



Assessment of Fertilizer Distribution Systems and Opportunities for Developing Fertilizer Blends UGANDA

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Executed by:



This assessment was conducted by the International Fertilizer Development Center (IFDC) and the African Fertilizer and Agribusiness Partnership (AFAP) for the Alliance for a Green Revolution in Africa (AGRA) as part of a consultancy for Assessment of Fertilizer Distribution Systems and Opportunities for Developing Fertilizer Blends. The views, information, and opinions expressed in this assessment are those of IFDC and AFAP and do not necessarily reflect the official policy or position of AGRA.

Table of Contents

Acronyms & Abbreviations	2
Introduction.....	3
Available Soil Information	3
Fertilizers Use in Uganda.....	3
Rationale for Why Available Fertilizer Products Were Developed.....	4
Types of Fertilizer Recommendations that are Available, and Their Suitability for Staple Crops and Agro-Ecological Zones that are Targeted by AGRA	5
Maize recommendations and their suitability	5
Rice recommendations and their suitability.....	6
Bean recommendations and their suitability.....	7
Cassava recommendations and their suitability.....	7
Gaps that Need to be Addressed to Come Up with Area and Crop Specific Blends.....	7
Fertilizer Companies and/or SME Blenders Existing in the Country and the Geographies Targeted by AGRA.....	8
Inventory of Partners and Ongoing Efforts or Investments that are Promoting the Availability of Appropriate Blended Fertilizers that AGRA can Leverage in the Target Countries.....	8
Recommendations and Interventions that AGRA could Implement to Address the Availability of Quality Fertilizers	8
Bottlenecks in Fertilizer Distribution Systems, and Interventions that AGRA and Its Partners can Implement to Help Farmers Access Quality Fertilizers	10
The fertilizer market structure	10
Fertilizer supply side.....	13
Fertilizer demand side.....	13
Proposed distribution system interventions and partners.....	14
Policy Bottlenecks that are Affecting the Availability of Blended Fertilizers, and Interventions that AGRA and Its Partners Could Design and Advocate for Implementation to Help Farmers Access Appropriate Blends	15
Appendix I. Soil Nutrient Maps of Regions Mapped under the CATALIST-Uganda and ISSD Projects, 2015.....	16
Appendix II. Potential Partners and Key Contacts in Uganda.....	18

Acronyms & Abbreviations

ACDP	Agricultural Cluster Development Program
AFAP	African Fertilizer and Agribusiness Partnership
AfSIS	Africa Soil Information Service
AGRA	Alliance for a Green Revolution in Africa
ASARECA	Association for Strengthening Agricultural Research in Eastern & Central Africa
B	boron
CAN	calcium ammonium nitrate
CCRP	Collaborative Crop Research Program
DAP	di-ammonium phosphate
DFID	Department for International Development, UK
DGIS	Directorate-General for International Cooperation, Netherlands
EAAP	East Africa Agricultural Productivity Enhancement Project
ECAAT	Eastern and Central Africa Agricultural Transformation Project
ERPC	Economic Policy Research Center
ETG	Export Trading Group
FAO	Food and Agriculture Organization of the United Nations
FUBC	Fertilizer Use By Crop
Ha	hectare
IFDC	International Fertilizer Development Center
IITA	International Institute for Tropical Agriculture
IPNI	International Plant Nutrition Institute
ISFM	integrated soil fertility management
ISRIC	World Soil Information
ISSD	Integrated Seed Sector Development
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
Mt	metric ton
NAADS	National Agricultural Advisory Services
NARL	National Agricultural Research Laboratories
NARO	National Agricultural Research Organisation
NOGAMU	National Organization of Organic Movement of Uganda
NCPB	National Cereals and Produce Board
NGO	non governmental organization
NPK	nitrogen phosphorus potassium
OCP	Office Chérifien des Phosphates
OFRA	Optimizing Fertilizer Recommendations in Africa
REACH	Resilient Efficient Agribusiness Chains project
SSA	sub-Saharan Africa
SSP	single superphosphate
TSP	triple super phosphate
TTFA	Toyota Tsusho Fertilizers Africa
UBS	Agricultural Cluster Development Program
UNFF	Uganda National Farmers Federation
USAID	United States Agency for International Development

Assessment of Fertilizer Distribution and Opportunities for Developing Fertilizer Blends in Uganda

Introduction

In the performance of this assessment, we conducted interviews with key informants in Uganda, including Dr. Kayuki Kaizzi (Soil Scientist, Kawanda Research Station), Wilfred Thembo (AFAP), Grace Kazigati (NAADS), Sunday Godfrey (Uganda Bureau of Standards), Erastus Kibuyu (Oneward Resources working with Palladium/ DFID), providers of multi-nutrient fertilizers including Balton, ETG, Yara, Toyota and Grainpulse, and representatives of Sasakawa Global 2000 and IFDC's REACH project. We conducted a visit to the Grainpulse blending facility outside of Kampala. We reviewed documents relating to policy and regulations, the national maize recommendation, and soybean and groundnut agronomic recommendations, which are referred to in the assessment.

Available Soil Information

The IFDC CATALIST-Uganda project and Integrated Seed Sector Development project (both funded by DGIS) collected full soil samples from several districts in Uganda, which are the basis for the maps in Appendix I. These maps indicate considerable diversity in some soil properties and elemental deficiencies, and consistent areas of S, Zn, and B deficiencies, but do not cover most of AGRA's zones of operation. Similar information is available on Ca, Mg, total N, and soil organic matter.

For the country as a whole, while no maps have been made, there is considerable information on pH, total N, organic C, available P, and exchangeable K that could potentially be converted to maps, though it will leave large gaps with respect to several secondary and micronutrients critical to development of balanced fertilizers. This information is housed at Kawanda Research Station.

Fertilizers Use in Uganda

The fertilizers use by product in 2016 and fertilizer use by crop (2015) are shown in Table 1. The compound 17:17:17 accounts for most of the fertilizer use, and some of product labeled "other" may also include 17:17:17. It is the main fertilizer used on sugarcane, which dominates fertilizer use in Uganda, followed by coffee and banana.

Rationale for Why Available Fertilizer Products Were Developed

Several Yara products are available through Balton (Uganda) Ltd and through their own distributors. ETG has begun importing fertilizers blended in Mombasa for field testing, and Grainpulse Ltd. (Kampala) has several products that are primarily NPK-based. In all cases, these diverse products were developed to be crop-targeted. In all cases, products were developed to meet crop-specific demands, without respect to specific soil analysis, but with regards to perceived widespread nutrient deficiencies. Grainpulse Ltd. has produced test products on the assumption of primarily NPK deficiencies only. More recently, Grainpulse has become aware of the likelihood of secondary and micronutrient deficiencies, and has imported granular ulexite (a slow-release boron source) and is intending to bring in zinc sulfate, and is modifying their blending line to apply spray coatings of Zn and B. The inclusion of sulfur in some of their formulations is based on avoidance of chloride (for example, using potassium sulfate instead of potassium chloride in blends), and was not designed to meet S deficiencies, though it serves that purpose. Fertilizer compounds (Yara products) contain various secondary and micronutrients based on a perception that they are generally lacking. ETG and others bring in fertilizers for cash crops (sugarcane, tea, and coffee).

With respect to trace element addition rates, only Yara product combinations can supply adequate S and Zn, and B. Boron can be also applied through one of their foliar products.

Table 1. Fertilizer use by product (2016) and fertilizer use by crop (2015)

Fertilizer	Volume (tons)	Crop	Hectares Planted	Hectares Fertilized	Fertilizer Tons
17:17:17	29,698	Maize	1,101,000	36,248	5,548
Other	15,058	Banana	972,000	42,753	8,151
Urea	9,785	Coffee*	284,624	23,406	9,366
CAN	2,856	Sunflower	238,000	5,536	692
Ammonium Sulphate	1,321	Rice	93,000	3,069	921
DAP	1,184	Sugar	70,000	50,590	23,423
Organic	190	Tea	52,000	15,600	3,900
Total	61,317	Potato	38,000	1,262	347
		Tobacco	17,568	4,881	732
		Wheat	14,000	800	100
		Total			53,180

* Coffee estimated at 402,000 ha in 2016 by EPRC.

Source: UBS, FUBC study 2015.

Types of Fertilizer Recommendations that are Available, and Their Suitability for Staple Crops and Agro-Ecological Zones that are Targeted by AGRA

Table 2 shows the nutrients extracted for given yield targets we believe routinely achievable for AGRA priority crops in Uganda, along with nutrients supplied in government and fertilizer company offerings.

Maize recommendations and their suitability

The government maize formulation is somewhat unbalanced with respect to N and P and contains no other nutrients. The recommendation is basically because it is derived from a per-acre recommendation: 1 50-kg bag of DAP and urea per acre.

Table 2. Nutrients extracted for given yield targets and nutrients supplied in government and fertilizer company recommendations for AGRA priority crops

Crop	Yield Target	Appl. rate (kg ha ⁻¹)		N	P ₂ O ₅	K ₂ O	CaO	MgO	S	Zn	B	Cu	Mn	Fe
		Basal	Top dress											
Maize	Mt/ha 5	-----Nutrients removed in crop and residue, kg ha ⁻¹ -----												
		100 46 121 18 35 13 0.23 0.24 0.07 0.73 0.36												
		-----Nutrients supplied in recommendation, kg ha ⁻¹ -----												
		Government recommendation	125 DAP	125 Urea	80	58	0	0	0	0	0	0	0	0
Greenpulse NPK 20:20:18	250	125	108	50	45	0	0	0	0	0	0	0	0	
Yara Various, according to soil analysis														
Rice	Mt/ha 7	-----Nutrients removed in crop and residue, kg ha ⁻¹ -----												
		150 46 217 42 50 7 0.28 0.21 0.07 0.566 0.923												
		-----Nutrients supplied in recommendation, kg ha ⁻¹ -----												
		Government recommendation		125-250 AS	22-45	0	0	0	0	30-60	0	0	0	0
Grainpulse NPK 23-17-12 +1.2S +2MgO	185	123 (urea)	57	31	22	0	0	2	0	0	0	0	0	
Yara Various, according to soil analysis														
Beans	Mt/ha 2	-----Nutrients removed in crop and residue, kg ha ⁻¹ -----												
		96 27 80 63 15 7 0.10 0.10 0.01 0.16 0.07												
		-----Nutrients supplied in recommendation, kg ha ⁻¹ -----												
		Government recommendation	125 SSP	125 CAN	34	25	0	35	0	14	0	0	0	0
Grainpulse NPK 11:29:23	125		14	36	15	0	0	0	0	0	0	0	0	
Yara Various, according to soil analysis														
Cassava	Mt/ha 30	-----Nutrients removed in crop and residue, kg ha ⁻¹ -----												
		96 27 80 88 24 6.7 0.10 0.10 0.01 0.16 0.07												
		-----Nutrients supplied in recommendation, kg ha ⁻¹ -----												
		Government recommendation	No recommendation		--	--	--	--	--	--	--	--	--	--
Grainpulse NPK 14-10-28+0.8S	185	185 (urea)	111	26	52	0	0	1	0	0	0	0	0	
ETG 15:9:21+5S, Ca, Mg, Zn, B	185	185 (urea)	113	17	39	9	?	9	?	?	?	?	?	
Yara Various, according to soil analysis														

? = ETG requested confidentiality regarding secondary and micronutrient rates.

The Grainpulse “recommendation” is again an NPK recommendation, more balanced for N and P when compared to the government recommendation, and contains a fair dose of K. However, it includes no S or micronutrients. It is being field-tested, so we do not yet call it a recommendation, and may evolve. Grainpulse is becoming aware of S, Zn, and B deficiencies and is therefore importing appropriate ingredients to include in future formulations. Its high rate of recommended application may discourage farmers, and is due in part to its K concentration, which accounts for 75 kg/ha of the basal application rate. This may not be universally necessary, depending on K content of Uganda soils.

Yara has no specific recommendation. Their model is to tailor their recommendation at demonstration sites from available products based on soil analysis at the demonstration site. This demonstration recommendation is then extended to nearby farmers. Through this model, Yara is able to meet N, P, K, S, and Zn requirements. They may also supplement this recommendation with a foliar product that contains (primarily) Zn and B.

Rice recommendations and their suitability

The government recommends only ammonium sulfate for rice, which supplies N and S. This is a rather dated recommendation but has some logic to it. For many lowland rice farmers not in rice irrigation schemes, both flooding and drought are regular occurrences. Ammonium sulfate, while not balanced for N and S, is actually a very cheap N source (the extra S is not detrimental to rice production). So, this recommendation was suitable to the conditions of many rice farmers some years ago.

Water control is probably the most significant factor affecting lowland rice farmers, as most are farming outside of rice schemes. In 2016, using improved water control practices, improved seeds, line planting, and weed control, paddy rice yields in control plots (no fertilizer) averaged 5.8 Mt/ha across 148 demonstration sites across 11 districts in Eastern Uganda by the IFDC CATALIST-Uganda project. This reflects the generally high soil fertility status, which is caused by frequent soil enrichment in flood water. Adding only 52 kg/ha N (as urea briquettes) further increased average paddy yields to 7.2 Mt/ha, making this small investment very profitable, and somewhat justifying the government recommendation of adding N only. A complete balanced fertilizer application (NPK 70-30:30 +6S + 0.4 Zn +0.3B +0.4Cu) further advanced yields to 8.8 Mt/ha.

What can be learned from this is that soil fertility is not the major problem facing lowland rice farmers, who last year averaged only 1.4 Mt/ha. Water management and improved cultural practices are more significant constraints. Poor water control creates risks, which in turn limits farmer desire to invest good agronomic practices and fertilizer. The situation today is further aggravated by additional risks: government policy on restricting cultivation in wetlands, and suspension of Common External Tariff on imported rice, which permits imported rice to depress prices. The take-away for AGRA investments is that they should concentrate in established irrigated rice schemes, which are also not likely to be affected by wetlands policy.

This also has some impact on fertilizer choice. The strong response to N only (under proper management) indicates that for farmers with limited resources, this is a good investment strategy, given the generally high soil fertility. Additional balanced fertilizer input at a modest rate in IFDC demonstrations (150 kg/ha basal) resulted in an additional 1.6 Mt/ha. Previous season's trials and soil analyses from these marshlands suggested that S, Zn and B were deficient. Given the inherent fertility of these soils, modest applications may sustain yields at higher levels until fertility is depleted, which may take some time.

A better target for rice fertilizer response may be upland rice, which is substantial in Uganda, but as with lowland rice, suspension of Common External Tariff on imported rice has pressured prices downward. Soil analyses in upland rice growing areas are necessary for developing test formulations.

Bean recommendations and their suitability

Beans need to be inoculated to meet their N requirements. Beans have been found responsive to K, Ca, S, Zn, B, and lime in neighboring countries, but we do not yet know the extent of these deficiencies in AGRA priority areas of Uganda. The government recommendation (SSP and CAN) is a good source of S and Ca; the Grainpulse recommendation is a good source of N, P, and K. Both are lacking in some nutrients that would likely increase response if they are deficient. The diversity of fertilizer products offered by Yara, if supplemented by even small amounts of lime as a Ca source, should be able to meet bean requirements when primary deficiencies are known. Yara makes no specific bean recommendation, and tailors its recommendations according to soil analyses at demonstration sites.

Cassava recommendations and their suitability

OFRA trials indicated that cassava was most responsive to N and somewhat to K, which has been affirmed by IPNI trials in various countries. Cassava has been found to be responsive to S, Zn, and B in Burundi, and can grow well in moderately acidic soils. There is no government cassava recommendation. Both ETG and Grainpulse make blends for K-demanding crops that should match cassava requirements, if supplemented by a urea topdress; they may need to be supplemented with Zn and B. The ETG formulation seems best balanced for N, P, K, and S, but its Zn and B concentrations are unknown (proprietary). Yara makes no specific cassava recommendation, and tailors its recommendations according to soil analyses at demonstration sites.

In sum, Uganda has some blends for all AGRA priority crops, but these are primarily NPK-based, and most are not benefitting from S, Zn, or B which appear to be deficient in areas of Uganda that have been mapped. Only one OFRA site had S, Zn and B added, and at that site, sorghum yields increased dramatically due to a diagnostic treatment containing Mg, S, Zn, and B, which was applied at the correct rates. One site cannot be indicative of responses elsewhere and on other crops, however.

Gaps that Need to be Addressed to Come Up with Area and Crop Specific Blends

The lack of soils information in AGRA priority areas is holding up the development of area- and crop-specific blends. Given the broad deficiencies of S, Zn, and B in areas that have been mapped, one might begin testing blend options based on that assumption. Eastern Uganda may prove to have very different soils due to the influence of Mount Elgon and the more intensive cropping in that area. Western Uganda may also be influenced by Rift Valley geology, so it is difficult to know if assumptions of S, Zn, and B deficiencies are correct. Potassium (K) deficiencies and response need to be evaluated in relation to AGRA priority crops. Relative to S, Zn, and B, addressing K deficiencies is costly and increases fertilizer volume, so it is important to apply K only where yield response justifies it.

While Grainpulse has developed some blends, they are NPK blends only. More “best bet” blends containing secondary and micronutrients need to be tested and honed to crop demands. While Grainpulse is the only in-country blender, both ETG and TTFA from Kenya are well-positioned geographically to meet Uganda demands, are more experienced in blend

formulation, and have more working capital to demonstrate and promote their products. All should be supported in the Uganda context.

An additional gap is a lack of government and private sector awareness of potential secondary and micronutrient deficiencies and impact on yields, which has resulted in an NPK focus. As yet, there have been no blended multi-nutrient products that have been evaluated extensively vs. current government NPK recommendations.

Fertilizer Companies and/or SME Blenders Existing in the Country and the Geographies Targeted by AGRA

Grainpulse (Kampala) is the only in-country blender. ETG has recently begun blending in Mombasa, from which it will supply two products to Uganda; it has the advantage of being Uganda's main fertilizer supplier, with some of the better distribution channels. Yara supplies several multi-nutrient compounds capable of addressing various soil and crop requirements, once deficiencies are identified. TTFA, based in Eldoret, Kenya, is also interested in the Uganda market. These four companies are sufficient to supply blending demand to Uganda and to deal with increasing demand in the future.

Inventory of Partners and Ongoing Efforts or Investments that are Promoting the Availability of Appropriate Blended Fertilizers that AGRA can Leverage in the Target Countries

A list of potential partners and key country contacts is in Appendix II.

Recommendations and Interventions that AGRA could Implement to Address the Availability of Quality Fertilizers

Filling soil information gaps: A large portion of AGRA intervention areas has not been sampled and received a full analysis for mapping. In the Uganda context, this is very important. Politically, complete nutrient deficiency maps push the balanced nutrition agenda away from 17:17:17 and towards more balanced formulations. The information could be critical in driving the World Bank-funded Agricultural Cluster Development Program (ACDP) to subsidize balanced fertilizers rather than current NPKs. How this is implemented can be a cost challenge. In Burundi, IFDC successfully argued that the subsidy program should fund full soil analyses, which led to the identification of multiple nutrient deficiencies and development of several crop-targeted fertilizers. The same argument could be made in the Uganda context. Grainpulse is already performing full soil analyses at their demonstration sites, and other players (TTFA, Yara, and ETG) could be encouraged to do the same in a data-sharing arrangement. In addition, the Ugandan National laboratories can contribute by 1) insisting that all soil samples be geo-referenced; and 2) performing complete soil analyses on a sub-set of samples; and 3) providing training to enter results into a database (preferably the ISRIC database). Once the database is sufficiently populated, ISRIC can quickly make the maps at a reasonable cost. This will require that they develop their capacity for S and B analyses. They should already have the capacity to analyze other nutrients. AGRA can assist

by funding training on complete soil analysis, how to get a geo-reference from a smart phone, and funding full analyses on a well-distributed set of geo-references samples. We emphasize that the main cost of soil analysis is in the sampling and delivery of samples to the laboratories, and not in the analysis itself. The contribution from the national system would be providing the soil samples, delivered to the laboratories.

Apart from the critical political role of soil maps, the maps will enable efficient development and targeting of crop- and soil-specific fertilizers.

Best-bet evaluation: AGRA can work with fertilizer companies providing multi-nutrient compounds to develop better fertilizers from best-bet trials. One important component of these trials is multiple treatments (such that response to individual nutrients can be ascertained from the results) and proper treatment structure and statistical analysis, which IFDC can provide. It is important that where feasible, national research and extension service personnel be identified and trained to support these trials. Soil analyses at these sites can contribute to soil maps and as well improve the understanding between crop response and soil analysis and is an important component of these trials.

Increasing farmer demand: As is well-understood, Uganda has a very low fertilizer consumption. One key to stimulating more consumption is achieving better response to fertilizers. The currently most used fertilizer, 17:17:17, is relatively expensive in terms cost per unit nutrient and cost per bag, and we believe that it will be easy to best this fertilizer using balanced fertilizers at a similar price. With side-by-side comparisons, most farmers would choose a thoughtfully blended product. So, an important component is demonstrating blends side-by-side with fertilizers available through the subsidy program. We suggest that AGRA interact with ACDP and providers of multi-nutrient fertilizers to have simple demonstrations of fertilizer options (those currently subsidized by ACDP, and blend alternatives). One aspect of these demonstrations should be that fertilizers are compared at similar rates of application, and that data are collected from these demonstrations. The data should provide persuasive evidence to ACDP to subsidize blends or multi-nutrient compounds in future seasons.

Increasing farmer and extension staff knowledge on fertilizer use: Lack of fertilizer knowledge basics: the 4R nutrient stewardship (right source, right rate, right time, and right placement) is a severe constraint to both farmers and extension workers, many of whom have never used or been exposed to fertilizers. Value chain projects as well can benefit from this training, as our experience is that some value chain projects are concentrated on market portions of the value chain and may have little experience in best production practices, including fertilizers. Value chain projects link farmers to markets, which is critical in ensuring continued fertilizers use. IPNI is very good at teaching fertilizer basics and has training materials appropriate to various audiences (farmer and extension), and IFDC is well-qualified in aspects of 4R as it relates to secondary and micronutrients in balanced fertilizers. Training should be followed by simple demonstration sites to train farmers and field days that include cost analysis to show the profitability of fertilizer use. Other partners in this should be fertilizer companies (who can provide product in regions they are interested in targeting and will often financially support field day activities) and agro-dealers, who benefit from increased sales.

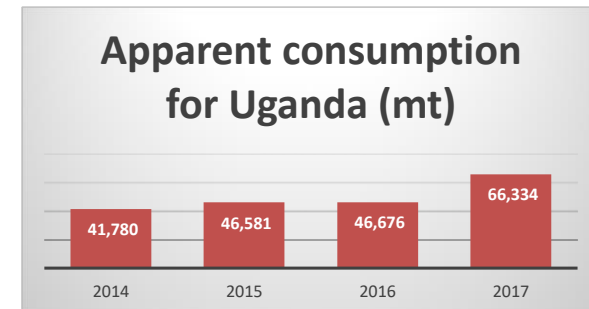
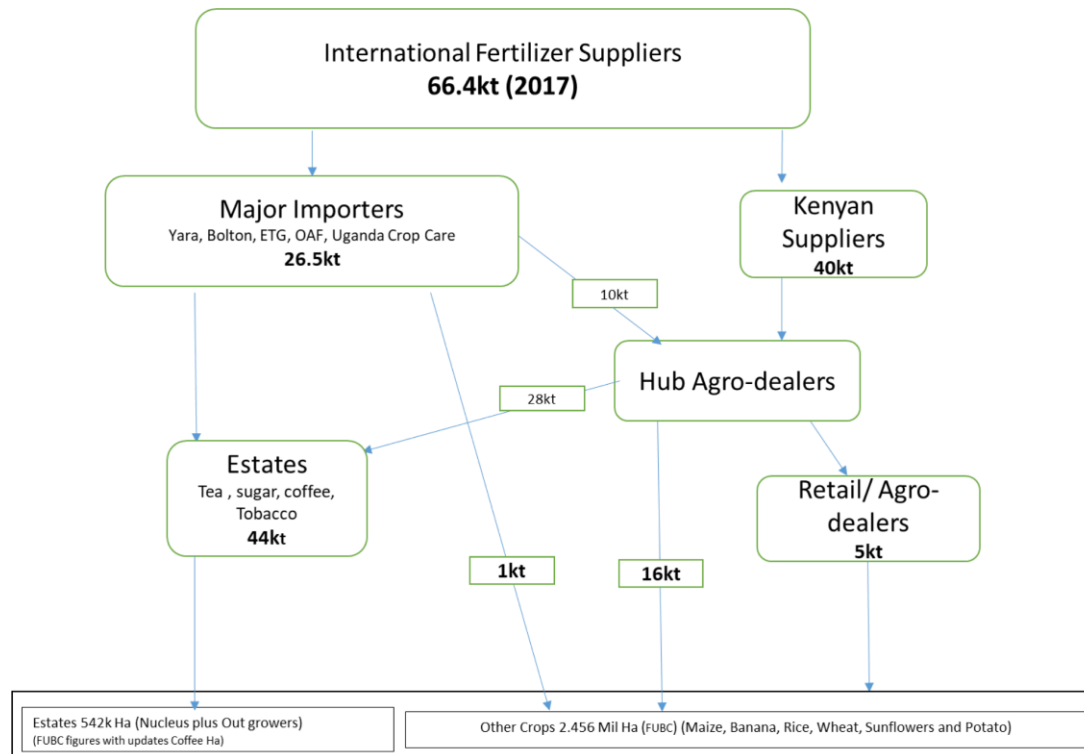
Bottlenecks in Fertilizer Distribution Systems, and Interventions that AGRA and Its Partners can Implement to Help Farmers Access Quality Fertilizers

The fertilizer market structure

The Uganda fertilizer market structure is outlined in Figure 1. The SWOT for this market is shown in Table 2.

The Ugandan market has the following key characteristics:

- A large number of poor smallholder farmers (SHFs); 69% of the 4.2 million SHF are classed below the poverty line and unable to participate in the formal market.
- Low demand at the SHF level. 44.1kt (66%) of the fertilizers used in Uganda are used by the estates on an estimated 542,000 ha (81 kg/ha). The remaining 22kt is used by small holder farmers on 2,456,000 ha of cultivated crops (11 kg/ha; UBS Fertilizer Use by Crop [FUBC] study, 2015).
- Poor fertilizer distribution capacity. Inefficient structures and supply lines lead to ineffective and high-priced supply outside of Kampala. While there are 2065 registered agro-dealers in Uganda, their throughput is low, with an estimated total of 5kt being sold through this channel, the majority of fertilizer (23.7kt) being supplied to the non-estate sector going through an estimated 45 larger “hub dealers”
- Cultivation of available arable land is low (3 million ha out of an estimated 6.9 million ha available; UBS FUBC, 2015)
- ETG, Yara, Grainpulse and Uganda Crop Care import 26kt direct from the international market into Uganda. Independent hub dealers bring a further 47kt into Uganda from a range of Kenyan suppliers.



	Fertilizer system	Volume (mt)	%
Estates	Bulk Plantation	43,824	66%
	Bulk Anchor	1,328	2%
	Bulk Government		
	Private	23,904	32%
		66,400	

Figure 1. Uganda Fertilizer market structure, apparent consumption, and volume distribution by system (2017)

	Strengths	Weaknesses	Opportunities	Threats
Manufacturer		<ul style="list-style-type: none"> Limited feedstock availability and quality 	<ul style="list-style-type: none"> There is a phosphate deposit with manufacturing limitations. Opportunities for small scale Nitrogen production 	
Importer	<ul style="list-style-type: none"> Fragmented imports from Kenya 	<ul style="list-style-type: none"> Majority is imported through informal channels (no manufacturer support) 	<ul style="list-style-type: none"> Lever off international experience to expedite product choice, formulations and best practice in fertilizer use Lever trade finance from manufacturers/Development funds and export banks Encourage manufacturers to provide flexible buying arrangements 	
Blender	<ul style="list-style-type: none"> One established blender (GrainPulse) with links to output markets (Savanah) Kenyan Blenders capable and interested in supplying the market (Yara, Toyota, ETG). 	<ul style="list-style-type: none"> Working capital demands on small blenders Lack of technical and commercial capacity at both private and public sector levels Low awareness of benefits of fertilizer use 	<ul style="list-style-type: none"> Recognition of the benefit of “balanced Nutrition” at all levels of the value chain. Productivity improvements have been demonstrated Provide clarity in regulations –truth in labelling Provide technical support on new fertilizer technologies and marketing—public/private platforms— 	<ul style="list-style-type: none"> Stronger quality regulations that ensure best product and process. That agro-dealers controlling the distribution focus on commodity sales rather than support agreed formulations
Distributor	<ul style="list-style-type: none"> Relationship with retailer Relationship with importers 	<ul style="list-style-type: none"> Lack of management and technical competence to guide fertilizer development (products, availability) Inadequate working capital 	<ul style="list-style-type: none"> Explore opportunities to work with WB funded ACDP program providing inputs to 450k farm households Work with Majors to support their own distribution networks Opportunities with DiFD/palladium fertilizer distribution program in North Uganda 	<ul style="list-style-type: none"> Strong competition from informal sector bringing commodities from Kenya Inefficiencies in the distribution channel reduce competitiveness “fake fertilizer” branding
Agro Dealer		<ul style="list-style-type: none"> Undeveloped due to low market development 		

Key Takeaways:

- Poor recognition of need for fertilizers. Creating demand is first step.
- Fertilizer products imported are predominantly Triple 17 (table 1). ROI at farm level have been proven to “Balanced fertilizers”—Need sensitization
- Opportunities with Anchor programs(breweries/sorghum, Mukwani cooking oil, rice) need policies to protect for establishment
- Distribution networks need strengthening (AFAP/Hub dealer development)—need linking to Majors to lever experience. Hub development should not be at the exclusion of majors own development
- Credit Guarantee to build confidence in supply chain finance and terms to allow coverage for peak offtake times

Figure 2. SWOT analysis for Uganda

Fertilizer supply side

- Very low demand for any fertilizers; low supply and distribution channel development.
- Poorly structured distribution channel, with low capacity. Questionable supply lines. More than half the product sold in Uganda comes through existing hubs from “non-supported” suppliers in Kenya (paid with cash and destination unknown). It is thought some of this is re-bagged NCPB product).
- Some frustrations with import system when trucks are held up for long periods at border post.
- Many of the major suppliers have expressed interest/future plans to start to develop the Ugandan market.
 - ETG/Yara to increase supply hubs and distribution points.
 - Toyota to market their technical expertise to estates and out-grower schemes in Uganda to develop their business.

Fertilizer demand side

- Low ROI at farm level—estimated at 2 for cereals.¹
- Poor understanding value proposition from balanced nutrition.
- Mantra of “We don’t need fertilizers—we have rich soils”. This is not supported by cereal productivity data (FAO) which shows average yields between 1.5 and 2 ton /ha (Figure 3), from OFRA data, and response Grainpulse have achieved from initial blended fertilizer trials (Maize: 1.7 t/ha national average, to 3.4 t/ha with Grainpulse maize formulation).
- Concern over fake fertilizers- poorly understood and addressed.
- Poor extension knowledge of fertilizers.
- High cost because of disjointed distribution channel. Margins between US\$50/ton and US\$100/ton at each point of exchange in the distribution channel. Most product is bought into Kampala and distributed on a range of vehicles depending on demand.
- Low cash ability at farm level to pay. ERPC (2015) claim only 8% of farmers use inorganic fertilizers because they are resource constrained and unable to afford fertilizer.

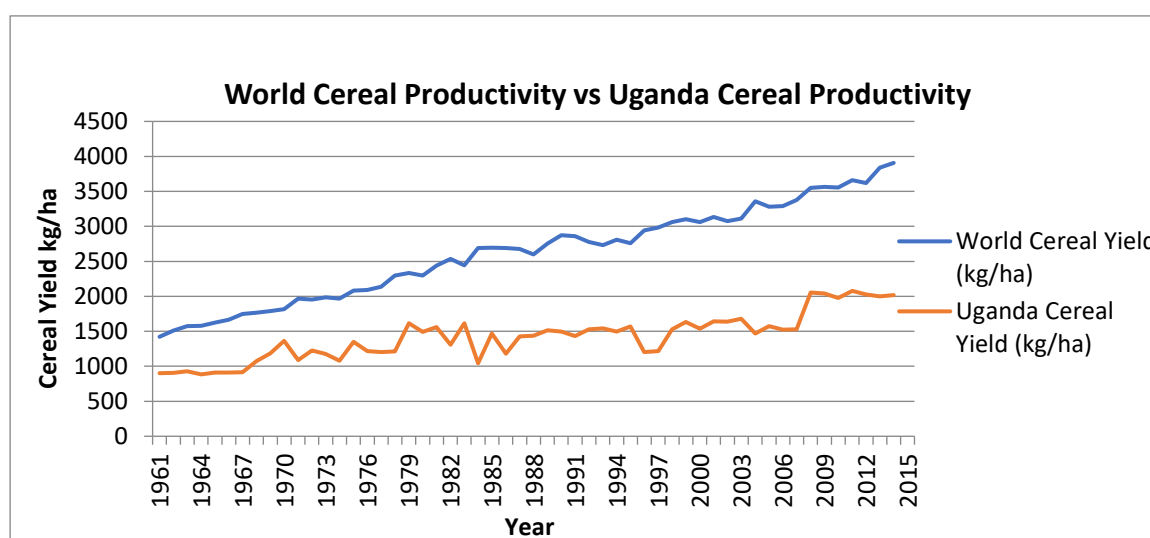


Figure 3. Ugandan Cereal Productivity Trends.

¹ AREEED, 2016. Evaluation of fertilizer and Seed Systems in Sub Saharan Africa. Prepared for AGRA.

Proposed distribution system interventions and partners

- The AGRA/AFAP Hub dealer development program is targeted the development of 10 Hub dealers in Uganda. This should be supported, particularly linking these with established manufacturers/importers/blenders to ensure maximum market development (catalytic), and not targeting building new blending facilities.
Development of new blenders require volumes to support the capital, working capital to cover procurement lead times, and time to recover sales and technical competence for both operations and marketing.
- The World Bank funded Agricultural Cluster Development Program (ACDP), implemented by NAADS, is targeting the 68% farmer population in poverty, providing subsidized inputs, through an e-voucher program, market linkages and advice. It has been slow to start with none of the planned 20kt to be delivered in 2017 being delivered. The ACDP is piloting in 6 districts in Northern Uganda this season, with an eventual target of 40 districts out of 121 over 5 years. NAADS has expressed interest in working with the private sector fertilizer businesses to implement.
- Yara, ETG and Toyota have all expressed interest in working together to develop Uganda. They all have different approaches and should be supported as they build on their own strengths. ETG has expressed interest in developing up-country storage at a number of sites in Uganda and supporting a chain of dedicated agro-dealers. Yara also plans to build distribution in Uganda and step up their development program. Toyota is planning to enter the Ugandan market with a range of their crop specific blends. Balton (a Yara Agent) also has undertaken hub dealer development by supporting the hub with stock to engage 30 to 40 village agents. Collectively their greatest concern is finding distribution partners who can manage stock and credit. These companies, who have depth in capacity and fertilizer knowledge, should be key partners in AGRA's balanced fertilizer development program and distribution development should be flexible to support different company approaches/strategies.

The three partners above (donor funded project, public sector project and Private Sector) could cover many of the weaknesses in the Ugandan system to create demand by

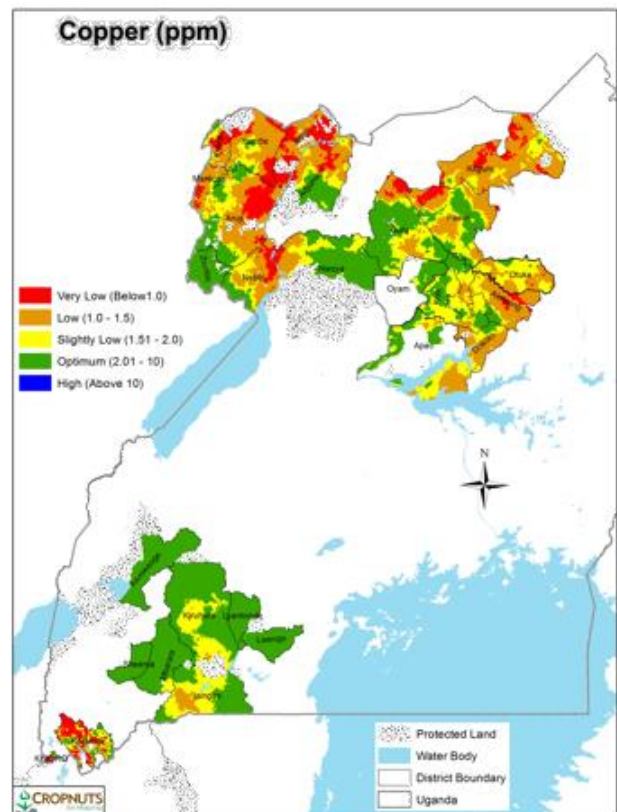
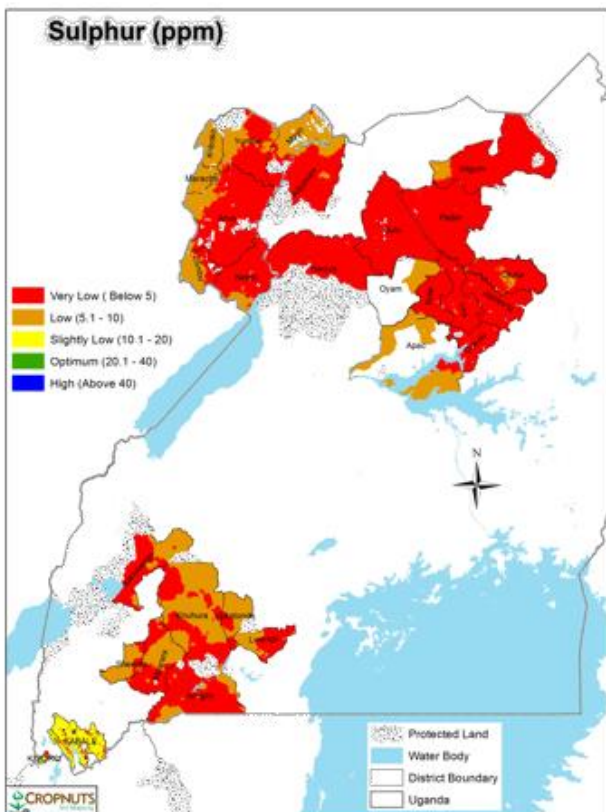
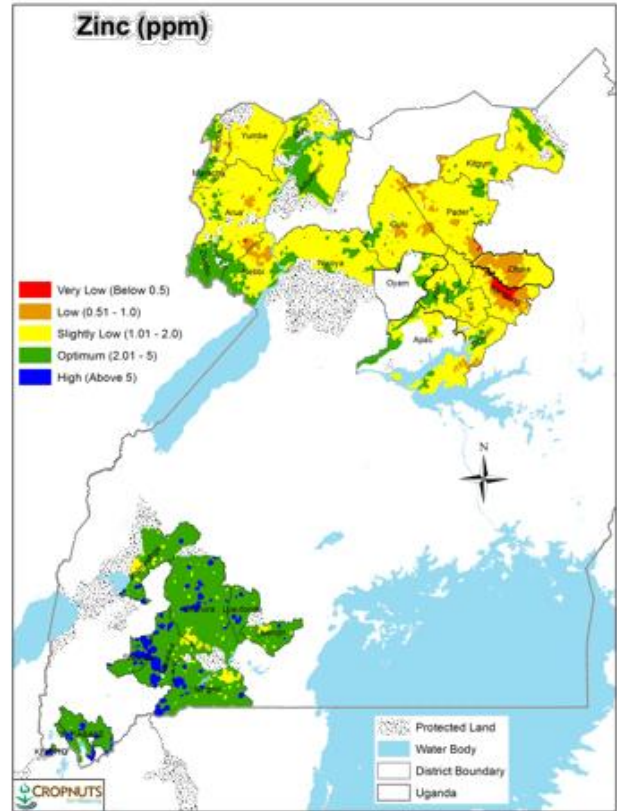
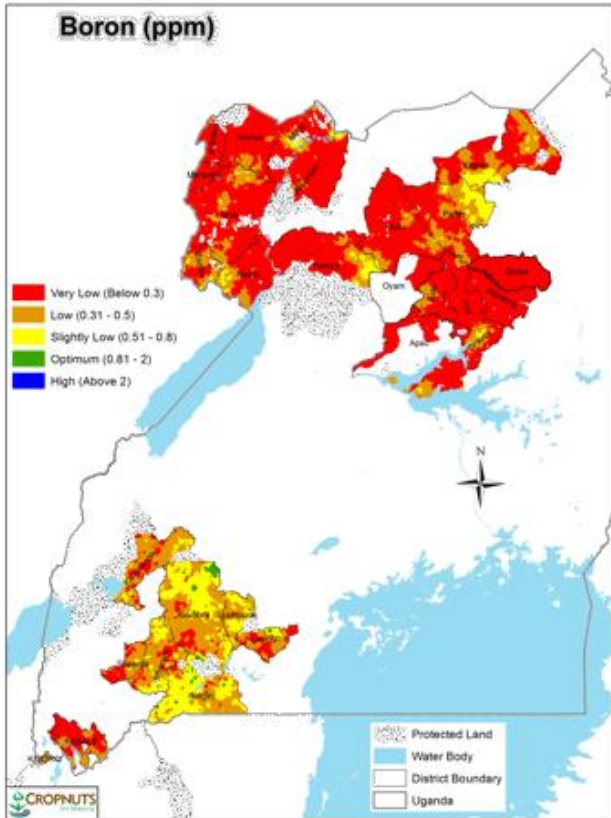
- Sensitizing farmers to the benefits of balanced fertilizers.
- Ensuring balanced fertilizers are included in subsidy offerings.
- Providing inputs to a market sector that would normally be excluded.
- Improving distribution systems for efficiency (storage, logistics).
- Capitalizing on manufacturer capacity to build Ugandan market capacity.

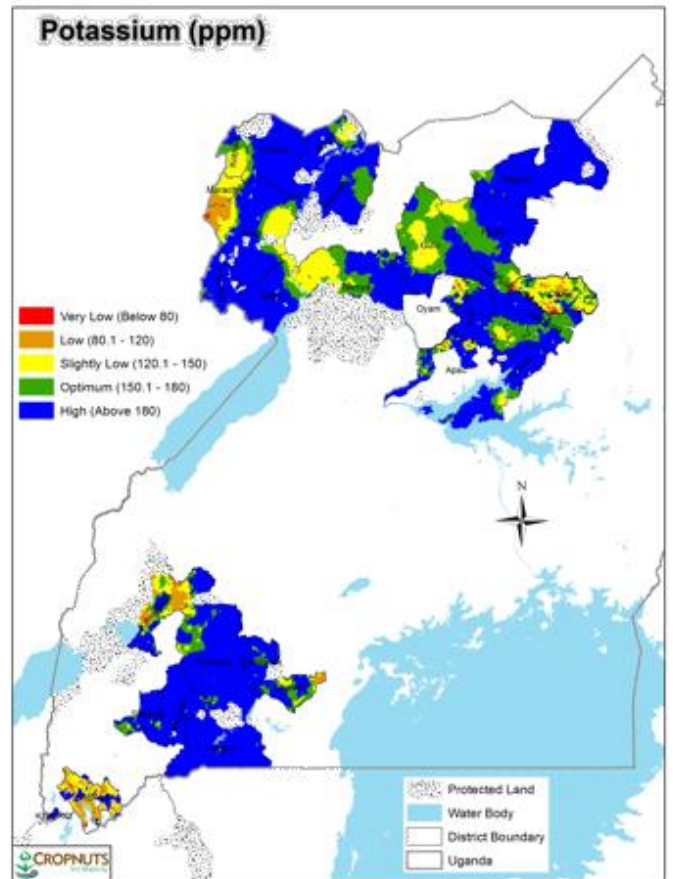
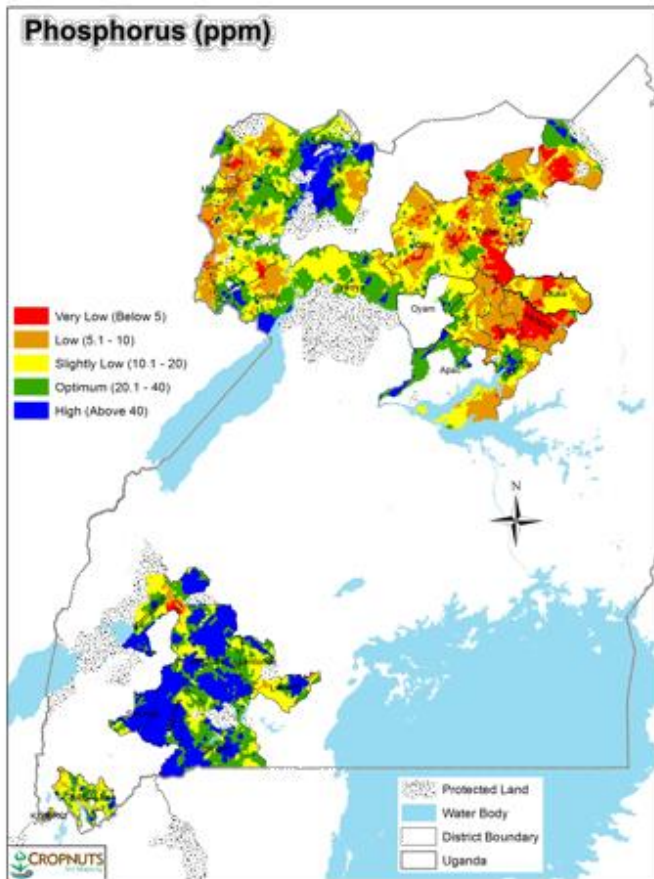
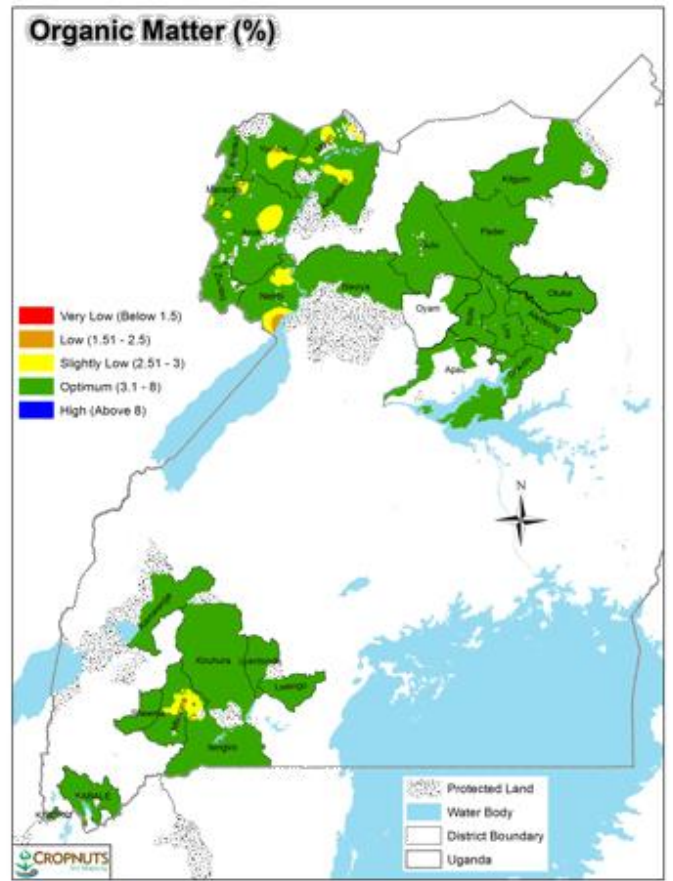
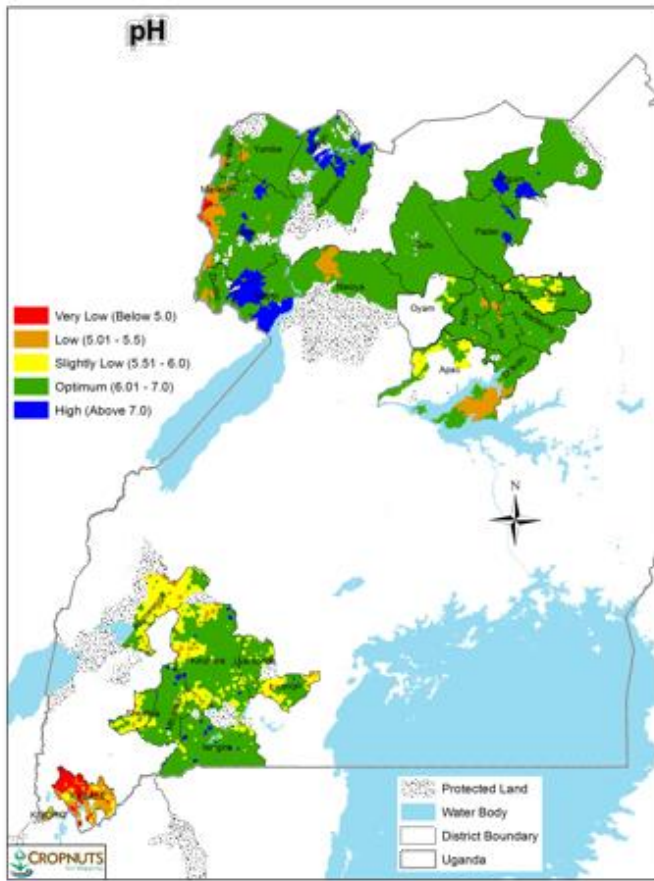
This should be done in a consortium/platform environment. Doing this will require fertilizer competence to ensure leadership to develop and implement a fertilizer road map that can deliver country growth objectives.

Policy Bottlenecks that are Affecting the Availability of Blended Fertilizers, and Interventions that AGRA and Its Partners Could Design and Advocate for Implementation to Help Farmers Access Appropriate Blends

- Develop a regulatory framework surrounding the two major issues impacting the market at this point
 - Govt. role as a regulator
 - Registration Process for fertilizers. This is unclear and while there is talk about having a number of years trial work to have a formulation approved, there was evidence this can be achieved by simply demonstrating formulations, with NAAD’s involvement. The process needs clarity.
 - Quality specifications
 - Discussions around quality as related to blends needs some technical support. While this discussion is happening now, there are comments that need deeper understanding of fertilizer blending to ensure the regulations are not restrictive. (e.g., particle sizing as it pertains to “Truth in Labeling”).
 - Claims of “fake fertilizer”. Both the EPRC 2015 report and the yet unpublished IFDC report of Fertilizer Quality in Uganda identify significant percentages of fertilizers for sale in Uganda that fail to meet standards. Many of these are associated with underweight bags and high moisture levels. Some of these failures would appear to have simple explanations that can easily be addressed; for example, many of the high moisture content failures are in re-bagged small packs and in some cases moisture specifications on some products are set below manufacturing capability. Low chemical analysis on the major NPKs is likely due to NPK 16:16:16 being imported into Kenya and sold as triple 17 because of the lower cost and Kenya having a 1.1% variation tolerance, and Uganda having a 1% variation tolerance. This claim provides uncertainty in the market and is an area AGRA can provide support to provide target interventions to reduce these failures. AGRA awarded a to Economic Policy Research Centre, Makerere University from 2011-2014 (extended to 2015) to support formulation and approval of national fertilizer policy, national fertilizer regulations national fertilizer strategy, and strengthen the capacity of agro-chemicals inspectors and analysts. The fertilizer policy and strategy were passed by Cabinet in May 2016.
 - Private Sector role in regulatory system (Fertilize Platform). Both registration and quality specifications outlined above will benefit from private sector participation and again needs to be part of a transparent and open process. There is the opportunity in Uganda as discussed above to bring all relevant players together to drive the process, but this will need experienced leadership to achieve.

Appendix I. Soil Nutrient Maps of Regions Mapped under the CATALIST-Uganda and ISSD Projects, 2015





Appendix II. Potential Partners and Key Contacts in Uganda

Organization and Contact Details of Key Personnel	Region of Activities	Brief Description of Activities as Related to AGRA Priority Crops
IFDC REACH Project David Slane, COP Ground Floor, Studio House Plot 5 Bandali Rise, Bugolobi P.O. Box 75391 Kampala, Uganda Tel. +256 757 288 385 dslane@ifdc.org ifdcuganda@ifdc.org	Eastern and Western Uganda	REACH-Uganda aims to improve farmers' market engagement, strengthen household resilience, and increase availability of agriculture support services for 40,000 farmers and businesses in the rice and potato value chains. The project is funded by Embassy of the Kingdom of the Netherlands.
National Agricultural Research Organization (NARO) Plot 11-13 Lugard Avenue, P.O. Box 295, Entebbe. Tel. +256 414 320326 Dr. Ambrose Agona Director General Tel. +256 772 423 245 agona@hotmail.com		Guides and coordinates of all agricultural research activities in the national agricultural research system in Uganda, trial / demonstration
NARO- NaCRRRI Dr. Jimmy Lammo Tel. +256 772 342 757 lamojim@gmail.com		Breeding - rice
Dr. Stanley Nkalubo Programme Leader - Beans Tel. +256 781 618 247 tamusange@yahoo.com		Breeding- beans
Dr. Micheal Otim Programme Leader - Cereals Tel. +256 772 897 040 motim9405@gmail.com		Rice and maize research
Godfrey Asea Director National Crops Resources Research Institute Tel. +256 782 031 285 grasea_99@yahoo.com		Maize Research
Dr Titus Alici Programme Leader - Roots and Tubers Tel. +256 772 970 585		Heads cassava research
NARO - NARL		Developing and Improving fertilizer

Organization and Contact Details of Key Personnel	Region of Activities	Brief Description of Activities as Related to AGRA Priority Crops
Dr. C. Kayuki Kaizzi Senior Research Officer Tel. +256 772 518 875 kckaizzi@gmail.com		recommendations (including maize, beans and rice), Agro-Ecological Zone specific recommendations, evaluating secondary and trace elements for increasing maize and rice production, development of Fertilizer Optimization Tool
Dr. Semalulu Onesmus Principal Research Officer Tel. +256 772 615 009 0.semalulu@gmail.com		Revising lime requirement, investigating effect of bentonite and ISFM on maize, bean and rice yield
Dr. Drake Mubiru Principal Research Officer Tel. +256 782 415 843 drakenmubiru@yahoo.com		Soil Mapping and Conservation Agriculture under maize and beans
Dr. Micheal Ugen Director National Semi Arid Resources Research Institute Tel. +256 772 446 439 michealugen@gmail.com .		Beans research - Agronomy
Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) P. O. Box 102 Entebbe, Tel. +256 414 320 004 ps@agriculture.go.ug Mr. Opolot Okasai Director Crop Resources Tel. +256 772 589 642 okasaaiopolot@gmail.com dcr@agriculture.co.ug		Enhancing crop production, improving food and nutrition security, widening export base and improved incomes of the farmers. The overseer of the Agricultural sector where it formulates, reviews and implement national policies, plans, strategies, regulations and standards and enforce laws, regulations and standards along the value chain of crops, livestock and fisheries.
Ms. Daisy Elesu SAO Tel. +256 772 311 553 daisyeresu@yahoo.com		Cassava, and bean specialist
Mr. Alex Rwakuba Assistant Commissioner Tel. +256 772 402 380 alwakuba@gmail.com		Soils and Land management
Mr Stephen Byantwale Commissioner Crop Inspection and Certification byantwale@gmail.com Tel. +256 772 513 180		Registration of Agro-chemicals including fertilizers
Mr. Bazale Ag. Commissioner - Seeds		Seed certifying
Mr. Alan Guma		Subject matter Specialists - Rice

Organization and Contact Details of Key Personnel	Region of Activities	Brief Description of Activities as Related to AGRA Priority Crops
Directorate Crop Resources		
Ms. Namaloba Directorate of extension Tel. +256 785 441 778 bnamaloba@gmail.com		Subject matter Specialists - Maize
Mr. Odongo Kizito Directorate Crop Resources okizito79@gmail.com		Subject matter Specialists Bean
Mrs. Beatrice Byarugaba Director Extension byarubeatrice@gmail.com		Heads the Extension directorate at MAIIF
IITA Dr. Peter Ebanyat Tel. +256 772 595 440 p.ebanyat@cgiar.org peter.ebanyat@gmail.com		Teaching and Research on soil fertility
K+S Dr. Hillary Rugema Regional Director - K+S, Tel. +256 772 504 772 hrugemabusiness@gmail.com		
Uganda National Agro Dealer Association Mr. Nangulu Moses Executive Director Tel. +256 772 633 333 nangulumoses@gmail.com	National	Selling of seeds and fertilizers for the priority crops
AFRICA 2000 NETWORK (A2N) Mr.Kyeswa ckyeswa@a2n.org.ug Plot 70 Bukoto Street, P.O. Box 21990, Tel. +256 414 541 571 Tel. +256 393 263 218 Tel. +256 393 263 219		A grassroots Non-Government Organization that supports rural farmers and their families to benefit from a sustainable livelihood in agriculture. Dissemination of productivity enhancing technologies for rice, beans and maize
National Organization of Organic Movement of Uganda (NOGAMU) Musa K. Muwanga Chief Executive Officer, Plot 957 Galukande Close off Tank Hill road Tel. +256 312 264 039 Tel. +256 312 264 040 Tel. +256 772 448 948 mkmuwanga@nogamu.org.ug		An umbrella organization which unites producers, processors, exporters, NGOs and other institutions and organizations that are involved in the promotion and development of the organic sector in Uganda

Organization and Contact Details of Key Personnel	Region of Activities	Brief Description of Activities as Related to AGRA Priority Crops
<p>Africa Innovations Institute Plot 1544, Koire Close, Off Old Kiira Road, Bukoto +256(0)414 530 288 E-mail: info@afrii.org</p> <p>Prof. George Otim-Nape CEO Tel. +256 752 689 830 wonape@afrii.org</p> <p>Mr. Francis Ouruma Alacho Country Manager Tel. +256 772 693 806 alacodnc@yahoo.com falacho@afrii.org</p> <p>- Mr. Thomas Awio AfrII Agronomist</p>		<p>Cassava Adding Value for Africa (CAVA), research on rice with emphasis on micronutrients in addition to macronutrients,</p>
<p>Sasakawa Global 2000 Dr. Nyamutale Roselline Tel. +256 772 635 069 rnyamutale@saa-safe.org</p>	National	<p>Promotes demonstration and widespread adoption of improved pre and postproduction agricultural technologies for smallholder farmers in Uganda in collaboration with relevant government institutions, farmers' organizations and the private sector</p>
<p>Kilimo Trust (KT) Plot 42 Princess Anne Drive, Bugolobi, Kampala Uganda Telephone: +256 392 264 980/1/2 Email: admin@kilimotrust.org Mary Shetto CEO Tel. +256 706 615 924 mcsheetto@kilimotrust.org</p> <p>Dr. Birungi Korutaro REACTS Team Leader Tel. +256 772 423 792 bkorutaro@kilimotrust.org</p>		<p>An independent organization working on agriculture for development across the East Africa Community (EAC) Region</p>
<p>Makerere University College of Agriculture and Environmental Sciences</p> <p>Prof. Twaha Basamba Tel. +256 782 475 422 twaha@agric.mak.ac.ug twahaateenyi@gmail.com</p> <p>Dr. Alice Amoding</p>	National	<p>Teaching, research, Soil and plant analysis</p>

Organization and Contact Details of Key Personnel	Region of Activities	Brief Description of Activities as Related to AGRA Priority Crops
<p>Senior Lecturer Tel. +256 782 355 494 amoding@agric.mak.ac.ug Prof. J. S. Tenwya Tel. +256 772 478 404 jstenywa@agric.mak.ac.ug</p> <p>Patrick Musinguzi Lecturer - Soil Science Tel. +256 774 068 824 musipato7@gmail.com</p>		
<p>Grainpulse Jeremiah Nyambinya Managing Director Grainpulse Plot 6/8 Nyondo Close Industrial Area Tel. +256 702 020 003 jnyambinya@grainpulse.co.ug</p> <p>- Hannington Karuhanga Director +256 752 718 858</p>		<p>Fertilizer blending facility in Uganda (Producing maize, cassava, rice and bean specific fertilizer blends)</p>
<p>General and Allied Ltd B.N.S. Gowda G Director Plot 17, Nakivubo Place, Kampala, Uganda Tel. +256 414 232 368 Tel. +256 712 732 368 Tel. +256 414 349 301</p>	Kampala	<p>Farming, Agriculture, Chemicals business activities. Deals in fertilizers and other agro-inputs</p>
<p>East African Seed (U) Ltd Tel. +256 414 566 585 Tel. +256 414 568 603 Tel. +256 392 773 321 easeed@spacenet.co.ug</p>	Kampala	
<p>Mr. Sam Bubolo Proprietor/Manager Tel. +256 772 421 639</p>	Mbale	<p>Agent for Yara</p>
<p>One Acre Fund 42 Bukoto St, Kampala</p>	Jinja and Kamuli	<p>One Acre Fund offers farmers hybrid maize seed and fertilizer. Supplies smallholder farmers with the financing and training they need to grow their way out of hunger and poverty by investing in farmers to generate a gain in farm income.</p>

Organization and Contact Details of Key Personnel	Region of Activities	Brief Description of Activities as Related to AGRA Priority Crops
<p>Nalweyo Seed Company Ltd. (NASECO) Mr. Nicolai Rodeyns General Manager Tel. +256 0772 618 001 Tel. +256 754 618 001 rodeynicolai@yahoo.com</p> <p>Katwere Godfrey Marketing Manager Tel. +256 776 618 004 gkatwere@yahoo.co.uk</p>		<p>Production of upland rice, and maize seeds. It also offers bush bean and seeds of other crops.</p>
<p>The Uganda National Farmers Federation (UNFFE) Plot 27 Nakasero Road Tel. +256 414 230 705 info@unffe.org</p>	National	<p>Uganda National Farmers Federation (UNFFE) advocates for, lobbies and articulates farmers' developmental issues and programs. Its activities reach grassroots farming communities in all corners across the country. UNFFE disseminates and sells productivity enhancement technologies for maize, cassava, bean and rice</p>
<p>Balton Uganda Tel. +256 752-270100/1/2 balton@balton.co.ug</p>	National	<p>Fertilizers, agro-inputs and chemicals importation and marketing</p>
<p>Uganda Crop Care Head office Godown No- N 7- C, Madhvani Business Park Plot-96/98, 5th Street, Industrial Area, Kampala, P.O. Box 72163, Kampala, Uganda, Tel. +256 414 258 857 Tel. +256 758 333 899 ucclkampala@gmail.com info@uccl.co.ug</p>	National	<p>Importation and marketing of fertilizers and other Agro-chemicals and inputs</p>
<p>Tilda Uganda Limited Bugiri Tel. +256 772 255 444 venu@tildauganda.com</p>	Eastern	<p>Farming, processing, import, export, sales and distribution of rice in Uganda</p>
<p>Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) Plot 5, Mpigi Road, PO Box 765 Entebbe, Uganda +256 414 320212/320556/321885 Email: asareca@asareca.org</p>	Eastern/ Central	<p>Regional Research Organization, coordinating research in ECA, funded several research projects on maize, beans, cassava and rice. Coordinated the World Bank Funded Project "East Africa Agricultural Productivity Enhancement Project (EAAP)" with cassava and rice as key crops. Will coordinate "Eastern and Central Africa Agricultural Transformation (ECAAT) project" a followup of EAAP project. Cassava, rice, bean and maize are priority crops under ECAAT.</p>

Organization and Contact Details of Key Personnel	Region of Activities	Brief Description of Activities as Related to AGRA Priority Crops
Masindi Seed Company Ltd Mr. Luzige Eugene General Manager Tel. +256 0772 550 802 Tel. +256 465-442 297 masindiseed@gmail.com leugine@yahoo.co.uk	Masindi	Production, processing and marketing of maize, rice and bean seeds
Pearl Seeds Ltd Mr. Richard Masagazi Tel. +256 772 451 871 Pearlseedltd1@gmail.com		Producing, treating and distributing maize, rice and bean seeds