Malawi Fertilizer Assessment

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# Table of Contents

Executive Summary ....................................................................................................................... vi
1. Introduction................................................................................................................................. 1
  1.1. A Conceptual Framework for Linking Inputs to Outputs ................................................. 3
2. The Malawi Agricultural Policy Context .................................................................................... 5
  2.1. The Agricultural Development Program (ADP) ............................................................... 6
  2.2. Fertilizer Policy ................................................................................................................ 8
  2.2.1. The Fertilizer Subsidy Program ........................................................................... 10
  2.3. Fertilizer Law and Regulations ....................................................................................... 14
3. The Malawi Agriculture Sector ................................................................................................ 15
4. The Malawi Fertilizer Market: Supply and Demand ................................................................ 19
  4.1. Fertilizer Supply in Malawi ............................................................................................ 21
  4.2. Fertilizer Demand in Malawi .......................................................................................... 27
  4.3. Fertilizer Supply Chain Cost Structure .......................................................................... 29
5. Estimating Fertilizer Requirements .......................................................................................... 34
6. Main Issues Facing the Fertilizer Supply in Malawi ................................................................. 37
7. Conclusions and Recommendations .......................................................................................... 41
  7.1. Restructuring the FISP Program ..................................................................................... 42
  7.2. Investment in Logistics Infrastructure: Transport and Storage ....................................... 43
  7.3. Improving Access to Finance ......................................................................................... 45
  7.4. Creation of an Enabling Business Environment ............................................................. 45
List of References ......................................................................................................................... 47
List of Tables

Table 1. Private and Public Sector Involvement in Fertilizer Imports, Sales and Purchases (mt), 1997/98-2006/07 ............................................................................................................. 14
Table 2. Total Crop Area and Production in Malawi, Averages, 2007-2011 ..................... 17
Table 3. Estimates of Fertilizer Product Suppliers in Malawi, 2007 ..................................... 23
Table 4. Importers Involved in Supplying the Malawi Fertilizer Market, 2008 .................. 24
Table 5. Fertilizer Cost/Price Structure in Malawi, 2004 ..................................................... 34
Table 6. Yield and Production Differences Between Current and MGDS II Targets ........... 35
Table 7. Required Fertilizer Nutrients Using Nutrient Removal Factors for a Set of Crops .... 36
Table 8. Incremental Nutrient and Product Requirements .................................................. 36

List of Figures

Figure 1. The Double Value Chain ........................................................................................ 3
Figure 2. Fertilizer Imports and Use in Malawi, 2004/05-2011/12 Seasons ...................... 20
Figure 3. Total NPK Nutrient Imports in Malawi, 1990-2010 ............................................. 21
Figure 4. Map of Malawi Showing Distribution Networks ............................................... 25
Figure 5. Fertilizer Distribution in Malawi ......................................................................... 27
Figure 6. Proportion of Fertilizer Costs to Regional Warehouses in Malawi ....................... 30
Figure 7. Proportion of Inland/Domestic Costs to Regional Warehouses in Malawi ........... 32
Acronyms

ADD  Agricultural Development Division
ADMARC  Agricultural Development and Marketing Corporation
ADP  Agricultural Development Plan
AFAP  African Fertilizer and Agribusiness Partnership
AfDB  African Development Bank
AGMARK  Agricultural Market Development Trust
AGRA  Alliance for a Green Revolution in Africa
AISAM  Agro-input Suppliers Association of Malawi
AISP  Agricultural Input Subsidy Program
A-SWAp  Agriculture-Sector Wide Approach
AU  African Union
CAADP  Comprehensive African Agriculture Development Programme
CAN  Calcium ammonium nitrate
CIA-WFB  Central Intelligence Agency-World Fact Book
CNFA  Citizens Network for Foreign Affairs
COMESA  Common Market for Eastern and Southern Africa
DADO  District Agricultural Development Officers
DAS  Development Assistance Strategy
DFID  Department for International Development
FAM  Fertilizer Association of Malawi
FAO  Food and Agriculture Organization
FFFRA  Fertilizer, Farm Feeds and Remedies Act
FISP  Farm Input Subsidy Program
FtF  Feed the Future
GBI  Green Belt Initiative
GDP  Gross Domestic Product
GoM  Government of Malawi
HIPC  Heavily Indebted Poor Countries
IFDC  International Fertilizer Development Center
IMF  International Monetary Fund
ISFM  Integrated Soil Fertility Management
MDG  Millennium Development Goals
MGDS  Malawi Growth and Development Strategy
MoAFS  Ministry of Agriculture and Food Security
MPRS  Malawi Poverty Reduction Strategy
NEPAD  New Partnership for African Development
NFS  National Fertilizer Strategy
<table>
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<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>NGO</td>
<td>Non-governmental organization</td>
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<tr>
<td>NPK</td>
<td>Nitrogen ($N$), phosphorus (phosphate: $P_2O_5$), potassium (potash: $K_2O$)</td>
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<td>SAP</td>
<td>Structural Adjustment Program</td>
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<td>SFFRFM</td>
<td>Small Farmers Fertilizer Revolving Fund of Malawi</td>
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<td>SO</td>
<td>Strategic objectives</td>
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<td>SSA</td>
<td>Sub-Saharan Africa</td>
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<td>MBS</td>
<td>Malawi Bureau of Standards</td>
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<td>MFC</td>
<td>Malawi Fertilizer Company</td>
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<tr>
<td>MK</td>
<td>Malawi Kwacha</td>
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<tr>
<td>MoF</td>
<td>Ministry of Finance</td>
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<td>MoPED</td>
<td>Ministry of Planning and Economic Development</td>
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<td>SWAp</td>
<td>Sector-Wide Approach</td>
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<td>UNDP</td>
<td>United Nations Development Program</td>
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<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>WB</td>
<td>The World Bank</td>
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Malawi Fertilizer Assessment

Executive Summary

To address the challenges of poverty, food insecurity and malnutrition, the Government of Malawi (GoM) is implementing the second phase of the Malawi Growth and Development Strategy (MGDS II), which encompasses policies and programs in line with the pillars of the Comprehensive Africa Agriculture Development Program (CAADP) framework. Under the MGDS II, the GoM has committed to raise agricultural growth by at least 6.0 percent and keep the national budget allocated to agriculture to at least 10 percent, in compliance with the CAADP. To achieve these goals, the GoM has adopted the Agricultural Development Plan (ADP), embraced in the Agriculture-Sector Wide Approach (A-SWAp).

The agricultural sector in Malawi is dominated by smallholder farmers with low productivity. Considering the small size of the country and the limited availability of arable/crop land, there is a need to raise productivity through agricultural intensification. A key tenet to raising productivity and production to achieve the agricultural growth rates of the A-SWAp is the adoption of improved technologies such as integrated soil fertility management (ISFM) and modern cropping practices, while in the process, increasing smallholder farmers’ incomes. This report provides information and estimates of fertilizer consumption levels necessary to achieve the A-SWAp growth rate that will contribute to reaching the targets of the MGDS II by 2016. It also analyzes the challenges in the supply chain and recommends policies that will support the increased levels of projected fertilizer consumption.

The estimates in this assessment indicate that Malawi must double its consumption from 297,000 metric tons (mt) of fertilizer products to 600,000 mt annually in order to meet the agriculture sector growth targets by 2016. This level of fertilizer use will require addressing existing constraints in the supply chain so that larger volumes of products can be handled without significant issues. This includes addressing bottlenecks in the procurement of fertilizer and logistics and financing issues as well as research and extension services for agro-dealer and farmer capacity building.
The current availability and consumption of mostly NPK fertilizer in the form of Compound D (a local term that refers to an NPK blend of 7-14-7) and of urea, provides a limited set of products to farmers who face heterogeneous agro-ecological conditions and cultivars that demand different production technologies. Though not all fertilizer products may be imported at competitive prices, taking advantage of the available domestic natural resource base and/or establishing or expanding existing blending facilities may offer alternative products that better target farmers’ local conditions. The introduction of new fertilizer products requires public and private investments and capacity building to increase agro-dealer and farmer knowledge of agronomic practices and the benefits of their use – together with the establishment of a clear legal and regulatory framework with enforcement capacity. With this framework in place and the provision of appropriate fertilizer blends and pack sizes that are affordable to farmers, coupled with a risk management financial instrument (e.g., indexed crop insurance) and credit facilities, an environment that contributes to increased access to improved production technologies by smallholder farmers will be established, thereby increasing the consumption and use of fertilizer.

The estimation of annual fertilizer import requirements at a national level can be a challenging exercise that can lead to under- or over-estimations of demand. The movement of a rather larger quantity of cargo can be further complicated by poor logistics, which requires starting the procurement process fairly early to make it available to farmers before planting. Carryover stocks can contribute to the availability of fertilizer at the right time and possibly cushion the domestic industry and users from international price fluctuations. However, depending on the design and operations of storage facilities and related storage costs, user prices may be affected and the quality of fertilizer compromised, which will further affect accessibility to fertilizer; even if accessible, lower yields than expected can occur as a result of lower fertilizer quality. Therefore, it is important to make estimates that are based on realistic expectations of the performance of the existing fertilizer supply chain and agriculture sector while accounting for climate (weather) and technological changes.

Malawi faces the same logistics issues as most countries in the region, which at times are exacerbated given its landlocked geographical location. The country relies on importation
through neighboring countries’ ports (Dar Es-Salaam in Tanzania, Beira and Nacala in Mozambique, and sporadically from Durban in South Africa), some of which face inefficiencies and other structural issues. In addition, Malawi’s poor road infrastructure, low investments in rural storage and in trucking services are constraints that add to the costs of fertilizer. Therefore, improved roads, investments in transport vehicles and more efficient logistics arrangements can reduce the costs of moving fertilizer from foreign ports to the nation’s farmers. Good roads can also encourage investments in other support businesses and services in the rural sector, such as food processing plants, rural farmers’ markets and other means of market access for farmers’ outputs.

Fertilizer prices in Malawi are set primarily by market forces in the open market and by a GoM tender-bid for the provision of subsidized fertilizer. The price setting process of subsidized fertilizer may not capture all of the relevant elements that influence open market price formation, given that private sector importers are involved in the procurement and importation of the product and its distribution and retail is in the hands of state enterprises. A consequence of this is that the actual cost and, therefore, the implicit price of subsidized fertilizer may be inflated or above the actual open market price, resulting from private importers hedging against any eventuality (e.g., late government payments and devaluation, among others) and the apparent inefficient operation of the state enterprises. Although this practice does not affect the cost to beneficiary farmers (because the product is so heavily subsidized), it does affect the cost of delivery and market expansion, given that the private sector is excluded from participating in the distribution of subsidized fertilizer and is unable to compete with subsidized prices. This approach by the GoM discourages further private investment in the sector, causing final beneficiaries to be affected by the low supply of non-subsidize and subsidized fertilizer whose quantities are bound by budgetary/fiscal constraints.

A possible alternative to address the issue of low availability is to allow the private sector to set prices based on their actual costs along the supply chain and supply the product all the way to the farm gate while the GoM provides targeted/smart subsidies to vulnerable groups that otherwise would not have access to fertilizers, allowing the private sector to “pursue” those vouchers wherever they are distributed. In addition, the government must create a more
conducive business environment (legal and regulatory) and increase public investment in infrastructure and perhaps provide incentives for the private sector to develop and expand their businesses closer to farmers by facilitating the pursuit of the vouchers.

Though the state intervention in the nation’s fertilizer markets has made significant contributions in raising consumption since the introduction of the Farm Input Subsidy Program (FISP), success has depended on support from development partners, and it is still not clear whether the real beneficiaries are the intended farmer population with the greatest need. As a consequence, Malawi continues to have some way to go to achieve the relevant Millennium Development Goal (MDG1) of food security and nutrition. It remains crucial for Malawian farmers to raise productivity as crop land becomes scarce, which may involve a re-assessment of previous approaches and the adoption and adaptation of relevant options (including wider private sector participation in the market) to ensure that smallholder farmers have access to the appropriate technologies adapted to their local conditions, accompanied by the right information. A judicious mix of private and public investments with legal and regulatory guidelines will be necessary toward encouraging increased commitment to food security in Malawi.
Malawi Fertilizer Assessment

1. Introduction

The landlocked country of Malawi is one of the fastest growing economies in East Africa. During the 2000-2010 decade, the Malawi economy registered modest development, with gross domestic product (GDP) growth averaging 5.2 percent per year (from US $1.72 billion to US $5.1 billion), compared with 3.7 percent for the previous decade (The World Bank [WB], 2012). The population is estimated at 16.3 million with 2.76 percent growth per year (Central Intelligence Agency-World Fact Book [CIA-WFB], 2012), ranking Malawi among the most densely populated and least developed countries in Sub-Saharan Africa (SSA). Despite its economic growth and declining poverty incidence, poverty remains high, especially in rural areas. Malawi ranks ninth among the 20 poorest countries in the world, with a US $860 annual per capita income (2011 estimate), and is among the 10 poorest in SSA. An estimated 52 percent of the population (8.5 million people) survives with an income below the poverty line, with rural poverty estimated at 56 percent. Approximately 88 percent of the population lives in rural areas, primarily engaged in smallholder subsistence farming.

While Malawi’s economy is diversified, it remains heavily reliant on agriculture as the main source of employment. The sector is dependent on two crops – tobacco and maize – for the generation of income, foreign exchange earnings and overall food security. In 2012, it is estimated that agriculture accounted for 90 percent of total employment, 90 percent of exports and 29.6 percent of GDP. The service and industry sectors accounted for 53.5 and 16.9 percent of GDP, respectively (CIA-WFB, 2012). The narrow economic base and small domestic market size has limited economic growth, which is hindered by an erratic electric power supply, poor infrastructure and high transportation costs. Macroeconomic instability is reflected in high inflation rates, a heavy domestic debt burden and dependence on donor funding.

Over the last couple of decades, the economic contribution of various sectors to the GDP has shifted. Although in 2009 the agriculture sector presented a strong growth rate of 14.4 percent, the sector share of GDP, at 30.5 percent, had actually declined from a 1990
estimate of 45 percent (WB, 2012). This structural shift away from agriculture, primarily to the service sector, can be attributed in part to the success of the MGDS I. Still, during the 2000-2010 decade, agriculture registered a rather slow average growth rate of 2.9 percent per year, below the overall economy growth rate (WB, 2012). Within the agriculture sector, cereal and export crop subsectors are the most important in terms of contribution to GDP, with 29.8 and 25.3 percent shares, respectively (COMESA/NEPAD 2010).

Given the economic importance of the agriculture sector, the GoM has been refocusing efforts to improve its performance. To address this challenge, the GoM has engaged in a series of countrywide discussions and consultations with various public entities, economists, higher education institutions, private sector partners and civil society. These discussions led to the revision of the MGDS, new policies and programs in support of the MGDS and to the adoption of the CAADP Compact. In the agriculture sector, these discussions also included the donor community, leading to the development of the Agricultural Development Program (ADP), the Development Assistance Strategy (DAS), and to the adoption of the Agricultural Sector Wide Approach (A-SWAp) as a mechanism to implement the ADP.

The purpose of this assessment is to estimate the quantities and types of fertilizer required to meet the agricultural production targets laid out in the ADP and other GoM policy documents, and identify the primary challenges in the fertilizer sector that might thwart this growth. The report addresses two fundamental questions:

- How much fertilizer is needed for smallholders to produce the quantities of food, cash crops and export crops targeted in the ADP and A-SWAp?
- What public investments and policy changes are necessary to ensure a smooth flow of these new and significantly increased quantities of fertilizer through the supply chain, to satisfy the demand of millions of smallholder farmers?

Information and data for this study were collected through interviews with stakeholders in Malawi and also from secondary data and other published reports. The Ministry of Agriculture and Food Security (MoAF), private sector businesses and other organizations and institutions conducting research in Malawi provided significant input for this report.
1.1. A Conceptual Framework for Linking Inputs to Outputs

To address the question of procuring and distributing enough fertilizer to meet the ADP and A-SWAp targets for the agricultural sector in 2016, this assessment adopts a value chain framework as the core methodology. The premise of this framework is that market price signals are the link between input and output markets since it is the input to output price ratio that influences farmers’ decisions to use inputs like fertilizer and other productivity enhancing factors of production. An analysis of fertilizer needs and the capacity of the existing fertilizer distribution systems to supply those needs require an assessment of public policies, stakeholders (private and public sectors), and commodity flows along two inextricably linked and complementary value chains:

- The fertilizer value chain, spanning from fertilizer domestic production and importation to consumption by farmers.\(^1\)
- The agricultural outputs value chain, spanning crop production by farmers, processing, marketing and consumption by the ultimate consumers (domestic or export).

Figure 1 provides a simplified illustration of what are, in reality, very complex interactions among a vast array of actors along this set of dual, integrated value chains.

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1 Although we present the value chain for mineral fertilizers, we acknowledge that their effectiveness is determined by interactions with: (a) organic fertilizers, which make up a parallel soil nutrient value chain, and (b) other inputs such as improved seed varieties, water and mechanization.
the quantity of inputs needed to reach the A-SWAp, output targets and what policy measures are needed to ensure that the right quantity of fertilizer flows through the existing distribution system, we make the following assumptions:

1. That the ADP/A-SWAp crop production targets accurately reflect the public’s food preferences, the quantities needed to achieve national food security and agricultural growth, etc., and that the country has storage, processing capacity and market access for all agricultural products.
2. That output markets are well developed and capable of absorbing the increased levels of production. This output will be stored, processed, domestically consumed or exported.
3. The analysis also assumes that the agents involved in Node 4 have the capacity to transport, store, transform and market the increased commodity output.
4. Since prices vary depending on the levels of supply and demand, it is assumed that the use of fertilizer will remain profitable and that farmers will have an incentive to continuously use fertilizer in their production processes. Specifically, it is assumed that even if crop prices fall (e.g., due to an increased supply), either a reduction in fertilizer prices, improving production efficiency, or both, will more than compensate for lower output prices – therefore, improving or at least maintaining acceptable returns on fertilizer use.
5. Given that Malawi’s consumption of fertilizers is a small fraction of the world trade, it is also assumed that Malawi is a price-taker and does not influence international prices.

These assumptions allow for simplification of the analysis of the outputs value chain and an increased focus on the input value chain to address the following question: How much fertilizer is required to produce, in an economically viable manner (Node 3), the level of crop output to reach the targets in the ADP and A-SWAp, and therefore those of the MGDS?

This study applies a crop nutrient removal approach to provide estimates of the levels of nitrogen (N), phosphorus (P) and potash (K) that is required to reach the level of output to meet the ADP and A-SWAp crop production targets. Details on the specifics of this approach, data and analysis are presented in Section 5. Having determined these estimates, we then assess the capacity of the current fertilizer system (Node 2) to timely procure, import, store, transport and distribute such quantity to farmers (Node 3). We ask the question: What investments and policy
changes will be necessary to ensure the flow of increased quantities of fertilizer through the chain to a dispersed smallholder farmer population?

Node 2 (fertilizer traders) in Figure 1 consists of the following steps and players:

- **Importation** – Private and public importers, bankers, shipping companies, port service providers (stevedores and bagging agents), revenue authorities, quality inspectors, blending facilities and transporters.
- **Wholesale Distribution** – Private and public wholesalers and distributors such as the Small Farmers Fertilizer Revolving Fund of Malawi (SFFRFM), the Agricultural Development and Marketing Corporation (ADMARC) and Farmers World, among others.
- **Retail Distribution** – Independent and private retailers affiliated with importers/wholesalers, ADMARC retailer network, etc.

Furthermore, the study examines the physical, human, institutional and financial capacity and discusses possible actions by value chain participants in light of increased fertilizer use. It also identifies necessary investments in support structures along the supply chain as well as policy changes needed to ensure the right quantities of fertilizer flow to the end user. Tabular, graphic and descriptive analyses are used throughout the text to explain the assessment results.

2. The Malawi Agricultural Policy Context

The GoM’s overarching development goal is to promote economic growth by improving productivity and profitability of agriculture, especially among smallholder farmers. This is to be accomplished through public-private partnerships and by encouraging private investment. The revival of agriculture as a leading strategic sector is at the core of the government commitment and at the highest political and policy levels within the CAADP framework (Chinsinga, 2012). By 2020, Malawi envisions a high level of agricultural productivity, diversification and commercialization to ensure equity, household food security, income, employment and a sustainable utilization of natural resources (International Monetary Fund (IMF)/GoM, 2012).
The MGDS is the GoM medium term policy framework for social and economic development adopted in 2006 and implemented through 2011. The MGDS supersedes the Malawi Poverty Reduction Strategy (MPRS) launched in 2002. A Second MGDS has been prepared for the 2012-16 period with minor modifications to the original plan. The overall objective of the MGDS is to “reduce poverty through sustained economic growth and infrastructure development” in order to achieve the MDG. Through the implementation of the MGDS I, it was expected that Malawi’s economy would achieve growth of at least 6 percent per year in order to meaningfully reduce poverty. The success of the strategy, however, exceeded its target and achieved an average growth of about 7.5 percent. Consequently, during the implementation period of the MGDS II, the economy is expected to achieve an average GDP growth rate of at least 7.2 percent between 2012 and 2016 (IMF/GoM, 2012).

Under the MGDS I, real GDP growth during 2006-09 averaged 8.4 percent and was expected to continue to be strong, helped by increased revenue from the mining industry. However, during 2009-10, growth slowed due to the ripple effect of the global financial crisis; still, the level of growth during 2009-10 was above the 6 percent threshold, critical for a national economy to sustain agriculture-led economic growth and reduce poverty (Anderson, 2011). During this period, the nation’s fiscal deficit was reduced, as the Heavily Indebted Poor Countries (HIPC) initiative helped relieve the burden of debt service. Despite this positive macroeconomic outlook, the ability of the country to assure an acceptable level of economic growth remains limited due to economy-wide structural constraints.

2.1. The Agricultural Development Program (ADP)

In the MGDS, the agriculture sector figures preeminently as the driver of economic growth. Recognizing that increasing productivity and production is a pre-requisite for food security, real economic growth and poverty reduction, the MoAFS and development partners formulated the ADP with the vision to align donor’s funding in contribution to the GoM development goals. The ADP aims at achieving better coordination of existing programs, including plans for complementary priority investments to improve food security and generate agricultural growth through increased productivity of food and cash crops, while ensuring sustainable use of natural resources, as stated in the MGDS.
Under the ADP, the GoM is to implement prioritized sub-programs based on strategic objectives (SO) focusing in three key areas: (i) food security and risk management; (ii) commercial agriculture and market development; and (iii) sustainable land and water management. These three focus areas will be strengthened by two key crosscutting support services: (a) research and technology generation and dissemination and (b) institutional strengthening and capacity building. These ADP provisions for achieving sustainable agricultural growth and development are embraced by the CAADP.

Through the CAADP initiative, the MoAFS formulated a series of consultative meetings with government officials (Ministry of Planning and Economic Development [MoPED], donors such as the World Bank and the United Kingdom Department for International Development [DFID], and other development organizations [FAO, WFP, UNICEF, UNDP]) to enhance coordination and improve efficiency and effectiveness of service provision in the agriculture sector. The result of these consultations was the Development Assistance Strategy (DAS) created as the donors’ commitment to better harmonize and align their support to the GoM.

The DAS sets out the policy and strategies for increasing efficiency and effectiveness in the mobilization and utilization of donors’ resources to achieve the development results set out in the MGDS. The DAS recognizes, strongly promotes and calls for donor commitment to harmonized and aligned support under a sector-wide approach (SWAp2) as a modality to support Malawi policies and programs. As a result, the ADP evolved into a SWAp for the agriculture sector (A-SWAp) to implement the Paris Declaration principles and the 2008 Accra Agenda for Action on aid effectiveness to achieve the MGDS and the MDGs. The A-SWAp is also meant to serve as an instrument: (a) to prioritize activities and (b) as an investment framework for the GoM and development partners, focusing on food security, natural resources management and agribusiness development along with capacity building and technology dissemination. As is the ADP, the A-SWAp is also aligned with the CAADP.

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2 A Sector Wide Approach (SWAp) is a process in which funding for the [agricultural] sector – whether government funds or from donors – supports a single policy and expenditure program, adopting common approaches across the sector, under government leadership. It is generally accompanied by efforts to strengthen government procedures for disbursement and accountability.
The A-SWAp seeks to operationalize the ADP through the development and enforcement of a code of conduct and as a memorandum of understanding (MoU) with development partners. The GoM has taken the lead in developing and implementing the ADP/A-SWAp, which has an element of institutional capacity building so that all future sector development programs are implemented with full government leadership (Policy Network for MDGs, 2009). Under the A-SWAp, the Ministry of Finance (MoF) is responsible for mobilizing mainly GoM financial resources, and the MoPED is responsible for coordinating the development and effective implementation of sector plans and the monitoring and evaluation system.

The A-SWAp aims at sustaining a minimum annual average growth rate of 6 percent in the agriculture sector and raising household agricultural incomes from US $280 to US $600 per annum by 2014. Currently, the A-SWAp is heavily focused on two programs: the Farmer Input Supply Program (FISP) and the Green Belt Initiative \(^3\) (GBI). These programs account for 70 percent of the total A-SWAp budget in support of the ADP focus area of food security and risk management. Significantly less attention and budget resources are devoted to the private sector, capacity building, agricultural diversification efforts, value chain development and financing to accelerate the commercialization of agriculture. (COMESA/NEPAD, 2010).

2.2. Fertilizer Policy

Fertilizer, along with seeds and other inputs are essential to raise productivity and production. Since independence, the de-facto fertilizer policy in Malawi has been driven by the overall [rural socio-economic] agricultural landscape, with the goal of promoting economic growth through the production of white maize as a staple food crop and tobacco for export. These crops are intended to be primary sources of income among smallholder and subsistence farmers, and to achieve self-sufficiency. Although, agricultural policies have changed in response to changes in socio-economic and political conditions, policies on fertilizer have rarely moved away from the goals of supporting tobacco and maize production (Aberman, et al., 2012).

\(^3\) Considering that water development is key to socio-economic development and in expanding commercial and smallholder production, under the MGDS II, the President of Malawi proposed the Green Belt Initiative (GBI) to promote investment for exploiting the potential for irrigation along Malawi’s rivers and lakes that cover 20.6 percent of the country and increase agricultural productivity and production.
More recently, in an effort to improve the productivity and profitability of agriculture among smallholder farmers, the GoM issued a written policy on fertilizer that was embedded in the National Fertilizer Strategy (NFS). This strategy, although preceding the MGDS policy framework, supports the ADP and therefore the MGDS.

The purpose of the NFS is to address key issues affecting the adoption and utilization of fertilizer technologies through short-, medium- and long-term actions for developing private sector-led fertilizer markets, with a view to improve agricultural productivity and profitability, especially among smallholder farmers. The strategy also identifies priority actions that are likely to accelerate farmers’ access to affordable fertilizer and incentivize its use. Considering that Malawi is a net importer of fertilizer, the strategy also serves as an input into the development of a Regional Fertilizer Action Plan to accelerate access to fertilizer and other complementary inputs to millions of poor farmers (MoAFS). To meet its purpose, the NFS identifies the following strategic issues affecting fertilizer markets in Malawi:

1. The availability of fertilizer in terms of timeliness of importation and distribution, addressing also the issue of the country’s installed capacity to produce blended fertilizer, potentially using available natural resource deposits.
2. The high cost of fertilizer due to poor transportation infrastructure, equipment and rural feeder roads.
3. Fertilizer accessibility with respect to distance to markets and price (both of which are closely related to transport issues) and farmers’ purchasing power to buy fertilizer.
4. Fertilizer utilization related to the proper type of fertilizer according to specific crops and soil/environmental conditions.
5. New research and extension and the establishment and enforcement of a legal framework.

To address these issues, the NFS sets five objectives:

1. To increase timely fertilizer availability.
2. To facilitate farmers access to affordable fertilizer.
3. To improve utilization of fertilizer and related inputs.
4. To facilitate infrastructure improvement.
5. To create an enabling environment for public-private partnerships in support of fertilizer industry development.

In order to achieve these objectives, the GoM has prioritized the following initiatives and actions:

a. Build private sector capacity for bulk procurement, blending and distribution and for the proper use of fertilizer and other inputs among farmers.

b. Government market intervention through a subsidy program while building a fertilizer buffer stock, with a clear exit strategy in a time frame of five to 10 years.

c. Government/MoAFS collaboration and partnership with the private sector and international development organizations to enhance knowledge and skills among farmers and input dealers in nutrient requirements according to specific crops and ecological conditions.

d. Scale up investments in transportation infrastructure, mainly rural access roads and roads for access to coastal ports.

e. Further develop and implement a fertilizer policy that address not only the issues affecting food security, poverty and soil fertility, but also the issues of harmonization at the regional level, along with a legislative and regulatory framework that includes procurement, formulation and distribution of fertilizer.

In implementing the NFS thus far, the government has primarily focused on the less capital- and time-intensive actions, namely the enactment of a legal and regulatory framework (action “e”), enhancing the skills and knowledge of agro-input dealers through donor programs collaboration (action “c”) and market intervention through the implementation of a subsidy program (action “b”). Less emphasis has been placed on the structural constraints (actions “a” and “d”) that hinder fertilizer market development. Given the fiscal burden of the subsidy program, other actions and activities that could increase the supply and use of fertilizer have been neglected.

2.2.1. The Fertilizer Subsidy Program.

The Farm Inputs Subsidy Program (FISP) is implemented under ADP focus area (i) food security and risk management. However, its origins can be traced back to 2004. The program has
become the centerpiece of the GoM agricultural policy, with the goal of achieving food security at national and household levels by increasing small farmer access to inputs and the adoption of improved technologies in maize production systems (MoAFS, 2011). It is estimated the FISP absorbs almost 60 percent of the MoAFS budget, or about 9 percent of government spending (or 3.5 percent of GDP), making the program unsustainable. In 2008/09, the costs escalated dramatically to 16 percent of GDP due to the global spike in fertilizer prices (Dorward and Chirwa, as cited in Green, D.). The high level of fiscal requirement makes the subsidy program unsustainable.

Although Malawi has implemented some type of subsidy on inputs since the early 1980s, the commitment was interrupted in the 1990s by the imposition of the WB-IMF Structural Adjustment Program (SAP). The re-introduction of a subsidy on fertilizer in 2005/06 under the Agricultural Input Subsidy Program (AISP) and later the FISP, was meant to address the issue of chronic and pervasive hunger in Malawi by reviving the agricultural sector.

Originally, the subsidy delivery modality was to directly address vulnerable smallholder farmers through the distribution of targeted coupons (a voucher system), with the distribution of fertilizer conducted through state agencies. Importation was left to private importers. However, some small farmers were unable to afford the purchase of fertilizer, even if subsidized, and sold their vouchers in a secondary market. In an effort to limit the sale of vouchers in the secondary market, the subsidy delivery modality changed to specifically target individual farmers that met certain conditions (e.g., they had land) and could not afford inputs at the market prices. Private importation and public distribution remained unchanged.

Success of the 2005/06 subsidy programs in increasing production attracted larger support from the donor community. Donors engaged the GoM to improve the program design to make it more effective and efficient (Chisinga, 2007 and Mangisoni, 2007). Donors were motivated to contribute to the program to enhance the participation of private businesses in the distribution of subsidized fertilizer, which they saw as a constraint to private sector growth and development and to the diversification of subsidies to crops other than maize and tobacco.
It was recognized that diversification in the use of fertilizer is essential for a sustainable fertilizer flow in the market beyond the subsidy program and for private sector growth and development. Consequently, private businesses were allowed to distribute fertilizer during the 2006/07 and 2007/08 seasons in competition with the two state agencies, and the subsidy was extended to tobacco production, a cash crop widely grown by smallholder farmers. By 2007/08, the subsidy was also extended to the production of legumes as a means to incentivize crop diversification and to improve soil fertility while increasing farmers’ incomes and overall nutrition. Private distribution of subsidized fertilizer was eventually discontinued and the activity reverted back to the state agencies. However, private companies are still involved in procurement and importation.

By 2009/10, the FISP was intended to benefit 1.6 million farmers with the importation and distribution of 160,000 mt of fertilizer. Under the subsidy delivery mechanism, selected farmers throughout the country received vouchers that could be exchanged for fertilizer with an out-of-pocket cash payment that covered the remaining balance of the fertilizer market price. Each selected farmer received at least two vouchers: one for a 50 kilogram (kg) bag of NPK (basal) and the other for a 50 kg bag of urea (top dressing), each at an 81 and 90 percent discount below the market price, respectively (Dorward and Chirwa, 2009). These farmers also received a maize seed voucher with a redemption value of MK 1,500 (US $4.55) that could be exchanged for a 5 kg hybrid or 10 kg open pollinated maize seed variety, with a discretionary cash contribution not exceeding MK100 (US $0.30). To incentivize crop diversification, the same selected farmers also received a legume seed voucher with a redemption value of MK 350 (US $1.06) that could be exchanged for a seed pack of 1.0 to 1.5 kg containing one of the following: bean, cow pea, pigeon pea, and groundnut or soybean seeds.

Tobacco producers were entitled to one bag of calcium ammonium nitrate (CAN) and NPK compound D (7-14-7) at a 78 percent discount to the market price (Chinsinga, 2012). The out-of-pocket payment from farmers after 2007 was gradually reduced during subsequent seasons, from MK 950 (US $2.88) to MK 900 (US $2.73), MK 800 (US $2.42) and MK 500 (US $1.52) for fertilizer used in both tobacco and maize. By 2009, this represented a subsidy of more than 95 percent compared with the market price. In addition, the subsidy program was
extended to cotton producers. By the following season, the GoM withdrew the subsidy from cotton and tobacco, and kept it only for maize and legumes. This level of subsidy remains in effect at the time of this country assessment, during early 2013.

For the distribution and targeting of the subsidy, the MoAFS took the responsibility of organizing the printing of vouchers. The MoAFS District Agricultural Development Officers (DADO) – working with local community leaders – are responsible for the selection of beneficiaries and the subsequent distribution of vouchers. The MoAFS Logistics Unit’s role consists of updating the Farm Family Registry used by the DADOs. On completion of selection, the Logistics Unit electronically generates the Beneficiary Register used by the DADOs in the distribution of vouchers.

The distribution of subsidized fertilizer was originally dominated by the public sector because the GoM did not trust private businesses to distribute the subsidized fertilizer. Currently, procurement and importation of subsidized fertilizer is secured through private companies; the Smallholder Farmer Revolving Fund of Malawi (SFFRFM) conducts a competitive tender. Distribution is through the Agricultural Development and Marketing Corporation (ADMARC). When the GoM issues tenders for the importation of fertilizer, bid winners are contractually obligated to deliver the imported fertilizer to the three SFFRFM main regional warehouses located in Mzuzu, Blantyre and Lilongwe, which in turn supplies to the ADMARC rural warehouses for distribution and retail to farmers. ADMARC has an extensive rural retail network closer to farmers.

Distribution of the fertilizer from SFFRFM warehouses to ADMARC rural outlets is through private transport under contracts awarded through government tenders. Table 1 presents the importation, sales and percentages of subsidized and non-subsidized fertilizer by private companies and state enterprises between seasons 2000/01 and 2006/07. As of 2008, a lower percentage of the tender was awarded to the SFFRFM and ADMARK for full importation and distribution to farmers (Chirwa and Dorward, 2012) – percentages that remain in effect at the time of this assessment. The balance has been imported by private companies and distributed by the state enterprises.
Table 1. Private and Public Sector Involvement in Fertilizer Imports, Sales and Purchases (mt), 2000/01 - 2006/07

<table>
<thead>
<tr>
<th></th>
<th>2000/01</th>
<th>2001/02</th>
<th>2002/03</th>
<th>2003/04</th>
<th>2004/05</th>
<th>2005/06</th>
<th>2006/07</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total imports</strong></td>
<td>178,213</td>
<td>174,613</td>
<td>213,778</td>
<td>200,311</td>
<td>191,761</td>
<td>290,396</td>
<td>209,120</td>
</tr>
<tr>
<td><strong>Total sales</strong></td>
<td>166,978</td>
<td>174,956</td>
<td>201,798</td>
<td>208,183</td>
<td>193,237</td>
<td>223,920</td>
<td>259,120</td>
</tr>
<tr>
<td><strong>Importation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFFRM/ADMARC</td>
<td>5,012</td>
<td>0</td>
<td>48,461</td>
<td>N/A</td>
<td>28,129</td>
<td>77,000</td>
<td>56,415</td>
</tr>
<tr>
<td>Private sector (PS)</td>
<td>173,201</td>
<td>174,613</td>
<td>165,317</td>
<td>N/A</td>
<td>163,632</td>
<td>213,396</td>
<td>152,705</td>
</tr>
<tr>
<td>Percent PS</td>
<td>97%</td>
<td>100%</td>
<td>77%</td>
<td>N/A</td>
<td>85%</td>
<td>73%</td>
<td>73%</td>
</tr>
<tr>
<td><strong>Sales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFFRM/ADMARC</td>
<td>55,455</td>
<td>34,814</td>
<td>13,024</td>
<td>32,403</td>
<td>24,661</td>
<td>131,000</td>
<td>124,206</td>
</tr>
<tr>
<td>Private sector</td>
<td>111,523</td>
<td>140,142</td>
<td>188,774</td>
<td>175,780</td>
<td>168,576</td>
<td>92,920</td>
<td>134,914</td>
</tr>
<tr>
<td>Percentage PS</td>
<td>67%</td>
<td>80%</td>
<td>94%</td>
<td>84%</td>
<td>87%</td>
<td>41%</td>
<td>52%</td>
</tr>
<tr>
<td><strong>Purchases</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsidized</td>
<td>27,301</td>
<td>15,281</td>
<td>35,425</td>
<td>17,829</td>
<td>50,700</td>
<td>131,000</td>
<td>175,412</td>
</tr>
<tr>
<td>Unsubsidized</td>
<td>139,677</td>
<td>159,675</td>
<td>166,373</td>
<td>190,354</td>
<td>142,537</td>
<td>92,920</td>
<td>83,708</td>
</tr>
<tr>
<td>Percent subsidized</td>
<td>16%</td>
<td>9%</td>
<td>18%</td>
<td>9%</td>
<td>24%</td>
<td>59%</td>
<td>68%</td>
</tr>
</tbody>
</table>

Source: IFDC/NEPAD internal report

Although the government tender under the subsidy program is presumably competitive and open to any fertilizer business in the country, some locally established companies have been at a disadvantage and excluded from the process, despite their potential ability to import and supply the market (Chemonics/IFDC, 2007).

2.3. Fertilizer Law and Regulations

The Fertilizer, Farm Feeds and Remedies Act (FFFRA) has regulated the availability of fertilizer in Malawi. It has restricted the types of fertilizers that can be traded and has allowed for little room for innovation and development of new formulations. For example, NPK 23-21-0+4S, is a formulation developed in the 1980s when the overriding priority was to get high nutrient fertilizer into Malawi at the lowest cost possible. At the time, it was appropriate as a compound maize fertilizer when potassium (K) levels were high in Malawian soils. However, throughout the past 30 years, these soils have undergone mineral depletion, which includes potassium and trace elements such as sulfur, zinc, and magnesium (MoAFS). This formulation has been intensively used for maize production and it has spilled over into tobacco cultivation.
Consequently, FFFRA regulations are no longer applicable; a new act has been introduced, which is under revision but not yet approved.

With regard to fertilizer regulation, the Malawi Bureau of Standards (MBS) is responsible for carrying out pre-inspections and sample testing at the border for quality control. This latter function is mandated despite pre-import analyses performed by importing companies. Little or no post-import sampling and analysis is carried out in Malawi.

3. The Malawi Agriculture Sector

The country of Malawi covers a total area of 118,500 km² (74 percent land and 26 percent lakes and rivers), with over one-third of the land (or almost 36,000 km²) suitable for cultivation. Despite the fact that agriculture is the backbone of the economy and presents an encouraging macro-economic situation, poverty in rural areas continues to be endemic, constraining agriculture and rural sectors sector development. Economic stagnation and chronic poverty can be attributed to the persistently poor performance of the agriculture sector. Rural livelihoods are precarious, with no coping mechanisms or assets to mitigate the impacts of any exogenous shocks, and food security is far from assured. The situation is exacerbated by non-diversified rural livelihoods and long-held dependence on cereal food crops (mainly white maize), leading to malnutrition and high incidence of infectious diseases – all the while soils are continuously degraded due to land pressure. In fact, over 50 percent of the total cultivated area is dedicated to cereal crops, with maize occupying about 46 percent of cultivated land (Table 2).

As in many SSA countries, the agriculture sector in Malawi is dominated by smallholder farmers who cultivate 96 percent of total cropland and produce 99 percent of total agricultural output (Table 2). Small, resource-poor farmers cultivate more than 3 million hectares (ha), with an average land holding of 0.5 to 0.8 ha, typically located in harsh climates. This situation makes farming difficult, with stagnantly low productivity. Production processes are labor intensive and farmers are often unable to afford basic productive inputs like fertilizers at prevailing retail market prices. Small holders devote almost 90 percent of their cereal crop land to maize cultivation, the main staple crop that defines the food security situation of the country; however,
one third of these small-scale farmers also cultivate cash crops. The status quo of the smallholder subsector is exacerbated by weak links to markets, high import and export costs and limited access to extension services, land and credit. Lack of irrigation infrastructure, despite the country’s access to water through its system of rivers or lakes, is also a significant constraint.

Maize is Malawi’s staple food and plays an integral role in what food security means to Malawians. They regard themselves as being food insecure if they do not have maize available in their diets. In terms of area, the main food and export/cash crops produced mainly by smallholders include cereals, pulses, groundnuts, tobacco, cotton cassava, sweet potato and cashew nuts. Other crops produced by smallholders include export and cash crops like chilies, coffee, soybeans, and sunflowers, all of them covering 95 percent of total planted area. In terms of production the main crops are tobacco, maize, cassava and sweet potato, covering 98 percent of total production. The concentration and intensity in production of these crops depends on the agro-ecological conditions, the basis for the country’s differentiation in eight Agricultural Development Divisions (ADD) (Chinsinga, 2012). Tobacco accounts for roughly 65 percent of agricultural exports, followed by sugar at 11 percent and tea at 10 percent (Chirwa et al., 2004 and 2006).
Table 2. Total Crop Area and Production in Malawi, Averages, 2007-2011

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Production</td>
<td>Yield</td>
<td>Area</td>
<td>Production</td>
</tr>
<tr>
<td>Maize</td>
<td>1,628,306</td>
<td>3,224,070</td>
<td>2.0</td>
<td>56,929</td>
<td>182,497</td>
</tr>
<tr>
<td>Sorghum</td>
<td>78,456</td>
<td>61,553</td>
<td>0.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rice</td>
<td>60,884</td>
<td>116,914</td>
<td>1.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Millet</td>
<td>44,891</td>
<td>29,736</td>
<td>0.7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wheat</td>
<td>1,610</td>
<td>2,765</td>
<td>1.7</td>
<td>25</td>
<td>52</td>
</tr>
<tr>
<td>Total Cereals</td>
<td>1,814,147</td>
<td>3,435,037</td>
<td>1.9</td>
<td>56,975</td>
<td>182,497</td>
</tr>
<tr>
<td>Pulses</td>
<td>636,691</td>
<td>462,145</td>
<td>0.7</td>
<td>13,097</td>
<td>10,698</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>281,560</td>
<td>281,302</td>
<td>1.0</td>
<td>14,354</td>
<td>17,467</td>
</tr>
<tr>
<td>Tobacco</td>
<td>140,007</td>
<td>90,791,233</td>
<td>640.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cotton</td>
<td>102,345</td>
<td>94,077</td>
<td>0.9</td>
<td>397</td>
<td>537</td>
</tr>
<tr>
<td>Cassava</td>
<td>188,909</td>
<td>3,817,081</td>
<td>20.1</td>
<td>2,434</td>
<td>52,675</td>
</tr>
<tr>
<td>S. Potatoes</td>
<td>169,777</td>
<td>2,716,523</td>
<td>15.9</td>
<td>2,601</td>
<td>50,654</td>
</tr>
<tr>
<td>Cashew Nuts</td>
<td>76,543</td>
<td>356</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Macadamia</td>
<td>50,989</td>
<td>3,409</td>
<td>0.1</td>
<td>13,596</td>
<td>300</td>
</tr>
<tr>
<td>Sesame</td>
<td>1,906</td>
<td>688</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sunflower</td>
<td>9,949</td>
<td>8,269</td>
<td>0.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Coffee</td>
<td>2,614</td>
<td>2,681</td>
<td>1.0</td>
<td>42,400</td>
<td>9</td>
</tr>
<tr>
<td>Paprika</td>
<td>4,060</td>
<td>80,699</td>
<td>20.6</td>
<td>64</td>
<td>38</td>
</tr>
<tr>
<td>Chilies</td>
<td>2,610</td>
<td>1,515</td>
<td>0.6</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>I. Potatoes</td>
<td>47,449</td>
<td>754,673</td>
<td>15.8</td>
<td>92</td>
<td>1,776</td>
</tr>
<tr>
<td>Total Crops</td>
<td>3,529,555</td>
<td>102,449,687</td>
<td>146,020</td>
<td>316,720</td>
<td>3,675,575</td>
</tr>
</tbody>
</table>

Source: Data collected during country visit, mainly from MoAFS.
The average cereal yield among smallholders is 1.9 mt/ha, with maize yields being the highest among cereals at 2.0 mt/ha. Cereal yields are higher among estate farms, with maize averaging 3.2 mt/ha. The low productivity among smallholders is attributed to declining soil fertility due to the dominance of subsistence farmers who plant about 96 percent of the crop land, dependency on rain-fed mono-cropping farming systems with erratic and unpredictable rain patterns, and the use of traditional production technology with very low application of productive inputs like fertilizer (Chirwa et al., 2011). Yet, the smallholder subsector produces about 70 percent of domestic food and 20 percent of exports (Chirwa et al., 2006). The estate subsector produces mainly commercial products for the domestic and export markets, principally sugar, coffee and tea.

The adoption of fertilizer among smallholder farmers, at least until 2005-06, was affected by the absence of a policy framework to guide the formulation, importation and marketing of fertilizer and the enforcement of those standards. Currently, the use of inorganic fertilizer – estimated at an average of 43 kg/ha – is among the major factors contributing to declining agricultural productivity. The level of nutrient application is low when compared with the world average and that of developing countries in other regions of the world.

In terms of climate, rainfall is more abundant in the sparsely populated and least developed northern region. The most densely populated southern region, where the landless population is high, is particularly vulnerable to drought. The central region, where the capital city of Lilongwe is located, has some of the country’s most fertile and productive land, including many large commercial estate farms. Following Malawi’s independence, estate farms had preferential access to capital and export markets. However, the estate farm subsector has shrunk since the late 1990s. Currently, estate farms occupy about 150,000 ha of land, much of which is not utilized or used for the cultivation of tobacco, tea, sugar, coffee, rubber and nuts. There is pressure to implement land reforms for the allocation of estate land to small-scale farmers.
4. The Malawi Fertilizer Market: Supply and Demand

The Malawi fertilizer market can be considered more mature than markets in the surrounding countries. Although the GoM liberalized its agricultural input markets almost 20 years ago, the public sector continues to play an integral role in the fertilizer market through the evolving FISP program. The government plays a role on the supply side through imports (using tender-bids) and distribution by state agencies, and on the demand side through a voucher program distributed to selected farmers to incentivize effective demand.

During the early years of FISP implementation, there were about 12 private businesses involved in procurement of fertilizer, which were eventually reduced to eight. The GoM open tender system, coupled with state agencies competing in the fertilizer market, has placed private importers at a disadvantage and driven many agro-dealers out of business. Due to the uncertainty and risks introduced in the market by the government policies through the subsidy program, Rab Processors withdrew from the fertilizer market as of 2008/09 (Kelly, Boughton and Lenski, 2010). Despite arguments against subsidies, the GoM and private businesses, especially importers, believe in and understand the need for a subsidy on fertilizer and perhaps on other inputs – given that without subsidies, demand and consumption will be reduced, as smallholder farmers cannot afford fertilizer at the market price. From the private businesses view, the main issue with the FISP is the way in which the GoM is managing and implementing the program.

Between 1990 and 2011, both fertilizer imports and consumption in Malawi increased, mostly attributed to the FISP, which since 2006 has absorbed 50 percent or more of total imports. In fact, fertilizer consumption has more than doubled from approximately 114,000 mt in the mid 1990s to more than 260,000 mt by late 2011 (Figure 2). Despite that increase, fertilizer use represents about 47 percent of potential needs based on recommended application rates for all crops, and represents only 43 percent of the estimated requirements in this assessment to increase the level of production and achieve the goals as stated in the ADP and A-SWAP. Moreover, crop yields have been stagnant, further demonstrating the underuse of agro-inputs and modern technologies.
The average annual fertilizer imports for the previous nine years, estimated at 290,000 mt as of 2013, fluctuated considerably over the period. The longer-term trend depicted in Figure 3 shows similar volatility following a decade of stagnant imports ending in 2004, prior to the FISP. These fluctuations are attributed to unstable GoM policies that discouraged private sector import and distribution to supply the open market demand (as can be observed in Figure 2 above) and to adverse weather conditions for agricultural production, particularly related to droughts. The amount of fertilizer demanded by the FISP varies from year to year depending on funding and decisions on the purpose of the subsidy program, which determines the GoM procurement levels. The difference between the volumes of subsidized fertilizer and total imports and consumption is supplied by private sector importers and distributors in the open market, mainly to estate farms and for the production of commercial and export crops.
Figure 3. Total NPK Nutrient Imports in Malawi, 1990-2010

Historically, the fertilizer market has been dominated by NPK products. However, after market liberalization, the product mix changed considerably. Inconsistent policies, regulations and traditional cultural practices discouraged the development and use of new products and of existing low cost compounds like diammonium phosphate (DAP), a widely used product until market liberalization. The low consumption rate of DAP shifted from being used for top dressing to being used in blending. Currently, the main fertilizer types used in Malawi include urea and 23:21:0+4S (mainly for maize), calcium ammonium nitrate (CAN), compound D and Super D for tobacco production. The overall consumption trend in the past two decades has been a shift from CAN to urea, as farmers have become more knowledgeable about the nutrient content of fertilizer products and have learned to use it economically.

4.1. Fertilizer Supply in Malawi

Malawi does not have significant natural resources for the economic production of fertilizer. However, it does have limited phosphate rock deposits. Nevertheless, the country is a net importer of fertilizer, most of which is used for blending or applied directly for basal and top dressing. The available phosphate rock has a high concentration of up to 38.9 percent P2O5, but low solubility, requiring high levels and concentration of sulfuric acid to process it into
phosphoric acid and its derivative products. Currently, most phosphate rock deposits are small and not considered of economic value.

Like many SSA countries, Malawi presents a hybrid public-private fertilizer supply system. The major players are private importers, the government through the state agencies (the Smallholder Farmers Fertilizer Revolving Fund of Malawi [SFFRFM], the Agricultural Development and Marketing Corporation [ADMARC]), major distributors/wholesalers, cooperatives and independent distributors. Private importers along with one of the state agencies, the SFFRFM, participate in a presumably open and competitive tender to import and supply the fertilizer for the subsidy program and partially for the open market.

The state agencies are generally involved in distribution of subsidized fertilizer to the exclusion of private wholesalers and retailers. However, there was a time during the 2008 and 2009 period when the GoM allowed for the private sector to import and distribute about 17 percent of the subsidized fertilizer. The state agencies’ importance in fertilizer distribution is based on their ample outlet network in the rural areas that can reach smallholder farmers, especially in areas where there is no presence of private retailers. They have about 321 small- to medium-size warehouses and 11 central depots across the country, catering mainly to the FISP.

The SFFRFM is the main recipient of the subsidized fertilizer imported by the private importers who deliver the product to the SFFRFM regional warehouses. These facilities in turn deliver the product to the ADMARC rural warehouses and then to the retail outlets located in rural areas closer to farmers. Both state agencies have the ability to obtain government credit guarantees, enabling them to access finance in the domestic and international market, and to make use of government facilities (storage and transportation) to distribute the fertilizer.

Major private importers and distributors include international companies with country offices (Yara Malawi, Export Trading Co.), national companies (Optichem, Farmers World, Agora, Malawi Fertilizer Company [MFC]) and independent traders (Sea Land Investment, Agricultural Trading Company, Simama General Dealers Company) with close links to international suppliers, which in addition to receiving inputs/fertilizer products also receive
credit at reasonable terms. Some of these importers and distributors are vertically and horizontally integrated; they operate their own blending facilities and have an ample network of more than 400 private and public outlets/retailers for distribution in the open market (outside the subsidy program), targeting mainly the peri-urban market, large-scale farmers and estate farms. Thus, they account for a large percentage of the private retail market. They are also diversified into other commercial activities such as buying farmers’ outputs, food processing, selling food products and farm equipment, and providing agriculture advisory services. In addition, they supply an informal network of about 250 independent agro-dealers supported by donor programs through the Agri-Input Suppliers Association of Malawi (AISAM) and the Citizens Network for Foreign Affairs (CNFA), as well as donor-funded programs and NGOs involved in input procurement and distribution to smallholder farmers.

Table 3. Estimates of Fertilizer Product Suppliers in Malawi, 2007

<table>
<thead>
<tr>
<th>Market Type</th>
<th>Qty. (mt)</th>
<th>Supplier</th>
<th>Qty. (mt)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Subsidy Programs</td>
<td>170,000</td>
<td>Farmers World[a]</td>
<td>80,000</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transglobe</td>
<td>20,000</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yara[a]</td>
<td>25,000</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Omnia[a]</td>
<td>20,000</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rab Processors</td>
<td>15,000</td>
<td>6%</td>
</tr>
<tr>
<td>Commercial Retail Sales</td>
<td>100,000</td>
<td>Export Trading</td>
<td>30,000</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Optichem</td>
<td>10,000</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other Private</td>
<td>15,000</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SFFRFM [b]</td>
<td>55,000</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td>270,000</td>
<td></td>
<td>270,000</td>
<td></td>
</tr>
</tbody>
</table>

\[a\] Yara, Omnia and Farmers World also supplied other commercial sales.
\[b\] Smallholder Farmer Fertilizer Revolving Fund for Malawi.

According to Table 3, in 2007, about 60 percent of imported fertilizer was on behalf of the FISP, with the balance sold in the open market to estates and for the production of cash and commercial crops. The main suppliers to the FISP were Farmers World, SFFRFM, Export Trading, Yara, Tran Globe and Omnia. Table 4 presents the amounts of fertilizer imported in 2008 by company, with their market share and intended crops.
Table 4. Importers Involved in Supplying the Malawi Fertilizer Market, 2008

<table>
<thead>
<tr>
<th>Fertilizer Importer</th>
<th>Quantities imported</th>
<th>Market Share (percent)</th>
<th>Target Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTICHEM</td>
<td>30,000</td>
<td>14</td>
<td>Maize and tobacco</td>
</tr>
<tr>
<td>Rab Processors</td>
<td>15,000</td>
<td>4</td>
<td>Maize and tobacco</td>
</tr>
<tr>
<td>Export Trading Company</td>
<td>40,000</td>
<td>10</td>
<td>Maize and tobacco</td>
</tr>
<tr>
<td>Agricultural Resources Ltd</td>
<td>25,000</td>
<td>6</td>
<td>Maize and tobacco</td>
</tr>
<tr>
<td>Omnia</td>
<td>60,000</td>
<td>14</td>
<td>Maize</td>
</tr>
<tr>
<td>Simama</td>
<td>25,000</td>
<td>6</td>
<td>Maize</td>
</tr>
<tr>
<td>Trans Globe Ltd</td>
<td>30,000</td>
<td>7</td>
<td>Maize and tobacco</td>
</tr>
<tr>
<td>MULLI Brothers</td>
<td>30,000</td>
<td>7</td>
<td>Maize</td>
</tr>
<tr>
<td>Sealand</td>
<td>20,000</td>
<td>5</td>
<td>Maize</td>
</tr>
<tr>
<td>Nyiombo</td>
<td>20,000</td>
<td>5</td>
<td>Maize</td>
</tr>
<tr>
<td>Farmers World</td>
<td>30,000</td>
<td>14</td>
<td>Maize and tobacco</td>
</tr>
<tr>
<td>SFFRFM</td>
<td>35,000</td>
<td>8</td>
<td>Maize and tobacco</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>360,000</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Internal IFDC/FAO/NEPAD report.

Most fertilizer importers are organized under a business association, the Fertilizer Association of Malawi (FAM), formed in 2007 in response to the GoM need for a public-private partnership (PPP) in support of the FISP. The association originally embraced about 15 members, few of whom have been involved in the FISP tenders for importation; the remaining membership participates in open market wholesale and retail sales.
Figure 4. Map of Malawi Showing Distribution Networks
In addition, a small group of private importers/distributors has developed a small distribution network that serves markets neglected by the large importers, making use of their own transportation to deliver fertilizer to their customers. They have imported fertilizer from South Africa, consequently facing high transportation costs and relatively low effective demand. Unlike their large counterparts, these importers do not have access to supplier’s credit (IFDC, 2004).

Independent agro-dealers are small retailers that sell more than just fertilizer; they carry a small stock and differentiate themselves from larger dealers and distributors by selling other inputs and fertilizer in quantities smaller than the traditional packages. They have invested in establishing distribution outlets closer to farmers and make use of other means to reach those small farmers not served by large agro-dealers. Some of them are agents for the large importers, and therefore are supplied by larger importers and distributors. Depending on the eligibility criteria, some may have access to credit facilitated through donor-funded programs (i.e., CNFA) that offer financial institutions 50-75 percent credit guarantees. Some have graduated from these programs and are now receiving credit directly from financial institutions.

Cooperatives are considered another type of institutional agro-dealer group. Typically, they have been organized around donor programs to better target beneficiaries, and as such they benefit from donor support in terms of funding, training and other types of assistance related to fertilizer and other inputs. Although they have been a major source of input supply for their members, including subsidized fertilizers, increasing financial pressures led to their withdrawal from fertilizer sales almost entirely, even before the 2008/09 GoM decision to limit distribution of subsidized fertilizers to government outlets (Fitzpatrick, 2012).

In general, the fertilizer supply structure in Malawi can be conceptualized as a bi-level pyramid. The top level is comprised of a small number of large importers and small importers/distributors and the second level consists of a larger number of distribution outlets that retail directly to farmers. Most of these outlets are independent agro-dealers and others that belong to a network owned by large importers and distributors. The diagram in Figure 5 is a
graphic representation of the flow of fertilizer from international suppliers to import and distribution in Malawi.

![Fertilizer Distribution in Malawi](image)

Source: Authors’ creation

**Figure 5. Fertilizer Distribution in Malawi**

4.2. Fertilizer Demand in Malawi

The main players on the demand side of the fertilizer market are the FISP (on behalf of smallholder farmers), commercial farmers and estate farms. Most Malawian smallholders have small cropping areas, low income, limited credit and a higher aversion to risk. Consequently, their fertilizer demand/consumption is low. Malawian farmers use a narrow range of fertilizer products that have been selected based on traditional practices, while estate farmers use a broader range of formulations tailored to their specific crop and soil requirements.
The seasonal use of fertilizers in Malawi relates to a distinct pattern of rainfall. The rainy season begins in the south in late October/early November and proceeds to the central and northern regions in late November and December, continuing through April. Basal, or starter application of fertilizer (typically an NPK formulation), is typically applied just prior to the arrival of the rains, during soil preparation or planting, while topdressing, or side-dressing fertilizer (typically nitrogen sources of fertilizer like urea), is normally applied four to five weeks after the basal dose. However, farmers normally procure their complete fertilizer requirements at one time, leading up to or during planting.

Despite a history of subsidy programs, not enough fertilizer has been consumed in Malawi to halt, let alone reverse, the widespread declines in soil fertility and low crop yields. Crop-planted area has been increasing at a faster pace than the use of fertilizer. An estimated one-third of the country’s farming population uses some type of fertilizer, resulting in one of the highest average use rates per hectare (43 kg/ha) in SSA. However, use has been in decline and is less than half the recommended level. Smallholder average fertilizer consumption is 34 kg/ha, which is even lower than the national average and recommended use. In contrast, estate farms consume an average of 150 kg/ha (GoM and the WB, 2007).

The major commercial and export crops — tobacco, tea, sugar, and coffee — consume about 40 percent of total fertilizer imports. Tobacco and coffee production are a combination of small and estate farmers, while sugar and tea are produced almost entirely on estate farms, though there is a growing trend toward out-grower schemes in both sectors. Based on recommended application rates, the potential fertilizer demand has been estimated to be at least 546,000 mt (MoAFS NFS). However, results from this assessment, as it is explained later in this report, estimate a higher potential annual fertilizer demand of up to 600,000 mt.

Low fertilizer use and demand has been influenced by erratic rainfall, resulting in high variability of crop yields and low output prices relative to fertilizer prices. The demand-depressing effects of low output prices are further aggravated by farmers’ lack of market information, financial constraints for fertilizer purchases and a lack of knowledge on best fertilizer/agronomic practices. There is a need for stronger farmer organizations and for
agribusiness training to teach farmers how to apply business concepts to agricultural production. Though farmer incomes are affected by high production costs and low yields, productivity can be increased through improved inputs and better crop management. Extension agents also require training in agronomic and agribusiness concepts.

4.3. **Fertilizer Supply Chain Cost Structure.**

The cost of marketing fertilizers includes all costs from the point of production or importation to the point of sale to the farmer. In Malawi, there is no production of fertilizer. Therefore, costs originate from importation through neighboring country ports. Given Malawi’s geographic location as a landlocked country, this generally contributes to higher fertilizer costs. During 2012-13, the domestic price of fertilizer to farmers was estimated at Kw 14,000-16,000 per 50 kg bag (US $42.42 – $48.48).^4

Since market liberalization almost 20 years ago, it is presumed that fertilizer prices have been determined by market forces that take into consideration the cost of supplying that fertilizer. The main costs, in addition to the price of the fertilizer itself in the international market, are transportation costs, financing and the importer’s gross margin (overhead plus markup). Figure 6 presents the average costs from ports to Lilongwe. CIF charge is the cost of the product at the port of importation; loading/unloading includes port charges (unloading, bagging, demurrage and loading to trucks); transportation includes the cost of moving the product from port through neighboring countries to the [SFFRFM] regional warehouses in Malawi; and margin includes operating costs such as insurance, bank commissions/charges, interest charges and other administrative costs and returns.

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^4 Exchange rate conversion used is Kw 330/US $1, July 2013 rate.
The timely availability and cost of fertilizer in Malawi are greatly influenced by the choice of entry port in neighboring countries. The main ports of entry are Beira and Nacala in Mozambique and Dar Es-Salaam in Tanzania. Each of these ports offers different cost structures as a result of their level of efficiency on product loading/unloading and the distance to delivery points in Malawi. These land transportation costs are one of the largest cost components of the fertilizer supply chain in Malawi.

Of these three ports, Dar Es-Salaam is the farthest port from Malawi, with deep-water berths for large vessels and is well equipped to handle dry bulk cargo. In addition, the port is serviced by two railway companies that link it to the hinterlands, but the railways do not have direct routes to Lilongwe. The GoM has established a dedicated cargo facility at Dar Es-Salaam mainly to handle and speed up the transit of fuel and other petroleum products to and from Malawi.

According to an IFDC regional assessment in 2007/08, the average land transportation cost by truck between Beira and Lilongwe was US $77.00/mt plus loading/unloading at the source and destination, respectively. This cost included other charges such as road tolls of up to
US $127/truck through Malawi, along with permits and insurance that amounted to about US $45.00 per haul. Fertilizer imported through the ports in Mozambique and Tanzania remains costly, between US $90 and US $125/mt (or higher), depending on the season and availability of backhaul cargo, due to insufficient linkages to international markets and inefficiencies related to congestion delays at port, high risks and limited competition. Not surprisingly, some producer/export groups in Malawi have turned to the longer distance/higher-cost port of Durban in South Africa in an effort to reduce uncertainties regarding timely deliveries to their target international input and output markets.

Currently, a high percentage of imports pass through the Beira port and transport through Mozambique by land to Lilongwe. Port costs at Beira are reasonable at US $9 per metric ton, but bagging costs are high at US $30 per metric ton. Despite Beira’s good road link to Lilongwe through Blantyre, especially during the dry season, Beira port is limited by inefficient depth at the entrance channel. This limits cargo vessels to a maximum of 10,000-15,000 mt, which increases the per-unit shipping costs by three to five percent compared with 25,000 metric ton ships. Beira’s port entrance channel also requires constant dredging. Due to this situation, there are congestion issues, especially during the fertilizer-importing season, since a larger number of vessels arrive almost simultaneously. As a result, vessels incur considerable demurrage charges, which negatively impact the cost of importation and the final price of fertilizer to farmers. This situation is exacerbated by the difficulty in obtaining the necessary number of trucks during this importation peak season, the unavailability of back hauls and the exportation of commodities from Mozambique and surrounding countries that also make use of Beira port. Beira does not have a direct rail link to Lilongwe.

The Nacala port in Mozambique offers the advantages of docking vessels up to 30,000 mt, a relatively shorter distance to Lilongwe and the option of transport by road and rail. However, the port has been used sporadically by only a few importers (mainly Farmers World and Export Trading). Some of the reasons are slow port operations because it is not well equipped to handle bulk fertilizer, unreliable rail service due to insufficient availability of rail wagons suitable for bulk fertilizer and poor road conditions. During the late 2000s, rail transport from Nacala to Lilongwe increased from US $80 to $100/mt and truck transport almost doubled,
from US $70 to $125/mt, between 2007 and 2009 (IFDC, 2002). Privatization of the railroad company and Malawian representation in its ownership was expected to improve the situation. The greatest impact on the use of the rail system would be an extension of the rail line by 20 miles to the Zambian border. It is unlikely that the Nacala rail corridor could handle all of the fertilizer required in Malawi. Figure 7 presents the inland cost structure from ports to Malawi. Transport costs shown can be higher depending on the importing season, availability of land transport and back haul cargo, among other factors.

![Figure 7. Proportion of Inland/Domestic Costs to Regional Warehouses in Malawi](image)

Source: Authors’ estimation based on data gathered during field visit.

Figure 7. Proportion of Inland/Domestic Costs to Regional Warehouses in Malawi

Domestic transportation costs to reach retail outlets in Malawi are high and remain a major component of the overall cost structure. This is mainly the result of prevailing high fuel prices and poor road conditions that reduce the useful life of transportation equipment. Prices of spare parts and high maintenance and repair costs contribute to high transportation costs and result in companies having few vehicles in good working condition at any point in time.

In terms of finance, major importers have access to trade finance at internationally competitive rates. In contrast, distributors and small retailers face difficulties accessing financing in the domestic market. Local nominal interest rates are higher than 21 percent, with collateral requirements (100-140 percent) for local currency loans adding to the cost of finance. This hampers efforts to expand businesses, especially in the agribusiness and agriculture sector.
Margins are also a major cost component of the fertilizer supply chain in Malawi. Major importer gross margins average around eight percent. In 2006, the combined importer, wholesale, and retail margins on imported urea was 14-17 percent per metric ton, considered excessive by any standard and resulting in higher retail prices. In cases where importers also play the roles of distributors and retailers, profit margins are combined for importer-distributors and separate at retail with importer-wholesalers retaining the higher share of the profit margin. The low profit margin and the unclear/non-transparent wholesale pricing to independent retailers constrains their efforts to establish their businesses in areas outside the main markets not serviced by major importers-distributors.

Table 5 presents a detailed cost structure of fertilizer imported in Malawi, from its origin in Northern Europe to the Koronga region in Malawi, based on the work of IFDC in 2004. Although actual costs have changed, it is believed that the main cost structure and proportions remain similar.
Table 5. Fertilizer Cost/Price Structure in Malawi, 2004

<table>
<thead>
<tr>
<th>Route: Antwerp – Nacala – Lilongwe – Karonga</th>
<th>Cost</th>
<th>% Farm-gate Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange Rate: US $1 = MK 94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. f.o.b. price Western Europe ports (bagged)</td>
<td>912</td>
<td>42</td>
</tr>
<tr>
<td>2. Ocean transport from Antwerp</td>
<td>259</td>
<td>12</td>
</tr>
<tr>
<td>3. Insurance @ 2% of C&amp;F</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>4. c.i.f. Nacala</td>
<td>1,194</td>
<td></td>
</tr>
<tr>
<td>5. Port charges (customs, handling, losses</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>6. f.o.t.</td>
<td>1,254</td>
<td></td>
</tr>
<tr>
<td>7. Rail transport Nacala to Lilongwe</td>
<td>263</td>
<td>12</td>
</tr>
<tr>
<td>8. SGS inspection fee</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>9. Bank charges, customs, handling, losses</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10. Handling costs (unloading)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11. c.i.f. Lilongwe</td>
<td>1,530</td>
<td></td>
</tr>
<tr>
<td>12. Overhead</td>
<td>152</td>
<td>7</td>
</tr>
<tr>
<td>13. Importer’s markup (10%)</td>
<td>168</td>
<td>8</td>
</tr>
<tr>
<td>14. Ex-warehouse Lilongwe to independent trader, Karonga</td>
<td>1,851</td>
<td></td>
</tr>
<tr>
<td>15. Transport cost to Karonga</td>
<td>219</td>
<td>10</td>
</tr>
<tr>
<td>16. c.i.f. Karonga</td>
<td>2,071</td>
<td></td>
</tr>
<tr>
<td>17. Trader’s gross margin (5%)</td>
<td>104</td>
<td>5</td>
</tr>
<tr>
<td>18. Retail price (Karonga)</td>
<td>2,174</td>
<td></td>
</tr>
</tbody>
</table>

Source: Malawi AIMS Project based on interviews with large importers. IFDC internal report, 2004.

5. Estimating Fertilizer Requirements

In this section, we estimate quantities of fertilizer required to meet the agricultural production targets as stated in the ADP and A-SWAp to contribute to achieve the MGDS II growth goals. These estimates are based on a crop nutrient removal and fertilizer use efficiency approach that relies on a number of assumptions to determine the level of nutrients necessary to reach targeted production levels, as explained below.

To provide relevant estimates for the increased quantities of fertilizer required to achieve the ADP and A-SWAp targets, first we determined the gaps between current and target production levels (Table 6), then we applied the nutrient removal factors to estimate additional and total fertilizer nutrient required to meet the increased production. According to Table 6, assuming no significant change in cultivated area over the five-year planning period, crop yields
and production must increase about 34 percent from 2011 levels by 2016, translating to more than 4.0 million mt. The crops included in Table 6 represent 98 percent of total planted area.

**Table 6. Yield and Production Differences Between Current and MGDS II Targets**

<table>
<thead>
<tr>
<th>Major Crops</th>
<th>Estimated Cultivated Area (ha x 10^3)</th>
<th>Estimated Yield (mt/ha)</th>
<th>Production Current (mt x 10^3)</th>
<th>Target (mt x 10^3)</th>
<th>Incremental (mt x 10^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1,685</td>
<td>2.0</td>
<td>3,407</td>
<td>4,559</td>
<td>1,152</td>
</tr>
<tr>
<td>Sorghum</td>
<td>78</td>
<td>0.8</td>
<td>62</td>
<td>82</td>
<td>21</td>
</tr>
<tr>
<td>Rice</td>
<td>61</td>
<td>1.9</td>
<td>117</td>
<td>156</td>
<td>40</td>
</tr>
<tr>
<td>Millet</td>
<td>45</td>
<td>0.7</td>
<td>30</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>296</td>
<td>1.0</td>
<td>299</td>
<td>400</td>
<td>101</td>
</tr>
<tr>
<td>Cotton</td>
<td>103</td>
<td>0.9</td>
<td>95</td>
<td>127</td>
<td>32</td>
</tr>
<tr>
<td>Potatoes</td>
<td>48</td>
<td>15.9</td>
<td>756</td>
<td>1,012</td>
<td>256</td>
</tr>
<tr>
<td>Tobacco</td>
<td>140</td>
<td>1.0</td>
<td>146</td>
<td>196</td>
<td>49</td>
</tr>
<tr>
<td>Beans, dry</td>
<td>650</td>
<td>0.7</td>
<td>473</td>
<td>633</td>
<td>160</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td>172</td>
<td>16.0</td>
<td>2,767</td>
<td>3,703</td>
<td>936</td>
</tr>
<tr>
<td>Cassava</td>
<td>191</td>
<td>20.2</td>
<td>3,870</td>
<td>5,179</td>
<td>1,309</td>
</tr>
<tr>
<td>Cashew Nuts</td>
<td>77</td>
<td>0.005</td>
<td>0.36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sunflower</td>
<td>10</td>
<td>0.8</td>
<td>8</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>3,556</strong></td>
<td></td>
<td><strong>12,029</strong></td>
<td><strong>16,098</strong></td>
<td><strong>4,069</strong></td>
</tr>
</tbody>
</table>

Source: Authors’ calculations based on data from various sources, mainly MoAFS statistics.

5.1. Estimating Fertilizer Use on Key Crops Using Nutrient Removal Approach

This approach estimates the amount of nutrients removed by the harvested crop, which are used to calculate the amount of fertilizer required to maintain soil fertility levels and a sustained increase in production. Nutrients removed by the harvested crops must be replaced for the next cropping cycle. The approach assumes good crop management practices.

Nutrient levels removed in the incremental production were estimated and then adjusted using efficiency recovery factors for N, P2O5 and K2O. These estimates are an indication of the amount of nutrients that must be applied before or during the next cropping cycle to maintain soil fertility according to a particular crop and levels of production. This approach assumes that the full nutrient uptake needed beyond removal levels is met by other sources including recycling of crop residues. Table 7 shows the nutrient removal estimates for a set of crops.
Table 7. Required Fertilizer Nutrients Using Nutrient Removal Factors for a Set of Crops

<table>
<thead>
<tr>
<th>Key Crops</th>
<th>Incremental Crop Production (mt x 10^3)</th>
<th>Nutrient Removal (mt x 10^3)</th>
<th>Total Incremental Nutrient Removal (mt x 10^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>P_2O_5</td>
</tr>
<tr>
<td>Maize</td>
<td>1.152</td>
<td>16.32</td>
<td>7.13</td>
</tr>
<tr>
<td>Sorghum</td>
<td>21</td>
<td>0.35</td>
<td>0.14</td>
</tr>
<tr>
<td>Rice</td>
<td>40</td>
<td>0.49</td>
<td>0.23</td>
</tr>
<tr>
<td>Millet</td>
<td>10</td>
<td>0.19</td>
<td>0.07</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>101</td>
<td>4.01</td>
<td>0.76</td>
</tr>
<tr>
<td>Cotton</td>
<td>32</td>
<td>0.79</td>
<td>0.34</td>
</tr>
<tr>
<td>Potatoes</td>
<td>256</td>
<td>0.90</td>
<td>0.38</td>
</tr>
<tr>
<td>Tobacco</td>
<td>49</td>
<td>1.39</td>
<td>0.25</td>
</tr>
<tr>
<td>Beans, dry</td>
<td>160</td>
<td>5.94</td>
<td>1.69</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td>936</td>
<td>4.87</td>
<td>2.15</td>
</tr>
<tr>
<td>Cassava</td>
<td>1,309</td>
<td>1.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Cashew Nuts</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sunflower</td>
<td>3</td>
<td>0.08</td>
<td>0.04</td>
</tr>
<tr>
<td>Totals</td>
<td>4,069</td>
<td>36.8</td>
<td>13.7</td>
</tr>
</tbody>
</table>

Source: Data from MOAFS and authors’ calculations using estimated nutrient content of crops.

Table 7 shows that the incremental output of 4.07 million mt (the difference between base and target outputs) from these crops will require 74,000 mt of [N, P_2O_5 and K_2O] nutrients. Table 8 is derived from Table 7 by adjusting nutrient removal for fertilizer use efficiency factors, expressed as metric tons of fertilizer products.

Table 8. Incremental Nutrient and Product Requirements

<table>
<thead>
<tr>
<th>Crop Categories</th>
<th>Nutrient* (mt x 10^3)</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Crops in Table 6</td>
<td>146</td>
<td>284</td>
</tr>
<tr>
<td>b. All Crops (Table 6 including others not shown on table)</td>
<td>149</td>
<td>290</td>
</tr>
</tbody>
</table>

Sources: Authors’ estimates. The nutrients are converted to urea, DAP and MOP fertilizer products.

*Note that the total nutrients were adjusted for urea, DAP and MOP use efficiency factors.

The estimated additional amount of fertilizer nutrients necessary to meet the ADP/A-SWAp targets are 146,000 mt,\(^5\) which translates to an equivalent fertilizer product weight of approximately 284,000 mt of urea, DAP and MOP combined. The corresponding

\(^5\) To estimate the total amount of nutrient necessary to achieve the A-SWAp targets, we applied a recovery efficient factor of 50 percent, 35 percent and 70 percent for N, P_2O_5 and K_2O, respectively, to the amount of nutrients removed by increased production of 4.07 million mt.
values when all crops are included are 149,000 mt of nutrients or 290,000 mt of fertilizer products. Therefore, the increase in agricultural production from current to target levels for all crops being produced in Malawi will require a gradual increase in consumption of 290,000 mt of fertilizer product (urea, DAP and MOP) by 2016 in addition to the estimated five year average (2017-2011) current consumption of 297,000 mt (estimated based on Chirwa and Dorward, 2012), for an estimated total amount of nearly 600,000 mt of fertilizer product by 2016. This additional quantity almost doubles the current fertilizer consumption in Malawi.

6. Main Issues Facing the Fertilizer Supply in Malawi

The fertilizer supply chain in Malawi is not as efficient as it could be, in part because Malawi is a landlocked country – resulting in high agricultural input costs. Expensive traditional compound fertilizer procurement from South Africa, lack of efficient logistics systems (roads and rail) from the nearest port of Nacala in Mozambique and high costs of local currency due to an unstable foreign exchange constrains accessibility to fertilizer by small market actors, specifically rural agro-dealers and smallholder farmers.

In an effort to counter these high prices to fertilizer users, the GoM implemented a subsidy program, but that has also become one of the factors that affect supply costs. Uncertain government policies and actions related to the fertilizer subsidy program have been detrimental to the development of private distribution networks, especially small private retailers in rural areas. Subsidy policy uncertainties include annual timing for tendering, volume allocations, tender currency choice, validity of quoted prices, and payment delays when vouchers are redeemed. The voucher program dictates a specific location to redeem (or cash-in) vouchers that makes it difficult for retailers to receive payment.

The FISP has significantly undermined small private importers and retailers that were emerging under the donor support programs targeted to improving agribusiness acumen. It has also skewed the private fertilizer market to the commercial-export production sector. Private companies have developed a wide network of outlets for the provision of inputs other than fertilizer and innovative services (such as financing facilities in their stores) catering to tobacco
farmers, while neglecting the smallholder farmer beneficiaries of the subsidy program and producers of staple food crops necessary for Malawi to maintain food security. This has raised questions about the role of the government in importation and distribution, particularly with respect to depressing demand for inputs from the private sector and discouraging private investment and development.

A major issue is the uncertainty faced by private companies resulting from continuous involvement of the state agencies in the fertilizer market. The state’s open tender system, coupled with direct market competition with state agencies, places private importers at a disadvantage. These agencies benefit from government transport and storage facilities at costs well below market, which generally offsets the relative inefficiency compared with private sector distributors.

Although there have been attempts to privatize these state agencies, the process has been interrupted in response to public pressure for the government to have a distribution network that extends further into rural areas, especially in places not served by private networks, to reach smallholder farmers during emergency situations. The participation of the state agencies in the market makes the distribution process of subsidized fertilizer highly inefficient, at times incurring additional and unnecessary transportation costs (one of the highest cost components along the supply chain). However, their extensive network is strategic for the government in times of food scarcity for food distribution and for the distribution of basic inputs like fertilizer in the case of shortages. This situation makes it unlikely that these state agencies will be privatized in the foreseeable future.

There are also donor programs that provide heavily subsidized fertilizer to selected small subsistence farmers. These programs may displace fertilizer from the market by providing it to farmers who could and would be willing to pay retail prices, but instead rely on these programs to obtain discounted fertilizer rather than purchasing it from independent dealers in the open market. These government and donor programs benefit large importers since they make use of private sector suppliers to import and/or distribute the fertilizer via their own outlets. However, they crowd out beneficiary farmers who may be willing to pay full price for additional fertilizer.
because dealers in their areas have sold all their stock to these programs, leaving dealers with little or no inventories to sell in the open market. Furthermore, these programs are also crowding out non-program participants (independent distributors and dealers/retailers and smallholder farmers) by reducing their effective demand.

Another major issue facing the fertilizer supply system in Malawi is logistics, mainly related to port inefficiencies and transportation infrastructure and equipment. According to the 2012 Malawi Business Climate Survey Report, the major problem for imports is the cost of international transportation (across neighboring countries). Because Malawi is a landlocked country, importers are fully dependent on ports in the neighboring countries of Tanzania and Mozambique, and in South Africa. In many cases, inefficient port facilities cause delays at port and increased demurrage, which combine with poor roads and insufficient and obsolete transportation equipment to result in high transportation costs. In an attempt to address this issue, the GoM supported the construction of a port in the southern region of Nsanje on the Shire River to allow vessels to travel on the Zambezi River through Mozambique to gain access to the Indian Ocean. However, the port has been idle due to delays on a concession from the Mozambican Government to allow the transit of cargo on the Zambezi River; still there are reports of cruise vessels transiting through Mozambique on the Zambezi and anchoring at the Nsanje port in Malawi.

Other major issues facing the fertilizer supply and industry in Malawi are:

- An erratic, expensive and inadequate electric power supply, which has resulted in frequent blackouts. To address this problem, many private companies use expensive petro-fuel-generated electric energy to avoid interruption in their production process. However, the supply of petro-fuel is also a challenge. This issue becomes relevant for the exploitation of the available natural resources (i.e., phosphate rock deposits) and the expansion or establishment of a new fertilizer blending capacity.

- Exchange rate policy as a result of a macro-economic instability. In 2012, the GoM implemented a series of monetary reforms, including the liberalization of foreign exchange rates. However, such measures have not been accompanied by complementary fiscal measures, resulting in inflationary pressure crowding out domestic private investment due to
a lack of foreign currency for importation while making stable foreign currencies more expensive. This is more of an issue for companies that rely mostly on imports like fertilizer and have previously-acquired foreign debts, making the cost of doing foreign business more expensive.

- Macro-economic instability has resulted also in the high cost of finance, and therefore affects accessibility to credit. The Reserve Bank of Malawi recently increased the interbank loan rate to 21 percent. Considering the inflationary pressure and the foreign exchange rate adjustments and fluctuations, commercial loan interest rates are even higher than 21 percent. Although this does not appeared to be a major issue for fertilizer importers, it is more relevant for the domestic supply chain (distributors and retailers) that relies on domestic financing; smallholder farmers are especially affected. Exacerbating this issue is the high risk associated with agricultural production enterprises.

- Agricultural policy uncertainties and regulatory environment. Most policies in support of the MDGS are not being properly implemented or are slow in their progression. In agriculture, a major policy that is affecting the sector is export bans and control, which has serious repercussions on the input sector – especially on fertilizer supply. In terms of regulatory procedures, they are bureaucratic, increasing delays in import and export procedures, and therefore the cost of doing business. There is also speculation of corruption at high levels in the implementation of policies, which would be a major factor in constraints of business expansion. This is relevant in the implementation of the policy for a fertilizer subsidy, where there are few recurrent private companies that participate in the provision of fertilizer to the GoM subsidy program under a non-transparent tender-bid process.

On the demand side of the market, the main issues are at the farm level, where the market price for outputs is low and farmers need access to market information, marketing options and buyers. There is also a need for stronger farmer organizations and for technical and agribusiness training to teach farmers the proper use of inputs like fertilizer and how to apply business concepts to their farming activities. Though farmer incomes are affected by high production costs and low yields, productivity can be increased through the use of inputs and better crop management. Extension workers also require training in agronomic and business concepts.
7. Conclusions and Recommendations

The results from this study indicate that in order for Malawi to achieve the A-SWAp agricultural crop production targets, it must double its consumption of fertilizers by 2016. This section addresses policy recommendations necessary to overcome the issues facing the fertilizer supply chain, thereby improving the capacity of the private sector to handle higher volumes of fertilizer in order to achieve such targets in support of food security and increased incomes for smallholder farmers.

Malawian agriculture is dominated by smallholder farmers, and over 90 percent of cultivated land is under food crops (mostly grains) and cash crops. As cropland becomes scarce, increases in production will be driven largely by intensification rather than expansion of crop land. This will require the intensive but rational use of agricultural inputs. This makes fertilizer a strategic agricultural input in agriculture intensification to increase productivity.

Though this study focuses on fertilizers, it is important to note that increased productivity and production will require a holistic approach, including other production-enhancing inputs like new cultivar varieties, an integrated crop and soil fertilizer management (ISFM) approach and the development of local knowledge and output markets. However, the agriculture sector growth outlook to ensure increased fertilizer use remains limited due to the following sector structural constraints:

- The sector’s heavy reliance on two key crops: maize for food and tobacco for export.
- The small size of the domestic fertilizer market.
- Lack of or poor infrastructure, mainly major roads and rural feeder roads, leading to high transport costs, and the lack of sufficient storage in rural areas.
- Erratic power supply and heavy reliance on costly energy imports to establish and develop local production and blending capacity.
- The involvement of the government in the fertilizer market, interfering with normal market conduct and performance.
• Lack of or weak capacity in the public sector to implement policies and to manage government programs like the FISP.

Still, the Malawi fertilizer market has significant potential for growth, particularly in the smallholder sector. Yet, realizing fertilizer demand and incentivizing consumption will depend on a number of factors:

• The performance of the supply chain to ensure timely availability of the right type of fertilizers at the right place that is accessible to farmers and at a reasonable price.
• A favorable fertilizer-crop price ratio, which implies improving market access to farmers’ output in addition to an efficient use of inputs.
• Appropriate research and extension programs tailored to smallholders to demonstrate and disseminate information on the proper use of inputs (e.g., on-farm demonstrations).
• A credit system tailored to the sector that includes the development and use of risk management instruments (e.g., indexed crop insurance, credit guarantees) to protect farmers against potential eventualities, but more importantly, to protect the financial institutions’ lending portfolios.

7.1. Restructuring the FISP Program

Perhaps the major fertilizer sector concern in Malawi is the government’s fertilizer policy. There are questions regarding the proper role of the GoM through the FISP and the state agencies in the importation and distribution of subsidized fertilizer. FISP has transformed the operation of agro-dealers in a way that is less supportive of the nation’s growth strategy and the A-SWAp. FISP, rather than being an engine of private sector-led agricultural growth, has come a hindrance to sector development. Therefore, the government is called to restructure (not necessarily to eliminate the subsidy program) in a way that is more market friendly and supportive of private sector market development.

In this area, it is important for the government to envision a better targeted subsidy system that allows for broader private sector participation, not only in importation but in distribution of fertilizer to farmers as well – with a clear and enforced exit strategy by allowing beneficiary farmers to graduate from the program after a specified period of time. This approach
can liberate public funds necessary to broaden support for other services such as research and extension that enhance productivity and to invest in the infrastructure necessary to support private sector expansion for long-term market development. These long-term investments are essential and should be viewed as a long-term public capital investment rather than a recurrent expenditure.

There is a need for a paradigm shift in the implementation of subsidy programs. The better role of the government is to withdraw from intervention in the supply side of the market. One approach is to provide coupons to targeted farmers to effectively incentivize demand and allow private businesses to compete more freely in pursuit of the coupons wherever they are allocated in the rural areas. The distribution of coupons should be accompanied by other measures that will allow the private sector to do business in rural areas at a minimum cost and earn a reasonable profit.

7.2. Investment in Logistics Infrastructure: Transport and Storage

Investment should be oriented at establishing the right physical conditions for the private sector to reduce transaction costs in order to develop their businesses and extend the reach of the fertilizer market closer to the farmers. This requires investment in infrastructure.

Malawi relies on multiple ports from neighboring countries for importation of fertilizer, each having different levels of inefficiency that add to the cost of importation and inhibit the smooth flow of goods through the ports. Unfortunately, the resolution of these port issues is not dependent solely on Malawi’s action; it is a regional issue that affects other countries that utilize the same ports. Addressing these port issues will require initiative and actions at a regional level. Malawi could take the lead and raise the issues to the highest regional authorities (COMESA, SADC, and EAC) to seek a multilateral resolution. More directly, Malawi should follow up on the negotiations with Mozambique to allow Malawi cargo vessels to navigate the Zambezi River and make use of the Nsanje river port in Malawi.

Another logistical issue with regional implications is the rehabilitation and upgrading of the railroad system. Officials should capitalize on the opportunity to follow up on the concession
agreement with Vale Logistics Limited.\textsuperscript{6} This will rehabilitate the railroad in an expedited manner, improving service reliability and upgrading equipment. A detailed logistics study that takes into account all of the cargo moving through the port, the existing and potential modes of transport and the storage facilities available to the logistics chain should be conducted to highlight areas that require improvements to reduce costs along the chain.

There are other infrastructure issues primarily related to a poor domestic road network, which raises transportation costs due to additional time and the reduced productive life of equipment. This acts as a disincentive to supplying fertilizer into remote areas at the right price and time, creating a drag on demand. Better maintenance and upgrading of existing roads in Malawi as well as construction of new rural feeder roads are necessary to improve logistics and extend the life of transportation equipment. New roads will also provide access to output markets, improving farmer incomes and creating incentives for entrepreneurs to expand retail input businesses to reach more farmers.

In terms of storage infrastructure in the rural sector, the government should take the initiative to create a public-private partnership for the use of existing public storage facilities by the private sector, at least during market expansion, and eventually privatize the public facilities or provide incentives for them to invest in their own facilities as the market matures. These incentives should be accompanied by public investment in road infrastructure that will further facilitate private sector expansion in underserved rural areas.

The government must continue support and funding for the GBI initiative, investing in improvements in and construction of new irrigation infrastructure, which will help reduce risks in production and contribute to increased fertilizer use – and perhaps even increase farmer access to finance.

\textsuperscript{6} Vale Logistics Limited, a subsidiary of Vale Emirates – the fourth biggest mining company in the world, based in Brazil – has a concession agreement with the GoM for the construction and rehabilitation of railway lines from different points in Malawi to Nacala port for the export of coal and other commodities. This investment is expected to reduce transportation costs of goods from Nacala port to and from Malawi by about 40 percent.
7.3. Improving Access to Finance

Other GoM efforts should be oriented toward establishing the conditions for farmers to increase their use of fertilizer, in addition to and as a complement to the subsidy program. There is a role for the government to assist those farmers with restricted access to credit in order to increase fertilizer consumption, especially considering that Malawian farmers are not using the necessary levels of fertilizer in their productive activities. Therefore, in light of the potential risk associated with farming/crop production activities, the GoM should support the development of a credit system tailored to the sector that must include the development and use of risk management instruments (e.g., indexed crop insurance, credit guarantees) to protect farmers against potential environmental eventualities, but more important to protect the financial institutions lending portfolios.

7.4. Creation of an Enabling Business Environment

Furthermore, GoM efforts should be oriented toward fostering a business environment that enables the private sector to supply the necessary amount of fertilizer to the market and provide the education for farmers to make better use of fertilizer. This includes the establishment of conducive legal and regulatory frameworks and investment in long-term and sustainable research and extension services in support of the supply and demand of fertilizer.

Research and extension play important roles in supporting the business environment. They are critical in ensuring that smallholders have the right information, are aware of and have access to and new technologies and products that are appropriate to their local conditions. They provide a critical service that contributes to the successful development of input markets.

To encourage farmers and other private businesses to invest in improved technologies and related services, it is also important to nurture an environment that maintains macro-economic stability and minimizes costs to businesses while providing the necessary regulatory and enforcement system. It is crucial that businesses have the benefits derived from a legal and regulatory framework that is predictable and not subject to high transaction and indirect costs for meeting requirements that deter investments. Private investments can be limited by competition from state agencies that may not be subject to the same regulations. This was the case for the
private companies that have withdrawn from the market. Well established regulatory and enforcement entities will allow for innovation and the development and introduction of products better suited to the environmental conditions and varied crops being grown by farmers in Malawi. Greater competition will contribute to more efficient operation; therefore it is essential that the GoM expedite the revision and approval of the new fertilizer act.
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