



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

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Executed by:



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Acronyms and Abbreviations

2SCALE	Toward Sustainable Clusters in Agribusiness through Learning in Entrepreneurship
AEZ	agro-ecological zone
AFAP	African Fertilizer and Agribusiness Partnership
AfSIS	Africa Soil Information Service
AGMARK	Agricultural Market Development Trust
AGRA	Alliance for a Green Revolution in Africa
ARM	Athi River Mining
B	boron
BMGF	Bill and Melinda Gates Foundation
CAN	calcium ammonium nitrate
CCRP	Collaborative Crop Research Program
CIMMYT	International Maize and Wheat Improvement Center
CNFA	Cultivating New Frontiers in Agriculture
CNLS	Conseil National de Lutte contre le SIDA
DAP	di-ammonium phosphate
ETG	Export Trading Group
FUBC	Fertilizer Use By Crop
ha	hectare
ICL	Israel Chemicals Ltd
ICRAF	World Agroforestry Center
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFDC	International Fertilizer Development Center
IITA	International Institute for Tropical Agriculture
IPNI	International Plant Nutrition Institute
ISFM	integrated soil fertility management
ISRIC	International Soil Reference and Informatin Centre
K	potassium
KALRO	Kenya Agriculture and Livestock Research Organization
KAPAP	Kenya Agricultural Productivity and Agribusiness Program
KARI	Kenya Agricultural Research Institute
KEBS	Kenya Bureau of Standards
KIRDI	Kenya Industrial Research and Development Institute
LMAA	Last Mile Agripreneur Alliance
MoA	Ministry of Agriculture
MOP	muriate of potash
MT	metric ton
N	nitrogen
NAAIAP	National Accelerated Agricultural Inputs Access Programme
NCPB	National Cereals and Produce Board
NGO	non governmental organization
NPK	nitrogen phosphorus potassium
OAF	One Acre Fund

OCP	Office Chérifien des Phosphates
P	phosphorus
SHF	smallholder farmer
SME	small and medium enterprise
SSA	sub-Saharan Africa
SSP	single superphosphate
TSP	triple super phosphate
TTFA	Toyota Tsusho Fertilizers Africa
USAID	United States Agency for International Development

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

Introduction

In preparing this report, we had discussions with Toyota Tusho Fertilizers Africa (TTFA), Yara, ETG, ChemAgra, Maaden, OCP, OAF, AGMARK, and AGRA policy staff. We met with two Hub dealers and two agro dealers. We reviewed "Updates on Policy Matrix for Agriculture Sector in Kenya (AGRA presentation to ARD 2018), the Big Four Detailed Action Plan (December 2017), the 2017 Fertilizer Situation Statement, and 2013 Fertilizer Use By Crop (FUBC) documents (AFAP/IFDC).

Available Soil Information

Considerable soils information exists in Kenya in various permutations. The former Kenyan Agriculture Research Institute (KARI, now KALRO) reported on the analysis of over 4000 soil samples across all Kenyan counties. Though this information is not georeferenced, it does include information down to farmer name and sub-county location. The information is summarized in "Soil suitability evaluation for maize production in Kenya" NAAIAP, 2014) and includes analyses for pH, organic C, total N, available P (method unspecified), exch. Ca, Mg, and K, and EDTA-extractable Zn, Cu, Mn, and Fe. These analyses in themselves would suffice for a fairly good representation of the soil fertility status of Kenya, though lacking in S and B analysis. Further large databases that are publicly available include several thousand samples analyzed by One Acre Fund primarily in western Kenya (still increasing), 1800 samples from University of California (Davis), and hundreds of samples from Crop Nutrition Laboratories (Nairobi) that were paid for by public funds and hence publicly available; these samples used various analytical methods, including wet chemistry and spectral.

Some of this information has been used by ISRIC (2400 One Acre Fund and 1800 UC Davis samples) to piece together a database that can be used for mapping constraints. Vital Signs has web-accessible draft Kenyan nutrient maps based on ISRIC but with some obvious and serious legend errors, which for several elements are off by apparent factors of 1000, so it is not at all clear what the nutrient levels are.

In sum, it seems that Kenya has a huge quantity of soils data and much of it from complete or almost complete analyses (KARI data lacking S and B). Indeed, their dataset exceeds that of most SSA countries, and with a minor investment, could be pieced together.

Fertilizer Availability and Use in Kenya

Fertilizer use for major Kenyan crops and total use by fertilizer in 2016 are shown in Table 1. Half the fertilizer used in Kenya is used for maize production. Excluding the tea fertilizer

26:5:5, DAP and 23:23:0 are the major basal fertilizers and CAN is the most used topdress fertilizer, followed by urea.

Kenya has seen an explosion in the availability of crop-targeted multi-nutrient fertilizers, both blends and compounds (Table 2). This list should not be viewed as comprehensive, as new products are being constantly introduced or modified. Kenya has a liberal fertilizer registration policy typical of many developed fertilizer markets, which results in a diversity of product availability at the smallholder level. Though these products are still a small part of the market, they are finding their way to smallholders through demonstration campaigns, largely financed by the manufacturers.

Table 1. Fertilizers use by crop and by product, Kenya (source: Africafertilizer.org, 2016).

Crop	Hectares Planted	Hectares fertilized	Consumption by crop (MT)	Product	Volumes (MT)
Maize	2,272,213	1,617,877	287,223	DAP	188,105
Tea	187,855	174,227	98,984	CAN	108,118
Wheat	153,060	139,154	29,621	NPK 26 5 5	74,581
Sugarcane	213,610		29,472	Urea	41,297
Bean	1,171,710	347,100	24,138	NP 23 23 0	37,945
Irish potatoes	171,164	132,814	17,413	NPK 17 17 17	29,322
Flowers	11,880	11,880	15,913	Calcium nitrate	23,338
Sorghum	184,654	62,597	6,777	Others	15,763
Rice	29,530	27,706	5,384	Ammonium sulfate	15,178
Barley	18,827	17,886	3,664	NPK 25 5 5	12,633
Cowpeas	227,809	27,111	2,540	NPK 25 5 10	7,700
Tobacco	14,828	10,380	2,053	NP 19 38 0 + 7S	7,143
Coffee	109,795	18,171	1,638	TSP	6,879
Millet	27,061	12,592	333	MOP	4,756
Total			525,152	SOP	3,340
				Rock phosphate	2,984
				NPK 25 5 5 + 5S	2,634
				Total	581,716

Rationale for Why Available Fertilizer Products Were Developed

While fertilizer use in Kenya is still dominated by commodity NPKs, new emerging products are designed to meet balanced crop-specific nutrient demands, based on perceived nutrient deficiencies. It is not clear that all of the nutrients in these formulations are required, but they are attractive to farmers when compared in demonstrations to commodity fertilizers, and a few of them receive government subsidy support. In addition to the products shown in Table 2, blenders also make specialty products for commercial farmers based on professional laboratory analysis and interpretation.

Table 2. Multi-nutrient fertilizers on the open market in Kenya in 2018.

Formulation	Trade brand	Main use
Yara compound fertilizers		
NPK 22-06-12 +2CaO, +1MgO,+3S, +0.2B +0.2Zn	Java	Coffee and tea
NPK 23-10-5 +2 MgO +3 S +0.3 Zn	Cereals	Cereals
NPK 15-9-20 +1.8 MgO +9.5 SO ₃ +0.015 B +0.02 Mn +0.02 Zn	Winner	Fruits and vegetables
NPK 12-24-12 + 5S +2MgO + 0.2Fe + 0.007Zn	Otesha	Rice
NPK 17-17-17		Coffee, maize, melon, rice, vegetables
NPK 10-18-24 +3CaO +0.5MgO +7S +0.012B	Tobacco	Tobacco
NPK 40-0-0 + 5.5S	Amidas	Topdress; cereals (rice, maize, barley)
NPK 24-0-0 +6S +7CaO	Sulfan	Topdress; all crops, particularly those
NPK 15.5-0-0 +26.3CaO	Calcium nitrate	Topdress; fruits and vegetables
NPK 15.4-0-0 +25.9CaO + 0.3B	Nitrabor	Topdress; vegetables and potatoes
NPK 5-7.5-5 +5S +5Zn +5B +0.1 Cu +0.1Fe +0.1Mn +0.1Mo	Tracel BZ	B and Zn foliar; multiple crops
NPK 0-44-7.5 +6.6MgO +4.6Zn	Cereal Boost	P and K foliar; cereal crops
Minjingu compound fertilizers		
NPK 10-20-0 +25CaO +1.5MgO +5S +0.5 Zn +0.1B	Minjingu Mazao	Maize; phosphate rock based
NPK 0-29-0 +38CaO +2.5MgO	Phosphate rock	Multiple crop and tree soil conditioner
NPK 9-16-6 +25CaO +2MgO +5S +0.5 Zn +0.1B	NAFAKA Plus	Rice, coffee, tobacco, and sugarcane;
NPK 27-10-0 +15CaO	Minjingu topdress	Topdress formulation (urea+PR)
MEA Fertilizers Ltd. Nakuru, Kenya		
NPK 10-26-10 +2CaO +5MgO +3S		Maize and french beans
NPK 14-26-6 +4CaO +5S		Barley
NPK 10-22-20 +9S +0.7MgO		Maize
NPK 0-23-15 +10CaO +4S		Beans, soybeans
NPK 22-6-12 +2CaO +1MgO +3S +0.2Zn +0.2B		Coffee
NPK 26-0-0 +13CaO		Sugarcane topdress
Toyota Tusho Fertilizers Africa (TTFA), Eldoret		
NPK 14-29-6 +S +CaO +MgO +Zn +B		Primarily cereals
NPK 14-28-14 +S +CaO +MgO +Zn +B		Potato, Onions, Tomatoes
NPK 37-0 -3 +S +CaO +MgO		Cereals topdress fertilizer
NPK 18:21:0 +S +CaO		Potato topdress fertilizer
ARM Ltd. Athi River		
NPK 10-26-10 +Ca, Mg, S, Zn, Cu, Mn, B, Mo	Mavuno Planting	Maize, Sugarcane, Wheat
NPK 25-5-5 +5 S +Ca, Mg, Zn, B, Cu, Mo		Tea
NPK 20-10-10 +S, Ca, Mg, High B, Cu, Zn, Mn, Mo		Coffee
NPK 10-3-20 +S, Ca, Mg, Zn, Cu, B, Mn, Mo		Banana
NPK 20-10-18 +S, Ca, Mg, Fe, Cu, Zn, B, Mn, Mo		Green Leafy Vegetables
NPK 15-10-18 +S, Ca, Mg, Fe, Cu, Zn, B, Mn, Mo		Peas, Beans & Root Vegetables
NPK 15-10-22 +S, Ca, Mg, Fe, Cu, B, Mn, Mo		Fruits & Garden Vegetables
NPK 12-34-0 +S, Ca, Mg, Zn, Cu, B, Mn, Mo		Barley, Wheat
NPK 14-14-20 +S, Ca, Mg, High B		Tobacco
NPK 20-10-20 +S, Ca, Mg, Zn, Cu, B, Mn, Mo		Rice
NPK 26-0- 0 +Ca, S	Mavuno topdress	General topdress
Export Trading Group, Mombasa		
NPK 18:38:0 + S + Ca + Mg + Zn + B		Row crops
15-29-0 + Ca, Mg, S, K, Zn, B		Row crops
15:9:21+Ca, Mg, S, K, Zn, B		Horticultural crops
Agritain urea 46:0:0 topdress	KynoPlus	Primarily cereals
Agritain urea-AS blend 40:0:0+6 S topdress		Primarily cereals

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

Table 3 shows the nutrients extracted for given yield targets we believe routinely achievable for AGRA priority crops in Kenya, along with nutrients supplied in government and fertilizer company offerings.

Maize recommendations and their suitability

The most recent government recommendations are documented in “Soil Suitability Evaluation for Maize Production in Kenya” (NAAIAP/KARI, 2014). These are down to the sub-county level and are too numerous to summarize here, though well-summarized in that document. The recommendations therefrom are based primarily on considerations of perceived acidification potentials of the fertilizers, with DAP being considered the most acidifying, 17:17:17 and 23:23:0, and Mavuno less acidifying, and TSP and SSP not acidifying. Unfortunately, the recommended rates seem to not take into consideration the percentages of N, P, and K in the formulations. Hence, recommended rates of DAP and 17:17:17 both go up to 300 kg/ha; in the case of DAP, this results in 138 kg P₂O₅/ha being applied (quite in excess for even a 10 MT/ha maize yield target), while for 17:17:17, this rate would only result in an application of 51 kg P₂O₅/ha. Indeed, the source of P in Mavuno and other NPKs is DAP, such that when applied on an NP-equivalent basis, they are very similar in acidulating potential (the exceptions being SSP and TSP). The above highlights some of the challenges faced by the national system in translating soil analysis into recommendations that could be addressed with some basic fertilizer training.

The recommendations were based on commodity fertilizers commonly available at the time of writing. No S or B recommendations were made (two common micronutrient deficiencies) because they were not determined in the otherwise complete soil analysis. For some sub-counties, zinc sulfate, copper sulfate, and manganese sulfate are recommended based on the soil analysis.

Fertilizer company recommendations for maize (from Toyota Tusho Fertilizers Africa, or TTFA), Omya-ARM, Yara, Minjingu, and ETG are shown in Table 3. These are multi-nutrient blends and compounds are all on the market. TTFA, Omya-ARM, and ETG did not want their Ca, Mg, S, and micronutrient contents made public (even though for Ca, Mg, and S, contents must be expressed on the fertilizer bag). Micronutrient concentrations (B, Zn, Cu, Fe, Mn, and Mo) are not required on bag labelling in Kenya. This may have some disadvantages. As part of this consultancy, we analysed the micronutrient concentrations of the Omya-ARM fertilizer. For Zn, Cu, and B, they were so low as to be negligible (less than 2% of what would be considered an effective dose). Declaring such low nutrient levels as a product benefit while having truly inadequate levels may be a marketing strategy or reflect poor knowledge of the manufacturer of what an effective dose is. While not declared by Toyota and ETG, we know that they are providing effective micronutrient doses when specific micronutrients (Zn and B) are listed. Though we did not show them for certain manufacturers as per their request, the S contents of all products are adequate.

Table 3. Nutrients extracted for given yield targets, and nutrients supplied in various recommendations for AGRA priority crops

Crop	N	P ₂ O ₅	K ₂ O	CaO	MgO	S	Zn	B	Cu	Mn	Fe	
Maize	-----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 -----											
	ETG 123 kg/ha NPK 18:38:0 +S +Ca +Mg +Zn +B basal, 123 kg/ha Kynoplus topdress	79	47	0	?	?	?	?	?	0	0	0
	ETG 123 kg/ha NPK 15:29 +K +S +Ca +Mg +Zn +B basal, 123 kg/ha Kynoplus topdress	75	36	?	?	?	?	?	?	0	0	0
	ARM 185 kg/ha Planting, 185 kg/ha ARM topdress	68	48	19	?	?	?	?	?	?	?	?
	TTFA 185 kg/ha Barkaka Cereals basal, 185 kg/ha Baraka cereals topdress	94	54	17	0	?	?	?	?	0	0	0
	Yara 370 kg/ha Cereals, split application	85	37	19	0	7	11	1.11	0	0	0	0
	Yara 185 kg/ha Power basal, 185 kg/ha Amidas topdress	96	44	22	0	2	18	0.02	0	0	0	0
	MEA 185 kg/ha NPK 10:26:10 +2CaO +5MgO +3S basal, 185 kg/ha CAN topdress	68	48	19	24	9	6	0	0	0	0	0
Minjingu 185 kg/ha Mazao basal, 185 kg/ha Minjingu topdress	68	56	0	74	2.8	9	0.93	0.19	0	0	0	
Minjingu 185 kg/ha NAFKA Plus basal, 185 kg/ha Minjingu topdress	67	52	11	74	3.7	9	0.93	0.19	0	0	0	
Sorghum	-----Nutrients removed in crop and residue, kg ha ⁻¹ -----											
	120	41	86	14	11	14	0.13	?	0.02	0.11	?	
	-----Nutrients supplied in recommendation, kg ha ⁻¹ -----											
	Government 124 kg/ha DAP basal, CAN topdress	45	57	0	14	0	0	0	0	0	0	0
	Government 247 kg/ha 17:17:17, split between basal and topdress	42	42	42	0	0	0	0	0	0	0	0
	TTFA 124 kg/ha Barkaka Cereals basal, 124 kg/ha Baraka cereals topdress	63	36	11	0	?	?	?	?	0	0	0
	Yara 185 kg/ha Power basal, 185 kg/ha Amidas topdress	96	44	22	0	1.9	18	0.02	0	0	0	0
ARM 185 kg/ha Planting, 185 kg/ha ARM topdress	68	48	19	?	?	?	?	?	?	?	?	
Beans	-----Nutrients removed in crop and residue, kg ha ⁻¹ -----											
	88	46	53	27	17	7	0.13	0.14	***	0.29	6.00	
	-----Nutrients supplied in recommendation, kg ha ⁻¹ -----											
	Government 50 kg/ha DAP	9	23	0	0	0	0	0	0	0	0	0
Yara 185 kg/ha NPK 12:24:12 +4S +0.01Zn +1MgO	22	44	22	0	2	7	0	0	0	0	0	
MEA 185 kg/ha NPK 0:23:15 +10CaO +4S +247 gm/ha Biofix beans inoculant	0	43	28	19	0	7	0	0	0	0	0	
Irish potatoes	-----Nutrients removed in crop and residue, kg ha ⁻¹ -----											
	233	69	284	48	35	40	0.23	0.19	0.10	0.21	3.10	
	-----Nutrients supplied in recommendation, kg ha ⁻¹ -----											
	Government 494 kg/ha DAP basal	89	227	0	0	0	0	0	0	0	0	0
	TTFA 247 kg/ha Baraka vegetable basal, 247 kg/ha potato topdress	79	69	86	?	?	?	?	?	0	0	0
YARA 247 kg/ha Power basal, 247 kg/ha Yara Bela Sulfan topdress	94	59	30	0	2.5	96	0	0	0	0	0	
MEA 494 kg/ha NPK 16:8:26 basal, 247 kg/ha CAN topdress	146	40	128	28	0	0	0	0	0	0	0	

? = TTFA, ARM, and ETG requested confidentiality regarding secondary and micronutrient rates.

All manufacture recommendations arrive at reasonable NP rates, certainly more balanced than those generally achieved in government recommendations (NAAIAP/KARI, 2014). Potassium (K) is not always required for maize. The diversity in recommendations reflects each blender targeting their comparative advantage: Omya-ARM with its granulated lime additions (they manufacture granulated lime), Minjingu with its slow-release P from its PR-based product, and TTFA and ETG using standard blending ingredients though somewhat different processes and nutrient ratios, and perhaps targeting different zones based on the limited soils data available to them. Yara products, while less nutrient-dense, are formulated to maximize nutrient efficiency both through nutrient source and timing of nutrient applications through basal and topdress formulations. Yara performs their own soil analyses at demonstration sites. All fertilizer companies are entering the topdress fertilizer market with their own compounds or blends.

Each product may find its niche, depending on where it is applied, and in this respect, soil maps would greatly assist in product development and targeting, which 3 of the manufacturers mentioned as a constraint. We have seen a few TTFA field demonstrations comparing TTFA, Minjingu, Omya-ARM, and government products directly, and in the particular zones of these trials, the TTFA fertilizers were better-performing. However, it would be better if such trials were run independently, for example by government research or extension or by an NGO “Anchor”, to increase confidence that the assessment is independent. Other trials have demonstrated both superiority and inferiority of Minjingu and Omya-ARM trials vs. DAP and CAN at the same rates.

“Harmonized Fertilizer Recommendations for Optimal Maize Production in Kenya” (KALRO/KSHK, 2016) provides a good summary of ISFM-based research conducted in Kenya and provides users with a depth of understanding of ISFM complexities. It includes several agro-ecological zone-based fertilizer recommendations. Though it does not truly arrive at harmonized fertilizer recommendations, it does present a basket of ISFM options relative to each AEZ and is relevant in indicating zonal diversity in yield potential. Benefit-to-cost ratios point to best ISFM strategies in various AEZs, most of which involve fertilizers, though often ones not commonly used outside of research.

Pulses recommendations and their suitability

A wide variety of pulses are grown in Kenya (including beans, green grams, cowpeas, pigeon peas, njahi, chickpeas and lentils) and we could not source nutrient extraction data for most. We used beans as a nutrient extraction guide crop (Table 3; it is the only pulse that consumes substantial fertilizer volumes (24,000 MT in 2016; Table 1). While the government recommendation of DAP seems low, one might consider that beans are often intercropped with cereals. Other pulses are also grown in rotations, intercrops, and relays with cereals (primarily maize and sorghum) and may benefit from fertilizers applied to those crops.

Recommendations from MEA and Yara are well-balanced vs. crop removal for N, P, K and S. The MEA recommendation includes inoculation for N fixation and includes substantial quantities of Ca which would be beneficial to beans in acidic soils. Neither recommendation includes Zn and B, to which beans are responsive when deficient.

Nutrient extraction data were difficult to source for other pulses, but generally speaking, they do require S for protein synthesis, and most respond to K when deficient. Apart from the MEA and Yara recommendations, Minjingu, Omya-ARM, TTFA, and MEA have fertilizers that could be appropriate for various pulses, though they did not extend recommendations.

Suffice it to say that there are several multi-nutrient fertilizers available that could be evaluated independently to find the best fertilizers to match the pulse, the soil, and the cropping system.

Sorghum recommendations and their suitability

Government recommendations for sorghum (Table 3) are reasonably balanced for N, P, and K (where applied), as are the fertilizer company recommendations, which have added benefits of secondary and micronutrients. Some additional recommendations were given to us by KALRO staff, but no documentation was sourced. Omya-ARM and Yara recommendations are the same as for maize; TTFA did not offer a specific rate but suggested that a lower rate would be required than maize. None of these fertilizers have received evaluation in sorghum-growing areas, but along with ETG options present a worthy basket of multi-nutrient fertilizer options that can be quickly screened.

Potato recommendations and their suitability

The government potato recommendation (Table 3; the equivalent of 4-50 kg bags of DAP per acre) is very poor for potatoes, which consume substantial amounts of K in addition to other secondary and micronutrients. DAP also over-supplies P and is costly. Many farmers actually follow this recommendation, though generally with poor results, because potato fertilization is so profitable and because historically they have obtained DAP on subsidy. Potatoes are a significant target crop, and Yara, TTFA, and MEA all offering fertilizer combinations for potatoes, as well as ICL. We are aware of company-sponsored demonstrations where average yields have been improved to between 30 and 40 MT/ha in Western Kenya, a marked increase from approximately 10 MT/ha using government recommendations. We believe that from the basket of options currently available to farmers in Kenya, multi-nutrient options exist that can be extended.

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

Many of the pieces are in place in Kenya for a thriving blending industry: two commercial lime producers (one making innovative products that includes finely-ground lime products), a commercial producer of SSP, availability of blending ingredients, port access, 2 new blenders (ETG, Toyota Tusho Fertilizers Africa), one company to soon open a steam granulation plant, all companies using modern blending equipment, a relatively unrestrictive fertilizer approval process, quality commercial soil and plant analysis laboratories, and a government that increasingly appreciates the advantages of multi-nutrient fertilizer products. Farmers, already accustomed to fertilizers, seem to be receptive to new products, having noted increasingly poor returns to commodity NPKs. Given the diversity of players and products, there is real opportunity for Kenya to become a learning stage for innovative multi-nutrient products.

A major gap is that the tremendous amount of soil analytical data has yet to be translated into easily accessible maps. Several Kenyan blenders mentioned lack of soils information to be a serious constraint to targeting blends to smallholder farmers.

For AGRA priority crops, we believe that for maize and potato in particular blends and multi-nutrient compounds that are substantially better than government recommendations are on the

market, and only need to be evaluated in particular zones. For sorghum and pulses, several companies can provide options to evaluate in different agro-ecologies. This evaluation however is lacking, so there is yet firm evidence of their efficacy vs. government recommendations.

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

Commercial blenders in operation in Kenya include ETG (Mombasa), TTFA (Eldoret), MEA (Nakuru), and Omya-ARM (Athi River). ETG, having a portside operation, can effectively extend their blended products throughout Kenya and to other East African countries (Uganda and Rwanda in particular, as they are operational in both countries and have a desire to sell their blends there). TTFA serves primarily west and central Kenya but is interested in extending its markets outside of Kenya and is geographically positioned to do so. Omya-ARM's location in central Kenya may not be ideal from a distribution viewpoint, and its location there is due to its lime resources, which are an essential component in its fertilizers. In its alliance with OMYA, improved granulated lime products will become an increasing part of its portfolio, and can be blended into products made by other fertilizer producers. Minjingu is based in Tanzania but has a market in Kenya, and occasionally supplies phosphate rock to KEL Industries (Nairobi) to produce SSP. Yara operates all over Kenya.

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 I.

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

1. **Maps production:** Gathering all of the soils information available (from the first section of this report) would provide considerable detail on many nutrient constraints. Based on our assessment of available data, the entire country is covered for most nutrients except S and B, and for other counties, this information should be available. This information needs to be harmonized as it was developed using different analytical methods. CNLS Laboratories and IFDC can assist in the data harmonization. The best repository of this information should be with ISRIC, who already has some of this information in its database. ISRIC can then develop detailed nutrient and pH maps, as it already has done for Kenya but using a limited dataset. Data points for each nutrient will enable identification of nutrient gaps, which can be filled in using soil analysis. This should be a short-term activity (3 months maximum).
2. **Additional soil analysis:** KALRO is regularly analyzing soil samples. To fill gaps, KALRO staff will require training in S and B analysis. These elements can be determined

using available equipment using colorimetric procedures and fed into the ISRIC database. Going forward, it would be good for KALRO as well to train their staff in GPS coordinate collection and require that with soil samples. This will enable easy map upgrading over time.

3. **Best-bet trials:** Even though maps will result in better formulations, we believe that sufficient formulations have been developed such that for many regions and AGRA priority crops, better yields can be realized. Best-bet trials comparing available multi-nutrient compounds and blends would help identify best formulations for given regions and encourage manufacturers to develop better formulations. It is best that these evaluations are independent in nature and could be a regular KALRO activity. The requirements are some assistance in trial design, field layout, and performance of good agronomic practices, taking into account as well various agronomic systems, particularly for pulses. Information on best-performing fertilizers should be accumulated and evaluated seasonally and could be used to inform national and county subsidy programs. That said, farmers may have many reasons for fertilizer purchase, so an open subsidy that permits farmers to make their own fertilizer choices might be desirable. With a national goal of achieving 50% blends by 2020, subsidies can be a potent tool to encourage better fertilizer use, in light of Kenya's stagnant yields (Figure 3).
4. **Soil acidity correction:** Once maps are completed, specific areas of soil acidity should be well-defined, enabling a more targeted liming program. The Kenyan government already considers soil acidity correction a high priority. Both dolomitic (Ca and Mg) and calcitic (Ca) limestone are available in Kenya; targeting the right lime type is important. A liming roadmap should be developed, involving experts in liming, the Kenyan government, and the Kenyan lime manufacturers.
5. **Build capacity in the fertilizer sector:** Some of the blenders need additional support in terms of micronutrient rates per the various processes they are capable of implementing. In addition, the Kenya public and private sector needs additional capacity in fertilizer basics: knowledge of the importance of multi-nutrient fertilizers, calculating nutrient application rates from fertilizer formulations, matching that information to crop uptake, knowledge of fertilizer ingredients, and fertilizer formulation essentials such as costing and nutrient compatibility. This can be accomplished by in-country trainings which should involve soil scientists employed in the public sector (research and university personnel) and blending staff.

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

The fertilizer market structure and SWOT analysis of the market are shown in Figures 1 and 2 respectively.

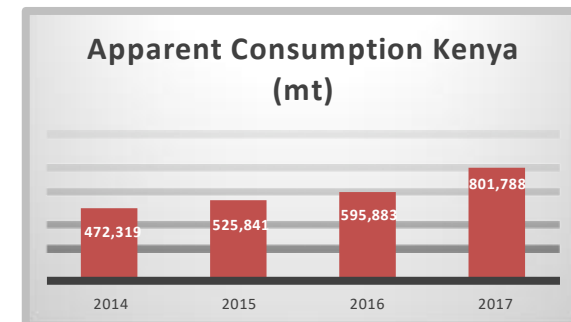
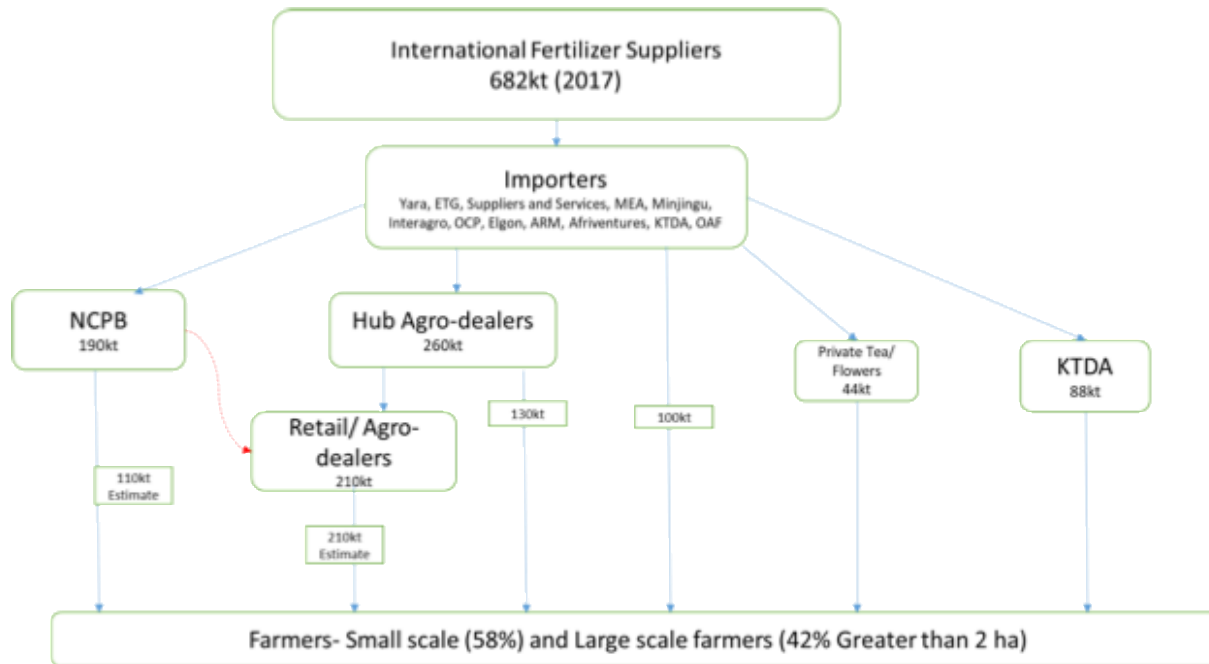
Market characteristics

The Kenyan fertilizer market is characterized as being a large, (second largest in eastern SSA after Ethiopia) open competitive market, an aspect that has in the recent past attracted international manufacturers pursuing entry options into Africa. Some 28% of the total fertilizers consumed is channeled through the National fertilizer subsidy program, distributed by the National Cereals and Produce Board (NCPB). Estimates suggest that 40% of product in the subsidy leaks to agro-dealers, across borders, and to farmers not targeted for subsidies rather than finding its way to targeted beneficiaries.

Supply

The Kenya fertilizer distribution system is well defined and comprehensive, comprising international and local importers but the marketing power lies with approximately 150 hub dealers, and 8,000 retailers (agro-dealers). Most importers channel product through the hubs and agro-dealers rather than market direct. The strong independent distribution system (hubs and agro-dealers) focus on margin (turnover) rather than farmer development and are therefore reliant on manufacturers to provide development programs and demand creation (market “pull”). Typically, this sector of the distribution channel has credit/cash constraints, meaning retailers will stock one or two lines that sell quickly. As such, they are not inclined to stock new products unfamiliar to farmers, which sell more slowly. Credit at peak offtake times (planting) for the middle to bottom end of the value chain is a major issue. This is not specific to blends, but all products will influence the stock holding decisions.

The major importers and manufacturers either have blending/granulation capacity or are planning capacity, including storage and other investments that facilitate product movement. Much planned and ongoing activity is around Mombasa, a corridor to Kenya and Ugandan markets. For example, ETG has blending capacity in Mombasa, Toyota Tsusho has blending capacity in Eldoret, MEA has blending and granulation capacity in Nakuru, and Omya (formerly ARM) has blending and lime granulation capacity in Athi River. Yara is developing its strategy with multi-nutrient compounds. There are other manufacturers contemplating investments to support multi-nutrient products within the corridor. Some suppliers have expressed the intent to support their independent networks with blend capacity as it develops.



	Fertilizer system	Volume (mt)	%
KTDA	Bulk Plantation	130,000	19%
Private Tea / Flowers	Bulk Anchor	20,000	3%
NCPB	Bulk Government	190,960	28%
Importers	Private	342,000	50%
		682,000	

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Figure 1. Kenyan fertilizer distribution, system, apparent fertilizer consumption, and distribution volumes through various fertilizer systems

	Strengths	Weaknesses	Opportunities	Threats
Manufacturer		<ul style="list-style-type: none"> Limited understanding of production capacity 	<ul style="list-style-type: none"> Nitrogen production capacity is being evaluated International manufacturers looking to participate directly in market, using Kenya as an entry point to Mombasa corridor 	
Importer	<ul style="list-style-type: none"> Established importers/agents Access to finance Supplier network Network within Government Relationship with wholesalers Range of diverse business models 	<ul style="list-style-type: none"> Focused on volume Competing needs of various importers to maintain business model 	<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 	<ul style="list-style-type: none"> Entry of manufacturers into the market Expansion of subsidy program at exclusion of private sector
Blender	<ul style="list-style-type: none"> Blending capacity varies. Some companies have invested in developing crop and soil specific fertilizers— proprietary. Access to finance Growing farmer awareness of benefits. 	<ul style="list-style-type: none"> Strong competing business models that challenge change Lack of product knowledge and availability Support NGO's lack industry knowledge (commercial and Technical) to guide change. Issue at National and county levels. Decision making is often relational ship rather than commercial . 	<ul style="list-style-type: none"> "Big Four Agenda" to get 50% of fertilizers applied as blends. Support public sector with fertilizer expertise Develop "best bet" critical levels of nutrients for public domain use Support research to validate and fine tune formulations— support demand creation.-create alternative "Pull" mechanisms Recognition of the benefit of "balanced Nutrition" at all levels of the value chain 	<ul style="list-style-type: none"> Stronger quality regulations that ensure best product and process. Unfavourable subsidy support
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 Trader mentality – only interested in buying low and selling --turnover Inadequate working capital 	<ul style="list-style-type: none"> Government and blender/importer demand creation activities to "pull " product through. Develop finance instruments that can provide flexible terms. 	
Agro Dealer	<ul style="list-style-type: none"> Wholesaler relationship Farmer interaction / relationships Last Mile benefit 	<ul style="list-style-type: none"> Lack of working capital- minimum stock holding. Dependent on wholesaler Lack of management and technical competence High percentage margin 	<ul style="list-style-type: none"> Credit instruments Create demand (Govt/blender/importer) 	<ul style="list-style-type: none"> Competitive models like OAF that will service a customer base in Kenya of 450k farmers in 2018/19

Key Takeaways:

- Market is a strong commodity market based on DAP and CAN.
- Market has a strong independent distribution network, sell multiple brands, are margin driven relying on turnover and terms— limited product development capacity
- 3 blenders operational (2 in last 2 years). History of compound market and negative association with blends— still marketed. Steam granulation plant under construction and lime granulation plant to be built in next 12 months.
- Market largely led by government supported products in the subsidy program.
- Diverse range of activities of importers from commodity suppliers to distributors, to blenders, to delivery to end users (OAF), to government subsidy distributors. Need to define which market is being targeted by AGRA

Figure 2. SWOT analysis of the Kenyan fertilizer value chain

Demand

There is a strong brand awareness in most African countries and this is no different in Kenya, where DAP and CAN are well known and preferred products. This was further encouraged by government only availing straight DAP and CAN through subsidies, only more recently adding 23:23:0 and 17:17:17. Farmers are resistant to change and even skeptical of new products. Subsidized product sells for about 66% of the market price product and hence can and should be used to influence change. The Presidential Legacy Project (The Big 4) aims to address this and has called for 50% of subsidized fertilizers to be blends in the next 4 years. The entry of Toyota Tsusho in the fertilizer sector as blenders in 2016 has generated a strong awareness of the added benefits of balanced fertilizers.

There is a real “seeing is believing-- on my own farm” culture which goes beyond the traditional sensitization of demonstrations by selected lead farmers, suggesting there is a healthy dose of skepticism among farmers, indicative of a lack of confidence in the source of knowledge (for example, fertilizer companies or extension services). This resultant fragmentation in the message being delivered diminishes the impact of the message and in Kenya is due to

- operators comfortable with the existing *Modus Operandi* competing against change that requires significant capital and capacity build up—conflict in message.
- a lack of independent technical fertilizer advice that means decisions may not be unbiased—no resolution of conflict.
- a weak platform that limits sound decision making—no venue to get resolution.

Significantly this problem has arisen from the fact that there is still a poor understanding of fertilizer blends at most levels, including public sector decision-makers.

The success of anchor programs such as One Acre Fund (OAF) merits examination with regards to targeted beneficiaries. OAF will target 450,000 smallholder farm families in Kenya in 2018 (average farm size 0.75 acre). This is a significant share of smallholder farmers (SHFs). It raises the question for AGRA as to who their target farmer base is. Is it SHFs who are producing for household food security and will not engage in the market economy, or SHFs who have the potential to expand and become viable farmers (national food security)? The approaches are very different. OAF undertakes research on various fertilizer offerings and are very interested and aware of the developments in balanced nutrition. They should be strong partners in both the development process and delivering demonstrated product advantages to targeted beneficiaries.

Post devolution, the agricultural extension services have weakened. A limited capacity within the public sector concerning multi-nutrient fertilizers and manufacturing processes. Another issue brought about by devolution was the introduction of county subsidy programs on fertilizers, creating a competitive subsidy purchase issue between counties and the national government. In both programs, there is a need for clarity and transparency on decisions on product choice, as they are often not technically based.

AGRA interventions in fertilizer distribution systems

The concept of balanced nutrition is at an early stage in Kenya. It has significant momentum, but perhaps lacks clear direction. At a high level, activities that are needed to provide this, and AGRA could drive and expedite the adoption by

- supporting the creation of a National Fertilizer Platform, currently being developed by the MoA, IFDC, and AFAP, to bring together all relevant stakeholders in the fertilizer sector. The proposed platform would collectively identify and resolve issues of common concern. The platform will need the support of technical specialists to provide independent support. It will need access to a range of skillsets to support its functioning, as required. The platform will extend beyond the adoption of balanced fertilizers to address all relevant topics in the fertilizer sector. A sub-role of the platform is to provide capacity support relating to fertilizer science and market issues (product specifications, program implementation, leverage of private sector, regulatory issues etc.). A national platform may need to support counties to address the local needs and provide continuity of message.
- speaking with a clear voice—a unified message. This could have several components:
 - Adoption of unified approach to delivering balanced fertilizers to smallholders. In 2017 at the AGRF side event in Côte d'Ivoire, industry (IFA, ETG, Yara, Sabic), donors (USAID, BMGF, AGRA) and implementers (various) of fertilizer change agreed on the need for all to speak with a common voice on issues relating to this topic. This acknowledged the confusion in the market but also the need to bring together a broad range of skillsets residing in various institutions to collectively address the gaps and adoption issues. The SMART concept was conceived by IFDC as a logical framework to address this.
 - Leveraging private sector to determine and support a road map for optimum implementation of productivity, recognizing the strengths and needs of the individual companies.
- the creation of an industry technical group (within or external to AGRA) with broad set of skills and experience (industry, fertilizer finance, agronomic, project management and policy) that can
 - engage with manufacturers and importers.
 - provide direction to country programs and support country platforms.
 - support regulatory structuring.
 - provide guidance to AGRA consortium projects involving fertilizers.
 - engage with industry to support the Last Mile Agripreneur Alliance (LMAA).

The development of the above two groups is important to undertake a deep analysis to develop a fertilizer roadmap under the sanction of the government of Kenya and industry participants.

- support for industry and public sector to develop appropriate sensitization programs.
- support for development of generic credit guarantee programs to target blended products.

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

The policy issues outlined in the AGRA report “Updated Policy Matrix for Agriculture in Kenya” are relevant with the following points being expanded on:

- The issue of transparency in the subsidy scheme and fears that it will be expanded to cover an increasing number of crops (e.g. coffee) limits the appetite to invest. Some comments estimate as much as 80kt leakage from NCPB from its intended recipients is having a serious impact on the ability to develop this channel at the last mile level. The issues, surrounding subsidy are best addressed in a sector platform as outlined above.
- The unclear role of counties providing subsidized product, further increasing the total volume of fertilizer subsidized in the market. Often there was evidence that product choices were not based on best crop/soil needs.
- An apparent lack of extension function/capacity with devolution. This needs to be incorporated in decisions regarding sensitization, capacity building and private sector leverage.

AGRA interventions and advocacy on policy issues

There is the need to have independent technical advice to government on quality criteria, fertilizer technology issues and standards for fertilizer activities. Relying largely on private sector to provide this knowledge, when the government doesn't have it, can leave the government open to charges of inappropriate decisions being made because of conflicts of interest. This should be a key component of the proposed technical group (outlined above). It will

- ensure best international practice.
- limit non-trade barriers to market entry.
- build capacity in local institutions such as KALRO, KEBS, Ministry of Agriculture, implementing agents (OAF) and private sector. While it is widely accepted that agronomic skills equate to fertilizer skills, this is not the case. Agronomic skills are one part of the equation, but fertilizer product/technology skills are very different and equally important, along with business skills—those required to run a business. These should all be part of the skill set in a team to build fertilizer value distribution systems and comment on regulations to ensure sustainable operations. South Africa is one of the few countries in Southern and Sub Saharan Africa that has a history in blending fertilizers and consequent product knowledge. The skills surrounding fertilizer technologies are not available in most countries, simply because the experience isn't there and so there needs to be a recognition that these core skills have to be learnt for success.
- establish a standard basis for assuring quality fertilizer.

Appendix I. Potential Partners and Key Country Contacts in Kenya

Organization and contact details of key personnel	Counties or regions of activities	Brief description of activities as related to AGRA priority crops
<p>Crop Nutrition Laboratory Services (Ltd) Jeremy Cordingly Managing Director +254 720 639 933 support@cropnuts.com Nairobi</p>	<p>Machakos, Makueni, Kilifi, Tharaka Nithi, Nakuru, Nyandarua, Elgeyo Marakwet (one client), Meru, Uasin Gishu, Kiambu, Narok, Bungoma, Nyeri, Murang'a, Homabay, Kisumu, Busia, Siaya, Migori, Embu</p>	<p>CropNuts offers lab testing services and independent agronomy services to farmers, commercial businesses, agricultural research institutions and non-governmental organizations.</p>
<p>IPNI Shamie Zingore Director +254 700393454 szingore@ipni.net Nairobi</p>	<p>Siaya, Bungoma, Kakamega (potential), Embu, Kiambu</p>	<p>IPNI is working on maize and soybean, focusing on balanced fertilizer management, incorporating soil analysis and proper crop management to improve on yields. They also do conservation agriculture by rotating maize and bean crop while retaining the maize crop residue for the next season.</p>
<p>CIAT Debisi Araba Regional Director +254 721574967 +254 719052800 a.araba@cgiar.org Nairobi</p>	<p>Bungoma, Busia, Kakamega, Siaya, Tana River, Machakos, Kitale, Nakuru, Thika , Embu, Makueni, Nyeri, Bomet, Elgeyo Marakwet, Transzoia, Kiambu , Kisumu</p>	<p>CIAT is linking common bean farmers to various markets under the Pan African Bean Research Alliance (PABRA). They also focus on integrated soil and water management by restoring degraded lands under the Water Landscape and ecosystems (WLE) project.</p>
<p>CIMMYT Stephen Mugo Kenya Country Representative (CCR) +254723621909 S.mugo@cgiar.org Nairobi</p>	<p>Kilifi, Makueni, Machakos, Embu, Kakamega, Nairobi, Transzoia, Busia, Siaya, Bungoma</p>	<p>CIMMYT works on maize and legumes in the listed counties. Legumes are incorporated to intensify production while minimizing the negative impact on the environment while improving soil fertility.</p>
<p>IITA Leena Tripathi Country Representative +254 204223472 l.tripathi@cgiar.org Nairobi</p>	<p>Bungoma, Busia, Kakamega, Siaya, Vihiga, Kisumu, Homabay, Migori</p>	<p>IITA works on maize, potatoes, groundnuts and cowpeas; putting nitrogen fixation to work for SHF in Africa(N2Africa). Maize and peanut; Aflasafe Technical Transfer and Commercialization (ATTC). Integrated soil fertility management for climate smart intensification of maize-based cropping systems in Kenya. Potatoes; field trials assessment; field deployable nutrient-rich biodegradable matrix for crop protection</p>

Organization and contact details of key personnel	Counties or regions of activities	Brief description of activities as related to AGRA priority crops
<p>TechnoServe, Inc. David Galaty Director, Research and Innovation dgalaty@tns.org Nairobi</p>	<p>Meru, Nyandarua, Elgeyo, Marakwet, Narok, Nakuru</p>	<p>Technoserve is working on an Irish potato crop by making the potato value chain more lucrative business. This is done by identifying bottlenecks in the value chain and look for intervention measures.</p>
<p>One Acre Fund Julia Franklin Global Sourcing Director +254 700 447 497 julia.franklin@oneacre.org Kakamega</p>	<p>Kakamega, Bungoma, Busia, Homabay, Siaya, Uasin Gishu, Transzoia, Nyeri, Vihiga, Kisii, Nyamira, Kisumu, Migori, Kericho, Nandi, Narok, Kirinyaga, Muranga</p>	<p>One Acre fund offers support to farmers growing maize, sorghum, green grams, sukuma wiki, beans, and onions through agronomic training and market facilitation. They also offer loans to facilitate fertilizer purchase and other production related costs.</p>
<p>ICRISAT Moses Siambi Country Representative Research programmes director East and Southern Africa m.siambi@cgiar.org Nairobi</p>	<p>Makueni, Elgeyo Marakwet and Siaya</p>	<p>ICRISAT develops improved varieties of pigeon peas as well as finger millet, pearl millet, and sorghum. They also aim to promote increased consumption of nutrient dense, drought tolerant crops (sorghum, millets, pigeonpea, groundnut, cowpea and green gram) and appropriate dietary practices</p>
<p>ICRAF Erick Ng'ethe Project Manager East and Southern Africa e.ngethe@cgiar.org Nairobi</p>	<p>Machakos, Kisumu, Kitui, Kericho, Nyando, Baringo, Turkana</p>	<p>ICRAF's work is focused on agroforestry research for development. They have a component of land restoration management. ICRAF has a soil-plant spectral diagnostics laboratory-The laboratory serves as the main analytical center for the Africa Soil Information Service (AfSIS) as well as supporting an increasing number of spectral labs worldwide.</p>
<p>IFDC -2 SCALE Peter Kirimi REGIONAL AGRIBUSINESS COORDINATOR Country Regional Agribusiness Coordinator +254 704 404 520 pkirimi@ifdc.org Nairobi</p>	<p>Nyandarua, Meru, Nyeri, Transzoia, Nakuru, Taita Taveta</p>	<p>2 SCALE works on potatoes, sorghum, lupin and oats. The project aims at improving the productivity of the crops by employing a combination of soil analysis, proper crop management and post-harvest management. Training of the support services (SMEs, Agro-dealers etc.) is emphasized. Farmer capacity building is also a key component by bringing the agribusiness side to the smallholder farmers.</p>

Organization and contact details of key personnel	Counties or regions of activities	Brief description of activities as related to AGRA priority crops
Lachlan Kenya Ltd Richard Stone-Wigg Founder and CEO +254 722 522 749 richard.stonewigg@lachlanafrica.com Nairobi	Bomet, Meru	Lachlan works with maize, potatoes, sorghum, pulses and legumes using soil analysis as a key component in developing suitable fertilizers for better yields. This is combined with crop management practices. Lachlan has a viazi power program that compares farmers practice with the newly developed practice.
SoilCares Research David Marcelis, GIS and Remote sensing Scientist +31 (0)6 310 14 930 david.marcelis@soilcaresresearch.com Nairobi	Bomet, Bungoma, Elegeyo Marakwet, Embu, Kakamega, Kericho, Kiambu, Kirinyaga, Laikipia, Machakos, Meru, Migori, Muranga, Nakuru, Nandi, Nyandarua, Nyeri, Tharaka Nithi, Trans Nzoia and Uasin Gishu	Soilcares provides soil testing services and use this knowledge to advise farmers on the type of fertilizer and quantity to use so as to optimize on production. Projects in Kenya include CROPMON and PASIFIK
Cultivating New Frontiers in Agriculture (CNFA) Margaret Anderson Program Director, Farmer-to-Farmer Tel: +1.202.296.3920 Fax: +1.202.296.3948 1828 L Street NW, Suite 710 Washington, D.C. 20036 info@cnfa.org	Bungoma, Vihiga, Bondo and Siaya	Through its locally registered Kenyan affiliate AGMARK, CNFA developed a multifaceted approach to respond to the constraints in the input distribution system, in order to stimulate the flow of productivity enhancing inputs so that smallholders could benefit from increased production, food security and incomes.
AFSIS Keith Shepherd Leader Land health Decisions afsis.info@africasoils.net Nairobi	Kitui, Machakos, Makeni, Murang'a, Siaya	AFSIS project collects and disseminates information that help the SHF increase their productivity with emphasis on soil health. In addition, AfsIS have created digital soil maps to aid in precision farming. They also compare crop performance as affected by agroecological zone and different fertilizer levels of application.
Kenya Industrial Research and Development Institute (KIRDI) Samuel M. Wambugu Senior Research Scientist +254 02 555738 ; +254 722758781 info@kirdi.go.ke Nairobi	Machakos, Makeni	In collaboration with Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), KIRDI is working on sorghum in a project that ensures value addition thus increasing sorghum utilization and marketability.
Kenya Agricultural Productivity and Agribusiness Program (KAPAP) Francis Muthami National Coordinator 0722-757406 fkmuthami@kapp.go.ke Nairobi	Garissa, Wajir, Meru, Embu, Makeni, Nyandarua, Nyeri, Kilifi, Kwale, Tana River, Taita, Nakuru, Trans Nzoia, West Pokot, Busia, Bungoma, Kakamega, Gucha, Siaya, Homa Bay	Through the University of Nairobi, KAPAP is enhancing production, value addition and marketing of cowpea and French beans among other crops among smallholder farmers in Kenya

Organization and contact details of key personnel	Counties or regions of activities	Brief description of activities as related to AGRA priority crops
KALRO Food Crop Research Institute Deputy Director General [Crops] Felister Wambughu Makini Tel.: 020-2029637 Felister.makini@kalro.org Kitale	Trans-Nzoia, Embu, Kiambu, Machakos, Kisii, Nakuru, Kitui, Kiambu, Bungoma, Kakamega	The organization deals with among other crops maize, sorghum, dry beans, pigeon peas, green grams, dolichos and potatoes. They advocate policy, promote markets and marketing strategies and enhance availability of knowledge, information and technologies on Food crop product value chains research.
Kenya Agricultural Value Chain Enterprises Maria Cheronu Senior Deputy Director, + 254 020 331 8581 mariakcheronu@gmail.com Nairobi	Kisumu, Siaya, Homabay, Kisii, Nyamira, Bomet, Kericho, Nandi, Uasin-Gishu, Marakwet, Bungoma, Busia, Vihiga, Kakamega, Migori, and Trans Nzoia, Meru, Tharaka-Nithi, Machakos, Kitui, Makueni, and Taita-Taveta	KAVES works on maize, Irish potatoes, sorghum and pulses. They aim at increasing the productivity and incomes of smallholder farmers, and other actors along the value chain.
ICRA Irene Njogu Capacity strengthening coordinator East Africa +254 720 275704 Irene.Njogu@icra-edu.org Nairobi	Meru, Nyeri, Nyandarua, Embu, Laikipia, Nakuru	ICRA supports Irish potato smallholder farmers to sell their produce. They also strengthen producer organizations and the relationship between them with local agribusinesses and other value chain actors
Collaborative Crop Research Program (CCRP) Beth Medvecky East & Horn of Africa Liaison Scientist bethmedvecky@gmail.com Cornell University	Westpokit, Keiyo, Marakwet, Baringo, Siaya, Bungoma, Kisumu, Kakamega, Migori	Value added bean(ongoing)and sorghum technologies for enhancing food security, nutrition, income and resilience to cope with climate change and variability challenges in Eastern Africa.
Bioresources Innovation Network for Eastern Africa Development (Bio-Innovate Dr Julius Ecuru Programme Manager, BioInnovate Africa j.ecuru@ecuruline.com/julius.ecuru@gmail.com +256 772 595 233 ICIPE, Nairobi	They work with smaller contractors all over the country	Value added bean(ongoing)and sorghum technologies for enhancing food security, nutrition, income and resilience to cope with climate change and variability challenges in Eastern Africa.
Kenya Climate Smart Agricultural Project Francis Muthami National Project Coordinator +254 20 271 5466 francis.muthami@kcsap.go.ke	Marsabit, Isiolo, Tana River, Garissa, Wajir, Mandera, West Pokot, Baringo, Laikipia, Machakos, Nyeri, Tharaka Nithi, Lamu, Taita Taveta, Kajiado, Busia, Siaya, Nyandarua, Bomet, Kericho, Kakamega, Uasin Gishu, Elgeyo Marakwet, and Kisumu	The project covers sorghum, pigeon peas and Irish potatoes in an initiative to build resilience to climate change risks in smallholder farming and at the same time increase agricultural productivity

Organization and contact details of key personnel	Counties or regions of activities	Brief description of activities as related to AGRA priority crops
<p>Farm-Concern-International John Riungu Country representative /programs manager +254 715 408 379 john.riungu@farmconcern.org Nairobi</p>	<p>Kisumu, Siaya, Homabay, Kisii, Nyamira, Bomet, Kericho, Nandi, Uasin-Gishu, Marakwet, Bungoma, Busia, Vihiga, Kakamega, Migori, and Trans Nzoia, Meru, Tharaka-Nithi, Machakos, Kitui, Makueni, and Taita-Taveta</p>	<p>FCI provides market development and business development services to KAVES partners and targeting smallholder farmers operating within the USAID designated 'Feed the Future'. Their target crops include maize, sorghum, Irish potatoes and pulses among others</p>
<p>ICL Fertilizers Lilian Wanjiru Mbuthia Senior Agronomist IPI Cordinator +254 20 8070710/713 Lilianwanjiru.mbuthia@icl-group.com Nairobi</p>	<p>Narok, Marakwet, Narok, Uasin Gishu, Bomet, Nakuru</p>	<p>Large scale outreach on potato production availing farm inputs (Fertilizers and Agrochemicals) through a partnership program with Syngenta. Linking Farmers to input finance, agronomy skills as well as marketing skills. Improved farmers yield from 12 -14t/ha to 25-30t/ha</p>