilizer use will be profitable despite changes in relative prices occasioned by demand and or supply forces in input and output markets.

The study discusses the role and effect of policy on the value chain participants in light of increased fertilizer use and examines the complementary role played by the existing physical, human, institutional and financial capacity in raising efficiency of the distribution system. The challenges to increasing fertilizer that flow through the chain are identified using simple tabular, graphic and descriptive analyses.

3.0 Data Collection Methodology

Two methods were applied in collecting data and information for this study: (1) secondary data and (2) empirical data collection through interviews with key players in the public and private sector (Ministry of Agriculture, importers, research institutes, etc.). The study derived most of the data from existing or secondary literature or reports on fertilizer issues in Uganda by various organizations and research institutes, including IFDC. This exercise covered the following areas, though some information was unavailable in sufficient detail:

- National country investment plan targets from country development plans and CAADP documents.
- Agricultural production data: crops, area cultivated and production.
- Fertilizer: imports, consumption, application rates per hectare and percentage of farmers applying fertilizer.
- Agro-ecological data.

There is a significant amount of data that is not available from literature sources, which therefore required the study team to travel to Uganda to meet with and collect necessary information and perspectives from key stakeholder players. We encountered problems where some data for the

same items were inconsistent depending on the source of data. Some desired data were not available or accessible, including:

1. Disaggregated data on application rates per hectare by crop.
2. Percentage of farmers using fertilizer by crop and region.
3. Quantity of fertilizer products for each crop; fertilizer consumption in many SSA countries is reported at the national level and quantities are not allocated by crops or regions.
4. Soil profiles are outdated and not available in digital format.

3.1 Description of the Data: Agricultural Trends and Statistics

The following section provides information collected on the area of arable land, its allocation to different activities, area under crops and production and yields across the country. Uganda is a landlocked country with the most efficient route to the sea through Kenya to the port of Mombasa. The other alternative is through Tanzania to the port of Dar es Salaam. These ports are accessed from Uganda by a combination of roads, waterways and rail systems. Figure 1 shows the administrative units in Uganda and the location of neighboring countries.

Figure 1. Location of Uganda in Relation to Other Countries (Google Maps)

3.1.1 Allocation of Arable Land and Area Under Crops

It is estimated that out of approximately 200,000 square kilometers of land area in Uganda, 83,000 square kilometers is arable, of which 41,000 is cultivated (UBOS, 2011). According to a study by EMU (2007), production levels and land productivity vary by crop depending on soil

conditions and use of improved technologies. These have been declining over time; current yield levels are sub-optimal and need to rise to counter the pressures from a growing population (World Bank, 2007).

In the 1960s, Uganda was reasonably land-abundant relative to other countries in the region, with 0.65 ha cultivated per farmer. Forty years later (2000-2009) this had fallen to about half as much, with 0.34 ha cultivated per farmer (Table 3). The information on area under crops *vis-a-vis* available national land resources indicates that any short- to medium-term increases in production will be driven by input intensification rather than expansion in cultivated area. There is limited land for expansion unless the less productive land areas are enhanced through soil improvement measures and irrigation infrastructure.

Table 3. Ratio of Cultivated Land to Agricultural Population for Some SSA Countries

	1960-69	1970-79	1980-89	1990-99	2000-09
Uganda	0.65	0.57	0.51	0.42	0.34
Zambia	0.64	0.61	0.40	0.34	0.29
Ethiopia	0.50	0.44	0.33	0.22	0.21
Kenya	0.46	0.36	0.30	0.26	0.21
Malawi	0.58	0.47	0.36	0.30	0.30
Mozambique	0.36	0.34	0.32	0.31	0.29
Rwanda	0.21	0.21	0.19	0.19	0.17

Note: Land to person ratio= (land cultivated to annual and permanent crops) / (population in agriculture). http://www.faostat.fao.org/. Adapted and updated from Jayne, Chapoto, Chamberlain (2011).

The main cash crops are coffee, cotton, tea, cocoa, tobacco, sugarcane, export flowers and horticulture (Table 4). The total output for cash crops declined as a result of poor performance by coffee and some other crops. Coffee production in the 3 years prior to 2011/2012 portrayed a negative trend largely due to effects of climate change with prolonged droughts at the critical time of bean development. However, in 2011/12 the cash crop sub-sector grew by 8.2 percent (Table 4) due to increased growth from coffee (7.2 percent), cotton (77 percent), tea (18.5 percent), cocoa (10.6 percent) and horticulture (4 percent) (MAAIF, 2012a). However, the production of sweet potatoes declined in 2011 compared to previous years (UBOS, 2012).

Table 4. National Area Under Select Crops ('000 ha)

	2004	2005	2006	2007	2008	2009	2010	2011	Average	% of Total
Bananas[2]	1,811	1,817	1,819	1,820	1,822	1,824	1,843	1,873	1,828	25.6%
Beans	812	828	849	870	896	925	930	1,143	907	12.7%
Maize	750	780	819	844	862	942	1,032	1,063	887	12.4%
Sweet potatoes	602	590	584	578	599	609	620	532	589	8.2%
Millet	412	420	429	437	448	460	470	484	445	6.2%
Cassava	407	387	379	386	398	411	415	426	401	5.6%
Sorghum	285	294	308	314	321	340	355	364	323	4.5%
Coffee	264	263	220	285	345	320	270	320	286	4.0%
Sesame seed	255	268	276	280	286	292	280	283	278	3.9%
Groundnuts	221	225	230	235	244	253	235	236	235	3.3%
Sunflower seed	149	157	165	173	183	195	207	221	181	2.5%
Soybeans	144	144	145	147	148	150	150	150	147	2.1%
Seed cotton	180	110	91	100	125	70	80	160	115	1.6%
Rice	93	102	113	119	128	86	87	90	102	1.4%
Irish Potatoes	83	86	90	93	97	101	102	97	94	1.3%
Pigeon peas	84	85	86	87	88	90	98	93	89	1.2%
Cowpeas	70	71	71	72	74	77	80	91	76	1.1%
Onions	54	50	64	66	65	61	60	75	62	0.9%
Sugarcane	35	34	35	35	39	47	40	40	38	0.5%
Field Peas	25	25	26	26	26	27	28	28	26	0.4%
Tea	21	20	19	22	21	25	27	30	23	0.3%
Wheat	9	9	10	11	11	12	12	13	11	0.1%
Total	6,765	6,764	6,827	6,999	7,226	7,317	7,421	7,810	7,141	100.0%

Source: FAOSTAT.

[2] For this report, bananas include plantains, a type of bananas that are starchy, low in sugar, and usually cooked by steaming before eating. Regular bananas are consumed as a raw fruit when ripe and are more sugary and generally smaller in size.

Table 4 shows the considerable significance of bananas which account for more than 25 percent of cultivated area under major crops. Bananas are the staple food crop in Uganda, covering an estimated 1.5 million ha[3] and providing income security to millions of smallholders (DSIP, 2011). Cassava is also an important staple crop and a major income earner with approximately 5 million mt produced each year. These two crops are faced with market access constraints, poor seed material, diseases and pests, and underdeveloped value-adding opportunities.

There has been little movement over time in area under most crops except for some slight decrease or increase for some crops (Table 4, Figure 2). Millet and sorghum have witnessed a steady increase in hectares over time, while cassava has been increasing at slower rates.

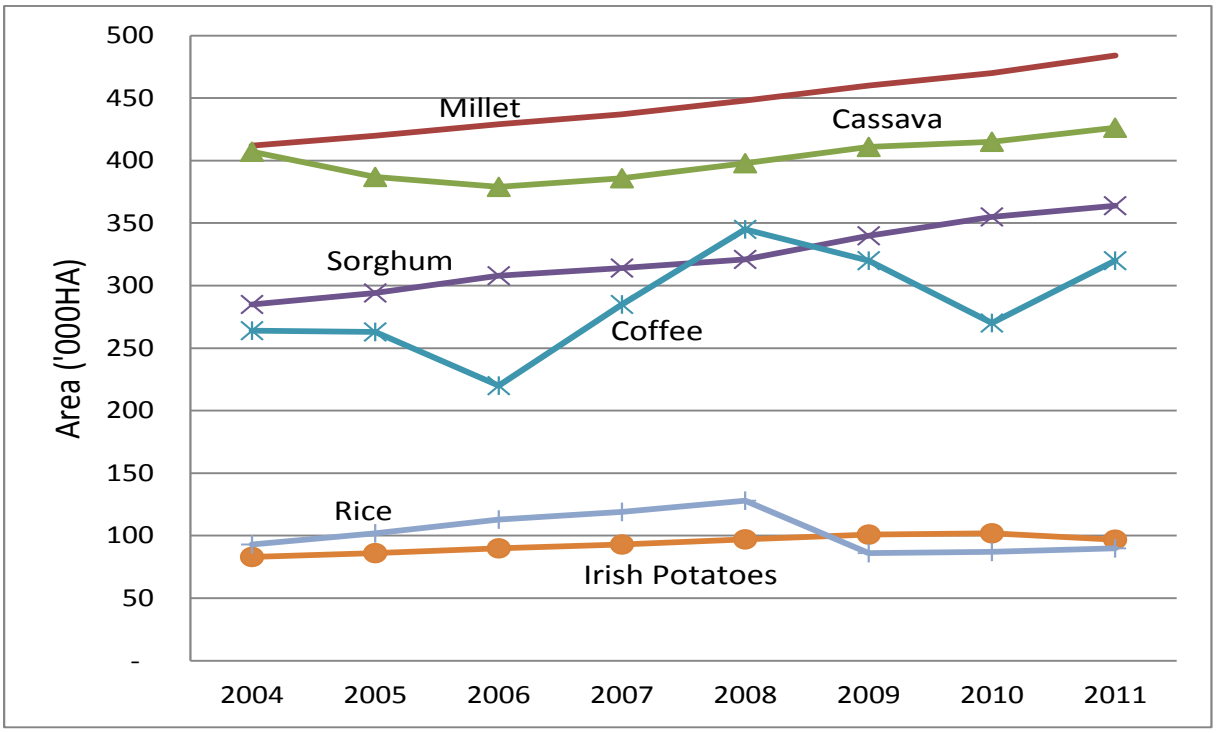

Figure 2. Area Under Other Crops for 2004/05-2010/11 Period

Apart from contributing to food security, maize is increasingly becoming an export crop to the region as reflected in 2008/09 when Uganda met half of Kenya's import demand for maize. The

[3] There are some differences between MAAIF and FAOSTAT production statistics, even between various MAAIF reports for the same crop; some of these differences result from reporting of estimates versus actual production without noting this distinction.

current national strategic plan aims at raising production to 1.78 million mt from the 1.45 million mt achieved in 2009 (DSIP, 2011) by encouraging increased adoption of improved technologies, access to information, reduction in post-harvest losses and developing new markets. Most of the area under maize is held by smallholder farmers. Though area under maize and beans has grown steadily over time (Figure 3), productivity per unit area needs to rise sufficiently to raise incomes and reduce food insecurity.

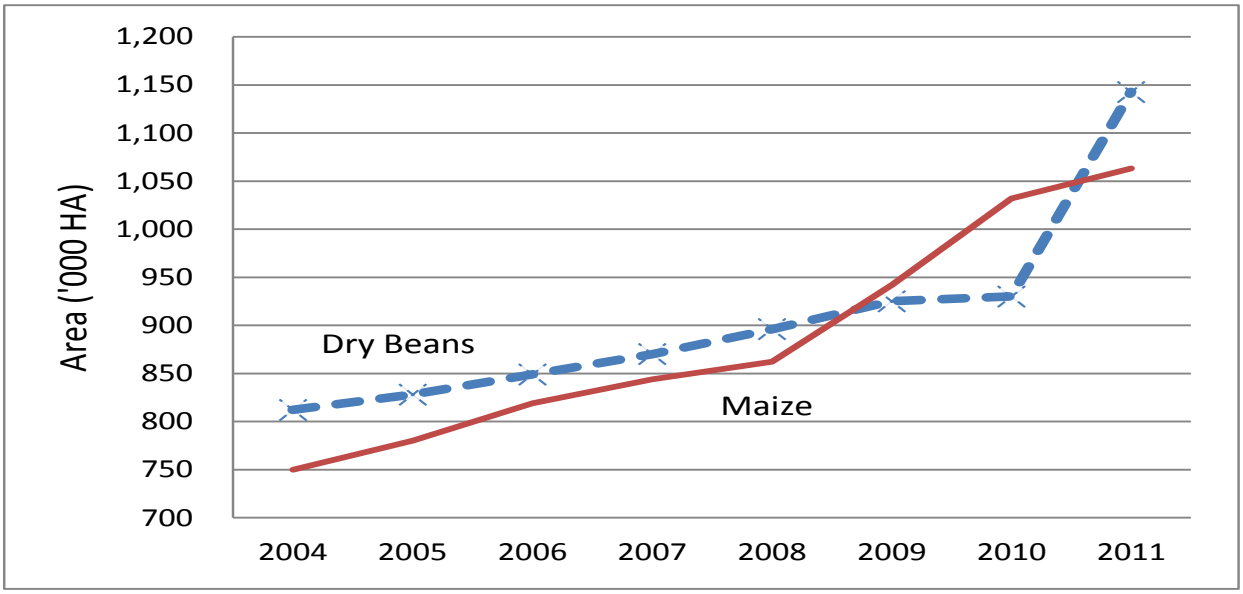

Figure 3. Area Under Maize and Beans for 2004/05-2010/11 Period

3.1.2 Production and Yield Trends for Crops

The major commercial export crops include coffee and tea; the target for tea is to have 2,500 additional hectares planted per year culminating in 12,500 ha by 2018 above the current level of 28,000 ha, leading to expected production of 100,000 mt (MAAIF, 2012b). This increase will require improved productivity through use of improved clone material, extension and processing facilities, coupled with quality controls. Other commercial crops include cotton and rice where there are increased efforts to strengthen the research component at the NARO to develop appropriate seed technologies. In 2011 approximately 90,000 ha of rice were harvested and produced 233,000 mt (UBOS, 2012).

Maize is grown widely in Uganda and has become an increasingly important non-traditional export crop. Yields average 1.8 mt/ha compared to potential of 5 mt/ha (Table 5) mainly due to

poor seed, rapid soil nutrient depletion exacerbated by low or no fertilizer use and poor extension of information and knowledge. Yields reported in a number of studies indicate some variability with a general downward trend. A report published in 2010 on maize productivity and use of improved inputs indicates that yields declined from 1.8 mt/ha in 2004 to 1.5 mt/ha in 2008 (Okoboi, 2010). Irish potatoes are a source of income, particularly in the production of chips, and policy is focused on the production of high quality seed, improved agronomic practices, quality standards and international trade. Cassava is a food and industrial crop facing yield constraints (12 mt/ha compared to optimal 80 mt/ha in Indonesia for example) due to poor agronomic practices and roots that deteriorate and perish within 2 days of harvest. The thrust of the efforts aimed at raising productivity is to supply good planting material resistant to diseases, support markets to rural an urban consumers and encourage processing or value addition activities.

Table 5. Yield and National Production (Average over 2005- 2010) for Some Crops

Crops	Yield)	Total Production
	(mt/ha)	('000 mt)
Bananas	5.17	6,705
Millet	1.33	460
Maize	1.80	1,685
Sorghum	1.18	376
Rice	1.75	208
Wheat	1.71	18
Sweet potatoes	4.45	2,638
Irish potatoes	5.81	542
Cassava	12.90	5,058
Beans	0.50	437
Peas	0.51	13
Cow peas	0.59	28
Pigeon peas	0.59	52
Groundnuts	1.05	306
Soybeans	0.95	139
Sesame seed	0.59	145
Coffee	1.12	196

Source: Various MAAIF & UBOS reports, FAOSTAT, and authors' calculations. Note that the yield and production estimates are based on averages over several years (2005-2010).

Bananas take a significant portion of cropped land and are grown by 24 percent of farming households, making this crop the most important staple food in the country with per capita

consumption averaging 300 kg, the highest in the world; bananas have a number of uses including cooking for food, processing into juice and as dessert for local and export markets. The program intervention objectives are to raise yields from a low 3.2 mt/ha to 15 mt/ha (on-farms research indicates 33 mt/ha is possible) using appropriate input technologies and innovations (seed, fertilizer, ISFM), tackling the banana bacterial wilt disease (BBW) and disseminating agronomic and market information.

4.0 Uganda's Fertilizer Market

4.1 Fertilizer Market and Policy Overview

The fertilizer sector in Uganda is predominantly private sector-driven and the GoU is focused on creating an enabling environment that is conducive to increased investments. A census by AT-Uganda (2009), an agricultural development NGO, indicated that there were 966 fertilizer agro-dealers out of 1992 agro-input dealers in the country under the umbrella of UNADA for purposes of joint advocacy, market development, training and networking. There are five major importers in the country, with some involved in wholesaling and retailing as well (overall, Uganda has approximately 10 fertilizer importers). Most of these importers are based in Kenya with local branches in Kampala or have some link to major importers in Kenya.

Despite having an open market system in place, fertilizer application rates are low at 4 kg/ha, which is not sufficient to replenish the nutrients and meet the DSIP targets. Raising productivity will require training farmers on ISFM, encouraging public-private sector investments and providing market information. To support the ISFM effort, the DSIP indicates that the NAADS will use soil testing kits to provide fertilizer recommendations to farmers, conduct fertilizer demonstrations and training of farmers, and provide starter packages of improved seed and fertilizers to some farmers to stimulate demand (MAAIF, 2012b).To raise adoption of fertilizers, the policy endeavors to boost access to finance by encouraging development of innovative approaches that utilize loan guarantee funds and risk management tools.

Though the market is liberalized, there is no formal regulatory policy governing quality for the fertilizer market; what is available is a draft Fertilizer Regulations Act, which has not been signed into law yet and is undergoing a stakeholder confirmation process under the coordination of EPRC to make sure all relevant issues have been accounted for[4] (Benson et al., 2011).

4.2 Fertilizer Resources and Consumption Trends

FAO data indicate that SSA produces 0.1 percent of the world's fertilizer nutrients, consumes 0.9 percent and accounts for 2.2 percent of imports and 0.2 percent of global exports. The small share of the global market is reflected in low application rates resulting from unfavorable input-output price ratios and constraints to input and output market development (Gregory and Bumb, 2006; Ariga and Jayne, 2009) which lead to decreasing soil fertility.

4.2.1 Local Resources for Manufacture of Fertilizers

Like most SSA countries, Uganda depends on the international markets for its fertilizers as local production is currently limited to exploratory and testing activities. There has been some interest and effort by the GoU to encourage local manufacturing in order to improve access to fertilizers and agricultural productivity; this would save on foreign exchange and temper international price fluctuations. There are two areas of interest regarding fertilizer manufacturing in Uganda: a recent discovery of oil deposits in the West and the continuing mining and testing of phosphate rock deposits in the East. Therefore, there is the potential for producing nitrogen and phosphate fertilizers. The success of such efforts will depend on a combination of factors including detailed feasibility studies on the extent of resources and logistics, the extent of regional demand to warrant investments, and the competition from relatively cheaper products from the Middle East and other sources[5] (Gregory and Bumb, 2006).

Work by Van Kauwenbergh (2006) summarizes soil mineral studies conducted by various parties (both businesses and researchers) over a period of time in Uganda. Phosphate deposits have been

[4] More recent information indicates that both the National Fertilizer Policy and Strategy have been developed and validated and are awaiting cabinet approval.
http://www.eprc.or.ug/data/mevents/37/Validation_Workshop_on_the_National_Fertilizer_Strategy.html.
[5] By the time this report was completed, a Chinese company had a ground-breaking ceremony to start the Sukulu Phosphate Project in Tororo District, with Uganda's president in attendance:
http://www.newvision.co.ug/news/658839-extortionists-delayed-fertilizer-project--museveni.html.

discovered in several areas in eastern Uganda (Sukulu, Tororo, Bukusu, Bitriku and Budeda). Tests have indicated significant amounts of high-grade material in the soils (Davies, 1947). These were used in the 1960s to produce single superphosphate (SSP) in a manufacturing plant that shut down in the late 1970s. Studies of Sukulu ore and concentrate samples by IFDC (McClellan and Cooper, 1982; IFDC, 1984) indicate the presence of significant high-grade ore. Tests done under a World Bank-funded study carried out by IFDC looking at the suitability of Sukulu concentrate for SSP (1983), TSP, MAP and DAP (IFDC, 1985) showed that a wide variety of products of internationally accepted specifications could be made from Sukulu concentrate, as detailed in Van Kauwenbergh (2006).

An analysis of data from previous studies puts the reserve of residual soils at Sukulu estimates at 230 million mt of ore averaging 12.8 percent P_2O_5 (Bearden-Potter Corporation, 1982). Some international companies have been mining and testing rock phosphate deposits in Sukulu Hills near Tororo along the border with Kenya, and feasibility studies are ongoing to assess its commercialization. Beneficiation and blending with other products (TSP) is being conducted (van Straaten, 2002), but these efforts face challenges from the inadequate knowledge of farmers on the benefits of using phosphate rock and other constraints in the fertilizer value chain including difficulties in securing inputs to manufacture other phosphate products like SSP and TSP (Benson et al., 2011). The results from direct application of phosphate rock have not shown sufficient promise yet, but efforts are ongoing to blend with other products to raise efficiency.

In 2006, a small nitrogen plant with a capacity of 1,500 mt per day was estimated to cost more than U.S. $500 million to set up (Gregory and Bumb, 2006), a capital investment ranging from U.S. $0.75 billion to U.S. $1 billion in current values. A review of available data suggests that the current annual market for urea in the region is around 75,000 mt. This is the equivalent of 23 percent of the annual production of a urea plant with only 1,000 mt/day capacity (operating for 330 days per year). Therefore, if a plant is built in the region, there will need to be export outside the region in order to utilize the plant's capacity and minimize production costs per metric ton. Fertilizer production in this location must be competitive with import parity pricing in the regional market; export pricing would have to be competitive with other export sources, essentially the Arab Gulf urea producers. Apart from technical feasibility, it is important to have

the demand or market and the infrastructure to make sure the operations are efficient in satisfying the market.

4.2.2 Import and Consumption Trends

Use of improved technology in Uganda is very low because available seed technologies at NARO are not widely adopted by farmers and there is low use of fertilizers (ASDS, 2010). A World Bank (2006) study associates 40 percent of productivity increases with fertilizer use and 21 percent to improved seed, all other things held constant. Less than 5 percent of farmers use improved seeds or agrochemicals respectively; application rates for fertilizer are at a low of 4 kg of nutrients per hectare (MAAIF, 2010), most of which is applied on large commercial estates on crops meant mostly for exports.

Common fertilizers consumed in Uganda include DAP and Urea (mostly on maize), NPK (17:17:17), CAN, SSP, TSP and 25:5:5+5s (coffee); potash fertilizers are not commonly used with little MOP being sold in the market. Fertilizer use varies across regions depending on agro-ecological conditions, type of crops and other variables. Most farmers do not use fertilizer, citing high prices, poor knowledge on agronomic aspects related to fertilizer use and its benefits, access to auxiliary services such as credit and poor infrastructure (irrigation, storage, roads) leading to poor access to markets (Okoboi and Barungi, 2012).

It is difficult to get statistics for fertilizer imports or consumption over time for Uganda, and various sources have statistics that differ substantially; for instance, data from FAOSTAT gives fertilizer quantities for a period up to 2002 and what is available in UBOS does not match with what is in other reports. This shows the problem with data collection or availability which mirrors problems encountered in Mozambique.[6] Figure 4 shows that fertilizer consumption in Uganda is below 50,000 mt per annum, a relatively small market equivalent to 225,000 ton shiploads.

[6] It is important that the MAAIF put in place a system of collecting and verifying agricultural data in coordination with other agencies like the Revenue Authority and importers.

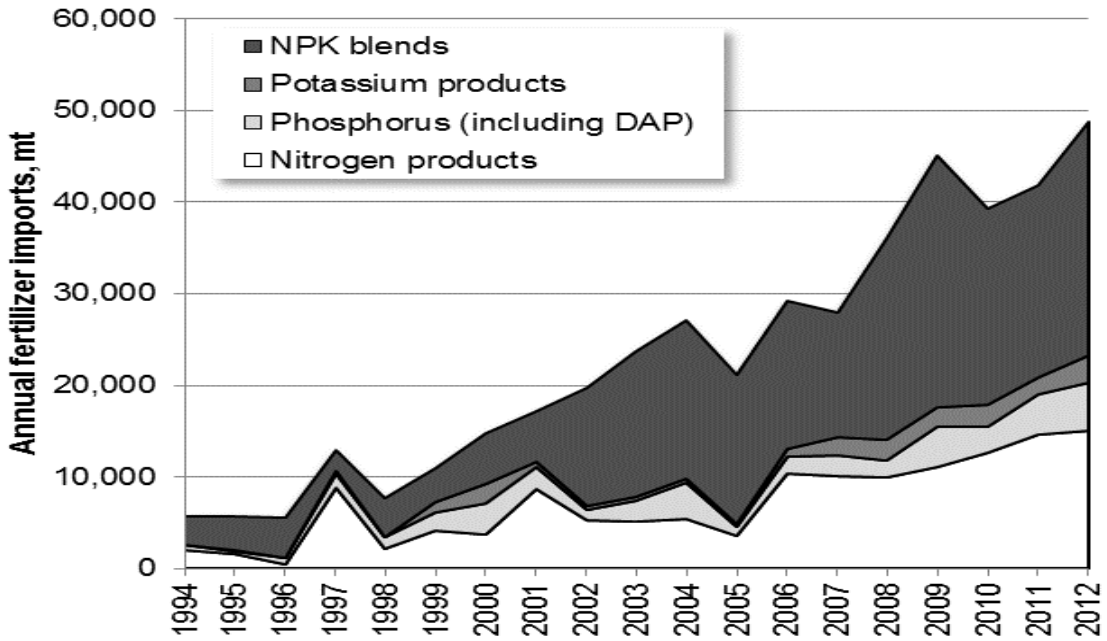

Figure 4. Fertilizer Import Trends by Category
(Note: It is assumed that all fertilizer imports were consumed domestically.)

Source: Uganda Revenue Authority import database (Adapted from IFPRI [2012]).

This quantity is a reflection of the demand situation and low application rates; as in Mozambique, increasing fertilizer use will hinge mostly on getting information to farmers on the benefits and provision of support services including efforts to lower the farm gate prices for inputs in order to encourage accessibility by smallholders. In addition, for farmers to significantly increase their fertilizer use, it is necessary that they be linked to efficient and reliable output markets that offer attractive prices for their produce and input markets that lower farm gate costs for fertilizer and other technologies. This cannot be overemphasized; fertilizer use is closely linked to working and expanded markets; therefore, regional agreements that expand the markets to Kenya, Tanzania and other EAC countries will provide the impetus for fertilizer use. But expanding markets regionally faces some hurdles resulting from tariff and non-tariff barriers to trade between countries.

The EAC countries have agreed to a zero-rated fertilizer tax, meaning that there should be no tax or duty on fertilizer imports. However, there is a withholding income tax levied at the time of importation into Uganda. This is refunded if it is determined that the income tax liability is less

than the tax withheld when a tax return is filed by the importer, or additional tax may be due if it is determined that the importer's tax liability is more than the withholding tax. This is a tax to finance government obligations which is levied on profits before the goods are sold (i.e., it is not a tax on imports per se, but the timing of taxation may have unintended consequences). This has several ramifications: (1) it raises the cost of imports which the importer may transfer to farmers before he does his final tax accounts to assess total tax liabilities and (2) there is an indirect cost if refund funds take a long time to revert to the payer and are tied up in an unproductive account, which may raise the farm gate prices for fertilizer.

4.3 Uganda Domestic Fertilizer Value Chains

Some key supply chains for Uganda fertilizer are depicted in Figure 5. There are basically two pathways to importing fertilizers into Uganda: acquiring directly from international sources or through key importers based in neighboring Kenya and Tanzania. Large commercial plantations or estate farms growing tea, sugarcane and tobacco import their specialized fertilizers directly from these sources or their local branches. Domestically, distribution to smallholder farmers is done through wholesalers, cooperatives and retailers (also known as agro-dealers or stockists).

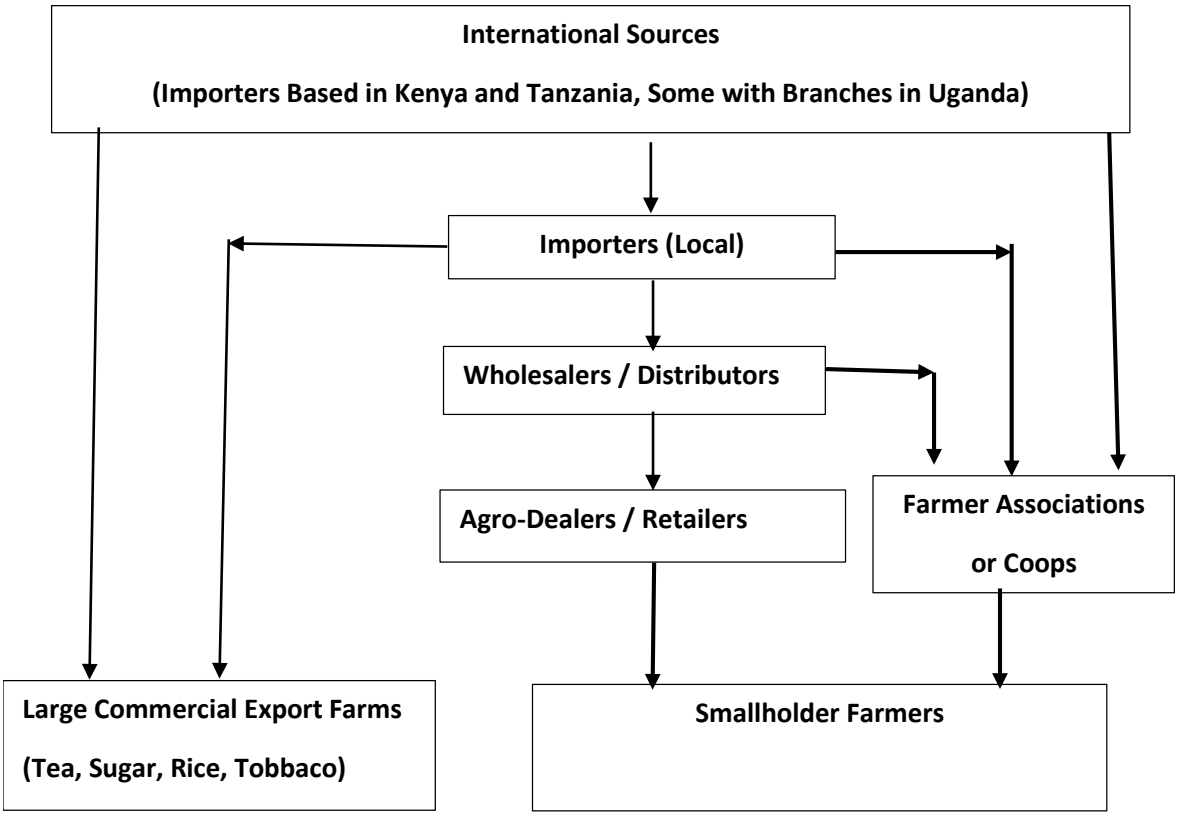

Figure 5. Key Domestic Value Chains for Uganda Fertilizer

Source: Authors, from information collected from field interviews.

Uganda has no national fertilizer subsidy program like most of its neighbors, though in the early 1990s there were some donor-driven fertilizer imports distributed by NGOs to various farmer groups. The fertilizer market is driven by the private sector mostly distributing to areas where high-value crops are grown, covering commercial and export-oriented sectors.

4.4 A Breakdown of International and Domestic Fertilizer Distribution Costs

An analysis of the costs of distributing fertilizer from the port to the farm gate is useful in identifying ways of raising fertilizer consumption. This provides information that will guide decisions on specific areas to be targeted in order to mitigate costs so that farm gate prices are reduced. Uganda is a landlocked country and therefore the supply chain is impacted significantly by costs incurred internationally (outside the continent and within Kenya before reaching the Uganda border at Malaba) as well as domestic costs. In this case, the government will be interested in domestic costs where public policy may have some effect since international costs cannot be influenced by domestic policies; however, recent efforts by the EAC to work together to change the lead times from port to destinations by reducing the number of weighbridges and police inspection stops in Kenya and the possibility of jointly constructing a new railway line implies that the GoU may have some leeway in influencing international costs through the regional cooperation.

Ugandan supply costs mirror those documented for Kenyan farmers, but Ugandan farmers face higher transport costs due to the longer distances and border-related constraints. The supply chain costs consist of four major items: port handling, transport, transaction costs and trade margins. Of these categories, port and transport costs generate the most interest; it is important to note that estimating business margins and transaction costs is challenging due to difficulty in getting reliable information and data on the individual elements (confidentiality and the difficulty of measurement). For this study we use an estimate of margins from interviews with importers as a percentage of costs.

Figures 6 and 7 illustrate the key costs from the port of Mombasa (Kenya) to Kampala (capital city). Kampala is approximately 1200 km from the port of Mombasa.

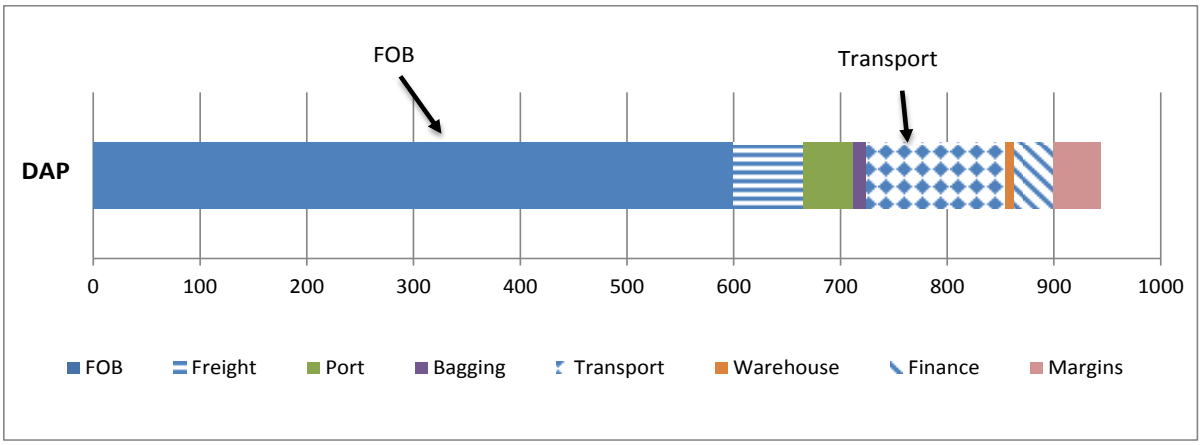

Figure 6. Total Cost Buildup for DAP Fertilizer (Mombasa to Kampala), April 2013

Source: Authors' calculations. Note costs are in U.S. $.

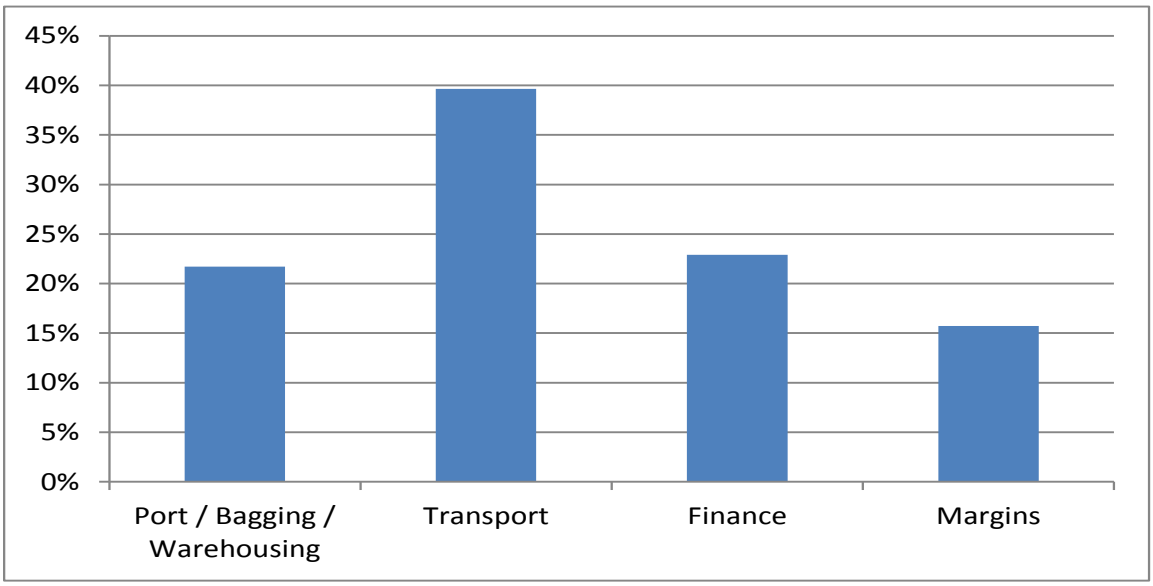

Figure 7. Proportion of Individual Items in Total Domestic Fertilizer Distribution Costs

Source: Authors' calculations.

Inland transport costs add significantly to the cost of fertilizer. Transport accounts for a substantial portion of fertilizer costs from the port of Mombasa to Kampala at around 40 percent. It is important to note that margins are 'gross' (i.e., the internal costs incurred by the businesses related to the fertilizer activity, including labor, capital and overhead, are part of these margins); therefore, the 'net' margins are lower than what is reflected here, depending on the respective costs for these firms.

Clearly, these costs create a challenge to improving the flow of fertilizers to farmers at attractive prices. Efforts toward increasing fertilizer consumption in Uganda will have to design ways to improve the efficiency of transport.[7] The following sections examine ways to gain such efficiencies by tackling domestic infrastructure constraints, particularly in light of estimates of increased fertilizer required for reaching CAADP targets.

5.0 Estimating Fertilizer Required to Meet Agricultural Growth Targets

The ideal way to estimate fertilizer requirements is to account for both market and agronomic relationships that influence productivity and profitability. However, due to the absence of and/or incomplete data sets such as production, fertilizer use by crop for each agricultural region over time and updated soil profiles, this analysis relies mostly on simple agronomic methods. Therefore, these estimates are intended to highlight priority areas in the process of meeting the agricultural goals and provide information for further research, analyses and discussions toward improving the accuracy of the estimates.

The estimation process follows a two-step procedure. First, we analyze the gap between the current and target production levels (Table 6). This gives an indication of the incremental production that must be bridged by increasing fertilizer use. The next stage is then to estimate the fertilizer needs that correspond to this increase in production (discussed in the next section).

[7] During September-October 2013 the presidents of four EAC member countries met twice with the intent of implementing one-stop-windows for import documentation and payment. There are also plans to construct a new railway line using international sources of funding. Other similar meetings have taken place since.

Table 6. Yield and Production Gaps Based on CAADP Targets

		Yield		Total Production		
	Area	Current	CAADP Target	Current	CAADP Target	Gap (CAADP) *Less* Current)
	('000 ha)	(mt/ha)		('000 mt)		
Millet	344	1.33	1.79	460	615	155
Maize	938	1.80	2.40	1,685	2,255	570
Sorghum	318	1.18	1.58	376	504	127
Rice	119	1.75	2.34	208	278	70
Wheat	11	1.71	2.28	18	24	6
Irish potatoes	93	5.81	7.77	542	726	183
Cassava	392	12.90	17.26	5,058	6,768	1,711
Beans	874	0.50	0.67	437	585	148
Peas	26	0.51	0.68	13	18	4
Cowpeas	48	0.59	0.78	28	38	10
Pigeon peas	87	0.59	0.79	52	9	17
Groundnuts	291	1.05	1.40	306	409	103
Soybeans	147	0.95	1.27	139	186	47
Sesame seed	245	0.59	0.79	145	194	49
Coffee	175	1.12	1.50	196	262	66

Source: Various MAAIF & UBOS reports, FAOSTAT and authors' calculations. Note that the yield and production estimates are based on averages over several years (2005-2010).

For example, to meet the CAADP targets for maize, production has to increase by approximately 570,000 tons.

5.1 Estimation of Crop Nutrient Use

We construct estimates for crop targets based on crop nutrient removal rates. This method estimates fertilizer requirements based on nutrients removed by harvested crops, adjusted to reflect fertilizer use efficiency. Nutrient levels contained in the incremental harvested crops were estimated and adjusted using efficiency factors for N, P and K. The approach assumes good management practices on the part of farmers and that fertilizer application is for maintaining rather than building soil fertility levels.

Table 7 shows the results from this approach. The analysis indicates that incremental nutrient removal associated with the increased output of targeted crops would total 62,790 mt of nutrients, approximately half of which is attributed to maize and beans. In this analysis we use efficiency factors of 50, 35 and 70 percent for N, P and K, respectively. Therefore, based on these factors, for the crops to remove 62,790 mt of nutrients as shown in Table 7, the

corresponding total incremental quantity of nutrient needed to be applied to the targeted crops[8] is approximately 132,000 mt, which is equivalent to 260,640 mt of urea, DAP and potash (Table 8). Approximately 60 percent of this (i.e., 160,950 mt of urea, DAP and potash) is attributed to maize and beans and 99,690 mt to the rest of the crops. The cereal crop category accounts for 114,790 product tons out of total of 260,640 tons required for all crops (Table 8).

Table 7. Using Nutrient Removal Factors to Estimate Fertilizer Requirements

	Incremental Production	Nutrient Removal			Total Nutrient Removal
		N	P_2O_5	K_2O	
	('000 mt)	('000 mt nutrient)			
Millet	155	1.72	0.65	0.39	2.76
Maize	570	8.57	3.75	2.17	14.48
Sorghum	127	2.09	0.85	0.52	3.46
Rice	70	0.60	0.28	0.24	1.12
Wheat	6	0.15	0.06	0.03	0.24
Irish potatoes	183	0.19	0.08	0.30	0.58
Cassava	1,711	2.21	0.74	2.88	5.84
Beans	148	11.74	3.34	5.15	20.23
Peas	4	0.00	0.00	0.00	0.00
Cow peas	10	0.10	0.03	0.05	0.18
Groundnuts	103	3.45	0.65	0.55	4.64
Soybeans	47	0.51	0.12	0.14	0.78
Sesame seed	49	1.29	0.62	0.21	2.12
Coffee	66	2.62	0.33	3.41	6.36
					62.79

Note: Numbers may not add due to rounding.

Source: Data from MAAIF & UBOS, FAOSTAT and authors' calculations using representative nutrient removal factors.

Therefore, including the current consumption of 50,000 mt to this incremental estimate leads to a total of 310,640 mt of product required to meet the agricultural growth targets.

[8] Bananas, a dominant crop in Uganda, are not included in estimating fertilizer requirements. Usually inorganic fertilizer is not used on bananas in Uganda, and so excluding it avoids giving estimates that may not align with actual demand.

Table 8. Incremental Nutrient and Product Requirements for Target Crops

Crop Categories	Nutrient Tons	Product Tons
Cereals	57,890	114,790
Other Crops	74,110	145,850
Total	132,000	260,640

Sources: Authors' estimates based on nutrient removal factors. The product conversions are to equivalent tons of urea, DAP and MOP.

These results point to the need for a significant increase in Uganda's fertilizer utilization in order to meet crop production targets. The country will therefore need a sixfold increase in fertilizer consumption from the current level of about 50,000 mt in order to achieve the targeted crop production levels. If the focus were only on cereal crops, fertilizer consumption would have to more than double from its current levels.

6.0 Key Challenges in Fertilizer Value Chains

6.1. Dealing with Challenges in Fertilizer Value Chains to Meet Agricultural Growth Targets

In the following sections, we discuss the challenges across the fertilizer value chain and possible responses to mitigate them so that fertilizer consumption can increase to meet the agricultural sector goals set in national development plans.

6.1.1 Transport and Transaction Costs

Uganda is a landlocked country relying on Kenya and Tanzania seaports for imports. Two recent IFDC reports (2012a, 2012b) touching on the constraints facing the fertilizer sub-sector in Kenya and Tanzania provide a backdrop to the Uganda case. A number of studies conclude that a major impediment to international trade in sub-Saharan Africa is the state of the ports (JICA, 2009). The ports have not been modernized and expanded to meet the increased flow of goods, increasing pressure on existing inadequate facilities.

The slow clearance at these ports is not just a reflection of the volume of cargo handled at the port but also the inadequacy of existing facilities and bureaucratic procedures involving the filing

of required forms and making payments. There have been recent concerted efforts by the EAC member states to address this problem by: (1) implementing a one-stop-window for filing necessary import documentation and making payments online to ease the congestion at the ports; (2) setting in motion plans to replace the current poor rail system with a new standard gauge railway line from Mombasa in Kenya to Juba in South Sudan, Kampala in Uganda and Kigali in Rwanda to help reduce the long days of hauling cargo by road; this is an expensive undertaking and these countries are working toward doing it jointly as soon as funds are acquired; (3) reducing the number of road blocks (police inspections) and weighbridges on the road linking Mombasa to these inland ports; these frequent stops are a source of additional rent-seeking contributing to non-tariff barriers to regional trade.[9] According to this agreement, only one weighbridge will be left on a journey from Mombasa to the border with Uganda. This will reduce travel times from the port (after off-loading from ship) to Malaba (border point with Uganda); and (4) having a single border control point where both countries' officials are situated in the same office or building. Most of the road infrastructure is also in a poor state, adding to costs for truck maintenance and increasing haul times.

At the border posts, the clearing agents have to show an import permit issued by MAAIF, an invoice of the shipment and a certificate of the chemical analysis of the fertilizer products. The latter may sometimes be subject to verification by inspectors which may mean holding the cargo until the results from tests come back.

Delays in clearing through the port and roads are problems that increase the cost of fertilizer and also affect general business competitiveness by raising costs of goods relative to other regions in the world. Without improvements in these areas, the higher estimated import volumes resulting from increased demand to meet national development goals will overwhelm the system and raise costs for businesses and farmers.

[9] The meetings held by the presidents of Kenya, South Sudan, Uganda and Rwanda and reported by the Standard Newspapers on http://www.standardmedia.co.ke/business/article/2000096450/kenya-lauded-by-presidents-for-efficiency-at-the-port-of-mombasa. Benson et al. (2011) report over 25 inspection stops on the road between Mombasa and Busia on the Kenya-Uganda border.

6.1.2 Farm-Related Demand Constraints

The low use of improved fertilizer technologies is contributing to declining soil fertility, particularly for smallholder farmers. A number of factors are contributing to low adoption and application rates of fertilizers. There has been misleading information by some environmental groups suggesting that fertilizer is bad for the soil which, combined with limited information on the benefits of using fertilizer, creates uncertainty. However, efforts by MAAIF and its partners to educate farmers is beginning to bear fruit, and farmers are slowly starting to recognize the benefits of using fertilizer. These and other challenges are explained in the sub-sections below.

6.1.2.1 Human Capital Development and Access to Information

Adoption of new technology requires training on its use and information on the economic benefits accruing from investing in the technology. A large proportion of smallholder farmers have no knowledge of how to use fertilizer and the benefits that accrue from its use. Though some import firms, the ministry of agriculture and development partner organizations are helping train some agro-dealers on fertilizers, this is still miniscule and requires scaling up. For fertilizer use to increase significantly, more training through demonstration farms and other fora will be an important ingredient to increase adoption by farmers that are not using fertilizer and also to encourage farmers who are using fertilizer at non-optimal levels to adjust their application rates.

Though there is an effort funded by AGRA to map soils in Uganda and other SSA countries, the current situation does not provide information on location or crop-specific fertilizer recommendations for most parts of the country, which leaves farmers using inappropriate or wrong fertilizers. As a result, farmers have a limited choice of fertilizer products whose economic benefits have not been well documented.

6.1.2.2 Financing and Linking Input and Output Markets

Access to financing for smallholder farmers is an important ingredient to connect farmers to input sources and also to markets for their produce. There is inadequate on-farm storage for most smallholders, forcing farmers to sell their produce at harvest when prices are considerably lower instead of taking advantage of relatively higher prices later in the season. Furthermore, farm storage is closely linked to efficient output markets, which will drive the demand for inputs. If farmers are not able to sell their produce at favorable prices, then it is less likely for them to

adopt or use improved technologies. Warehouse receipt systems and interlinked input-output arrangements between famers and agricultural output processors dealing with financing challenges are some ways to deal with these issues.

6.1.2.3 Limited Markets and Value Addition Opportunities

Ugandan agriculture is relying more and more on regional trade particularly for its maize output, most of which is consumed in Kenya. Apart from the problem of poor infrastructure, smallholder farmers lack value addition opportunities in rural areas; MAAIF and other organizations like FAO are working with CBOs and NGOs to link farmers to markets regionally and locally as well as training them on commercial-oriented farming in place of subsistence objectives in conjunction with NAADs providing the relevant extension services.

6.1.3 Legal and Regulatory Framework

There is no formal policy dealing with fertilizer regulation in Uganda but there is a draft Agro-Chemical Control Act (2011) that has not been enacted into law yet. This Act splits fertilizers and pesticides into two separate sets of laws replacing the previous 2006 Act which combined the two sets of inputs under one law. This needs to be updated, signed into law to create an unambiguous framework for fertilizer market stakeholders to operate. In general, Uganda has a free fertilizer market policy allowing the private sector to play a relatively unimpeded role in importation and distribution of fertilizers. However, the transit route, including the border entry points into Uganda, face a number of non-tariff constraints where cargo is delayed for clearance and a refundable withholding tax on fertilizer may be contributing to the rising cost of fertilizers as explained in section 4.2.2. It is important that regional legislation and trade policy frameworks are harmonized, particularly on quality standards, taxes and tariffs for fertilizers at the regional economic community (REC) level in order to encourage increased private investment and low farm gate costs. The recent proposed 18 percent value-added tax on key agricultural inputs in Uganda is likely to substantially raise costs for farmers (Mbowa et al., 2014), reduce profitability and discourage use of improved technologies.

Bationo and Beatrice (2010) report that Ugandan regulations may be constricting introduction of new technologies into the country by applying tough testing procedures. New products, even

those that have already been approved in neighboring countries like Kenya, take up to three years for testing and approval.

7.0 Conclusions and Recommendations

The fertilizer sector in Uganda is liberalized, allowing for participation by a growing private sector that is building local and international networks and is poised to meet demand if existing constraints in the fertilizer value chain are eliminated. However, despite the open market system, the current fertilizer application rates are very low at 4 kg/ha which is insufficient to replenish nutrients and meet the DSIP targets. The biggest challenge to fertilizer use in Uganda is the limited or lack of farmers' knowledge on the benefits of using fertilizer. It is, therefore, important to avail information to farmers showing the gains in yields (and income) from using improved technologies through demonstrations and other extension approaches.

A dynamic site and crop-specific fertilizer recommendation system is an important ingredient in raising fertilizer demand. If farmers do not have information on what nutrients are deficient on their plots and specific nutrient requirements for each crop, it is difficult for them to choose the right fertilizer and quantities to be applied per hectare. Though some farmers deem their land to be "fertile" and assert that fertilizer use will "spoil" the soils, this can be corrected by educating them on best management practices, provision of soil test services and implementing appropriate recommendations for nutrients that will sustain soils and improve production. Providing information through various media – press, internet, cell-phone messages, extension and agro-dealer-training – is an important aspect of encouraging fertilizer use.

Fertilizer intensification in conjunction with complementary inputs and ISFM can help to transform farmers into net-sellers so that they can take advantage of available market opportunities. Commercialization of agriculture should be encouraged to take advantage of expanded markets resulting from economic integration of East Africa countries. The East African Community (EAC) market offers many opportunities for these farmers to improve their livelihoods by trading with regions within and outside their countries. The current efforts by

heads of states to merge EAC, the Southern African Development Community and the Common Market for Eastern and Southern Africa will provide wider market access when the merger comes to fruition. Uganda is already exporting a large proportion of its maize output to Kenya each season.

The cost of fertilizer is influenced by a number of factors. This includes a costly distribution system that raises transport and transaction costs coupled with policy, regulatory and institutional impediments which constrain the efficiency of the value chain. Domestic manufacturing and blending of fertilizers may alleviate costs, but efforts in this direction will require comprehensive technical and economic feasibility studies looking at the size of existing market and potential consumption.

The small market sizes served by individual traders elevate the per-unit costs of moving products, which is then passed onto farmers. Regional integration provides opportunities for economies of scale in manufacturing, procurement and distribution of products resulting from access to a larger consumer base. The role of policy is crucial in setting up transparent rules of engagement, creating confidence and a sense of fairness among players throughout the chain and across countries. The disparities in customs regulations, quality standards and the presence of both tariff and non-tariff barriers are issues that require transparency and harmonization across countries.

Investments in fertilizer trade can involve enormous amounts of funds. Even procurement of a few thousand tons of fertilizer necessitates millions of dollars in investments. Financial markets in most of SSA are underdeveloped and the cost of credit is very high. Infrastructure is a constraint that adds to working capital costs, and existing regulations sometimes provide opportunities for rent-seeking. All of these challenges discourage private enterprise. Therefore, it is important that policymakers provide clear and consistent guidelines and rules for every player in the market. It is also crucial that public and private local-international partnerships are encouraged to tackle the problem of cost of finance by taking advantage of cheaper sources. Private-public partnerships can be useful in capacity building, provision of credit and extension services to farmers.

Uganda has no national fertilizer subsidy program like most of its neighbors, though in the early 1990s there were some donor-driven fertilizer imports distributed by NGOs to various farmer groups. This environment augurs well for any efforts aimed at developing the market for fertilizers since there are lessons to learn from other countries on what works or does not. The lack of state participation in import and distribution provides an opportunity for policy aimed at improving fertilizer markets based on experiences from other countries that have a mix of public and private sector participation in fertilizer markets. The current efforts to enact a fertilizer regulatory policy will help to create a framework to ensure quality fertilizer gets to farmers. Therefore, it is important to adopt lessons learned from various policies in other countries and implement policies that have high chances of achieving success.

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