

Mali Fertilizer Assessment



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Porfirio Fuentes, IFDC senior economist in trade and economic policies, produced this report with reviews from IFDC colleague Joshua Ariga and former colleague Sarah Gavian. The report is based on interviews conducted in Mali and literature reviews. This assessment is also a follow up to and complements the IFDC-IFPRI report on “Improving Fertilizer Markets in West Africa: The Fertilizer Supply Chain in Mali” by Fuentes et al. (2011). Special thanks to Amadou B. Ouadidjé, Diagana Bocar and Diallo Doua Demba, from IFDC Northwest Africa Division based in Mali, and local consultant Amadou Toure Malian for their collaboration in coordinating the field visits and to all government and private sector stakeholders who dedicated their valuable time for the interviews and provided data and information to make this report possible.

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Acronyms

2KR	Second Kennedy Round
BMS	Banque Malienne de Solidarité
BNDA	Banque Nationale pour le Développement Agricole
CAADP	Comprehensive Africa Agriculture Development Programme
CC	Central Commissions
CCAE	Commission Centrale pour l'Acquisition d'Engrais
CIA-WFB	Central Intelligence Agency-World Fact Book
CILSS	Comité permanent Inter-Etats de Lutte Contre la Sécheresse dans le Sahel
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement
CMDT	Compagnie Malienne pour le Développement des Textiles
CNFA	Citizens Network for Foreign Affairs
CSCR	Cadre Stratégique de Croissance et de Réduction de la Pauvreté
CSLP	Cadre Stratégique pour la Croissance et la Réduction de la Pauvreté
DAP	Diammonium phosphate
DNA	Directeur National d'Agriculture
DRA	Directeur Régional d'Agriculture
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GIE	Groupement d'Intérêt Economique
GoM	Government of Mali
IER	l'Institut d'Economie Rurale
IRAT	Institut de Recherches Agronomiques Tropicales
LOA	Loi d'orientation agricole
MAFAP	Monitoring and Analysing Food and Agricultural Policies (Africa)
MoA	Ministry of Agriculture

MoEF	Ministry of Economics and Finance
MOP	Muriate of Potash
MoRD	Ministry of Rural Development
NEPAD	New Partnership for Africa's Development
OHVN	Office de la Haute Vallée du Niger
ON	Office du Niger
ORIAM	Opérateurs d'Intrants Agricoles du Mali
PAPAM	Projet d'Accroissement de la Productivité Agricole au Mali
PCDA	Le Programme de compétitivité et diversification agricoles
PDA	Politique de Développement Agricole
PDES	Projet pour le Développement Economique et Social
PNISA	Programme National d'Investissement dans le Secteur Agricole
PNIP-SA	Programme National d'Investissement Prioritaire du secteur Agricole
PNT	Natural Phosphate du Tilemsi
PPP	Public-Private Partnership
PR	Phosphate Rock
RI	Rice Initiative
RO	Rice Offices
SDDR	Schéma Directeur du Développement Rural
SFD	Système Financier Décentralisé
UEMOA	Union économique et monétaire ouest-africaine
UNDP	United Nations Development Program
WA	West Africa

Executive Summary

This report provides a brief description of the agricultural sector, crop production and sector policies being implemented in Mali, followed by a description of the fertilizer market, its players, and the challenges facing the supply chain and farmers to gain access to fertilizer. It also provides estimates of the levels of fertilizer consumption required to achieve the Agricultural Sector National Investment Program (PNISA) agricultural growth targets, analyzes the challenges that are constraining fertilizer market development and makes policy recommendations to increase fertilizer consumption and, hence, output.

The Mali agricultural sector is dominated by smallholder farmers with low productivity, partly resulting from low access to improved production technologies, especially fertilizer. Although crop productivity and production has been increasing during the last five years, it is still low compared to other regions of the world. To continue raising productivity and production, it is important to encourage agricultural intensification by adopting improved technologies under an integrated soil and crop fertility management framework to meet PNISA targets of increasing farmers' incomes and reducing food insecurity while preserving the environment. In addition, policy reforms in support of private investments for market development and fertilizer use, are necessary to meet PNISA growth targets and the objectives of the Comprehensive Africa Agriculture Development Program (CAADP).

The estimation of annual fertilizer requirements at a national level is a challenging exercise that can lead to under- or over-estimation. In this assessment, we made use of the crops' nutrients removal approach to estimate the amount of fertilizer necessary to achieve the PNISA crop production growth targets. Results from the estimation indicate that Mali has to increase its consumption of fertilizer by more than two-fold, from the estimated current level of 250,000 metric tons (mt) to 554,000 mt of fertilizer products per year in order to meet the agriculture sector growth targets. This increase is expected to strain the capacity of the current supply chain, unless existing constraints are addressed through policy changes and investments to accommodate a larger volume of fertilizer and other inputs.

The fertilizer market in Mali faces a number of challenges that need to be tackled in order to raise agricultural productivity. Encouraging the supply and use of fertilizer requires improvements in financing and infrastructure to reduce financial cost and the costs of moving fertilizer from ports to farms. Good roads and rebuilding of the rail network can help expand output markets and encourage private investment in other support businesses and services in the rural sector such as rural markets and food processing plants, which will provide a pull factor for increased demand for fertilizer.

There are also constraints on the demand side of the market, mainly technical constraints related to knowledge of farmers to make better use of fertilizer, resulting from a lack of or poor research and extension services; and the lack of financial capacity of agro-dealers and farmers to meet supply and demand. In addition, the enactment of regulations and the creation of enforcement institutions – including developing human resources to support the implementation of the fertilizer law – is expected to create a conducive environment that encourages competition and private investments to strengthen the market and increase access to fertilizer by farmers.

Mali Fertilizer Assessment

1. Objectives and Conceptual Framework

This study's main objective is to estimate fertilizer requirements to meet the agricultural growth targets in the Government of Mali's (GoM) national development plans in line with the Comprehensive African Agriculture Development Program (CAADP) compact. These estimates will have policy and investment implications for tackling existing challenges in the fertilizer supply chain necessary to embrace the expected increased volumes of fertilizer and to meet the agriculture growth targets. The study also looks at the roles of the government and of the private sector in increasing the provision and use of fertilizer.

To satisfy the above objective, this study takes on a qualitative and quantitative analysis of the supply chain in Mali to identify constraints and make recommendations to strengthen the fertilizer markets. The analysis examines the policy framework and challenges faced by market players to increase fertilizer flow through the distribution system.

The estimations of the fertilizer nutrient quantities needed to meet crop output growth, and therefore the agricultural growth targets, are based on the following assumptions: (1) the Agricultural Sector National Investment Program (PNISA¹) crop production targets reflect the quantities needed to achieve national food requirements; (2) markets will adapt and absorb the increased levels of crop production; and (3) fertilizer use will be profitable after accounting for changes in relative input-to-output prices and other factors.

2. Data Collection

This study relies on: (a) secondary data and literature review and (b) empirical data collected through interviews with key players in the public and private sectors, such as the Ministry

¹ Most acronyms throughout the document, represent their names in French. For example, PNISA stands for "Programme National d'Investissement dans le Secteur Agricole" in French.

of Agriculture (MoA), importers and distributors/retailers, non-governmental organizations and others implementing projects and conducting research in Mali. To supplement published reports, an IFDC team travelled to Mali in March 2014, and then again in August 2015, to meet with key fertilizer sector stakeholders to learn first-hand about the market situation. During the field visits, efforts were focused on collecting information on the following topics:

- National investment plan targets from the GoM development plans and documents related to CAADP.
- Agricultural production data: crops, cultivated area and production.
- Fertilizer nutrients imports, consumption and use.

Some desired data not available in detail or accessible included:

1. Disaggregated data on application rates per hectare by crop.
2. Percentage of farmers using fertilizer by crop and region.
3. Quantity of fertilizer products for each crop.

3. Agricultural Crop Production

The Malian economy relies predominantly on the primary and tertiary sectors, which in 2014 accounted for 38 and 38.7 percent of GDP, respectively (The CIA World Fact Book estimates, 2015). The primary sector depends heavily on the exploitation of minerals and is dominated by agriculture, which in 2012 experienced a growth of 8.6 percent, up from 7 percent in 2010, with high annual variations since early 2000s.² Agricultural land is estimated at 42 million ha, or 34 percent, of the national territory, including 12.2 million ha under permanent and annual crops and fallow land, of which 6 to 7 million ha are cultivated annually with 2.2 million ha suitable for irrigation – especially in the delta along the 2,600 km of the Niger River (MoA, 2008; CIA-WFB, 2015). The rest of the agricultural land is for grazing, fauna and forest reserves.

Despite the country's available natural resources, agricultural potential is largely under-exploited, as these resources are spread widely over the national territory (dominated by a vast

² <http://databank.worldbank.org/>.

desert) in addition to widespread use of outdated agricultural production practices. This is reflected in low average cereal yields of 1.56 mt/ha in 2014 (Table 1), which, although increasing, are still below other regions of the world. The sector is dominated by 630,000 small family farms (about 30 percent cotton and maize and 6.5 percent rice; the rest are diversified farms including other cereals, fruits and vegetable) and contribute to more than 80 percent of the country's employment (The CIA World Fact Book estimates, 2015). Farm sizes average at 4.5 ha with approximately 40 percent of farms being less than 3 ha and an average household consisting of nine to 10 people.

Table 1. Cereals Planted Area, Production and Yields (2008-2014)

	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
Crops	Production (in mt)					
Millet	1,413,908	1,390,410	1,373,342	1,462,139	1,772,275	1,152,331
Sorghum	1,027,202	1,465,620	1,256,806	1,191,020	1,212,440	819,605
Rice	1,624,246	1,950,805	2,305,612	1,741,472	1,914,867	2,211,920
Maize	695,073	1,476,995	1,403,576	1,298,234	1,713,736	1,488,312
Wheat	13,166	15,132	13,788	18,842	21,038	27,430
Fonio	41,275	35,480	52,346	51,021	40,071	22,090
Total mt	4,814,870	6,334,442	6,415,470	5,777,728	6,674,427	5,721,688
	Planted Area (in ha)					
Millet	1,576,208	1,439,713	1,257,043	1,784,179	1,873,644	1,437,037
Sorghum	990,995	919,407	1,257,011	863,457	1,245,569	937,525
Rice	482,552	526,784	615,936	576,460	602,100	604,745
Maize	352,263	374,075	362,079	495,385	580,881	640,526
Wheat	5,394	5,101	3,935	4,810	9,947	6,900
Fonio	37,283	30,307	36,326	37,755	43,809	34,255
Total ha	3,444,695	3,295,387	3,532,330	3,762,046	4,355,950	3,660,988
	Yields (in mt/ha)					
Millet	0.9	1.0	1.1	0.8	0.9	0.8
Sorghum	1.0	1.6	1.0	1.4	1.0	0.9
Rice	3.4	3.7	3.7	3.0	3.2	3.7
Maize	2.0	3.9	3.9	2.6	3.0	2.3
Wheat	2.4	3.0	3.5	3.9	2.1	4.0
Fonio	1.1	1.2	1.4	1.4	0.9	0.6
Average yield	1.40	1.92	1.82	1.54	1.53	1.56

Note: Note that the data for 2013/14 are provisional estimates.

Source: Ministry of Rural Development (MoRD), 2014.

Cereal grains represent about 65 percent of total crops production in Mali. In 2013/14, cereal production was estimated at 5.7 million metric tons (mt), which represents an increase of 19 percent relative to 2008/09 production but a decrease relative to the previous three years.

According to IMF (2015), this decrease is in part attributed to a slump in the international commodity prices during the last couple of years which induced farmers to reduce the use of inputs in efforts to cut in production cost; and to climate change resulting in prolonged droughts. Most of the increase from 2012 to 2013 is attributed to rice (in response to a fertilizer subsidy, public investments in irrigation facilities and advances in the processing of paddy) and to maize and millet due to improvement in cultural practices and the liberalization of the grain markets. Of the total cereals production in 2014, rice alone represents 39 percent and rice, millet and maize combined represents 85 percent (Table 1). Cereal production provides for approximately 90 percent of domestic needs, complemented by the non-cereal crops.

According to MoA, legumes (cowpea, peanuts, sesame and soybeans) represent 4 percent of crop production while tubers represent just over one percent. Industrial crops are dominated by cotton, representing 11 percent of production and 39 percent of total commercial crops. Cotton, sugarcane and peanuts combined represent 93 percent of total commercial crop production and 99 percent of planted area (Table 2). Fruit and vegetable crops represent a small percentage of total crop production and are concentrated in the southern region of Sikasso and the central regions of Ségou and Mopti. There are also intensified fruit and vegetable activities in urban areas around major cities.

Table 2. Other Crops Estimated Area, Yield and Production (2014)

	Area (ha)	Yield (kg/ha)	Production (mt)
Cowpea	254,384	661	168,274
Bambara-bean	15,973	1,400	22,362
Potato	2,792	24	67,000
Total: Other Food Crops	273,149		257,636
Sugarcane	4,814	73,455	353,610
Cotton	570,300	1,094	624,000
Peanuts*	326,058	1,580	515,334
Onion/shallots	5,140	22	114,210
Total: Commercial Crops	906,312		1,607,154
Tomato	3,890	17	65,380
Grand Total	1,456,500		2,187,806

Source: MoRD, PNISA 2014.

4. Agricultural Policies

The GoM agriculture policies are guided by the principles and actions highlighted in international and regional statements such as the 2000 Declaration by the Heads of State and Government of the Member countries of the Sahel (CILSS), the call of the African Union Summit of July 2000 on food security and regional integration; the 2003 Maputo declaration; and the CAADP/Common Agricultural policy of the West African Economic and Monetary Union (UEMOA), among others.

According to the 2013 Food and Agriculture Organization (FAO) Monitoring and Analyzing Food and Agricultural Policies in Africa (MAFAP) report, Mali has a hierarchy of multiple agricultural and food policies and programs with a confusing array of objectives and priorities. However, the general thrust of these documents is for the sector to become the engine of economic growth and ensure the well-being of the population. These agricultural policies and programs focus on promoting a modern, competitive and sustainable agricultural sector to increase production for food security and improved returns to producers.

This focus is reflected in the substantial investment by the GoM and donors in the rural and agricultural sector. In 2010, the government allocated about 36 billion CFA for agriculture investment and to subsidize agricultural inputs (Traore and Diarra, 2010). Total government expenditures in the rural and agricultural sector increased by 82 percent between 2004 and 2010 (MAFAP, 2013). These expenditures represent more than 10 percent of the national budget and meet the objective of the 2003 Maputo Declaration.

Government investments and expenditures have concentrated on developing irrigation facilities, mainly along the Niger Delta, and on diversification of export crops through the Agricultural Competitiveness and Diversification Program (PCDA) and the Increasing Agricultural Productivity Project (PAPAM). In addition, the government increased input subsidies for agriculture from 13.6 billion CFA in 2009 to 31 billion CFA in 2012 (MoA, 2013) through the Rice Initiative (RI) launched in 2008, which has been extended to wheat and maize, cotton, millet, sorghum and cowpea.

The 2012 political upheavals brought uncertainty, and recent security concerns created an environment that challenges implementation of sustainable agricultural and rural policies. However, a number of programs and projects are underway with support of national authorities and development partners.

4.1 Key Strategies and GoM Priorities for Agricultural and Rural Development

The GoM has implemented policies and programs to boost economic growth in a five-year sequence of planning periods. Currently, there are three key policy statements which set the main parameters for agricultural development in Mali, envisioned at a macro, sectoral and programmatic levels.

The 2002 Strategic Framework for Fight Against Poverty (CSLP, 2002-2006) is a seminal document that set the government priorities for agricultural and rural development. The CSLP was replaced by the Strategic Framework for Growth and Poverty Reduction strategy (CSCRCP, 2007-2011) and eventually by the Strategic Framework for Growth, Employment and Poverty Reduction (CSCERP, 2012-2017).

The 2006 Agricultural Orientation Law (LOA) the long-term policy for agricultural development to be implemented in line with the NEPAD's CAADP/ECOWAS Common Agricultural Policy recommendations, aimed at modernizing agriculture by encouraging private investment which requires the disengagement of the government from the sector through decentralization, privatization and by promoting good governance. Under the LOA, the Master Plan for Rural Development (SDDR) strategy document guided the development of the rural sector, which eventually gave way to the Agricultural Development Policy (PDA 2011-2020), a national agricultural sector strategic framework to support agricultural modernization. This process requires financial resources estimated at U.S. \$307 million that the country could not meet on its own (CSCRCP 2007-2011, Annex III). This situation led to the development of the National Agricultural Sector Priority Investment Plan (PNIP-SA) and the subsequent National Agricultural Sector Investment Plan (PNISA), described below.

4.2 The PNIP-SA (2010-2015) and the PNISA (2015-2025)

In 2010, an interim five-year CAADP priority investment plan (The PNIP-SA) was elaborated to align both the donors' and government's efforts on strategic investments in five value chains: rice, maize, millet and sorghum, inland fisheries and livestock products; in addition to crosscutting activities to strengthen nutrition education. The PNIP-SA was superseded by the PNISA in 2011 as a broad investment plan in support of the CAADP/Common Agricultural Policy of ECOWAS, with a focus on a sector-wide approach. The PNISA came to reinforce the PNIP-SA, taking into account the plan's operational and investment needs and financing requirements, including the current and future projects and programs in a 10-year period. The PNISA was developed as a tool to prioritize programs and projects, as well as for planning and monitoring/evaluation of policy effectiveness. PNISA key objectives are embraced in its five key components:

- (i) **Capacity building** aimed at institutional development and improving governance by building the capacities of decentralized public authorities and local farmer organizations for them to take charge of agricultural development activities and meet the major agricultural development challenges.
- (ii) **Investment** in rural areas, focusing on basic factors of production (land, financing, infrastructures and equipment) and an emphasis on water control technologies, including improved irrigation and better surface water management (rains, runoff, rivers, etc.) in non-irrigated areas for farm modernization. All these, with the objective to ensure a sustainable use of land in compliance with environmental constraints and meet the challenges posed by climate change.
- (iii) **Increase productivity** and production in key agricultural activities for majority of low-income citizens, with special emphasis on income-generating activities particularly for women and youth; **and the competitiveness** of the sector by improving rural infrastructure to promote a better business environment and encourage investments aimed at produce processing and development of markets for agricultural produce in the national, regional and international markets.
- (iv) **Agricultural research and training** to develop and disseminate new and innovative technologies and skills that can improve Mali's agriculture productivity and meet the

production objectives while providing farmers the tools to manage their farms sustainably and face the challenges posed by climate change.

- (v) Ensure **food and nutrition security** for Mali's population by producing enough food to cover all the nation's nutritional needs by 2020.

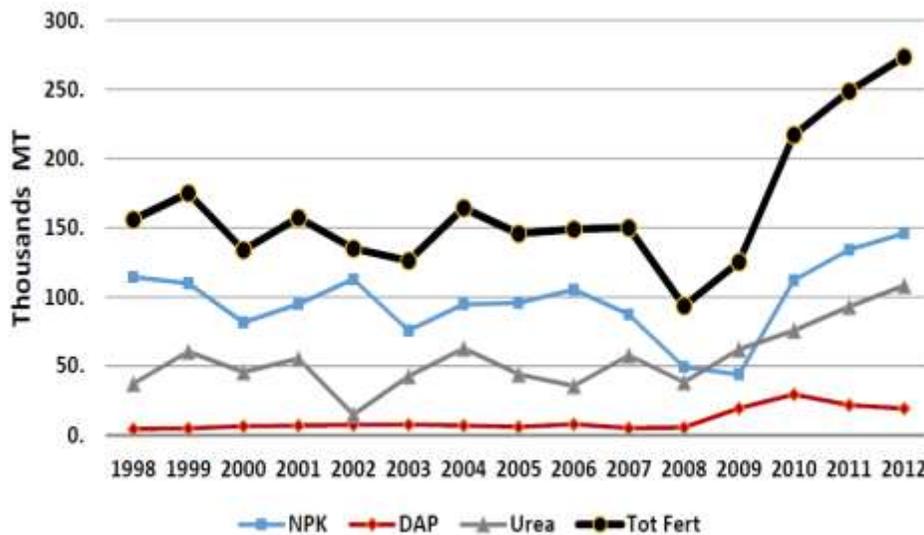
5. Fertilizer Market in Mali

5.1 Imports and Use

Mali has deposits of phosphate rock (PR) in Tilemsi, Tombouctou region, with a potential capacity of about 36,000 mt per year. This PR is sufficiently reactive that if directly applied to the soil, it can meet most crop's annual phosphorus (P) requirement. Despite numerous attempts to utilize this PR as a P source, successful market development has been constrained by numerous factors including most notably lack of infrastructure and civil unrest. While most of the PR is exported as raw material or transformed into phosphoric acid for the production of other fertilizer compounds abroad, the country imports the bulk of fertilizer it consumes. Few companies are involved in importation (Toguna Agro-Industries, SOMADECO and Arc en Ciel), importing up to 97 percent of the country's fertilizer expressed needs. These are local companies that have developed close relationships with (or represent) international fertilizer marketing firms and with the domestic private distribution network. In the last few years, post subsidy implementation, there has been a shift on the companies that dominate the importation of fertilizer, where some that were distributors have started gaining prominence in importation and distribution. Currently, Toguna Agro-Industries dominates the import market with about 70 percent market share.

The Mali fertilizer market is the second largest in the West Africa (WA) region, representing an average of 23 percent of the total fertilizer imported (in nutrients base) out of 11 countries in the Economic Community of West African States (ECOWAS), after Nigeria followed by Ghana, Côte d'Ivoire, Burkina Faso and Senegal, based on five years' average (2007-2012). Yet the average nutrient fertilizer application rate, estimated at 4 kilograms per hectare (kg/ha) in 2012 (FAOSTAT, 2014), is lower than the SSA region average of 10.3 kg/ha and other developing regions of the world.

Cotton and cereals, mainly rice and maize, are the major fertilizer consumers. These crops and their respective production zones (which includes other subsistence crops), consume more than 95 percent of imported fertilizer. Traditionally, cotton production alone absorbed an average of 73 percent of fertilizer consumption despite 77 percent of the arable land being used for cereal production. The drop in fertilizer consumption to 93,000 mt from 150,000 mt between 2005 and 2008 is attributed to the increase of fertilizer prices during the 2007/08 oil and food crisis. As a result of this crisis, during the 2008/09 crop season the GoM started implementing a fertilizer subsidy to incentivize its use. Since then, importation and consumption in Mali nearly doubled by 2012 (Figure 1) relative to the 2008 levels. Still this level of fertilizer consumption is estimated to represent 50 percent of the total demand, according to the National Director of Agriculture (DNA), based on *caution techniques*.³



Data Source: IFDC survey assessment 2009 and 2014.

Figure 1. Fertilizer Imports in Mali

According to the Economic and Social Development Project (PDES, 2007-12), the estimated needs of fertilizer in Mali in a normal year were between 140,000 to 175,000 mt of subsidized product. More recently, these needs have increased to about 275-350,000 mt due in part to the subsidy, according to interviews with Toguna Agro-Industries. These needs are divided

³ *Caution Technique* is a survey instrument implemented by the DNA, in which farmers are asked to estimate their fertilizer needs during the upcoming crop season, based on the expected planted areas and crops.

between the cotton complex (40-45 percent), which is a nitrogen-phosphate-potash (NPK) blend, urea (35 percent) and NPK 15-15-15 or 17-17-17 for cereal (about 11 percent for maize). The remaining 9 percent is composed of diammonium phosphate (DAP 18-48-0) and other formulations. Table 3 presents the main fertilizer products traditionally used in Mali.

Table 3. Fertilizer Product Traditionally Used in Mali

Fertilizer Type	Composition (NPK)	Crops
Urea	46-0-0	Cotton, cereals, sugarcane
Diammonium Phosphate (DAP)	18-46-0	Cereals
Simple Superphosphate	0-20-0	Peanuts
Cotton Complex	14-22-12-7S-1B	Cotton
Cereals Complex	15-15-15	Cereals
Sulfate of Potash	0-0-50-18S	Cereals – cowpeas
Chloride of Potash	0-0-60	Sugarcane
Natural Phosphate du Tilemsi (PNT)	0-28-0	Cotton, cereals, peanuts

Source: IFDC data collected during country visits and interviews to fertilizer market stakeholders, 2009.

More recently, fertilizer consumption by cotton (estimated at 8 percent of total planted area), has decreased to about 45 percent as a result of a substantial reduction in the planted area. Cereals production, representing more than 90 percent of the total planted area (MoA, 2013), absorbs about 55 percent of fertilizer, largely attributable to the subsidy.

In some areas, fertilizer recommendations for cereal production generated by the International Centre for Agricultural Research Cooperation and Development (CIRAD) date back to 1994. In the Malian Company for Textile Development (CMDT) zone for cotton, maize, sorghum and – in the Rice Offices (ROs) – for flooded and rainfed rice, fertilizer recommendations are based on experiments in research stations, taking technical, economic and ecological factors in consideration. However actual application rates are based on the CMDT and the ROs fertilizer quantities supplied depending on farmers' socio-economic conditions, the expected micro-climate (rain or water availability) and targeted production for the zone. According to the Institute for Economic Research (IER), fertilizer recommendations are not economically feasible for farmers who usually base their actual use on economic rationality, affordability and availability.

Farmers' typical cultural practice on fertilizer use is to apply "pinches," a form of micro-dosing. In 2006, the IER started replicating these practices in research stations in efforts to quantify the levels of fertilizer used under those practices, which was estimated at 5 kg/ha for sorghum and millet, representing about 3.5 percent of the recommended doses of 150 kg/ha. Analysis by the IER shows that despite the low fertilizer use relative to recommendations, farmers are economically efficient. IER budget analysis shows benefits of 20 to 40 CFA return for each 1 CFA invested, using the micro-dosing rates. However, these estimations do not take in consideration the cost of nutrient depletion due to soil nutrient mining.

5.2 The Fertilizer Subsidy

The fertilizer subsidy program in Mali, re-initiated during the oil and food crisis of 2007-08, is an integral part of the procurement and delivery of about 85+ percent of fertilizer along with credit and other services. All agricultural producers, whether organized or not, are expected to have access to subsidized fertilizer, provided they participate in filing the DNA *caution technique* to determine their needs. However, in practice, producers may not have access to subsidized fertilizer if they lack cash and do not have access to credit because of unpaid debts and/or lack of collaterals. In addition, even farmers eligible for credit may not be able to acquire the total amount of fertilizer needed for to their crops and planted areas due to adjustments made to the total needs based on the government production objectives for each crop, the estimated existing inventory of fertilizer in country and the availability of funds from the banking pool to finance the importation and use of fertilizer by farmers. To meet additional needs, farmers must purchase fertilizer in the open market at a non-subsidized price, if available, and if they have their own funds.

This subsidy program, originally targeted to rice, has been evolving in its delivery mechanism, originally with a coupon system that was discontinued due to pervasive corruption, to a subsidy paid to fertilizer providers for each bag of fertilizer sold against proof of delivery and sales. The amount of the subsidy payment to providers is the difference between the negotiated market price and the (subsidized) price paid by farmers with cash or with individual or group credit, if eligible. The subsidy control and regulation is done through the DNA and with the participation of the decentralized offices, the DRA, the CCAE and GIE. The RI extended coverage

of the subsidy to other crops and subsidized credit-in-kind (fertilizer) for the cash or out-of-pocket price component to a select group of farmers rejected by the financial system but considered eligible for credit according to the DRAs. Under this initiative, the fertilizer subsidy was extended to crops other than rice, to cotton and maize, millet/sorghum and wheat; consequently, the initiative increased competition at the distribution and retail levels to supply fertilizer to those farmers who were not eligible for credit before the initiative.

Subsidized fertilizer needs estimations by the DNA is a combination of state production targets to meet high level of food security, producers expressed needs based on the DNA *caution technique* and the availability of funds for subsidized fertilizer. The estimations also take in consideration expected crops yields, production regions and social impacts of the produced crops to determine the total fertilizer needs – especially in the northern Sahel region where farmers produce more drought resistance crops such as sorghum and millet with the objectives of food security. In this region they provide a minimum of 35 kg/ha of fertilizer for micro-dosing. Once the Ministry of Economics and Finance (MoEF) and the MoA determine the level of funding, the decision goes to the Higher Agricultural Council for planning and allocation of fertilizer for each production zone and crops, according to the estimated requirements.

According to the DNA *caution technique*, the expressed needs of fertilizer are above 300,000 mt. This estimate does not represent the total country needs since it does not considered the needs by commercial or cash crops not included in the RI. However, non-subsidized fertilizer quantities represent a small portion of the total national fertilizer needs.

Subsidized fertilizer accounts for almost 100 percent of the estimated cotton and rice needs. For other cereals crops, including maize, subsidized fertilizer covers up to 40 percent of the expressed needs. While the government is not able to provide the total expressed needs based on the *caution techniques*, based on available funds it has been able to cover about 250,000-270,000 mt, mostly for cotton and maize, rice and other cereals (mainly wheat and sorghum), given the government high priority of food security under the subsidy program.

The subsidized price to the farmers is based on the negotiated price between importers (considering their disclosed estimated costs) with the MoEF and MoA, according to available funds, and then by the tenders issued by the representative farmer organizations (GIE and CCAE) and DNA. This price can vary according to the products and production zones where the product is being delivered, where price differential is expected to reflect the competitiveness of procurement under the tender-bid process. However, there is a ceiling price at which all suppliers participating in the subsidy program must abide to. The subsidy program does not preclude anybody from importing additional fertilizer outside the tenders and selling it in the open market at full price independent of any subsidy.

Out of the negotiated market price (21,500 CFA for DAP and NPK complex and 20,000 CFA for urea during the 2013-14 season), farmers paid 11,000 CFA (reduced from 12,500 CFA by the President in 2013 [AFKInsider]) for each 50-kg bag of fertilizer, regardless of the fertilizer product and production zone, with the government paying the differential. Based on previous estimations (Fuentes et al., 2012), farmers received an average government subsidy of 30 percent across production zones and products. However, the level of subsidy varied depending on the production zone and fertilizer product. Since 2008/09 the cost of the fertilizer subsidy program has increased from 11 to 37 billion CFA, and it is expected to increase to 50 billion CFA or more if the government is to meet the increasing demand estimated at +350,000 mt/year according to the DRA. There is a concern that removal of the subsidy will cause farmers to stop using fertilizer and crop production to crash, leading to businesses downturn and potentially to economic and social problems related to income and food security.

5.3 Market Structure and Distribution System⁴

Prior to market liberalization, the GoM was directly involved in procurement and distribution of fertilizer through the parastatals CMDT and ROs – Office of the High Valley of Niger (OHVN), Office du Niger (ON) and the Office du Riz Segou – for cotton, maize and rice production, respectively. Since its creation, the CMDT has been directly involved in procurement of fertilizer through international tenders, including distribution and management of credit to

⁴ This section draws on the 2011 Fuentes et al. Mali market assessment, revised and updated based on recent field work in Mali, up to August 2015.

organized cotton producers. This operation entailed establishing an efficient logistics and distribution network to service the cotton sector through cotton producer cooperatives. For the rice sector under the ROs, fertilizer has also been procured through international tenders and supplied to producers through existing private distribution networks.

Over the past 20+ years Mali has made considerable advances in fertilizer market liberalization as a result of economic and structural reforms, giving rise to a more robust private distribution network which has played an increasing role in fertilizer importation and distribution, previously controlled by CMDT and ROs. Starting with the 2008/09 production season, a few years when CMDT privatization was initiated, fertilizer procurement was transferred to cotton farmer organizations. However, this transfer of operations faced difficulties related to the weak organizational and financial capability of these organizations (linked to credit guarantees) and of the existing private distributors, in addition to the lack of knowledge on handling of the logistics involved in procurement and importation. These factors contributed to inefficiencies in fertilizer importation and distribution, while constraining the sector development.

Despite the privatization efforts, the provision of fertilizer continues to be dominated by annual tenders launched by producer organizations through intermediary structures (to be elaborated on in sections that follow) in which CMDT and the ROs still play a central role, due to their experience and existing distribution network, equipment and infrastructure. These intermediary structures, intended to better facilitate the procurement, importation, distribution, financing and consumption of fertilizer, have introduced additional layers and some complexity to the process of delivering fertilizer to farmers; complexity that perhaps add to the cost but paradoxically, provide farmers more access to fertilizer, especially if they are organized in groups. Even if farmers are not organized or without collaterals, the GoM established a mechanism through the Regional Agriculture Director (DRA) to give eligible farmers access to subsidized fertilizer.

5.3.1 *Market Players*

The fertilizer market in Mali integrates most private and public stakeholders including the following: farmers and farmer organizations, financial institutions, importers, distributors and

retailers and the government through the DNA, in addition to the CMDT and ROs. These stakeholders are described below.

Independent Farmers include producers of cash or commercial crops not affiliated to any organization, in addition to non-organized farmers with negative or no credit history operating inside and outside the CMDT and ROs zones. For these farmers to access credit, they must be affiliated to an organization (co-ops, CMDT, ROs) and provide a credit guarantee, which most do not have. These farmers' main involvement in the fertilizer market is by filing the DNA *caution technique* to determine global fertilizer needs to potentially benefit from subsidized fertilizer should they have the means to purchase it.

Farmer Organizations are part of the CMDT and the ROs production zones representing individual farmers. Their focus is on credit sourcing and management, the centralization of credit and fertilizer needs of individual farmers (based on the DNA *caution technique*). Some of these organizations are considered non-solvent, based on the number of farmer members with a negative credit rating, perhaps due to production losses as a consequence of adverse climatic conditions, compelling organizations to affiliate only, farmers eligible for credit.

Central Commissions (CC) are intermediary structures led by a council of representatives from the organizations represented in the intermediary structure: producer organizations, regional agricultural chambers, the CMDT and ROs technical division; and financial institutions. They were created to address the inefficiencies of the previous system which allowed producers to carry debts from more than one crop season – a situation that led to a default on a multi-billion CFA francs aggregated sector debt, providing a disincentive to the banking system to continue agricultural lending without any form of collateral or guarantee.

The functions of these commissions include: (1) centralizing farmers organizations' fertilizer needs; (2) organizing the calls to tender and procure fertilizer needs in their respective zones; (3) reinforcing the negotiation capacities of the represented organizations to achieve economies of scale in procurement and distribution of fertilizer; and (4) exchanging information between market stakeholders to stimulate competition.

In the cotton zones, the CC is The Group of Economic Interest (GIE), which clusters cotton and maize producers and other foods producing farmers in the CMDT/cotton production zone and the SFD. The CMDT serves as a support structure for production technical assistance to farmers, and for the distribution of fertilizer. For the rice production zone, the CC is the Central Commission for the Acquisition of Fertilizer (CCAÉ), which clusters farmer groups in the ROs zone, the SFD and local agriculture chambers. The Office du Niger (ON) serves as the technical support structure of the CCAÉ and permanently holds the council chair.

Decentralized Financial Systems (SFD)/Caisses of Credit are a network of rural microfinancial institutions (MFI) that serve as support structures of the CCs to provide credit to distributors for procurement of fertilizer and to producer organizations members of the CCs to purchase fertilizer. Their functions include: (1) mobilize funds from the banking pool to farmers; (2) negotiate loan agreements with the CCs; and (3) loan adjustments to farmers and their organizations based on the *caution techniques*.

Bank Pool – The GoM established a fund through the Malian National Agricultural Development Bank (BNDA) based on a bank pool which combines funds from private and public banks to finance agricultural activities by lending directly to farmers and more so through farmer organizations and the CCs. This fund was created to finance purchase and marketing of cotton and was eventually linked to the financing of input/fertilizer supply. The functions of the bank pool include the following: (1) granting letters of credit for fertilizer procurement and importation; (2) financing the CCs through the SFDs to provide credit to farmer organizations or independent producers eligible for credit, based on own collaterals; and (3) financing government programs and activities based on agriculture development policy priorities.

CC Support Structures are the structures that provide technical support to the councils in determining fertilizer requirements, issuing calls to tender, performing fertilizer quality assurance and follow-up of credit for producers. Considering the lack of experience of the GIE and CCAÉ councils, since 2008/09 these support structures were filled by the CMDT and the ON for cotton and rice zones, respectively. Quality assurance is based on truth in labeling and on sampling for laboratory analysis – a practice that is sporadic due to a lack of laboratory equipment and a desire to

avoid delays in delivering the fertilizer to farmers. This is performed reactively based on requests due to suspected adulteration or in the event of litigation between the recipients and suppliers.

The Government – The government’s policy on fertilizer is to incentivize its use by reducing its price and making it accessible to producers and to reduce the cost of food production. This is accomplished through a subsidy on fertilizer and by establishing the bank pool funds for eligible importers, suppliers and farmers to access credit.

Private Importers and Distributors – In Mali, there is a dominance of two companies in fertilizer importation. After the fertilizer market liberalization, many merchants designated themselves as importers in an attempt to take advantage of the potentially profitable fertilizer importation and distribution activities. Most of them failed due to poor logistical capability, technical skills and business acumen necessary to run importation operations. Many of these companies respond to the calls to tender to provide the fertilizer needs for the GIE, CCAE and the DNA and also supply fertilizer to non-organized farmers within or outside the CMDT and ROs zones. Given the low capacity to import, some acquire fertilizer from major importers and sporadically through direct importation from regional markets.

Retail Networks – Most distributors in Mali rely on the GIE and CCAE system for the distribution of fertilizer. However, there are private small independent retail networks serving non-organized farmers within and outside the CMDT and ROs zones. Independent retailers, considered the weakest links in the national distribution network, are few in the rural areas. They rely almost entirely on their own funds for their operations, since they generally do not have access to finance partly due to their lack of business acumen. They sell fertilizer in the typical 50-kg bags or in smaller quantities. Most wholesalers and some retailers are represented by the Network of Agricultural Input Dealers of Mali (ORIAM), which is their advocacy organization that promotes the professionalization of businesses.

5.3.2 *The Fertilizer Distribution Channels*

Procurement and distribution of fertilizer is in response to the estimated demand from the cotton and rice zones and, to a lesser extent, from the non-organized sector (commercial and other grains/crops producers within and outside the cotton and rice zones). Demand estimations follow

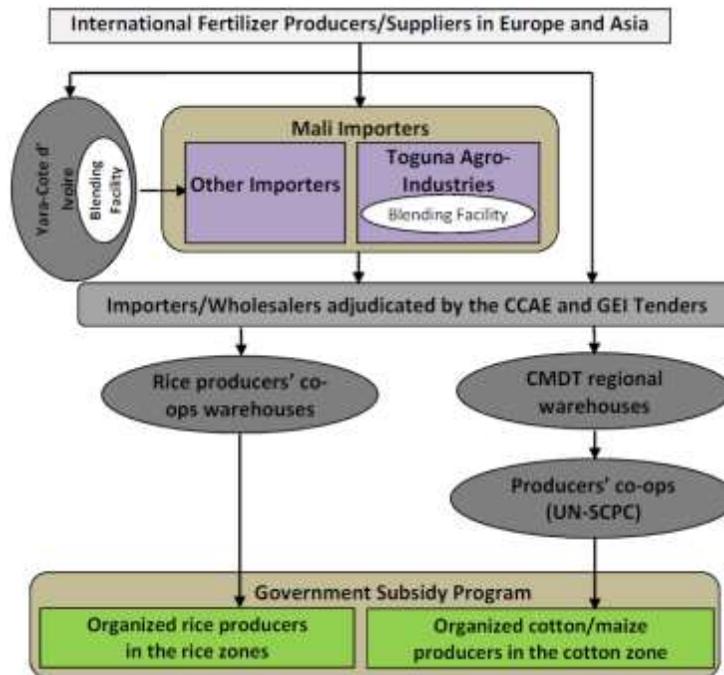
a bottom-up approach using the DNA *caution technique* before each agricultural production season. Fertilizer needs are totaled at the farmer's organization and then aggregated at the GIE and CCAE levels before issuing calls to tenders for the cotton-maize and rice zones. The intent of the tenders is for farmer organizations to benefit from favorable prices as a result of economies of scale in fertilizer procurement and importation. Once fertilizer has been imported, its distribution follows through three differentiated channels according to the management/supervisory structure determined by the production zones, the farmer organizational structure and the accessibility to credit. These channels can be categorized as follows:

- Rice production zones led by the CCAE.
- Cotton production zones led by the GIE.
- Independent small farmers/producers of staple food crops led by the DNA and commercial plantations.

Most fertilizer is distributed under the subsidized program for producers in the main production zones that are organized and eligible for credit, according to the banking system and the DNA.

5.3.2.1 *Implementing the Provision of Fertilizer in the CMDT and ROs Zones*

In the cotton zone, the provision of fertilizer is channeled through wholesalers adjudicated by the GIE tender. These wholesalers are required to deliver the fertilizer to the CMDT regional warehouses, which in turn deliver it to the cooperatives in rural villages. Cotton and maize producers collect the fertilizer from the co-ops according to their *caution techniques* and on credit. Farmers pay for the credit on fertilizer used on cotton and maize with cotton produce. In the ROs zones, the provision of fertilizer is typically by the same wholesalers as in the GIE tender. Wholesalers deliver the fertilizer directly to the rice cooperative warehouses, where it is distributed among rice producers according to their *caution techniques*. Figure 2 illustrates the cotton and rice fertilizer distribution under the CCAE and GIE systems.



Source: Fuentes et al., 2011, modified.

Figure 2. Rice and Cotton Zones Fertilizer Distribution Structure in Mali

Across the CMDT and ROs production zones, there are slight differences in the programming for the provision of fertilizer, which is linked to the management/supervision structure for acquisition and distribution and to the production support structure in place according to the agriculture activities (cotton, rice, other cereals, etc.). Programming the provision of fertilizer consists of the following phases:

- a. **Expression of farmers' needs**, which consists of filing the *caution technique* issued by the DNA through farmer organizations in the CMDT and ROs organized zones.
- b. **Centralization and validation of needs** consisting of aggregating fertilizer needs according to *caution techniques* in all production zones – activity which is typically fulfilled by the GIE and CCAE in their respective zones.
- c. **Financing** consists of searching and negotiating credit terms and adjustment of needs. The adjustments of needs and the level of finance is an intricate exercise linked to the production objectives of the government and/or the production zone, in addition to available funds from the banking pool. Fertilizer remnants from previous crop seasons are considered in these adjustments. Financing may also be adjusted based on the selection of farmers' organizations in the GIE and CCAE eligible for credit.

- d. ***Elaboration and launching of the calls to tender*** involve the analysis of the offers, selection of suppliers and designation of contracts implemented by GIE and CCAE in their respective zones. The quantity of fertilizer on the GIE and CCAE tender-bids combined represents about 50 percent or slightly more of the expressed total needs according to the DRA issued *caution techniques*. The tenders do not include non-organized farmers that lack credit, operating within the GIE and CCAE zones.
- e. ***Delivery to and reception of fertilizer*** by the CDMT and ON in their storage facilities, who also confirm the delivery and take samples for quality analysis and control, if necessary.
- f. ***Distribution and delivery of fertilizers to producers*** based on individual needs as expressed in the *caution techniques*, also supervised by the CDMT and ON, as the GIE and CCAE technical structures. If fertilizer requirements of a farmer increase after filing the *caution technique*, they have the option to purchase fertilizer in the open market at a non-subsidized price. There is also the option of waiting until all other farmers' *caution techniques* are fulfill, which is normally resolved late in the crop season when fertilizer may no longer be needed.
- g. ***Payments to fertilizer providers/suppliers***. After reception in storage facilities or after delivery to producers, payments to providers are issued through the banking system, according to the approved credit to the GIE and CCAE and against invoices and proof of delivery. The payment consists of the non-subsidized portion of the fertilizer price since the subsidized portion is paid by the government once the provider files a request for reimbursement of subsidized funds, with the *caution techniques* certified by the CDMT and ON as the GIE and CCAE technical structure of each zone.

The process of fertilizer procurement and distribution, as illustrated in Table 4, was originally envisioned and developed for the cotton zone. Consequently, it is applicable almost in its entirety to the GIE. It is partially applicable, however, to the CCAE and not applicable to the areas outside the cotton and rice zones.

Table 4. Chronogram for the Provision of Fertilizer in Mali

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

“y-1” is in reference to the agricultural season during the previous year; likewise “y” is in reference to the agriculture season in the current year.

Source: Fuentes et al., 2011.

The first few steps of the process (from expression of needs to the granting of the tenders) are done early for the cotton zone relative to the other zones; however, there is not much difference in the delivery time with the rice zones since the CMDT combines fertilizer delivery to farmers organizations and the collection of harvested cotton during the dry season, when rural roads are more accessible, and to make an efficient use of transportation by eliminating a transport leg in the process. This programming on the provision of fertilizer affects fertilizer costs and prices to the farmers, since importers procure fertilizer after they have been awarded the tender (in November-December) when prices in the international market are higher. The high cost of procurement faced by cotton producers is exacerbated by storage costs and losses since fertilizer is delivered early, months before the planting season.

5.3.2.2 *Financing Fertilizer in the Cotton and Rice Zones*

Financing is an integral part of the subsidized fertilizer supply in Mali. Financing and the distribution of credit follows the fertilizer distribution channels, taking in consideration whether producers are organized or not under the production zones/management structures (GIE, CCAE and DNA). Sources and methods of finance at different levels are described below. Under the GIE and CCAE, financing takes place at three levels:

- a. ***Financing for procurement of subsidized fertilizer*** – Providers responding to the calls to tender are required to make bank deposits on behalf of the organization making the call (GIE or CCAE) to support their application and as an indication of intent to deliver. To meet this requirement, these providers request and negotiate from their banks or the banking pool (led by the BNDA) the opening of a line of credit and of Letters of Credit to purchase fertilizer in the international market. Backed with these documents, the selected providers import fertilizer and deliver it according to the contracts (i.e., to CMDT warehouses). After delivery, providers submit invoices to the CCs (GIE and the CCAE) with proof of delivery endorsed by the respective technical structures (CMDT and ON). In turn the CCs gives the bank (Malian Solidarity Bank [BMS] or the BNDA) clearance to pay the provider according to the previously negotiated credit between the CC and the bank.
- b. ***Financing The Central Commissions (GIE and CCAE)***, consists on the acquisition of funds to pay fertilizer providers/importers, on behalf of affiliated farmer organizations, once fertilizer been delivered. In the case of the cotton zone, the GIE is responsible for borrowing funds on behalf of the affiliated farmer organizations and for repayment of loans backed by a government guarantee.

The distribution and recuperation of the GIE bank credit is done through its technical structure (CMDT), which is also in charge of supervising the proper use of fertilizer. In the cotton zone, the cooperative members collect the harvest from the farmers. The CMDT, with a credit line from the banking system and using its own transportation, collects the cotton from the cooperatives, processes it and sells it in the international market. The CMDT revenues are deposited in the MBS, which then transfer the funds to the BNDA after recovering the marketing credit provided to CMDT. The BNDA, after recouping the credit provided to the

farmer organizations to finance the purchase of fertilizer, makes payments to the producer cooperatives, which in turn pay the differential to producers.

Credit to farmers under the CMDT is determined by the type of farmer and their level of production. Based on the expected planted area and the farmer's production history, CMDT estimates expected yields and production to calculate the output value considering the current year output price and provide up to 60 percent of the estimated output value as inputs credit.

- c. *Direct financing to producer organizations for the acquisition of fertilizer* is more generalized and common in the CCAE production zones. In this case, financing is made directly by the banking system: banking pool through the BNDA, MBS or through the re-financings of SFDs. This last option is preferred by banks since it is a less risky option.

The CCAE pools the fertilizer needs of selected organizations based on their credit worthiness to achieve economies of scale and launches the calls to tenders with the intention of negotiating better prices. The CCAE also selects the providers and issues the contracts. However, although the tender contractual agreement is between the providers and the CCAE, it is not the CCAE but rather the selected producer organizations or cooperatives that are responsible for requesting credit to pay providers and to repay credit to the lending institutions. The credit-worthiness of an organization is based on the proportion of members with unpaid debts.

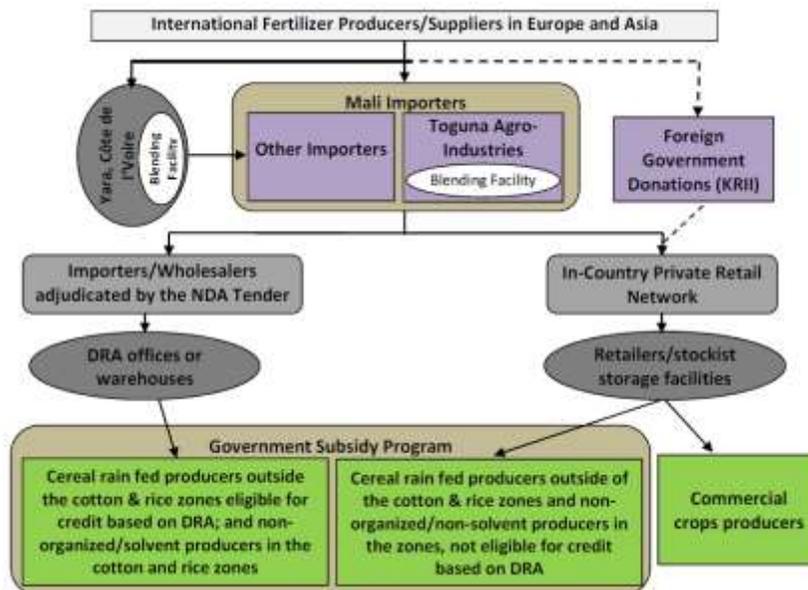
Once the fertilizer is delivered to the producer cooperatives, they are responsible for paying the total cost of fertilizer (including the subsidized part of the price) to providers/importers with a previously negotiated line of credit from the SFD. The co-ops are also responsible for recouping the credit from the farmers and paying the loans back to the SFD. However, farmer organizations under the CCAE are only required to pay the non-subsidized component of the fertilizer price. Therefore, it is the responsibility of the SFD to recoup the government subsidy, incurring additional administrative expenses and financial cost, which the SFD transfers to borrowers in the form of higher interest rates.

5.3.2.3 *Implementing the Provision of Fertilizer to Non-Organized Farmers and Those Outside the CMDT and ROs Zones*

This provision is facilitated by the DNA, mainly to cereal producers (maize, rice and wheat, sorghum, millet) outside the main cotton and rice production zones, and to non-organized and non-eligible for credit farmers within the rice and cotton zones. Some of these farmers may be eligible for credit according to the DNA. Under this system, subsidized fertilizer is supplied through the national retail private network in the open market.

In an effort to ensure access to subsidized fertilizer by these producers, the DNA facilitates the supply by providing importers and distributors with the potential needs based on the *caution techniques* and other estimates, leaving the procurement and distribution of fertilizer to providers' own initiative and entrepreneurship. The DNA encourage suppliers to make fertilizer available to producers by assuring the reimbursement of the subsidized component for the fertilizer sold.

The DNA estimates these farmers' fertilizer needs with the collaboration of the DRAs for farmers outside the rice and cotton zones, and with the collaboration of the CMDT and ROs for the non-organized farmers within the cotton and rice zones. The participating wholesalers are typically the same as in the cotton and rice tenders. The provision of fertilizer under the DNA system is dominated by Toguna Agro-Industries. Figure 3 illustrates fertilizer distribution for farmers under the DNA system.



Source: Fuentes et al., 2011, modified.

Figure 3. Fertilizer Distribution Structure Under the DNA System

Despite the DNA efforts, the portion of fertilizer being supplied in an “open” market is considered negligible, since this market consists mostly of non-organized subsistence producers of staple food crops within and outside the main production zone. These are producers typically located in marginal lands, facing adverse climatic conditions that determine their level of risk in production and consequently are cash poor – conditions that deter suppliers from providing fertilizer. The lack of or no access to credit by most farmers is a further deterrence to importers and suppliers to provide additional fertilizer outside the GIE, CCAE and the DNA tenders. Consequently, independent small farmers, producers of staple and food crops, whether within or outside the main production zones, must acquire their fertilizer directly from the private sector distribution network. Some of these farmers may include producers of commercial crops, which explains why some of the subsidized fertilizer destined for the production of food crops may be diverted to the production of commercial crops.

In the DNA system, the provision of fertilizer include the following phases:

- a. **Expression of farmers’ needs**, which consists of filing the DNA *caution technique* through the DRA and with the support of farmer organizations in the CMDT and ROs organized zones.

- b. ***Centralization and validation of needs*** consists of aggregating fertilizer needs according to *caution techniques*, done by the DRA outside the main production zones and with the support of the CMDT and ON for non-organized farmers within their respective zones.
- c. ***Financing*** for non-organized farmers within and outside these zones is the responsibility of the individual farmers who typically need collateral in order to gain access to finance if not eligible for partial credit by the DNA.
- d. ***Elaboration and launching of the calls to tender*** in the areas outside the cotton and rice zones. There is a mix of non-binding calls to tender organized by the DRA and a non-tender provision by private distributors according to their entrepreneurial attitude, whom are assured the subsidy payment per bag of fertilizer sold. The GIE and CCAE tenders do not include the needs of non-organized farmers operating within their respective zones that lack credit.
- e. ***Distribution and delivery of fertilizers to producers*** is an open market activity according to the needs reported by the DNA based on the *caution techniques*.
- f. ***Payments to fertilizer providers/suppliers*** after the sale of fertilizer, against invoices and proof of sale. The payment consists of the subsidized portion paid by the government once the provider has filed a request for reimbursement of subsidized funds with the *caution techniques* certified by the DRA.

In the DNA system, the supply of fertilizer remains unpredictable. For these farmers, access and use of fertilizer are considered distant needs because of high cost, lack of credit and, in most cases, the precarious conditions of production which explain in part the lack of interest in using fertilizers by producers, and for the low or nonexistent demand and supply in these zones. In addition, the delivery and availability of fertilizer happens late in the season (July to August) after the needs of producers in the organized cotton and rice zones have been met. Even if they have purchasing power, by then it is too late for the crops to make the most effective use of fertilizer. These conditions deter financial institutions from providing credit, compounding the lack of interest by the producers to use fertilizer.

5.4 Financing Fertilizer in the DNA System

Under the DNA system, there have been two scenarios in financing the procurement and distribution of fertilizer through special government programs:

- a. For many years, the provision of subsidized fertilizer was dependent on aid from Japanese Second Kennedy Round (2KR) donations. This fertilizer was sold through the local distribution network or distributed by the CMDT or ON on credit or against cash payment from farmers.
- b. The Rice Initiative (RI), a government program implemented in response to the 2007-08 food and oil crisis, expanded the subsidy on fertilizer to cotton and other food crops. Under the RI, the government, through the DNA, provided interest free credit for the out-of-pocket/cash component of subsidized fertilizer in addition to the price subsidy to non-organized farmers deemed eligible for credit by the DRA. This includes farmers under rainfed production systems within or outside the rice and cotton production zones. Under this arrangement, the DRA determines the needs of fertilizer to be subsidized based on the farmers *caution techniques*, issues non-binding calls to tender and provides credit-in-kind with fertilizer to the selected producers. The maximum credit provided to eligible producers is the equivalent to the out-of-pocket/cash component of subsidized fertilizer. This credit does not have collateral and is made against producers promise and commitment to reimburse the loaned amount, which can also be an in-kind payment.

Payments to fertilizer providers for this credit (the out-of-pocket/cash component paid by farmers) is made by the MoEF, channeled through the BNDA's banking pool and authorized by the DNA. For providers to recoup the government-subsidized portion of the price, they must follow the same process as with the GIE and CCAE, which consists of submitting a request to the DNA for reimbursement of subsidized funds with the *caution techniques* certified by the technical structure (DRA, in this case). In turn, the DNA gives clearance or authorizes the bank (BNDA) to pay the provider with government funds from the banking pool.

Outside the GIE, CCAE and DNA systems, there is another funding source by means of farmers' own resources to purchase fertilizer in the open market. This includes:

- a. Producers not organized because of their weak production capacity, because their precarious production conditions and/or the lack of credit.
- b. Producer ex-members of indebted farmer organizations, considered "not eligible for credit" by the banking system and the DRA.
- c. Large producers who can purchase fertilizer on their own without bank finance.

In general, non-organized producers who are not eligible for credit and do not have their own funds are officially excluded from the price and supplemental credit subsidies and therefore do not have access to fertilizer; although there has been some interest in looking for ways to provide access to fertilizer to producers under this last category, through self-financing by providing incentives to saving.

6. Estimating Fertilizer Requirements in Mali to Meet PNISA Targets

In this section, we estimate quantities of fertilizer required to meet the agricultural production targets, as stated in the PNISA, to achieve the GoM agriculture sector growth goals. For these estimates, first we determined the difference between the 2008-12 average and the targeted crop production levels based on the PNISA sector average growth of 7 percent by 2017-18 (Table 5); with specific rate growth rate of 7.3 percent for cotton, 7 percent for rice and 7.7 percent for all other [non-cotton non-rice crops]. We then estimate additional and total fertilizer nutrients required to achieve the PNISA increased production targets. According to these estimates, assuming no significant change in cultivated area, crop yields and especially production would need to increase about 38 percent, equivalent to more than 2.6 million mt of produce relative to 2008-2012 average levels, to meet the 2017-18 PNISA targets (Table 5).

The crops included in Table 5, selected based on available data, represent 93 percent of 2008-2012 average planted area and 80 percent of output as reported in different sources, including the Ministry of Rural Development (MoRD) and FAOSTAT data. These data and statistics include

cereals, pulses and legumes, roots and tubers, fruits and vegetables in addition to cash, commercial and export crops (cotton, peanuts, sugarcane and sesame seeds, among others).

Table 5. Yield and Production Differences Between 2008-12 Average/Base and Estimated Targets According to PNISA Growth Rates

Major Crops	2008-12 Average Cultivated Area	Yield		Production		
		2008-12 Average	Average 11 years (2013-25) Annual Growth (PNISA Target: varied)	2008-12 Average	PNISA 2018 Target	Targeted Increase 2012-2018
	(ha x 10 ³)	(mt/ha)		(mt x 10 ³)		
Millet	1,558	0.9	1.4	1,372	2,135	763
Sorghum	1,045	1.1	1.7	1,180	1,797	617
Rice, paddy	585	2.8	3.2	1,624	1,893	268
Maize	491	2.6	4.2	1,292	2,074	783
Fonio	36	0.8	0.5	29	19	-10
Wheat	6	3.6	4.1	22	25	4
Groundnuts	346	0.8	0.8	263	266	3
Cowpeas	256	0.5	0.8	141	199	58
Potatoes	5	21.0	26.1	95	119	23
Tomatoes	3	13.8	20.4	37	55	18
Cotton	397	1.0	1.2	397	463	66
Sugarcane	5	73.1	74.7	365	373	8
Totals	4,733			6,818	9,418	2,601

Source: Authors' calculations based on data from FAOSTAT, 2014.

6.1 Estimating Fertilizer Use on Selected Crops Using Nutrient Removal Approach

In estimating the amount of fertilizer needed to achieve the PNISA production targets there are several approaches including simulation models tailored to particularities of the country's agro-climatic zones, taking in consideration soils characteristics, rain patterns and crop varieties among other characteristics. Considering that specific data for the different production zones and regions in Mali are not ready available, this study used the Nutrient Removal Approach using nutrient removal factors as found in the literature. The basic assumption of this approach is that, to avoid soil depletion or at least sustain certain level of yields, nutrients removed by the crops during a season must be replaced for the next crop cycle – implying that incremental yields will demand incremental amount of fertilizer nutrients. Under this approach, we further assume good soil and crop management practices for an efficient use of the applied fertilizer nutrients. Table 6 presents the incremental amount of nitrogen (N), phosphate (P₂O₅), potash (K₂O) and total nutrients

[combined] required to achieve the incremental crop yields and production and meet the PNISA targets (final column of Table 5). These figures are converted into fertilizer product equivalents (Table 7), with adjustments using efficiency recovery factors for N, P₂O₅ and K₂O, assuming also the use of traditional fertilizer products and crop production technology. This approach does not take in consideration the nutrients that may remain in crop residues and be reincorporated into the soil after harvest.

Table 6. Nutrient Removal by the Incremental Production Needed to Meet PNISA Targets

Key Crops	2012 -17 Incremental Crop Production (mt x 10 ³)	Nutrient Removal			Total Incremental Nutrient Removal (mt x 10 ³)
		N	P ₂ O ₅	K ₂ O	
		(mt x 10 ³)			
Millet	763	14.63	5.51	3.35	23.49
Sorghum	617	10.24	4.18	2.55	16.97
Rice, paddy	268	3.30	1.56	1.30	6.16
Maize	783	11.08	4.85	2.81	18.74
Fonio	-10	-0.19	-0.07	-0.04	-0.30
Wheat	4	0.08	0.03	0.02	0.13
Groundnuts	3	0.12	0.02	0.02	0.16
Cowpeas	58	2.17	0.62	0.95	3.74
Potatoes	23	0.00	0.08	0.03	0.12
Tomatoes	18	0.02	0.01	0.05	0.08
Cotton	66	1.62	0.71	0.96	3.28
Sugarcane	8	0.01	0.01	0.01	0.03
Totals	2,601	43	17	12	73

Source: Authors' calculations using estimated nutrient content of crops based on MINAGRI production statistics.

According to results presented in Table 6, to achieve an increment on crop output (for crops included in Tables 5 and 6) equivalent to 2.6 million mt, will require 73,000 mt of nutrients combined (43,000 mt N, 17,000 mt P₂O₅ and 12,000 mt K₂O). Considering the typical fertilizer use efficiency using traditional fertilizer products and crop production technologies, this requirements increase to 153,000 mt of nutrients. Table 7 below presents the nutrient requirements in the last column of Table 6, adjusted for fertilizer use efficiency and then expressed as metric tons of fertilizer products.

Table 7. Incremental Nutrient and Product Requirements

Crop Categories	Nutrient*	Product
	(mt x 10 ³)	
a. Total Crops in Table 6	153	304
b. All Crops (Table 6 including others not shown on table)**	164	325

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

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

** Since crops in table 6 represents 93 percent of the total reported crop area, Nutrients and Products in row "a" are multiplied by a factor of 1.07 to estimate the fertilizer needs for all reported crops in different sources.

According to estimations as presented in Tables 5-7, the additional amount of fertilizer nutrients necessary to meet the PNISA targets of increasing agricultural production from 2008-12 average to estimated levels for crops in Table 5 will require a gradual increase in consumption of 153,000 mt of N, P and K nutrients, which is equivalent to about 304,000 mt of fertilizer product (urea, DAP and MOP) combined, representing about 1.2 times the current consumption in Mali of about 250,000 mt (according to Toguna Agro-Industries and the DRA). This is for an estimated total of nearly 554,000 mt of fertilizer product which is more than double the current fertilizer needs to achieve the PNISA target by 2018.

7. Identified Key Constraints and Bottlenecks in the Malian Fertilizer Market

7.1 High Finance Costs and Poor Access to Credit

According to findings based on interviews during the country visits, the main issue facing the fertilizer distribution network and supply chain in Mali is the cost of finance and access to credit. This is in spite of the government facilitating financing through the bank pool at reasonable interest rates. Perhaps the main reason for the high cost of finance is the result of the structure for procurement and distribution which introduces a larger number of layers relative to an open market system. This situation increases the cumulative cost of credit and at the same time may introduce operational inefficiencies. Farmers do not have access to the relatively low interest rate paid by GIE and CCAE to the bank pool. By the time the credit reaches the farmers, the rate has suffered increases from these intermediary structures, the cooperatives to which farmers are affiliated and

by the intermediary financial institutions (SFDs), if applicable, for all of them to cover their operational expenses and in some cases, profits.

To fund procurement and distribution, domestic businesses face a higher interest rate from the banking pool. Finance for importation and distribution, especially when sourced from the banking pool, is coupled with the subsidy program and for the organized cotton zones' tenders. Non-cotton activities must acquire finance from the banking system outside the bank pool, facing a much higher interest rate – between 10 and 25 percent. In addition, some national distributors and retailers, especially those serving producers outside of the organized cotton and rice zones, seldom have access to finance. This provides less incentive for the expansion of the private distribution/retail network. Furthermore, since credit is limited to organized farmers located within the main cotton and rice production zones, fertilizer use by non-organized farmers who are located within and outside these zones is restrained, further constraining the expansion of the distribution and retail network.

7.2 Degraded Roads, Infrastructure and Transportation Equipment

Transportation is another major cost which affects the profitability of fertilizer distribution while increasing the price paid by farmers. In Mali the most used mode for domestic transportation is by trucks; however, as a consequence of poor and deteriorated road conditions and equipment resulting from typically overloaded trucks and dependence on imported oil, high transportation costs are prevalent.

These high transportation costs add considerably to the overall domestic fertilizer supply costs, influencing the price paid by consumers. Mali and the WA region potentially have an alternative inland transportation mode that could be cheaper than truck transportation – railroad. Mali imports fertilizer mainly through Senegal and Côte d'Ivoire. Both countries have a railroad system, however, the only direct rail link between Dakar in Senegal to Bamako has not been fully operational for many years. There is no direct link from Abidjan in Côte d'Ivoire to Bamako except through Burkina Faso and then by truck to Bamako – an operation which may not be efficient considering the additional loading and unloading activities to and from rails and trucks, increasing transportation cost. Consequently, all fertilizer currently imported in Mali, whether from Dakar or

Abidjan ports, is transported by trucks. Trans-border crossings add substantially to the transportation cost, due to distances and road conditions in neighboring countries, but more so, due to the slow and burdensome process to clear the entry of fertilizer products at the border crossings.

7.3 Lack of a Regulatory Framework and of Enforcement Institutions

Despite Mali having a fertilizer quality control law, it is not regulated neither enforced. Samplings for quality testing are expected to be performed at importation. However, tests are typically performed in reaction to complaints from producers or farmer organizations and in laboratories outside the country. There is no testing of blended fertilizers either at wholesale or retail, due to lack of enforcement institutions with trained personnel and well-equipped independent laboratories. Consequently, there is perceived low quality and dubious truth-in-labeling (nutrient content, net product weight and physical qualities) among farmers, especially for blended products. In addition, farmers mistrust recommended fertilizer formulations and quantities, which are based on outdated research, further deterring the use of fertilizer.

It is important to point out that because of the dominance of the informal sector in the market, the implementation of any regulatory and enforcement system will bear heavily on the relatively small formal private sector. Thus, there is a need for the government to initiate a process to transform the economy and reverse the dominance of informal to a formal economy.

7.4 Low Farmers' Demand

Although the subsidy program has provided an incentive to increase consumption of fertilizer at the farm level, this policy does not seem to be fully achieving the intended purpose. Farmers are unwilling/unable to purchase non-subsidized fertilizer at full market price because of production (weather related) and market risks. The lack of sufficient research and extension on updated farming practices and other input technologies make matters worse.

Crop responses to fertilizer applications are typically much higher when used in combination with other improved technologies and practices, such as the use of crop varieties highly responsive to fertilizer. Because of the combination of technological packages and crops

grown can be quite distinctive across different agro-ecological and climatic zones, the lack of agricultural research and extension in Mali, especially outside the rice and cotton zones, has become a critical constraint for increasing fertilizer demand among a majority of food staple crop producers. The same can be said about access to output markets and other agricultural and rural support services. Non-organized small farmers outside the main production zones face the higher risk of erratic weather conditions (lack of rain and/or high temperatures) during the cropping season, and also market risk because they do not have access to physical markets nor to market information in terms of input or output prices and demand.

7.5 Undeveloped Domestic Distribution/Retail Network

The task of developing the distribution network down to the farmer has been left to a more competitive but weak domestic distribution private sector, national investors and small rural entrepreneurs. As previously stated, these entrepreneurs are not receiving the proper economic and financial incentives; instead, they are facing adverse conditions such as the lack of access to credit and logistics infrastructural constraints with a seemingly low profit margin. In the process, the expansion of the domestic fertilizer distribution network is being restrained.

These adverse conditions increase risk and costs faced by the domestic distributors and retailers outside the main production zones. Unfortunately, the current policy framework in Mali has not addressed these constraints directly. Even if the fertilizer reaches some of the rural retailers, most of them still lack sufficient technical product skills for advising producers and business acumen for marketing the products, despite past efforts of organizations (e.g., IFDC and CNFA) to address this issue. Moreover, lack of adequate access to markets introduces additional risks and costs to the already high marketing and distribution costs agro-dealers must absorb, also restricting expansion of demand for fertilizers.

7.6 Other Constraints

The structures for acquisition of fertilizer in Mali are based on calls to public and private tenders, activity that helps determine retail prices and requires a substantial amount of capital and logistics. This structure adds layers to the process, which may bring inefficiencies to the system and increases the cost of procurement and distribution. In addition:

- a. Tenders are not generalized, but based on the needs of organized farmers in the CMDT and the ON zones only, excluding farmers within and outside the cotton and rice zones considered “not solvent” or ineligible for credit. According to the DNA *caution techniques*, nearly half of actual fertilizer needs are represented in this group. Given these unmet needs, the GoM has partially addressed this issue through the DNA by providing “in-kind” credit to eligible farmers according to the DRA criteria, but much more needs to be done to have a greater coverage of these unmet needs.
- b. The tender processes and the subsidy program provide incentives to import only subsidized fertilizer and importers may or may not import extra quantities to supply unforeseen needs and those of producers outside the tenders. Some non-organized producers may have their own funds to purchase fertilizer in the open market, especially if it is subsidized and available.
- c. In the cotton zone, the most important issue with financial implications concerns the delivery of fertilizer to producers. This is the result of a dual transport strategy from the CMDT, which delivers fertilizers to farmer organizations at the same time that it collects the cotton from the villages (for processing and marketing), avoiding a “dead transport leg” to reduce cost. The problem with this dual transport is that timing of fertilizer delivery does not coincide with the needs for application, which happens months after delivery. The late delivery affects farmers because of additional financial and storage costs and storage losses.

In addition, as a result of dual transport, payments to fertilizer suppliers for fertilizer delivered during previous crop season are late, delaying their debts cancellation to the financial institutions and adding to the cost of their credit. Farmers must also wait until the next crop season for revenues from the previous season to cancel their debts. Farmer organizations, recipients of the fertilizer and those who are responsible for farmers’ debts, do not deliver the new fertilizer to farmers or issue new loans until all debts from the previous production season have been paid. During the 2008/2009 production season, this practice caused a deficit of about 1 billion CFA francs (\$2.2 million) to CMDT due to early fertilizer delivery and late payments to farmers.

- d. Delays in subsidy payments to importers and financial institutions for the fertilizer sold, a process that is administratively cumbersome, can take up to a year or more. This delay adds to

financial costs, which in the case of the savings and loans during the 2009 cropping season, meant an increase of about 175 CFA (U.S. \$0.38) per 50-kg bag.

8. Policy Implications and Recommendations

In this section, we offer what we believe are the most critical actions needed to improve fertilizer markets and increase consumption, given the key constraints and bottlenecks highlighted in the previous section. As most countries in the WA region, Mali has a great potential to increase productivity through the use of fertilizer, other inputs and best management practices, especially along the Niger River delta and in the southern region of the country. However, as long as fertilizer and other input prices remain high and not accessible, usage is expected to remain low, and the government will be compelled to continue with subsidies. Consequently, it is critical to consider other complementary policy measures, not only to increase the effectiveness of the subsidy program and the efficiency of fertilizer use by farmers, but perhaps more important, to reduce or eliminating unnecessary transaction costs along the input supply chain. This can be done by promoting broader policy reforms and longer term investments to stimulate sustained growth and commercialization of smallholder agriculture in Mali. In the interim, this process can increase the effectiveness of the subsidy program in terms of delivery and outcomes.

Fertilizer alone will not bring about the ambitious GoM goal of increasing agriculture production by 38 percent by 2018. In addition to fertilizer, it is also necessary to incentivize the use of improved genetic material that will make more efficient use of the subsidized input, coupled with an effective extension/education service to better use these inputs. These measures combined are expected to help improve the effectiveness of the subsidy program and the efficiency on fertilizer use. These are minimum recommendations in addition to development of road infrastructure and improvement of financial markets to facilitate credit and to further incentivize farmers to increase inputs use.

8.1 Creating and Establishing a Conducive Policy Environment for Investment

Mali must continue with the stabilization of the macro-economy to promote business confidence by creating an environment conducive to nurturing and developing the domestic fertilizer private distribution network. It is important for the government to maintain macro-economic stability and increase the availability of funds in the economy while maintaining a low interest rate. A related policy measure calls for the GoM to initiate plans to formalize the economic activities in the market.

Entrepreneurs are unlikely to invest in the fertilizer and input distribution business if there are risks, unnecessary extra costs and the absence of regulations and enforcement for better competition. Allowing for greater competition in fertilizer importation and distribution is expected to increase larger supply and demand (use) of fertilizer. Key to this process is to eliminate the tenders, to allow importers and distributors to compete in a more open market and to increase access to credit for input business development and for fertilizer use by farmers within and outside the main production zones. Farmers should have the freedom to purchase fertilizer at the lowest market price possible, resulting from larger competition.

Because of the volatility in global fertilizer prices, the GoM should re-evaluate the subsidy program and introduce mechanisms to tie the subsidy with the volatility in the fertilizer global market. Perhaps more important is to assess the affordability of continuously financing fertilizer subsidies vis-à-vis its current revenues and expenditures, which can result in an unsustainable fiscal imbalance. However, if the government is compelled to maintain or reintroduce a subsidy program, it should be for a limited time, better targeted to the needy farming population and to extend it to cover other inputs. This is in addition to funding complementary services like technical assistance and increasing access to output markets. Targeting and setting a time limit on the subsidy program can help to make the subsidy more effective and reduce the chances of fiscal imbalance. However, these measures alone may not achieve the expected effect of increasing fertilizer consumption and boosting production unless the government implements additional and complement policies at the macro- and micro-levels.

8.2 Increase Investments in Infrastructure and Transportation

The undeveloped input fertilizer market in Mali is inherently tied to the high cost resulting from poor and deteriorated infrastructure (mainly inland roads and railroads) and transportation equipment, restricting the development of input and output. Developing water conservation projects for irrigation and constructing storage facilities for input and output (to hedge against seasonal price risks) will incentivize intensification and higher productivity, which will cause a higher use of fertilizer and other productive inputs.

Upgrading and maintaining the existing roads, construction of new rural feeder roads and speeding up the implementation of maximum truck axle load regulation are necessary to maintain the existing road conditions and extend the life of transportation equipment. Policy measures to incentivize private-public partnerships (PPPs) should also be considered for the larger private sector traders to invest in rural infrastructure and upgrade transportation equipment. New rural feeder roads will help eliminate, or at least reduce, the isolation that characterizes some remote rural areas allowing farmers to have better access to local and urban markets to sell their surplus, increase their income and eventually incentivize local entrepreneurs to expand their input retail business and bring fertilizer nearer to farmers.

The improvement of rail infrastructure and upgrading equipment can have an impact in reducing overall costs of importing fertilizer and for providing output access to domestic and foreign markets. It would also provide a competitive advantage for exports, especially for high value perishable goods. Because railroad infrastructure connects various countries in the region and has the potential to facilitate intra-regional trade, this recommendation calls for country specific and regional commitment, efforts and actions.

8.3 Promoting and Improving Smallholder Agricultural Intensification

Investments and policy reforms that lower fertilizer supply distribution costs, while improving market performance, do not guarantee a dramatic increase in demand for fertilizers without other complementary investments on the demand side. For example, a critical demand-side constraint is not having adequate access to technical support services such as research extension and market information. Teaching the proper use of fertilizer with improved crop

varieties for higher fertilizer response, and expanding the existing market information systems, can also lead to greater agricultural intensification and increase the use of agro-inputs including fertilizer – especially among non-organized farmers located outside the main production zones. An alternative or complement to the fertilizer subsidy program is to offer complete technological package, to include, for example, technical assistance and incentives for purchasing complementary inputs such as seeds, pesticides and minor equipment. Crop insurance instruments should also be considered as part of the complete technological package.

Farmer involvement in the design and implementation of research and development is important to address their specific needs for an effective and efficient use of modern inputs suitable to their local agronomic and socio-economic conditions and for better extension service. This approach not only creates better links between researchers, extension agents and farmers, but also empowers farmers to participate more actively in the market place, both as buyers of inputs and sellers of output. The inclusion of agro-dealers in trainings related to the use of inputs and on business management extends links between farmers and input dealers. For fertilizer use in particular, sufficient research should be dedicated to providing specific recommendations for different environments and cropping systems.

8.4 Strengthening the Institutional and Regulatory Environment

Certain regulatory and institutional reforms are also needed, particularly those affecting market competition and efficiency, which are restricting the expansion of the domestic fertilizer trade. It is important for the GoM to recognize that quality control and truth-in-labeling are a problem and critical for proper market development, particularly when it is becoming more dynamic, as it is in Mali. Fertilizer users must be assured that the agricultural inputs they purchase are not nutrient-deficient, adulterated or sold in short-weight bags – reasons why it is necessary to start enforcing laws in rural areas to protect consumers, producers and merchants. To achieve this, the GoM needs to enact and pass fertilizer regulations in support of the approved law, along with building the proper institutions for enforcement (i.e., a well-equipped and staffed laboratory). In addition, to make any law and regulation effective and enforceable, it will be necessary for the government to initiate a process of formalizing the businesses, since most of them, including many in the input and fertilizer distribution, seem to be operating in the informal sector of the economy.

8.5 Financial Reform

Reforms should also be explored in the area of finance to ease the availability of credit, especially among domestic entrepreneurs for input distribution and warehousing. Options include increasing the bank pool and guarantee fund and expanding it to allow other businesses outside the cotton sector to access it in order to support of those businesses trading fertilizer and other agricultural inputs in neglected rural areas. Policies in support of further developing local financial markets, institutions and financial instruments (special savings accounts and loans for agriculture, crop insurance instruments, etc.) into rural areas could go a long way in helping the growth of the domestic fertilizer retail industry. Special savings accounts and incentivizing a culture of savings among small farmers would open the way for increasing the number of farmers capable of accessing credit for purchasing inputs and fertilizer. Because there are often high climatic production risks – normally associated with rainfall uncertainty – complementary incentives may also be needed to lower such risks, including the development and implementation of [indexed] crop/weather insurance. These instruments will help farmers hedge against the inherited risk associated with agriculture production and to protect financial institutions' lending portfolios. Essential to this process is to enact and implement a microfinancial institution law and regulations to protect them and give confidence to investors and the farming population.

8.6 Other Recommendations

Should the government maintain the subsidy on fertilizer, as expected, there are various issues that must be addressed:

- a. If the tender is not generalized or eliminated to allow for greater market competition, the government should implement measures to speed up a rather slow and bureaucratic tender bid process. Between the expressions of interest and the assignment of tenders, there seems to be a substantial price differential in the fertilizer international market compared to the lowest price of the year. Therefore, the tender should be assigned during the time when international prices are at their lowest. To achieve this, it is necessary to expedite the tender process, which currently takes about six months between the time of call to tender, the assigning of contracts and the delivery of fertilizer to producers.

- b. Government should regulate in favor of farmers to shield them against practices that, although might be unintentional, create financial burdens to farmers, such as the CMDT early delivery of fertilizer and late payment to farmers for their output – situations that further increase the overall inefficiency in the fertilizer and output markets.
- c. At the same time, GoM should expedite the payment of subsidies to supply players in efforts to reduce their financial burden, which may reduce cost and perhaps the delivery price of fertilizer to farmers.

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