



BACKGROUND PAPER

Agricultural Input Supply

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ACRONYMS

AFAP: African Fertilizer Agri-business Partnership

AfDB: African Development Bank

AfSIS: Africa Soil Information Service

AGMARK: Agricultural Market Development Trust

AGRA: Alliance for a Green Revolution in Africa

APCs: Agri-business Partnership Contracts

AU: Africa Union Commission

CIMMYT: International Maize and Wheat Improvement Center

COMESA: Common Markets for East and South Africa

EAC: East Africa Community

ECOWAS: Economic Commission for West Africa States

FANRPAN: Food Agriculture & natural resources, Policy Analysis Network

FARA: Forum for Agriculture Research in Africa

FO's: Farmers Organizations

FO'SCA: Farmers Organizations Support Center for Africa

GDP: Gross Domestic Product

ICRISAT: International Crops Research Institute for the Semi-Arid Tropics

IFA: International Fertilizer Association

IFDC: International Fertilizer Development Center

IFPRI: International Food Policy Research Institute

MFI: Microfinance institutions

NARS: National Agricultural Research Systems

NEPAD: New Partnership for Africa's Development

NGO: Non-Governmental Organization

OCP: Office Chérifien des Phosphates

P4P: Purchase for Progress

R&D: Research and Development

SAPs: Structural Adjustment Program

SADC: Southern Africa Development Community

SSA: Sub-Saharan Africa

WFP: World Food Program

EXECUTIVE SUMMARY

Over the past decade, a number of sub-Saharan African (SSA) countries have seen an upsurge in agricultural productivity (measured as yield per unit of area) driven by increased usage of higher-yielding seed, fertilizer and other inputs, along with better agronomic practices. Such changes in farming practices were early drivers of Green Revolutions in Latin America, India, and Southeast Asia, raising the hopes that Africa's moment for agricultural transformation may have at last arrived. The increased adoption of productivity-boosting inputs has been largely driven by private, local agri-businesses, including private, independent seed companies, fertilizer importers and distributors, and village-based agro-dealers who have learned to view Africa's smallholder farmers as potential customers for their products and services. Africa's governments have responded, in some cases providing welcome subsidies for fertilizers, made available to farmers via private distribution channels.

Full transformation of African agriculture requires major investments in growing these nascent input supply chains of improved seeds and appropriate fertilizers for smallholder farmers. In spite of the progress made, Africa's crop yields remain several orders of magnitude below the rest of the world. Although the usage of improved seeds and fertilizers has grown in several countries in the last decade, much remains to be done to broaden input markets and increase the range of solutions they provide.

Increasing uptake and adoption of improved seeds and fertilizers requires addressing several inter-related factors, including:

- i. Growing seed and fertilizer companies that can carry improved seeds and appropriate that are appropriate for different agro-ecologies and farming systems
- ii. Creating mass awareness of the benefits of the use of improved seed and fertilizer (plus lime for highly acid soils) through on-farm demonstrations and farmer-to-farmer learning.
- iii. Improving the availability and access to the inputs in rural areas by expanding the networks of agro-dealers.
- iv. Improving access to affordable credit from financial institutions for farmers and agri-businesses (input suppliers, agro-dealers, grain merchants, and processors). We should find and deploy creative ways for public funding to unlock private capital: underwrite, incentivize, support and leverage. However, subsidies (in any) should not distort the market.
- v. Strengthening the capacities and capabilities of the national research systems to develop appropriate and high yielding varieties and good agronomic practices to go with them in different agro-ecologies and farming systems
- vi. Grow public-private partnerships by organizing regular national and regional agribusiness forums along key value chains that bring the public, private, farmers and the development community together to dialogue, showcase and do business.
- vii. Providing an enabling policy environment for the private sector to grow and develop farmer-friendly solutions. At regional level, there is need to support the quick domestication of harmonized regional seed and fertilizer regulations in the EOWAS, COMESA, SADC, and EAC. This needs to be accompanied by political leadership and positive communication towards high productivity agriculture and 'farming as a business' by smallholder farmers in Africa. This should along with the promotion of commercial farming wherever possible. Promote messaging on private sector-driven, public sector support. Such leadership should also sanction political statements and directives that run counter to open trade in agricultural inputs and commodities.

Market access is important for these interventions to be sustainable. In particular, we recognize the need to open borders to regional agricultural commodity trade to expand markets, thereby stimulating demand for quality inputs. But the comprehensive coverage of market access interventions, and they are many, is beyond the scope of this paper.

It is worth noting that governments and their partners, including the Alliance for a Green Revolution in Africa (AGRA), have over the past 8-9 years rolled out several programs that address these challenges. The results have been impressive in geographies where the solutions have been integrated and take a value-chain approach. Under these conditions, the yields of staple food crops have more than doubled and incomes for millions of farmers improved. The number of input suppliers, including seed and fertilizer companies as well as agro-dealers, have also increased. These impacts are enhanced where there is strong public-private partnership. These programs provide good lessons and insights for scaling up and sustaining the gains made. To achieve this, we estimate about **US\$ 300 m additional funding** will be needed for **15-20 countries** in sub-Saharan Africa by 2020.

1. BACKGROUND

Africa is uniquely positioned to meet the challenge of feeding itself and the world, and spur economic growth. It holds more than half of the world's fertile yet unused cropland. It has abundant water resources that are not used at full potential. SSA uses less than 2% of its renewable water resources, against a world average of 5% (IFDC, 2014). It benefits from plentiful agricultural labor (about 70% of Africa's labor force is employed in the agricultural sector).

For Africa to realize its agricultural potential, it must grow its smallholder agricultural productivity through better access to yield-enhancing technologies. For most of the history of African agricultural development, smallholder farmers were viewed as largely uninterested in new technologies, and often even resistant to their use. Development programs mostly considered smallholder farmers as benign "beneficiaries" of their interventions rather than as eager potential adopters of new yield-increasing innovations. Input distribution and technical advice were mostly managed by government agencies or dealt with in ad-hoc fashion by NGO's. Links between public research and private agri-business were virtually nonexistent.

Agricultural input supply systems in Africa suffered a further blow following the structural adjustments programs (SAPs) that most countries in Africa implemented between mid-1980s to late 1990s. Both seed and fertilizer access were seriously affected, as were agricultural extension services. Deprived of public funding, few public seed enterprises survived during this period, leaving farmers with no access to quality seeds. Private sector investment in seed supply was slow to take off. In many countries, farmers were left with no alternatives in either the public or the private formal seed sector, creating a vacuum for NGOs to initiate local solutions mostly centered on the recycling and exchange of farmers' traditional varieties. The historic dominance of the state in seed markets had either excluded or left the local private sector weak and inexperienced in the basics of seed supply.

Beginning in the early 2000's, with support from The Rockefeller Foundation and several other donors and growing rapidly following the creation of AGRA by Rockefeller and the Bill and Melinda Gates Foundation, the center of gravity of input supply began to shift steadily toward private sector, especially indigenous, "SME" private agri-businesses. This shift was positively influenced by recently-instituted policies which encouraged liberalization of input supply, particularly in the seed sector. Crop breeders, seeing a new and more energetic outlet for their varieties, intensified their efforts, increasingly employing farmers in the selection of the final products in order improve adoption and incorporation of the new varieties into rural lives and livelihoods.

Small and medium-sized, private seed companies, sensing the demand among farmers for higher-yielding seeds, initiated marketing campaigns aimed at gaining more customers, and profits. For the first time in the history of many African countries, modern varieties had an outlet from the research station to farmers' hands. Farmers who grew the higher-yielding seed saw an opportunity as well, and invested in fertilizer. Demand for both improved seed and fertilizer grew, sparking many innovations within the companies competing for farmers' preference. Companies which began with a focus on seed of a single crop usually added several others within a few years. The net result has been exponential growth of the private African seed industry from about 1998 (AASR, 2013).

Fertilizer suppliers likewise began to offer new, locally-formulated blends of nutrients which gave better results than standardized formulations. As a result, fertilizer use is also growing in Africa. While average use is still only 12 kg of nutrients per hectare compared to the global average of 98 kg/ha (OCP, 2015), according to recent reports (Wanzala, 2012; Bationo, 2013), the number of countries consuming more than 20 kg/ha of fertilizer nutrients has increased. The goal is to push this to at least 50 kg/ha, as per the 2006 Abuja Fertilizer Summit (NEPAD, 2009). And commitments governments is growing fast; 13 African nations are now dedicating more than 10% of their annual budgets to agriculture.

The growth witnessed in seed and fertilizer supply is leading to growing agricultural outputs and productivity of smallholder farmers (Sanchez, 2015). There is growing evidence that agricultural productivity in a number of African countries has increased significantly over the past decade (AASR, 2013) although way behind the rest of the world (IFS, 2013). This is line with FAO projections indicating that output trends are likely to continue into the next decade, reflecting the potential for further gains in productivity (Fuglie and Rada, 2011). This growth is particularly noticeable in the yields of cereals and grain legumes that are important food and cash crops for farmers and rural households in sub-Saharan Africa. This growth that is probably driven by the intensification (as opposed to extensification) of smallholder agriculture needs to be accelerated since its environmental benefits are enormous. This includes longstanding nutrient mining from the soils with crop harvests and associated land degradation.

The results obtained by farmers from the use of improved seed and fertilizer has not escaped the attention of Africa's governments or development partners. The growth realized in agricultural production and productivity has been spurred on by national input subsidy programs implemented by many governments over the past decade. Although the efficiency of such schemes is still hotly debated, there is little doubt that they have helped to raise the awareness of many farmers regarding the benefits of improved seed and fertilizer, and that this is manifesting itself through increasing demand for such inputs in private markets. Moreover, a number of subsidy programs have been re-designed to be more "smart", though better targeting of recipient farmers and by engaging the private sector in the procurement and distribution of the inputs. This has been made possible in many countries by the proliferation of agro-dealer shops in rural areas in sub-Saharan Africa.

Hence, there is hope: access to improved seeds, fertilizers, and other technologies designed for smallholder farmers, developed by public sector but produced and delivered by private sector, has now been firmly proven to be the entry point for increasing smallholder productivity. This model is growing particularly fast in the seed supply in Africa. It has having a significant knock on effect on fertilizer supply and use. This is a model that is supported by AGRA and other organization, in particular Syngenta, OCP, Yara, and others promoting the use of improved seeds and fertilizers towards increasing agricultural productivity in Africa. Some of its impacts of the model and what is needed to develop it further are discussed in the next sections.

2. CHALLENGES

Smallholder farmers dominate Africa's agriculture, with estimates of 80% of the farming households being smallholder farmers. The dominance of small, often isolated farms (largely rainfed), together with roads and marketing infrastructure, inevitably complicates both the supply of inputs and the transfer of surpluses from rural to urban areas. Moreover, in spite of the gains made, average yields are still too low to feed a continent that is now spending over \$40 billion annually to import food.

A number of important challenges remain in the effort to build Africa's input markets. The most pressing of these include:

2.1 Limited development of seed systems

Getting improved seeds from the research station to the hands of farmers remains a complex challenge fraught with potential barriers to success. A key factor has been the limited number of seed companies available to multiply and carry seed of improved varieties that are adapted to local agro-ecologies and to the needs of farmers and markets.

A second key challenge is a chronic shortage of the foundation seeds used to produce adequate quantities of certified seeds. While many governments have liberalized the supply of certified (commercial) seed, they maintain monopoly control over the supply of foundation seed. The limited capacity of public agencies available to produce sufficient foundation seed for a rapidly growing seed sector has created a crucial bottleneck in seed supply. As with the problem of supply of certified seed, the response appears to lie in privatizing the supply of foundation seed as well. A third challenge is weak quality control systems, leading to a proliferation of fake seed which is hurting both farmers and the growth of the seed industry, overall. Solutions to these problems are presented in a later section of this paper on '*policies and institutional challenges*'. A fourth challenge is limited awareness among smallholder of the importance of planting seed of improved varieties, which reduces effective demand. Finally, seed companies face a severe lack of affordable financing, both for working capital and long-term debt.

Promising solutions. The situation is changing for the better rapidly; the seed industry in Africa is growing in ways that are unique. The majority of companies are owned by local entrepreneurs. They readily enter into agreements with national agricultural research institutes (NARS) to produce and market crop varieties that are appropriate to the agro-ecologies of the countries. For instance, over 125,000 metric tons of certified seeds have been produced through AGRA's support in 2014 by 82 local seed companies. These companies have helped turn around relatively quickly a long-standing problem of inappropriate and late delivery of seed. They are managed by private entrepreneurs who tend to have a passion for the activity, as many were initially farmers themselves. Equally important is their vision of contributing to the long-term welfare of their community while risking their own capital in hopes of a obtaining a reasonable return.

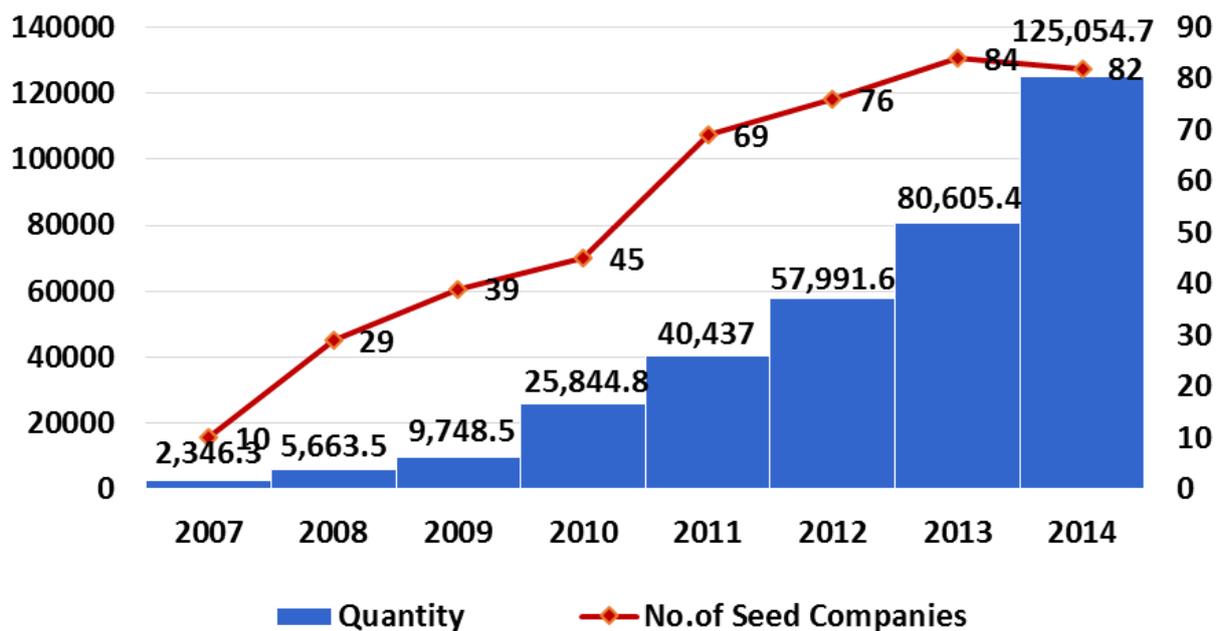


Figure 1. Seed companies supported by AGRA’s Seed program and quantity of certified seeds they have produced over the last 8 years (AGRA database, 2015)

The entry of large companies into the markets has also helped farmers access improved seeds. Examples are Syngenta, Pioneer, and Monsanto. The varieties are generally hybrids and not genetically modified. They have expanded access through opening distribution outlets and enhanced awareness through partnership with development projects and public extension programs.

2.2 Limited supply of appropriate fertilizers

Both supply-side and demand-side constraints affect the functioning and performance of SSA fertilizer markets. These constraints affect availability, accessibility and affordability of fertilizer in rural areas from one hand and the pull/demand on the other hand. On the supply side, number of companies actively pursuing the African market a few. This has contributed to the high price of fertilizers reaching farmers. This is exacerbated by many factors: poor port facilities, high transport costs, and the high cost of credit in Africa, among others (Figure 2).

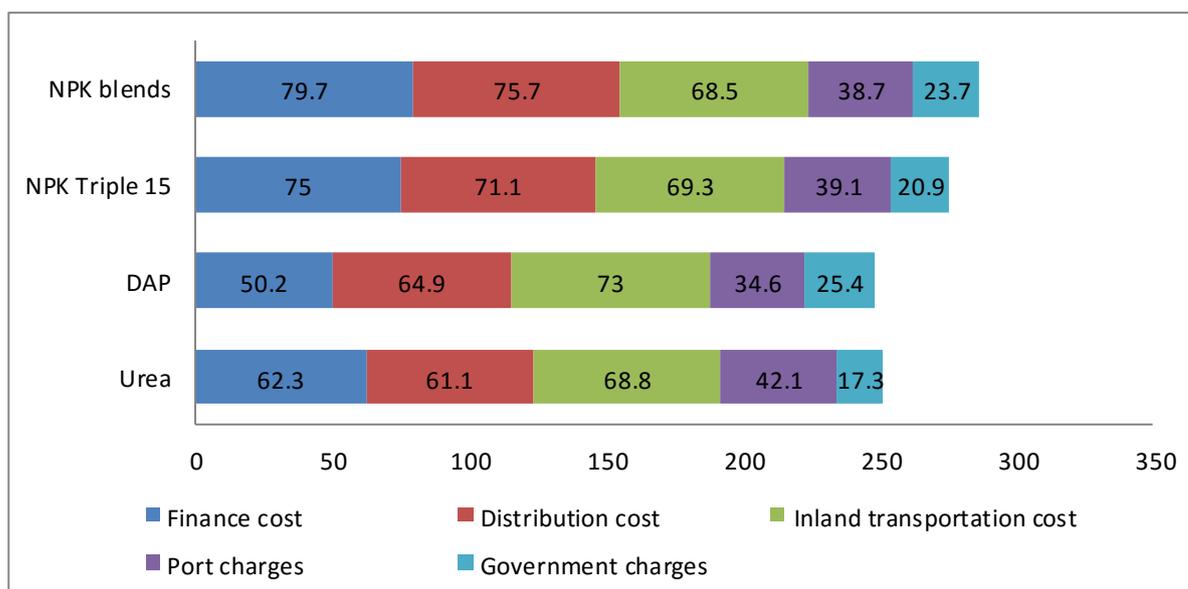


Figure 2: Domestic supply-chain cost components, average for Ghana, Nigeria, Mali, Senegal in 2009 (Source IFPRI Policy Brief 20, March 2012).

It is worth noting that over 90% of international trade between SSA and foreign countries is conducted via maritime transport (UNCTAD, 2005). As a result of the infrastructure issues, maritime freight costs to most SSA ports surpass those in other countries. Indeed, the cost of importing a standard-sized container is reportedly more than twice the world average (USITC, 2009). Freight costs as a ratio of import value were approximately 10% for SSA in 2004, while they averaged 6% for all developing. This ratio is even higher, reaching up to 24% for certain landlocked countries such as Mali and Rwanda (UNCTAD, 2007).

A recent study by IFPRI (2012) showed that finance, transportation and distribution costs account for between 75 and 80% of the total cost of fertilizer in the domestic supply chain in the four countries covered by the study. In another study, Wanzala and Groot (2013) also showed that transportation costs account for a high percentage in the retail prices, for instance, 32% in Mali and 22% in Tanzania. All these contribute to the high of fertilizers in Africa, at least 30% higher (even higher in landlocked countries) than Thailand which is a net importer (IFDC and Chemonics, 2007).

The higher transport cost is due to several factors including poor road conditions especially in the rainy season, old transportation equipment, and limited completion in the trucking industry. Moreover, access to the road network is uneven, with rural areas largely underserved. This makes the flow of fertilizer and inputs to rural areas difficult and expensive. Less than half of Africa's rural population has access to an all-season road. In these conditions, transport costs grow as fertilizer moves deeper into the market, closer to the farmgate and in an even small quantities. Rail transport is much cheaper than road transport, but rail infrastructure is the least developed in Africa. It is poorly maintained for the most part, and offers a poor service resulting in a significant reduction in usable track.

Additionally, the distribution channels are not sufficiently developed to serve the market. Distributors lack capacity to invest and carry inventory, mainly due to cost of finance due to high cost. Consequently storage capacity in the interior regions of SSA is severely limited

and is major constraint along the value chain. Lack of storage capacity, which is also due to lack of integration and investment of local distributors (mostly small players) is a major barrier to having fertilizer available at the right time and place, especially in large low density countries. These factors have all contributed to the low use and high costs of fertilizers in Africa. With over 10% of the world's population, sub-Sahara accounts for less than 1% of global fertilizer demand.

In the fertilizer sector, many governments have intervened in the procurement and distribution of fertilizers. Some have implemented subsidy programs. Although these price support programs were well intentioned, their implementation tend to have a negative impact on private operators and on fertilizer consumption in general as they add uncertainty and risk. Tendering processes exacerbate the situation and tend to limit market development and further disincentive investment:

- Purchase price of fertilizers can turn out to be higher than in the international market price;
- Late delivery of fertilizers to farmers can be induced, as well as late payment of importers, which increases cost to the farmer
- Fertilizers consumption can be limited to the subsidized quantity which is restricted in general⁷ (OCP, 2015) (e.g., maximum of 2x50kg bags per registered farmer in Nigeria and to 5 bags in Kenya) as farmers are unlikely to complement by buying the rest of their needs at market price;
- Important yearly carryover stocks can occur. It reached up to 30% in Nigeria in 2013 as local importers expected sales leap that year which did not materialize. In Ethiopia, for example, fertilizer carryover averaged 33% (IFDC and AFAP, 2012) of imports between 2002 and 2011.

Additionally, government control mechanisms tend to not take into consideration necessary profit margins for the intermediaries throughout the distribution value chain. Redemption mechanisms are (i) not reactive, (ii) tend to privilege some retailers or a supply chain over another and (iii) pressure retailer's financial health. In Ghana, for example, importers still owe 2 years arrears (OCP, 2015) in the cocoa sector. At a regional level, each country has a specific price support program. Price variation between countries discourage regional trade and create cross-border black markets.

Promising solutions: This situation is, however, changing rapidly. Investments in fertilizer supply and demand creation by both the public and the private sector is growing rapidly. For instance, in Tanzania, between 2008 and 2014, the number of companies grew from 6 to 46 while in Ghana it grew from 12 to 38. This growth has been accompanied by an increase in fertilizer supplies in most countries (Figure 3). Some estimates indicate that fertilizer consumption in SSA will increase tenfold by 2050 (IFDC, 2014), from 5 million to 50 million metric tons of fertilizer. Growth is expected all nutrients (macro, secondary and micronutrients) but nitrogen and phosphorus are likely to dominate it. Phosphate-based are in particular to grow rapidly. By 2025, SSA demand of such phosphorus fertilizers could, based on OCP estimates reach about 4.4 million metric tons of P₂O₅, up from about 1.0 million metric tons.

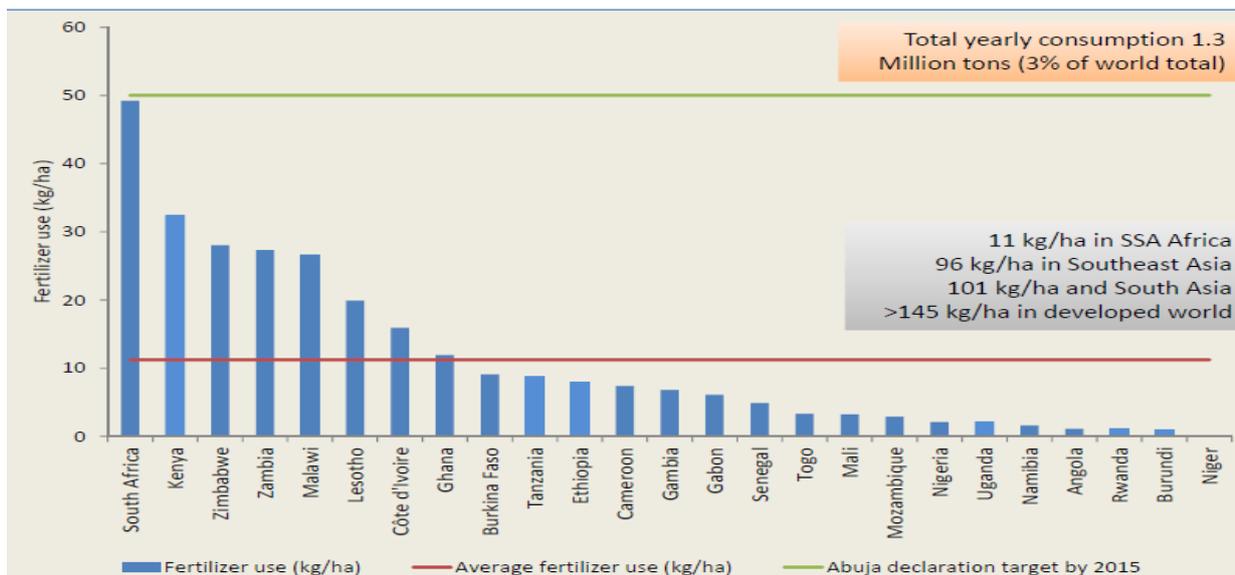


Figure 3: Fertilizer use across various countries in Africa (Source: World Bank: 2013)

The next priority is to blend fertilizers which more closely match the specific needs of soils and crops in Africa. At present, most fertilizer in Africa markets contains only a few major nutrients (primarily nitrogen, phosphorus and potassium), and lack secondary and micronutrients that are increasingly being recognized to be deficient in the major soil groups. Fortunately, this situation is changing. Many fertilizer companies are responding to the need for developing fertilizer blends. For example, the Norwegian fertilizer giant, Yara, has recently developed specific blends for maize production in Tanzania and Ghana. Several smaller companies are doing the same in Kenya, Tanzania, Mozambique, Mali, among others. In Kenya for example, MEA Fertilizer Co. has developed a unique blend for grain legumes.

The blending trend is fast catching up in the East Africa region. The culture is already there and accepted by farmers. However, only generic formulas based on outdated studies are available in the market. In recent years, soil mapping projects have been launched to develop recommendations customized to cultivated crops and based on soil analysis. Those initiatives are supported by NGOs and private organizations such as OCP. Indeed, OCP has financed and contributed to soil mapping in several countries such as Cote d'Ivoire, Guinea and Ethiopia.

Ethiopia is certainly in the lead in this course of soil mapping and developing appropriate fertilizer blends. It has now mapped the soils in most of major production zones and supported the blending of appropriate fertilizer blends. This has gone hand in hand with creating farmer awareness of the blends and in developing appropriate recommendations of what rates and methods of application. To date, 12 new fertilizer blends have been developed and are fast replacing the over 40-year standing recommendation to use DAP and Urea in equal amounts, despite the diversity of soil types, fertility status and agro-ecologies across the country (ATA, 2015). For instance, OCP helped its Ethiopia partners develop a soil specific fertilizer (NPS) as a response to the generalized soil deficiency in sulphur. This product will serve as the main ingredient for blends. OCP is also helping conduct field trials to validate the agronomical effectiveness of developed fertilizer products and assess the yield increase in comparison to conventional fertilizer application. This work has been done in several countries – Kenya, Cote d'Ivoire, and Ethiopia.

The Ethiopia soil mapping and fertilizer blending initiative was done under the coordination of the Ethiosis program of the Agricultural Transformation Agency (ATA). This is a body of the Ministry of Agriculture dedicated to the transformation agenda. The approach has encouraged other countries in Africa, and several are now planning on doing the same. This work will, however, require greater investment in the human and institutional capacity of the NARS.

It is worth noting that the fertilizer industry has, like the seed industry, benefited from the national input subsidy programs that are operational in many countries in sub-Saharan Africa, which have improved affordability of fertilizers by farmers and increased demand. This has in turn provided greater incentives for the industry to supply fertilizers.

More public support is required to grow the fertilizer industry, and in ways that allow Africa to produce fertilizer using its own resources. With roughly 75% of the world's phosphate reserves, Africa can surely meet much of its phosphate fertilizer needs from its own resources. Morocco that currently serves one third of the global demand is leading the way. There are also substantial deposits in Tanzania, Togo and Senegal. OCP has been pioneer in phosphate fertilizer production in Morocco (over 50 years in the fertilizer industry), and could facilitate the production of the same in other countries. It is encouraging to note OCP has set a facility dedicated to Africa's needs with annual production capacity of one million metric tons. Significant potash reserves have also been discovered recently in Congo (Brazzaville) as well as in Ethiopia. Several African countries (Nigeria, Tanzania, Gabon and others) possess substantial reserves of natural gas, an input used in the production of ammonia and urea-based fertilizers.

Notwithstanding the positive developments witnessed in the growth of the fertilizer industry, a major challenge has been the cost of financing the distribution system. The constraint here is working budgets and for capital improvement (e.g., increasing fertilizer storage space by agro-dealers). Towards addressing this challenge, the Africa Fertilizer Agri-business Partnership (AFAP) has developed innovative solutions using agri-business partnership contracts (APCs). The scheme has three interventions: a) credit guarantee for fertilizer suppliers, b) matching grants for agro-dealers, especially the larger (hub) ones, and c) technical support for agro-dealers and farmers cooperatives that are engaged in buying and distributing fertilizers.

The APC has been piloted since 2012 in three countries: Mozambique, Tanzania and Ghana and appears to have been successful. Some of its impacts include:

- The development of 70 “hub” (large-scale) agro-dealer carrying fertilizers. This has improved the availability of fertilizers for the 6.6 million farmers the pilot program targeted. In some countries, this has led to fertilizer price reduction for farmers, for instance, of US\$ 2-3 per 50 kg bag in Tanzania. In Mozambique, the reductions NPK fertilizer price are from \$41.03 to \$33.50 for a 50-kg bag (AFAP, 2015).
- Creating fora for strong public-private consultations and dialogue. This has particularly been helpful in Mozambique. To enhance impacts, it could be organized in the countries along key value chains that bring the public, private, farmers and the development community together to dialogue, showcase and

do business. This could be anchored and facilitated by growth corridor initiatives such as SAGCOT in Tanzania and Beira of Mozambique.

2.3 Limited awareness of improved seeds and fertilizers

Given the advantages represented by increased use of improved seed and fertilizer by Africa's smallholder farmers, and the opportunity to reverse decades of declining productivity, there is an urgent need for creating mass awareness of existing technologies. Fertilizer use is most effective when combined with good agronomic practices and improved seeds. Reaching this objective requires having strong extension system. IFPRI estimates the annual rate of return on extension services at about 80% (Alston et al., 2000). Due to the limited number of public extension staff in many countries in Africa, however, this is a major challenge limiting awareness, demand and use of fertilizers in many countries.

With the exception of Ethiopia that has at least 8,500 Farmers Training Centres and over 60,000 extension staff (of which 12 to 22% are women, depending on the region), the rest of Africa employs very low numbers who are also poorly supported. There is an urgent to reverse this situation. And countries are taking action. For example, Nigeria enunciated in 2008 a National Food Security strategy that aims at training 10,000 highly extension workers per year with the objective of achieving a ratio of at most 1:350 extension/farm family. Mozambique and Tanzania have also similar ambitious extension support programs.

In addition to increasing extension and advisory services, improving awareness of fertilizer benefits requires revising the outdated fertilizer recommendations. Most countries are still basing their fertilizer recommendations on data that are decades old. As a result, generic fertilizers are used based on outdated studies and findings, which can contribute to creating soil nutrient imbalances and reduce the economic value of fertilizers to farmers.

Promising solutions: By taking advantage of new incentives created by the emergence of a vibrant, competitive, private inputs sector, there are a number of promising approaches for raising farmer awareness, viz:

- *Agro-dealers* – these shops are generally located in rural areas and are increasingly important sources of agricultural extension to farmers. With the support of AGRA and other development agencies, agro-dealers have established demonstrations near their shops that showcase the benefits of using fertilizers and improved seeds. The demonstrations are important learning points for farmers, especially when combined with farmer field days hosted by the agro-dealer, who stands to reap the benefit of increased customers. To increase the extent of agricultural zones effectively served by agro-dealers, there is a great need to scale up their numbers, and assist them in addressing their challenges, especially those related to financing. The agro-dealer development approach is further highlighted in the next section.
- *Fertilizer and seed companies* – these enterprises can likewise play a key role in conducting demos and creating awareness. This is also in their interest of growing their business. One such approach employed by FIPS-Africa (an international NGO) in Kenya, Tanzania and Mozambique deploys a network of Village-Based Advisors (VBAs) to distribute small “sample” packs of improved seed to smallholder to rapidly create demand for improved maize, grain legumes, and other food crops, usually donated by seed companies. Fertilizer companies also provide small packs to familiarize farmers with new products and develop their markets. VBA's conduct large numbers of small, on-farm demo's with the inputs and with farmers'

participation. Previous experience in Africa has shown that farmers need to have knowledge on existence of new varieties and try new technology in small plots on their own farms to become convinced of their relevance to their situation before adoption. Farmers are taught on best fertilizer and agronomic management practices to ensure farmers benefit from the improved crop varieties. The VBAs are recruited from, and reside within, the villages. Experience with piloting this model in East Africa has shown that farmers, having gained experience with small packs, return to their nearest agro-dealer to purchase inputs in larger quantities to plant on larger sections of their land. The FIPS-Africa approach has proved to be a reliable and inexpensive way to empower farmers with adequate knowledge and access to farm inputs (seeds and fertilizer).

2.4 Limited use of ICT applications to supplement extension services

The role of ICT to help develop input markets and enhance food security is increasingly recognized in Africa as one of the drivers in scaling up agricultural transformation. This opportunity is, unfortunately, not explored fully. Increasing the efficiency, productivity, and sustainability of small-scale farms is an area where ICT can make a significant contribution. ICT's, taken in their broader sense, include the use of computers, internet, geographical information systems, mobile phones, as well as more traditional media such as radio or TV. The use of ICTs in Africa (mobile phone and internet specifically) has considerably increased in the last ten years. In 2013, almost 650 million mobile phone subscriptions were registered in Africa (World Bank, 2013). By the end of 2014, mobile phone subscriptions reached 69% (ITU, 2014).

These new developments have brought new opportunities, for example innovation platforms, e-learning, and e-extension. This has the potential to increase farm productivity by supporting the efficient use and enhancing access to critical inputs such as improved seed, appropriate fertilizers, lime, inoculum and agrochemicals along value chains in a timely manner. ICTs have also been shown to create better distribution of input supplies through government subsidy programs (AASR 2015). From experience in the field, an integration of ICT tools and traditional extension methods such as demonstrations has been shown to have greater impact at the farm level.

Promising solutions: Below are key ICT4Ag tools that have big potential in enhancing the awareness and access of agricultural inputs at the farm level.

- *Mobile phones and Internet platforms* - mobile phones and internet platforms offer the biggest opportunity in creating awareness of agricultural inputs and their use including good agronomic practices, help farmers find the best locations and prices of such inputs. A number of applications are available which show the type of seeds and fertilizers to be used in specific geographies and soil types including the rates (www.mbeguchoice.com). These services are interactive and use both sms and voice mail and now can also be accessed through basic phones. Agro-dealers using ICT platforms have increased their businesses by reaching more farmers and increasing their efficiency of doing business. A good example is the MFarms application (developed by ImageAd, Ghana) and is currently serving 7,600 agro-dealers. It is also now being used in 17 countries by various agribusinesses.

With such applications, farmers can locate their nearest agro-dealer and thus travel with surety of getting inputs. Another promising solution is eInputs by Agri-Tech Solutions that is based in Kenya which helps farmers manage input orders and supplies and links them directly to input dealers. In Rwanda, Agri-Tech is working with the government to profile all the approximately 2 million smallholder farmers in Rwanda in all the 30 districts and promote linkages that will avail to them vital services.

In Ethiopia, ATA has created in 2013 a new information hotline that gives smallholder farmers across the country access to best agronomic advice, thus revolutionizing traditional agricultural extension services. In Nigeria, the government's electronic smart card photo ID program leverages farmers' access to mobile phones that enables them to obtain subsidized inputs on time with less bureaucracy (Iboma 2014). This enhances governance of subsidy programs making sure they reach the target groups.

The main opportunity is scaling up these applications in other countries. Other promising supplementary ICT applications that could be brought to scale include:

- *Interactive videos* - as the adage goes “*Seeing is Believing*”. Interactive videos provide an opportunity for farmers to visualize application of inputs and good agronomic practices especially those that relate to knowledge intensive technologies. Interactive videos take different forms but one promising approach is the Digital Green (DG) approach and the modified video tricycle which doubles up as a community information center. The DG approach uses videos that are made by facilitators from the local communities after training by DG staff. DG has a self-monitoring component and has shown great impact and adoption, especially from women farmers. The local facilitator links farmers to the source of inputs shown in the videos. AGRA has supported the training of over 200 facilitators using the DG approach in Ethiopia, Ghana, Mozambique and Tanzania. The opportunity here is to ensure more equipment is available and increase the number of facilitators.
- *Interactive radios* - Radio is still the dominant channel for reaching out to smallholder farmers with information and advice on agricultural inputs. The use of interactive radio has changed the scale and mode of engagement with farmers, who can now interact and give feedback to scientists, fellow farmers and other value chain actors. In Tanzania, a local NGO has worked with three local FM stations in the Southern Highlands which, in two years, has impacted directly on 20,000 farmers who adopted improved agronomic practices.

2.5 Inadequate development of the agro-dealer networks in rural areas

The rural landscape is underserved with respect to functional agro-dealers (one-stop shops where farmers can get the inputs they require) because they tend to concentrate in cities and other big towns that are far away from the farmers, hence making fertilizers inaccessible to farmers (Jayne et al., 2013; Sheahan et al., 2013). Penetration of the network is low. Apart from such exceptions such as Kenya, farmers in most countries are over 20 km away from the closest input shop. Another factor contributing to this constraint is that the agro-dealers sometimes fail to stock the required types and quantities of fertilizers needed by farmers, especially at the start of planting season (Jayne et al., 2013). They also lack business management skills, knowledge of good agronomic practices, and financial planning to advise well on the use of inputs.

Wherever they operate, working capital is a key challenge for the agro-dealer network in Africa faces. Most of those trained do not have sufficient funding to run their business and/or to grow their space. Cost of seasonal credit from banks and financial institutions in Africa is high, at 20-30% interest rates per annum. This is neither attractive to most agro-dealers nor is it profitable where they have accessed the credit. Even for those who want to borrow, the financial institutions are reluctant to lend to agro-dealers (just as they are to farmers). This is because of perceived and real risks.

Promising solutions: It is against the above background that AGRA and its partners have made significant investments in growing the agro-dealer space in Africa. Over the past 7-8 years, AGRA has facilitated training and certification of over 25,000 agro-dealers across 18 countries in Africa. These investments have not only enhanced the service orientation of the agro-dealers to smallholder, they have helped them to improve business relations with input suppliers. Agro-dealers have gained new reputation as critical value chain actors much in-demand by governments, donor partners, regulatory agencies and farmer based organizations. The interventions of AGRA and partners have shortened the distance farmers have to travel to access inputs (in some countries to less than 2 km), and are raising farmer productivity.

Agro-dealer strengthening has also involved institutional building activities which consisted of organizing the agro-dealers into professional business associations with the capacity to provide business services to their members. The introduction of value-adding activities such as capacity building, financial linkages, demand creation, among others, has rapidly increased the valuation of the associations by the members and boosted membership and financial capacity of the associations.

In order to fully capitalize on the advent of agro-dealer networks, there remains a critical need to address their financial challenges. Microfinance institutions are more attracted to lending to agro-dealers than to farmers, but their scope is limited. Their interest rates are also equally high. To scale up the multiple benefits of agro-dealers in Africa, it is important we address the challenges of affordable financing.

Some key lessons emerging from our collective investments in the agro-dealer space include:

- Agro-dealer development is an effective strategy to foster the progressive development of a private sector driven input and output marketing system. Their development significantly reduces search costs faced by farmers, making much needed production inputs available in rural areas at the right time and in appropriate volumes, sizes, and affordable prices;
- Sustainable improvements on farmers' yield are only achievable through complimentary use of seeds, fertilizers, and improved management practices;
- Small packaging improves effective demand, especially among women farmers and very poor farm families. Selling seeds and fertilizers in small affordable packs expands the use of improved technologies and reduces the risk to farmers of experimentation;
- Demand and awareness creation through demos, field days, and input exhibitions encourage agro-dealers to establish new outlets to harness business potentials in remote locations;
- Use of "hub" agro-dealers enhances service orientation and builds a strong foundation for input market development. Given the training and previous exposure of hub-agro-

dealers to new technologies, they can readily provide value to smaller agro-dealers and help reduce cost of training other agro-dealers given that public resources to meet these needs are limited;

- Deployment of ICT platforms can dramatically boost strategic business partnerships between agro-dealers and other value chain actors;
- Financing for agro-dealers is critical for broadening the volumes and range of inputs agro-dealers provide to farmers. The use of credit guarantees has demonstrated the value of risk sharing with financial institutions to relax the high capital constraints faced by rural agro-dealers;
- Agro-dealers can be effective aggregators of harvested grain when linked well to strong value chains, thus increasing the returns to their farmers and clients;
- Policy reforms and supporting investments that can make agricultural input production and distribution more profitable and attractive are required in order to induce greater investment among agro-dealers. For example, efforts to promote subsidies of fertilizers for farmers must be done in ways that do not distort or displace these emerging rural input markets.

2.6 Poor access to affordable credit

Lack of affordable financing to farmers and agri-business is probably the most daunting challenge to growing Africa's agriculture today. It is estimated that by 2020 US\$ 11bn would be required annually in SSA (World Bank and AGRA; n.d.). Although agriculture represents around 25% of GDP in SSA, the share of commercial bank lending to agriculture remains very low (FAO, Deutsche Bank Research; n.d.): 3% in Sierra Leone, 4% in Ghana and Kenya, 6% in Uganda, 8% in Mozambique and 12 % in Tanzania.

For various reasons, perceived or real, banks in Africa are reluctant to lend to smallholder farmers and agri-business (especially small and medium enterprises). The situation is made worse by the cost of credit in Africa, typically 20 to 30% p.a. from financial institutions in most countries. This is made worse by the absence of formal land titles that be used as collaterals. Moreover, the number of financial institutions operating in the agricultural sector and present in rural areas is limited. There is an additional problem of banker's inexperience with agribusiness although recent experiences show that agricultural lending can become a profitable business for established banks. Consequently, rural households in Africa are still largely reliant, for their financial needs, on informal providers. This limits access to production inputs for smallholder farmers given that most do not produce enough marketable surpluses to invest in them.

Agriculture's seasonality and induced risk also complicates the problem of getting affordable credit. Most smallholders in Africa depend on rainfed agriculture. Effectiveness of inputs (fertilizers and improved seeds) is jeopardized under droughty conditions. Farmers, therefore, avoid using modern inputs as they turn to be unprofitable because of rainfall uncertainty. Irrigation is, therefore, critical to increase and stabilize production, reduce risks, and provide the basis for higher value agriculture.

Promising solutions. To address the finance challenge, AGRA and its partners have developed various innovative financing mechanisms (AGRA, 2011) with the public and private sectors. The key ones are:

- a. *Value chain financing* – this involves working with the private sector through value chains, and get them to support the input and output financing needs of the farmers

and agri-businesses. A good example of this is out-grower or contract farming schemes. It is important to recognize that there are few agricultural enterprises that have the capacity to invest in the entire value chain. On the contrary, if there were more actors investing in the value chain, the competition that arises would contribute to increasing the efficiency of the global value chain. The fertilizer and seed industry are, indeed, innovating on financing value chains. For example, OCP has created the OCP Innovation Fund for Agriculture. This is an investment fund that promotes innovation and entrepreneurship in agriculture and agribusiness. Such could be grown further through stronger links with the commercial banking sector in ways that cuts down the cost of credit for farmers and agribusinesses.

- b. *Credit guarantees* – AGRA and its partners started off with setting up this facility with several banks in Africa. A credit guarantee of \$17.1 million was set up with Equity Bank (in Kenya), NMB Bank (in Tanzania) and Standard Bank of South Africa (operating as Stanbic Bank in Uganda, Tanzania, Mozambique, and Ghana) to leverage \$160 million in lending to smallholder farmers and agri-businesses. Most progress was made with the Equity Bank facility of US\$ 5.0 jointly funded by AGRA and IFAD in 2008. A key focus of the facility was on smallholder farmers and their cooperatives, using part of their harvest as collateral for the next season. At the end of three years, \$26.31 million in loans were disbursed by Equity Bank to 43,775 smallholder farmers, 1,513 large scale farmers, and 407 agri-businesses. The repayment rate was 94% and Equity Bank chose not to claim from the guarantee. Success factors in this scheme were Equity Bank’s investment in marketing the financial products, creating financial literacy among the borrowers, and supervising the credit repayment process. Involvement of more in this model will be good to duplicate the experience in other countries.
- c. *Supporting governments to set up funds to finance the agricultural sector* - such funds support the development of value chains and allow agri-businesses to borrow at reasonable rates from commercial institutions. This concept was first designed by AGRA and set up in Nigeria in 2011 and known as the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (“NIRSAL”). The Central Bank of Nigeria invested \$500 million to leverage \$3 billion in lending to smallholder farmers and other value chain actors. The fund has five pillars: Risk Sharing, Technical Assistance for both borrowers and lenders, Insurance, Bank Incentive Mechanisms, and Bank Rating. As at February 2015, loans in the amount of ₦53.6 Billion (\$268 million) have been granted to farmers and agri-businesses. No guarantee default has arisen for payment since inception till February, 2015. Similar initiatives are currently being considered for Ghana, Malawi, Tanzania and Kenya.

These financing schemes need to be scaled up and scaled out to additional countries. The best way to do this, based on experiences elsewhere, is forging strong public-private partnership using value chains (UNDP, 2014).

2.7 Lack of strong farmers’ organization.

Because the majority of the smallholder farmers who grow staples such as maize and beans are sparsely distributed and are not in production nor marketing groups and have limited access to road and communication infrastructure, the cost to them of market (input and output) participation is high. A major challenge in this respect is that the majority of farmer organizations (FO’s) lack adequate business orientation in dealing with the organizational

and operational issues facing their members. In addition, these organizations and associations are rarely viewed by service and finance providers or other actors along the value chain as credible partners. As a result, they fail to exploit the potential for public/private partnerships and business-to-business alliances that is so critical to the development of smallholder agriculture. Farmers' lack of entrepreneurial skills has prevented them from properly utilizing marketing investment information for longer-term production and marketing planning and from taking advantage of economic opportunities. The possession of these skills would make their operations more efficient and profitable, thereby enabling them to earn more.

It is, therefore, necessary to create an entrepreneurial culture in rural communities where "farmers produce for markets rather than trying to market what they produce" (Lundy, Ostertag, and Best 2002). From an implementation perspective, this means aligning production-related activities with market-oriented interventions. It also means focusing on institutions of collective action - most often realized through the structure of farmer groups - as an important and efficient mechanism for enhancing the input acquisition and marketing performance of smallholder farmers (Kariuki and Place, 2005).

FO's can play a big role in collective action in terms of aggregating both in input and output markets and a facilitation role to ensure SHFs receive their input at the right time, in the right quality and to facilitate linkages with service providers such as traders, financiers etc. However, to do this FO's' institutional capacity need to be enhanced in order to ensure effective services to members. This is essential for developing sustainable value chains that can improve agricultural input supplies and output markets in Africa. Where this happened well in Africa and elsewhere in the world, farmers' organizations and cooperatives have been played a significant role. In Africa, some good examples of functional cooperatives are found in Ethiopia and Mali.

Promising solutions. To help grow FO's in Africa as business entities, AGRA and its partners invested in 4,000 FO's across eight countries. It has developed a tool, the Capacity Performance Index (CPI) which helps to assess and guide the institutional development of FO's through tailored capacity building interventions. These investments are paying off. For instance, an investment of US\$5000 by AGRA in a Kenya co-operative (to build capacity based on the CPI) has helped it now to turnover US\$ 50,000 (10X) in revenue from trading in cereals. The AGRA support helped the co-op to prepare a business plan, approached the Kenya Agricultural Finance Corporation, and accessed working capital. Additionally, AGRA has established (in partnership with the regional FO's in Africa), the Africa Farmer Organization of the Year Award (AFOYA). These initiatives are contributing significantly towards improving FO's in Africa. They need to be scaled up and resourced.

Stronger FOs can contribute significantly to improving the efficiency of the input supply chain. Programs that bring together smallholder farmers as purchasing groups of inputs and selling of outputs should be supported by all. This will give farmers access to inputs and output markets and to financing. The private sector can play a significant role in this task. It entails supporting aggregation programs and aims at offering fertilizers to organized farmers at competitive. Most companies, and certainly OCP, is willing to do that.

2.8 Inadequate policy and institutional support

Enabling policy environments are essential for the growth of input supplies in Africa. While this situation is improving in many countries, the pace in the development of policies, and mostly importantly, in their implementation needs to be hastened. This is needed in the seed and fertilizer sectors. With respect to seeds, the lack of foundation seeds is stifling the

growth of the industry. In many countries, this function is currently within the domain of public agricultural research institutes. Unfortunately they don't produce enough and of the qualities needed to meet the needs of the seed industry. The function needs to be passed on to the private sector and government plays a regulatory role. There is second problem of lack of quality control of seeds available in the markets. The incidence of fake seeds is also growing in many countries. This problem is also serious in the fertilizer industry. Many markets suffer from product adulteration and underweight bags, thus creating a crisis of confidence among farmers. Not only are farmers often not getting what they are paying for, but the situation is likely to limit the growth of genuine industry players. An additional problem in both seeds and fertilizer sectors is the lack of harmonized policies, standards and regulations that govern and support trade across countries.

Institutional support needs to address the poor infrastructure and logistics in SSA. Infrastructure development is a key driver for progress across for progress across the Africa continent, and a critical enabler for productivity and sustainable economic growth. High transport costs add up to 75% to the price of African goods, and underdeveloped infrastructure has been estimated to shave off at least 2% of Africa's annual growth.

Ports, in particular, are in pressing needs of investment and regulatory reforms to remove the bottlenecks. They tend to suffer from chronic congestion issues, leading to important delays before berthing (7 to 10 days I common; IFS, 2013). They also suffer from limited berth space and shallow depth, limiting the size of ships that can accost (typically 15 KT ships). Discharge capacity at the ports is generally limited. Handling and bagging equipment are often in sufficient and inadequately sized. In addition, handling costs average 50% in Africa than other parts of the world (Africa Development Bank Group, 2014).

Promising solutions. Drawing on the experience on policy interventions, AGRA and partners have recently begun to provide technical support to governments to help them create an enabling environment for expanding private sector investments in local agri-business that supply inputs and buy outputs in agricultural value chains of staple foods for smallholders. This involves identifying, prioritizing and reforming "problem" policies and regulations for the private sector that are missing or ambiguous; economically flawed; too restrictive or excessive; and poorly implemented. In addition, the interventions include building public-private partnerships and policy dialogue innovation platforms in order to reform "problem" policies and regulations from within the government; engaging the private sector in policy and regulatory reform needs identification and alternative reform options; bringing policy and regulatory reform solutions through the processes and stages that need to be followed for government approval and implementation; and building capacity of policy advisors to the Ministers of Agriculture through learning-by-doing to contiguously review, assess and reform regulations that limit private sector investment.

Some practical, based on on-going and past investments in several are, that could be scaled up are as follows:

- *Policy nodes and hubs* – these are evolving into agricultural technology multi-stakeholder coordination platforms linked to Agricultural Sector Working Groups and Joint Sector Reviews under the Malabo Declaration Implementation Strategy and Roadmap and Programme of Work. The nodes have, indeed, helped inform and improve policies in several countries: Tanzania, Mozambique, Ghana, and Mali. In Ghana, the Seed Node contributed to enactment of Plants and Fertilizer Act, 2010 (Act 803); development and approval of a new seed policy and regulations; National

Seed Testing Laboratory to get ISTA and OECD accreditation (on-going); legal framework and format of a contract to guide agreements between public research stations and private seed companies for providing seed firms with access to pre-basic and basic seed of publicly-bred hybrids and varieties; and Plant Breeders Rights accredited to UPOV (now before Parliament). In a nutshell, there is to support such legal initiatives in many countries that license the use of publically bred varieties by private seed companies. The Soil Health Node in Ghana has also contributed to the development and approval of fertilizer regulations, the National Fertilizer Policy, and generated evidence for advocating the Government to improve subsidy program.

- *Facilitating Agricultural Transformation and Advisory Support Centers* – a good example of this is Ethiopia’s Agricultural Transformation Agency. Similar agricultural ‘transformation engines’ have been piloted recently in Tanzania and Nigeria. They have, indeed, been influential in the implementation of policies and unlocking opportunities for private sector. Consequently, demand from countries for support in establishing centers is growing. The challenge is how to sustain them since they are mostly now supported by donors.
 - *Harmonization of regional seed, fertilizer policies, agricultural marketing and trade regulations and standards (and for seed sanitary and phytosanitary procedures).*
 - *Domestication of harmonized regional seed, fertilizer and agricultural marketing and trade regulations and standards policies, regulations and standards and sanitary and phytosanitary procedures.*

2.9 Weak human and institutional capacity

Improving agricultural input supplies and other services to small holder farmers in Africa requires strengthening the human and institutional capacity in the countries. Without strong capacity to develop and operationalize supply chains and enhance the use-efficiency of the inputs at the farm level, the gains from investing in them would be minimal. After more than a decade of neglect, our national research, training and extension institutions have run down and poorly resourced to serve the agricultural sector.

Research and development effort is limited. Africa’s R&D systems are underinvested and highly fragmented. With the exception of few countries, most get little funding from their governments and are subject to volatile funding from the donor community. It is important to recognize that effective input systems should be backed by a dynamic synergy between research and universities. This is the case in most of the developed the world. Even though agriculture represents an important share of SSA countries GDP, only 2% of the students major in agriculture.

Africa is short of crop breeders that can breed for the needs of the different agro-ecologies, farming systems, markets and farmers preferences. The same is true of soil scientists and agronomist that can develop fertilizer recommendations and good agronomic practices of the improved varieties. Currently, farmers efforts are hampered by outdated fertilizer recommendations. Consequently, crop yields and profitability are much lower than what should expect. There are enormous gaps in many other areas that are required to close yields, such as integrated pest and disease management, soil and water conservation, weed managements, among others.

The capacity gaps are also glaring in other parts of the production to marketing value chains. These are experts in market and agri-business developments, postharvest handling of produce

to reduce losses, experts in developing appropriate financing for farmers and agri-businesses, policy analysts, among others. In this era of climate change and climate variability, there is great need to have scientists and practitioners that can develop climate-smart agriculture, including drought tolerant crops and appropriate conservation agricultural practices.

Data from IFPRI and some national governments on the continent highlight the huge shortage of skilled manpower in agriculture (Figure 4). This works out to less than 10 researchers per 100,000 farmers. A rough estimate of minimum active agricultural personnel required per country is about 700 – 750 people with MSc and PhD level training in various disciplines (ASTI, 2015).

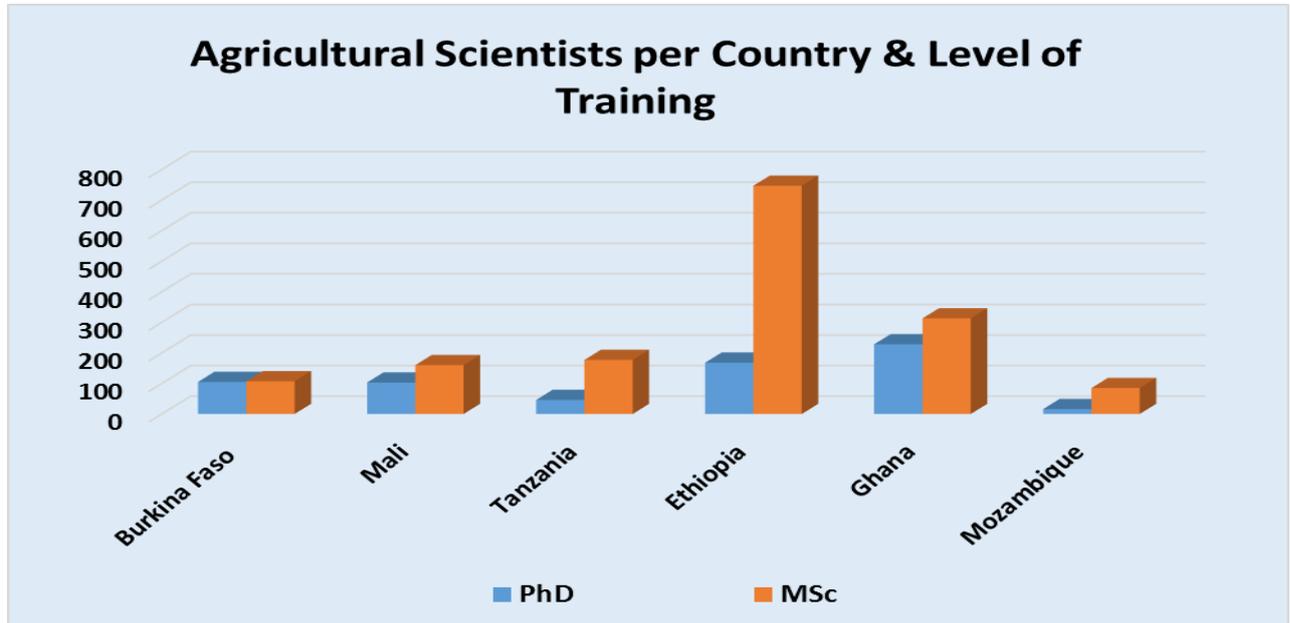


Figure 4: Numbers of scientists in a few selected countries in Sub –Saharan Africa

Promising solutions. The capacity development efforts of AGRA and other partners carried out so far have generated some cost-effective mechanisms that can rebuild the numbers needed. These are:

- *Graduate level training* - invest in universities in Africa, and upgrade some of them to be ‘centers of excellence’ that have regional functions. This has been done in several universities in Burkina Faso, Ghana, Kenya, Malawi, Nigeria, Tanzania, South Africa, Uganda and Zambia for seeds, soil health, agronomy, applied agricultural economics including policy analysis.
- *Technical and seed companies training* – a strong center for training seed companies has been established at a Kenya university. This center has trained over 600 staff from 100 seed companies over the past 6-7 years. This has helped the growth and efficiency of the companies as well as better serve the small farmers they serve with high quality seeds of improved varieties. This effort was enhanced further by the use of dedicated consultants to help develop the technical and business skills of the companies.
- *Technical training in soil testing, management of laboratories and field plant breeding technicians* – significant progress was made by using existing good labs in the continent, especially at the CGIAR centers and with private sector to conduct some of the training courses. This was used to train over 200 national soil and

fertilizer laboratory technicians, and about 90 field plant breeding technicians. Some of the national labs were also strengthened with additional equipment. These labs and the staff who have been strengthened are now providing good services to the countries, including fertilizer quality control.

- *Technical and vocational training* - tailor made non-degree courses that lead to professional or academic certificates, or other qualifications as part of the training for a specific career, or as a qualification in an area of study are needed to provide mid-level agricultural practitioners that provide good services to smallholder farmers. Extension services are an important mechanism to communicate new practices to farmers, and need to go hand in hand with technological advances such as mobile technologies. There is thus a need to provide practical skills, changed attitudes, and impart knowledge related to occupation in agriculture with the aim to address various challenges in the value chain. The courses in this category could include key demand driven courses from the following: Seed Enterprise Management Institute (SEMI) courses, Agri-business, Value addition and Food processing, Laboratory and field technicians, agro-dealers, agri-finance management training courses as well as new extension techniques and use of ICT. There is a need to build institutions that can develop vocational training courses that strengthen service provision to smallholder farmers

Developing African institutions that can in turn train and retain a critical mass of agricultural scientists to develop home grown solutions to the problems of the agricultural sector especially smallholder farmers is critical to the development of a sustainable agriculture sector with all potentials unlocked. There is, therefore, a particular need to strengthen the institutions and their working environments so that they are conducive to retaining and utilizing well their human resources. In many institutions, internet connectivity is poor; and so is water and electricity. The facilities to support the research such as laboratories, irrigation facilities among others are either dilapidated or non-existent. There is, therefore, need to increase investments in our NARS and training centers (including the Technical and Vocational Training Institutes) if significant gains are to be made from increasing agricultural supplies in Africa.

3. OPPORTUNITIES

3.1 Opportunities to Enhance Input Supply through Public–Private Partnerships

The previous section of this paper highlighted several opportunities for growing the agricultural input supply system. The key opportunities and entry points within each are summarized below: For Africa to achieve step changes in crop yields, both government and private sector actors need to work together to ensure access to technological packages including quality seed and fertilizer, including lime, to restore Africa's depleted soils. For fertilizers, actions taken have to go in the sense of applying the right nutrient, at the right rate, time and place. The following opportunities exist that need to be leveraged in order to ensure stable supply of high quality inputs (improved seeds and fertilizers):

- *Local seed companies* – increase the numbers, ease financing challenges, and address policy issues related to access of foundation seeds; support them to create mass awareness of the use of improved seeds. On financing local seed companies, the combination of soft loan facilities and small starter grants (one time) seems to be practical options that could be scaled up.

- *Fertilizer companies* – support the supply of appropriate blends and agricultural limes where necessary; support them to conduct soil testing for farmers and share the data with national institution for strategic planning purpose. The approach taken by Ethiopia through its Ethiosis program is worth replicating in other countries. On financing, the approach taken by AFAP of providing credit guarantees to fertilizer companies and matching grants for agro-dealers seems to be practical solutions that could be scale up. There is also need to resource the Africa Fertilizer Financing Mechanism that is hosted by the Africa Development Bank. This could provide much needed patient capital to the fertilizer industry, especially local ones that are needed to exploit Africa’s vast phosphate rock deposits.
- *Grow the agro-dealer networks* – capitalize on the existing investments and lessons to increase the number especially in rural areas; support the growth of hub agro-dealers than can carry inputs all year round; provide business development services; network them better; and ease challenges with working capital and resources to expand their storage facility. Here, a good strategy appears to be the combination of credit guarantees and matching grants that is proving to be a good tool to address the financing needs of agro-dealers
- *Create mass awareness of existing technologies* – in addition to using the input suppliers (seeds and fertilizer companies), use the agro-dealer networks extensively to conduct demos and fields. To enhance the training services available to agrodealers, both public and private agricultural extensionists should have opportunity to regular training through short courses or via ICT.
- *Enhance the use of ICT applications* – Mobile phones and Internet platforms, TV, videos, and interactive radio programs are some intervention that can go to scale. Governments should also
- *Improve access to markets* – practical options for going to scale include strengthening SMEs, forward contracts with offtakers, out-grower schemes, warehouse receipt systems, and the increased use of ICT to connect businesses and reduce the transactions
- *Strengthen the capacity of the national research and training institutions* to innovate and support the growth the input and output markets. Innovations are required to buffer farmers from growing problems of climate change and climate variability. Technical staff are needed by agri-business all through the value chains. The current numbers are too few to have the required impacts
- *Innovative financing approaches* – there are many promising approaches that need to be scale. At national, the Nigeria’s NIRSAL is worth replicating. The goal is to encourage affordable commercial bank lending to the agricultural sector. In this case, the Central Bank provides incentives for commercial banks to minimize collateral lending requirements and lower the interest rates. Donor funds could also be designed to provide the same functions. Also, flexible ICT legislations to provide mobile agricultural financing solutions should be encouraged. Finally, governments should enhance access to weather information and situational adverse such as disease outbreaks in a timely manner. This is important for minimizing risks to investments in production inputs, and for the private sector to develop appropriate mitigating mechanisms including insurance products.
- *Tap into private sector-led partnerships* – a good one is Grow Africa that provides opportunities for value chain financing and for bringing innovations that at scale. To

grow these partnerships, it is important to organize regular national and regional agribusiness forums along key value chains that bring the public, private, farmers and the development community together to dialogue, showcase and do business. At the country level, this momentum could be supported in many ways, including the creation of Special Economic Zones and Special Agribusiness Zones. There should be supplemented with greater investments in critical rural roads, ICT and electricity infrastructure. Also invest in enhancing port, rail and road capacity to reduce transport and time costs. This will go a long way in enhancing input availability and farmer access.

- *Improve the policy environment* – key areas are in foundation seed, implementation of quality control measures for both the seed and fertilizer industry. This should be done that support regional trade in seeds, fertilizers, and farm produce. Additionally, there is need to enact Intellectual Property (IP) and Plant Varieties Protection legislation to protect investor IP. Additionally, there is need to support the rapid adoption of regional seed catalogues as this will enhance improve access rapidly to farmers across countries. To help move the policy agenda forward, there are indeed many policy innovations taking place in several countries. They include thematic policy nodes and hubs, as well as the Agricultural Transformation Agencies that now exist in several countries that could be scale up. These initiatives are indeed moving forward much needed changes in the seed and fertilizer supply space. Other important areas where they should help include increasing the ease of starting (easing registration), doing, closing business which will encourage increased entry and investment by input companies.

We are confident that if these opportunities are couched within the framework of public-private partnerships and within value chains, the potential for growing Africa’s agricultural productivity and food security is enormous. Partnerships are essential for collectively setting the direction, invest and innovate, and mobilize and empower farmers. This is the right time to seize this opportunity. Let’s go for it.

4. ESTIMATED COSTS

The estimated costs for interventions in 15 - 20 in sub-Sahara Africa countries over 5 year period is as tabulated below

Intervention area	Amount (USD)
Seeds supply	60,000,000
Fertilizer use & supply	100,000,000
Awareness creation/extension/ICT	15,000,000
Human & institutional capacity building	65,000,000
Policy & Advocacy	30,000,000
Strengthening Farmers’ organizations	15,000,000
Access to output markets	15,000,000
Total	300,000,000

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