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

June 2018

Executed by:

IFDC
International Fertilizer Development Center

afap
African Fertilizer and Agribusiness Partnership
Partnerships Productivity Prosperity

BILL & MELINDA GATES foundation
The ROCKEFELLER FOUNDATION
UKaid
USAID
FROM THE AMERICAN PEOPLE

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

Introduction 1

Available Soil Information 1

Inventories of Fertilizers Available in the Markets 2

Rationale for Why Fertilizer Blended Products Were Developed 3

Fertilizer Recommendations that are Available, and their Suitability for Staple Crops and Agro-Ecological Zones Targeted by AGRA 3

- Maize recommendations and their suitability 5
- Rice recommendations and their suitability 5
- Cassava recommendations and their suitability 5
- Soybean recommendations and their suitability 6
- Groundnut recommendations and their suitability 6

Gaps that Need to be Addressed to Come Up with Area and Crop Specific Blends 7

Recommendations and Interventions that AGRA Could Implement to Address the Availability of Quality Fertilizers 8

The Nigerian Fertilizer Market 9

- Demand 9
- Supply 12
- Policy contribution and outcomes 12
- The Presidential Fertilizer Initiative (PFI) 13
- The Anchor Borrowers Program (ABP) 14

Ongoing Efforts or Investments that are Promoting the Availability of Appropriate Blended Fertilizers that AGRA Can Leverage in the Target Countries 15

Fertilizer Companies and/or SME Blenders Existing in the Country and the Geographies Targeted by AGRA 16

Policy and Regulatory Bottlenecks that are or may Affect the Availability of Blended Fertilizers, and Interventions that AGRA and its Partners Could Design and Advocate for Implementation to Help Farmers Access the Appropriate Blended Fertilizers 18

- Supply chain constraints 18
- Policy constraints 18
- Summary of constraints to achieving efficient fertilizer systems 19

AGRA Intervention Options 19

- Development of an institutional structure 19
- Strengthening of the capacities of implementation partners 20
- Commercialization of optimized products 20

AGRA Strategic Planning 20

Appendix I. Nutrient and Soil Property Maps from Nigeria 23

Appendix II. Potential Partners and Key Country Contacts in Nigeria 25

Acronyms & Abbreviations

ABP	Anchor Borrower's Programme
AFAN	All Farmers Association of Nigeria
AFAP	African Fertilizer and Agribusiness Partnership
AFEX	Africa Exchange Holdings
AfSIS	Africa Soil Information Service
AFSTA	Africa Seed Trade Association
AGRA	Alliance for a Green Revolution in Africa
B	boron
BVN	Bank Verification Number
CAN	calcium ammonium nitrate
CARD	Coalition for African Rice Development
CBN	Central Bank of Nigeria
CEC	cation exchange capacity
CPP	crop protection products
DAP	di-ammonium phosphate
ETG	Export Trading Group
F&C	Fertilizers & Chemicals Ltd
FAO	Food & Agriculture Organization of the United Nations
FEPSAN	Fertilizer Producers and Suppliers Association of Nigeria
FISS	Farm Inputs and Support Services Department
FMARD	Federal Ministry of Agriculture and Rural Development
FMN	Flour Mills of Nigeria
FSFC	Federal Super Sulphate Fertilizer Co
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
Ha	hectare
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Instutte
IITA	International Institute for Tropical Agriculture
ISFM	Integrated Soil Fertility Management
JICA	Japan International Cooperation Agency
KASCO	Kano Agricultural Supply Company
MAAN	Maize Association of Nigeria
MFB	microfinance bank
MIRA	Micro Reforms in African Agribusiness
MOP	muriate of potash
MT	metric ton
NABG	Nigeria Agribusiness Group
NAERLS	National Agricultural Extension, Research & Liaison Services
NAFCON	National Fertilizer Company of Nigeria
NAIC	Nigerian Agricultural Insurance Corporation
NBS	National Bureau of Statistics
NGN	Nigerian naira
NGO	non governmental organization
NIRSAL	Nigeria Incentive-Based Risk Sharing System for Agricultural Lending

NPFS	National Programme for Food Security
NPK	nitrogen phosphorus potassium
NSIA	Nigerian Sovereign Investment Authority
NSPFS	National Special Program for Food Security
OCP Office	Chérifien des Phosphates
OFRA	Optimizing Fertilizer Recommendations in Africa
PFI	Presidential Fertilizer Initiative
PROPCOM	Promoting Pro-Poor Opportunities in Commodity & Service Markets
RIFAN	Rice Farmers Association of Nigeria
SEEDAN	Seed Entrepreneurs Association of Nigeria
SHF	smallholder farmer
SMS	short message service
SSA	sub-Saharan Africa
SSP	single superphosphate
SWOT	Strengths Weaknesses Opportunities Threats
TSP	triple super phosphate
VP	Village Promoter

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

Introduction

In carrying out this assessment, we conducted interviews with key stakeholders in the Nigerian fertilizer sector including representatives of AFAP, Kano Agricultural Supply Company (KASCO), AFEX Commodities Ltd., Citizen, Al-Yuma Fertilizer & Chemicals Company Ltd., Funtua Fertilizer and Chemicals Company (Katsina), MFB Fertilizer & Chemical Company Ltd. (Kaduna) Citizens Fertilizer and Chemicals Nig. Ltd. (Kano), Morris Nigeria Limited (Niger), Golden Fertilizer Company Limited (Lagos), Bejafta Group Nigeria (Jos), OCP Nigeria, NAERLS, Springfield, FMARD, FISS among others.

We reviewed documents relating to policy and regulations, Federal Ministry of Agriculture and Rural Development (FMARD) fertilizer recommendations for soybean, cassava, rice, maize and groundnut.

Available Soil Information

AGRA is leading an effort to accumulate available soil information and convert it into workable maps. Some information on soil nutrient levels and associated properties is found in Appendix 1 from maps developed by the National Special Program for Food Security (NSPFS). While these maps are coarse, nevertheless some trends emerge. The most acidic areas are in the southern portion of the country, which receives higher rainfall. The cation exchange capacity (CEC) is generally low, and this is reflected by low levels of Mg in particular, which may be deficient for many crops. Areas of low Zn and B are also apparent. Regarding the classification of what is considered “low”, while we generally agree with the overall levels chosen, this should be confirmed through trial work, as it varies from crop to crop. Sulfur (S) was not included in this assessment. We did not show all maps in Appendix I. Subsurface (15-43 cm) layers were also assessed, and as is common, show declining nutrients and increased soil acidity in the subsoil.

AfSIS is due to complete more detailed maps by September 2018. OCP, in collaboration with IFDC, is mapping the maize and sorghum belt, but this work will remain confidential for another year as per the terms of their agreement. Indorama is also involved in soil sampling and analysis, but the analysis is owned by them and is not publicly available.

Two major types of acid soils limit food production in Nigeria: the leached acid soils (ferallitic soils, pH 4.5) in high rainfall areas of the south, and the drained acid sulfate soils (pH 3.5) of the delta areas and marshy coasts. Poor growth of crops like maize and cowpea in these areas is attributable to the prevailing acid conditions.

Liming acid tropical soils to near-neutrality has not produced the desired effects. In trials conducted in ferallitic, and ferruginous soils in the Imo - Anambra areas, for example, liming acid soils to pH 6.5 and 7.0 for maize depressed plant growth and yield. Similar trials conducted on the acid soils of Agege and Ikenne showed that lime in combination with manure and some essential trace elements gave better yields than lime alone. Calcitic lime can induce Mg deficiencies, and if over-applied exacerbates some micronutrient deficiencies, and should not be seen as a stand-alone solution.

Areas around Daya in Borno State are strongly saline-sodic in the sub-soils. In the Hadejia River Basin Area, about 20 - 40% of the soils are slightly alkaline. Soils at Kalmalo, Tungun Rundu and Wurno in Sokoto States are slightly alkaline in nature.

Inventories of Fertilizers Available in the Markets

Table 1 is the most updated list of the main fertilizer straights, compounds, and blends available in Nigeria that are available to smallholder farmers.

Fertilizer Type	Trade Name	Crops Applied to (main use)
Urea super granule (USG)	Notore	Rice
Urea	Indorama, Notore	Cereals, sugarcane, cocoa, tomato, onions, okra; all-purpose top dressing
Triple superphosphate (TSP)	SFC	Cowpea, groundnut, soybeans, cocoa, onions, legumes
NPK 12 12 12 + 4S		Tobacco, cabbage, grape, spinach, broccoli, leafy vegetables
NPK 16 16 16		Coffee, horticulture
NPK 23 10 5 + 4MgO +2Zn		Root and tuber crops
NPK 20 15 15		Maize, wheat, ginger
NPK 20 10 20		Rice, millet, maize
NPK 15 15 15	Golden, Springfield, OCP	Maize, rice, wheat, millet, sorghum, groundnut, sesame, cocoyam
NPK 20 10 10	TAK, Golden, MFB, Kasco, F&C, Morris, most blenders	Maize, rice, ginger, millet, sorghum, wheat, cocoyam, groundnut,
NPK 12 12 17 + 2MgO	Golden, Prime Gold	Yam, cassava, potatoes, palm oil, cashew, mango, rubber
NPK 27 13 13	Golden, Prime Gold	Maize
Di-Ammonium Phosphate (DAP)		Raw material for production of NPK blends
Muriate of potash (MOP)		Raw material for production of NPK blends

Rationale for Why Fertilizer Blended Products Were Developed

There are currently over 30 functional fertilizer blending plants in Nigeria that blend various types of fertilizers, even though some of the blends such as NPK 15-15-15 are still largely imported by both blenders and commercial farmers. Blending in Nigeria was started when the Government invested in the first urea plant on the Sub Continent (NAFCON now Notore) and in a 500,000 MT blending plant. With urea distribution centralized and controlled, States could have flexibility in formulation and cost of blends if they set up blending plants. A number of States and private investors set up blending plants between 1986 and 2006. The predominant blend was 20:10:10. In the early 1990s, Golden Fertilizer (FMN) started experimenting with 15:15:15 (compound), and subsequently 27:13:13 (blends) in a bid to improve the nutrient level offered to farmers and also to differentiate their products from common blends. The root and tuber blend was initially developed between IFDC and Notore for the IFDC cassava project.

The main rationale for product development are as follows:

- Blend for Presidential Fertilizer Initiative (PFI) request (NPK 20:10:10).
- To keep per-bag costs low. A 50-kg bag of 20:10:10 has about 27% filler product, which while adding little benefit, appeals to farmers who do not comprehend pricing on a per-nutrient basis but rather on a per-bag basis.
- To meet general crop-specific demands, especially in the northern part of the country, where fertilizer consumption for cereal production is high.
- Production for commercial farmers based on soil analysis, yield and target crops, especially for large estate oil palm producers.

The Nigerian smallholder fertilizer market is heavily influenced by the PFI program. The philosophy driving the program is to make a 50-kg bag of fertilizer at an affordable price using primarily domestic ingredients. Interviewed blenders understood that the addition of secondary and particularly micronutrients would increase the unit cost of producing one bag. The PFI was intent on getting fertilizers to small holder farmers at an affordable price estimated at NGN 5,500 ($15.3)/ 50 kg bag. Fixing the price led to a centralization of the procurement of the constituents of the blends. The company responsible for managing the PFI (NAIC-NPK) thus settled for 20-10-10 as the least costly of the recognized blends in the country.

Though blenders were not restricted in the blends they can offer to the markets, all blenders save one – Golden – are producing solely for the PFI and thus producing 20-10-10.

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

Table 2 shows the fertilizer source and rate for AGRA priority crops in Nigeria, along with recommendation and formulation process in different agroecological zones in Nigeria. Most recommendations are based on crop uptake, making best use of available fertilizers which

include NPKs, urea, simple superphosphate (SSP), and in cases where deficiency is indicated through soil mapping, zinc sulfate heptahydrate (21% Zn, 10% S) or crystalline borax (10% B). The SSP, Zn sulfate, and borax sources are not compatible with NPK blends for various reasons, but their recommendation reflects a perceived need to apply them. SSP, apart from supplying P, supplies considerable quantities of calcium (Ca) and sulfur (S), though rather in excess of crop demand for most crops.

Some updated recommendations that add Zn and S (as Zn sulfate) have been suggested, based on some experimental work. It is clear that some crops are Zn-responsive. The amount of S in Zn sulfate (only half of the Zn) is too little to adequately address sulfur deficiencies. While some awareness is growing regarding Zn and B deficiencies, the lack of soils information on S has led to a blind spot regarding its deficiency. Sulfur is not an easy element to determine in soils, and many national laboratories do not analyze for it.

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

Crop	Yield Target	N	P_2O_5	K_2O	CaO	MgO	S	Zn	B	Cu	Mn	Fe
	Mt ha^{-1}	----------Nutrients removed in crop and residue, kg ha^{-1}----------										
Maize	5	150	46	217	42	50	7	0.28	0.21	0.20	4.73	1.05
		----------Nutrients supplied in recommendation, kg ha^{-1}----------										
OPV: Sahel, Sudan, Northern Guinea Savannah: 333 kg/ha SSP, 50 kg/ha KCl, 260 kg/ha urea		120	60	30	93	0	37	0	0	0	0	0
OPV, Southern Guinea Savannah: 278 kg/ha SSP, 50 kg/ha KCl, 220 kg/ha urea		101	50	30	78	0	31	0	0	0	0	0
OPV,Forest Zone: 278 kg/ha SSP, 50 kg/ha KCl, 150 kg/ha urea		69	50	30	78	0	31	0	0	0	0	0
Maize Hybrid, other than savannah zones: 300 kg/ha 20:10:10, 200 kg/ha urea		152	30	30	0	0	0	0	0	0	0	0
Maize Hybrid, other than savannah zones: 300 kg/ha 20:10:10, 200 kg/ha urea		152	30	30	0	0	0	0	0	0	0	0
Maize Hybrid, savannah zones: 200 kg/ha 20:10:10, 100 kg/ha SSP, 200 kg/ha urea + 5kg/ha Zn sulfate		132	38	20	28	0	11.5	1.1	0	0	0	0
OFRA: 233 kg/ha 15:15:15, 75 kg/ha urea +15 kg/ha ZnSO4		69	35	35	0	0	0.8	1.6	0	0	0	0
	Mt ha^{-1}	----------Nutrients removed in crop and residue, kg ha^{-1}----------										
Rice	7	155	53	124	11	38	20	0.43	0.12	0.07	0.57	0.92
		----------Nutrients supplied in recommendation, kg ha^{-1}----------										
Upland 200-270 kg/ha 15:15:15; 50-100 kg/ha urea		40-80	30-40	30-40	0	0	0	0	0	0	0	0
Lowland 200-275 kg/ha 15:15:15; 25-100 kg/ha urea		40-100	40-50	40-50	0	0	0	0	0	0	0	0
Upland OFRA 228 kg/ha SSP, 150 kg/ha urea		69	41	0	64	0	26	0	0	0	0	0
Lowland OFRA, 90+90 kg/ha urea split		83	0	0	0	0	0	0	0	0	0	0
	Mt ha^{-1}	----------Nutrients removed in crop and residue, kg ha^{-1}----------										
Cassava	30	103	34	93	57	22	12	0.45	0.16	0.05	0.72	0.83
		----------Nutrients supplied in recommendation, kg ha^{-1}----------										
General, from various combinations of urea, DAP and KCl		20-90	12-47	48-90	0	0	0	0	0	0	0	0
General, 600 kg/ha 15:15:15		90	90	90	0	0	0	0	0	0	0	0
General, 450 kg/ha 20:10:10		90	45	45	0	0	0	0	0	0	0	0
General, 750 kg/ha 12:12:17+2MgO		90	90	128	0	15	0	0	0	0	0	0
	Mt ha^{-1}	----------Nutrients removed in crop and residue, kg ha^{-1}----------										
Soybean	3	88	46	53	19	10	7	0.13	0.14	0.03	0.20	0.61
		----------Nutrients supplied in recommendation, kg ha^{-1}----------										
General, 15-15-15 200 kg/ha +SSP 200 kg/ha		30	66	30	56	0	23	0	0	0	0	0
OFRA, 231 kg/ha SSP		0	42	0	65	0	26	0	0	0	0	0
	Mt ha^{-1}	----------Nutrients removed in crop and residue, kg ha^{-1}----------										
Groundnut	3	174	34	65	48	45	13	0.24	0.16	--	0.29	--
		----------Nutrients supplied in recommendation, kg ha^{-1}----------										
All zones: TSP 120 kg/ha + 42 kg/ha MOP		0	50	25	25	0	4	0	0	0	0	0
All zones: SSP 300 kg/ha + 42 kg/ha MOP		0	54	25	84	0	33	0	0	0	0	0
Savannah zones: additional 0.6 kg/ha B		0	0	0	0	?	0	0	0	0	0	0
OFRA: 100 kg/ha NPK 15-15-15 + SSP 155 kg/ha		15	43	15	43	0	17	0	0	0	0	0

Maize recommendations and their suitability

Current hybrid recommendations are based on the PFI formulation, 20:10:10. One rationale for this formulation is to encourage use of domestic ingredients (urea and coarse limestone) in order to produce an inexpensive fertilizer. In reality, it is not an efficient formulation for maize or any other crop. The coarse limestone employed is only 10% effective one year after application; thus, it is effectively a filler material of little value to farmers. Yet, it comprises 27% of the 20:10:10 blend. A blender could just as easily make a blend of its other 3 ingredients (urea, DAP and KCl) and reduce application rates by 27% with similar efficacy. This would both eliminate the cost of the coarse limestone and associated transport costs, and result in a less expensive per-ha application to achieve the same nutrient rates. If Ca is considered deficient or acidity correction is considered necessary, granulated fine lime is a better alternative as a blending ingredient, but it is more effective to apply standard agricultural lime.

As well, putting a high concentration of N in the basal formulation means that to achieve an even modest 30 kg P_2O_5/ha, one must apply 60 kg N/ha at planting. This high N application at planting is subject to leaching losses, meaning it contaminates the environment rather than nourishing the crop. While some basal (planting) N is required, probably no more than 20-30 kg N/ha is necessary before topdress N is applied as urea. Most formulations are unbalanced in relation to N and P, with too much N and too little P being applied.

While maize response to Zn is becoming increasingly recognized (as shown in two recommendations, including that of OFRA), the importance of S and B has not been evaluated.

Rice recommendations and their suitability

An estimated 3 million hectares is under rice annually out of the potential land area of 4.6–4.9 million hectares. For lowland rice (shallow swamp, irrigated, hydromorphic and inland valley swamp) fertilizer is applied by using half the N and all P and K at planting or transplanting and the remainder broadcast at 6-7 weeks after planting/transplanting or at panicle initiation stage.

For lowland rice, when the fertilizer is applied before transplanting, N losses are minimal; the foot traffic during transplanting works the N into the soil, where it remains in the less leachable ammonium form due to lack of oxygen. From an NPK standpoint, therefore, the generalized rice recommendations are appropriate, bearing in mind that lowland rice areas may have varying P and K status that will affect the optimal rates for these nutrients. Some recent research done by IFDC showed rice to be very responsive to small additions of Zn sulfate (primarily for Zn supply). Rice is also responsive to S, B, and even Cu where deficient, but no information is available on the prevalence of those deficiencies in rice-growing areas.

Cassava recommendations and their suitability

Cassava yields in Nigeria average 11-15 MT/ha, which is well below their potential. Yields of over 60 MT/ha are possible, but farmers often consider cassava a crop that will yield without fertilizers, and therefore do not fertilize it adequately, in spite of the fact that fertilizing cassava is highly profitable in the Nigerian context. Ideally, the N and K applications should be split, as cassava consumes very little N and K for several months. The

current recommendations do not reflect that split, and in our experience apply too much P and K. Cassava has also shown to be responsive to S, Zn, and B under various circumstances. We do not consider the current cassava recommendations to be efficient, in large part because it over-supplies P. Evidence from a number of African countries indicates that generally speaking, more N than K is required, as many soils are able to supply a considerable portion of the K demand. With all of the N supplied in basal formulations, much is lost to leaching.

Soybean recommendations and their suitability

Farmers' yields average 0.7 to 0.8 MT/ha, while yields of over 3 MT/ha have been recorded. Both government and OFRA recommendations include SSP, which is a good soybean fertilizer due to its Ca and S content, which soybeans require in greater quantities than cereal crops. Inoculation is important, and the N in the government recommendation should not be necessary under proper inoculation. Soybeans are also responsive to Zn and B where deficient, though this has yet to be evaluated in the Nigerian context.

Groundnut recommendations and their suitability

Land area put to groundnut annually is estimated at 0.8 - 1.5 million hectares. Both P and K are either applied in old furrows before splitting the ridges or side-dressed at or shortly after planting. It should be noted that if a source of P other than SSP is used, then sulfur must be supplied. Farmer' yields of groundnut range between 0.5-0.7 MT/half dry (unshelled) pods. With improved practices the yield range is 2.5-3.0 of pods. The yield potential in the Northern Guinea and Sudan zones is 2.5-3.5 MT/ha.

Groundnuts are very responsive to Ca and S, so those recommendations that include SSP are likely the best. It is only somewhat K-responsive under very low K conditions. The addition of B to formulations is desirable, as this prevents a condition called "black heart" and assists in Ca assimilation, which prevents poor pod-filling. Groundnuts can also suffer from Zn deficiency. In terms of ingredient compatibility, granular SSP can be blended with KCl and a granular B source such as ulexite.

Recently, other fertilizers have been proposed for staple crops in AGRA priority areas, based on some experimentation as shown in Table 3. Their main differentiation is the addition of Zn sulfate. However, these fertilizers are not yet generally available. Of these proposed formulations, we are not confident of formula 1 for cereals, as it contains too little P and too much N. The legumes formulation is perhaps more appropriate for cereals, and perhaps not as good for some legumes, where the added N is probably unnecessary. The roots and tubers formulation is at least better balanced for NPK. We consider that S and B may be lacking in all formulations, depending on deficiency.

Table 3. Fertilizer formulations for staple crops in the states targeted by AGRA

States	Fertilizer Formulations in the Agroecological Zones Targeted by AGRA
Kaduna	NPK 20-5-10 + 1Zn + 1S for cereals and vegetables NPK 15-5-10 + 1Zn + 1S for roots, tubers and tree crops NPK 10-20-10 + 1S + 1Zn + 2Ca for legumes
Kano	NPK 20-5-10 + 1Zn + 1S for cereals and vegetables NPK 15-5-10 + 1Zn + 1S for roots, tubers and tree crops NPK 10-20-10 + 1S + 1Zn for legumes
Katsina	NPK 20-5-10 + 1Zn + 1S for cereals and vegetables NPK 15-5-10 + 1Zn + 1S for roots, tubers and tree crops NPK 10-20-10 + 1S + 1Zn for legumes
Niger	NPK 20-10-10 + 1S + 1Zn for cereals NPK 10-20-10 + 1S + 1Zn for legumes

*Chude, V.O, S.O. Olayiwola, A.O. Osho and C.K. Daudu (eds.) 2011. *Fertilizer Use and Management Practices for Crops in Nigeria*, 4th edition, Federal Ministry of Agriculture and Rural Development, Abuja.

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

The Nigerian soil science community seems to have a good understanding of balancing nutrient applications with crop requirements. Rates of Zn and B, when recommended, are appropriate, and critical nutrient levels chosen for map delineations are better selected than by most national systems. We believe that the AfSIS maps, due out shortly for Nigeria, will give a more detailed picture of the scale of nutrient deficiencies in Nigeria. What is lacking is an appreciation of S deficiencies since they have never been mapped, and the potential response to secondary and micronutrients, with only Zn response being partially examined. We consider that S is very likely deficient, based on assessments from Ghana and the low CEC and organic matter content of Nigeria soils in general, which are conditions where S deficiency is likely. At present, Nigeria is still primarily an NPK country.

Further, the PFI fertilizer, 20:10:10, now dominates the smallholder Nigerian market, but is inefficient. The N needs to be shifted to the topdress. This is both a political issue and a farmer education issue. Politically, it may be seen as taking away from domestic urea use, but the reality is that it will not affect urea use if urea is shifted to topdress fertilizers. From a farmer point of view, fertilizer formulated with less urea and more P and secondary and micronutrients will be more expensive per bag, but fewer bags will be required. It should be easy to achieve a lower basal fertilizer application cost using fewer bags of a more expensive fertilizer, but the lower total cost needs to be effectively communicated to farmers, since the per-bag cost will be greater. Fertilizer blenders need to appreciate this as well and use it as a marketing strategy. Most blenders are simply blending for the market and have little understanding of the products they blend or their appropriateness to crops. They will be reluctant to shift until farmers' understanding of the value of more expensive but concentrated and balanced products is increased.

This may be difficult to achieve politically, and must be backed with solid data on a number of crops. This must involve respected national scientists, fertilizer blenders, and the government extension service.

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

1. AGRA can invest a small amount to finalize soil maps, combining data from the national system, AfSIS, and other sources. It should be born in mind that while AfSIS/ISRIC work together on these maps and have advanced capabilities relating to using mapping layers such as soil properties and underlying geology, they require some support in combining data from different analytical methods, and choosing mapping gradients relevant to low, medium, and high nutrient levels, which can be provided by IFDC or a professional soils laboratory such as Crop Nutrition Laboratories (Nairobi). This will require less than a month.
2. Support best-bet trials on AGRA priority crops, using soils information. One major objective of these trials should be to demonstrate that superior yields can be achieved at lower or equal fertilizer costs than are being realized with the current recommendations. This is highly likely for maize and rice; for groundnut and soybean, current recommendations are strong, but it may be possible to improve them with small additions of Zn and B. This should involve a coalition of fertilizer blenders, national research and extension staff, and strong external support to assist in trial design and implementation.
3. Invest in national research capacity to implement balanced crop nutrition research through appropriate technical training of national soil scientists, agronomists, and private sector field staff. Agronomic and soil science training does not equate to expertise in fertilizer formulating and evaluation but forms a solid basis. National agronomic staff have much local knowledge regarding varieties, crops, and market constraints, and have some track record in trial implementation. Advanced skills can be used to efficiently develop/validate new formulations and determine the agronomic effectiveness of different nutrients (omission trials). Solid partnerships with the private sector are required to share costs and maximize benefits to both sectors.
4. AGRA should invest in support of private blenders to manufacture multi-nutrient products to a high-quality standard. This support should include selection of ingredients for rate and cost optimization, according to the processes they have available, and assistance on sourcing appropriate ingredients. We also suggest some support to the major urea manufacturers on how to incorporate B into urea products. IFDC has a boron-core process for urea production, and coating B onto urea is also possible. Boron applied with urea is an excellent way of supplying B to cereal crops to avoid potential B toxicity issues (cereals are more sensitive to B at planting than at topdressing). B applied at topdressing is effective and has an added benefit of reducing N volatilization losses.

The Nigerian Fertilizer Market

The Nigeria Fertilizer Distribution Structure and Value Chain SWOT analysis are presented in Figures 1 and 2, respectively.

Demand

Nigeria is the largest fertilizer market in Sub-Saharan Africa (excluding South Africa) with apparent consumption peaking at 1.5M MT in 2017 (Figure 1). Consumption has however historically been dependent on Government policies, especially subsidies, and therefore the budget for fertilizer. This historical dependency is however beginning to change with the entry and investments of large manufacturers (Indorama, OCP, Notore) into the Nigerian market. The year 2017 reflects the change in distribution volumes with a historically high 65% of fertilizers going through private systems, while Government interventions accounted for the remaining 35%.

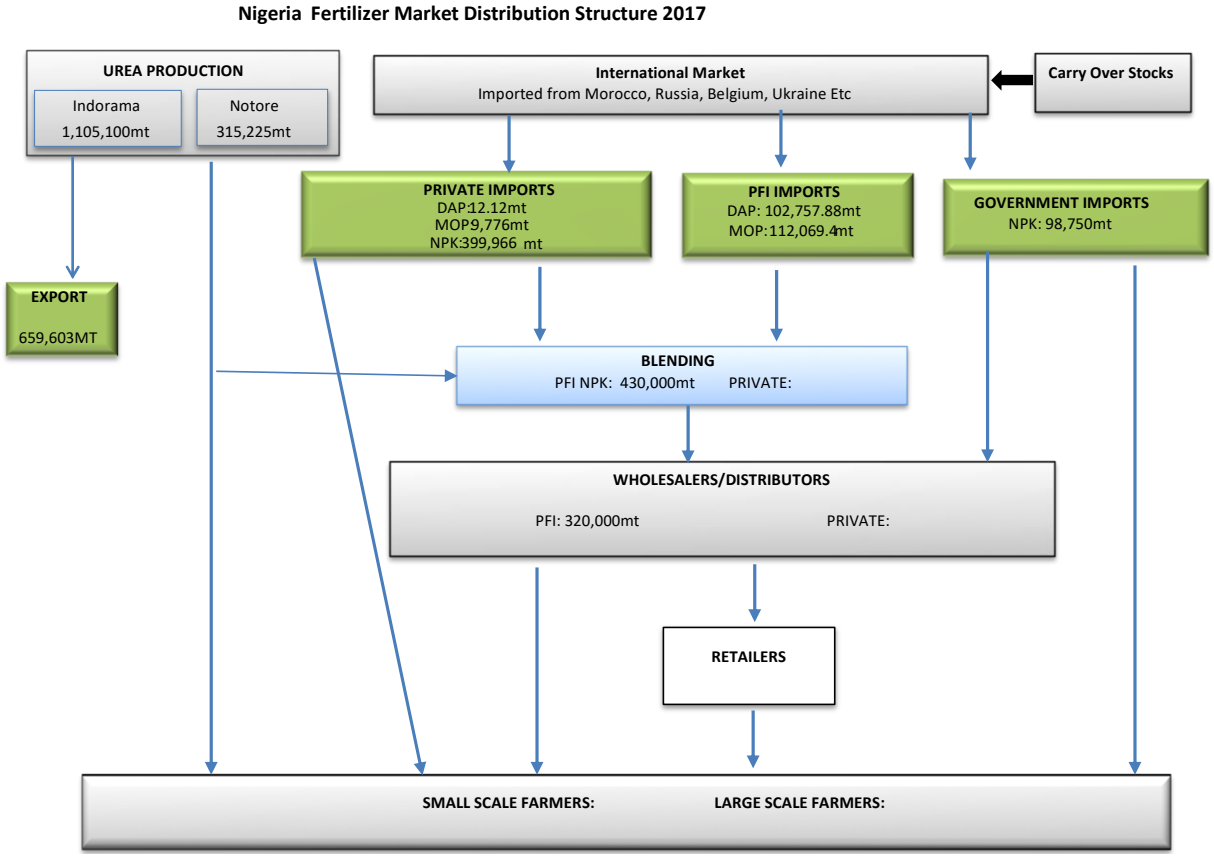
Private sector investments in urea are driven by the presence of natural gas (used in urea manufacture), the proximity of the South American markets and the latent potential of the fertilizer markets in Nigeria and the sub-region.

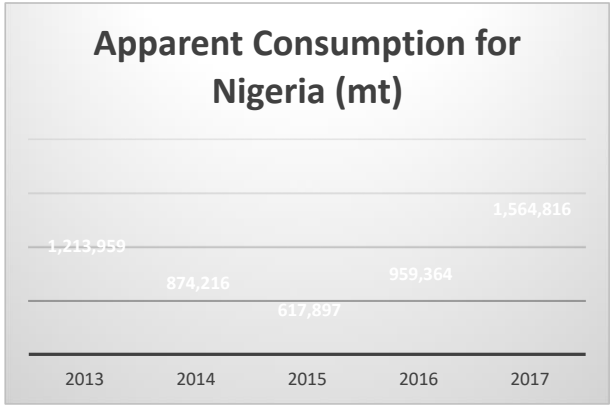
The potential fertilizer demand confidence is explained by four factors:

- Total fertilizer consumed has been dependent on supply. Supply has been dependent on Government policy and budget. Consumption has therefore fluctuated significantly year-on-year (Appendix 2). Carry-over stock has been hard to estimate and even if measured would not reflect demand, as supply of fertilizers is usually too late for the season.
- Estimates of consumption per hectare have ranged between 11kg/ha and 20kg/ha. Though these estimates depend on data on farmed land which are inaccurate, the estimates still provide a sense of an average consumption which is significantly below recommendations and less than required fertilization to restore the soils having been mined consistently for decades.
- The price of a standard good quality bag of fertilizer is beyond the investment capacity (and disposable income) of small holder farmers (SHFs) who are estimated to be responsible for about 90% of Nigeria's production.
- SHFs are typically unfinanced and are therefore either unable to purchase at all or are forced to purchase limited quantities.

The optimism about this demand potential, leading to investments, is based on 1) the slow but steady growth in private sector fertilizer systems since the investment by Notore; 2) the evangelization of agriculture by the Government of Nigeria; 3) the apparent determination of the Government to reduce subsidies and bulk procurement of fertilizers; and 4) the willingness of Government to transition into a different role in the sector.

NIGERIA FERTILIZER DISTRIBUTION SYSTEM





	Fertilizer System	Volume (mt)	
PFI	PFI	427,000	28%
State	Bulk Government	98,750	7%
Private	Private	976,500	65%
		1,502,250	

***525,750mt (35%) of Fertilizers were subsidized by the Government in 2017**

Figure 1. Nigeria fertilizer market distribution structure, apparent consumption, and volumes distributed via various distribution systems

VALUE CHAIN SWOT SUMMARY - NIGERIA

	Strengths	Weaknesses	Opportunities	Threats
Manufacturer	• Yearly urea production more than demand • Brand awareness in markets	• Insufficient working capital downstream leading to lack of products	• Latent demand is significantly more than production; WA will be the cherry on the cake, • Local prices are more attractive than export • Proximity to South America (Brazil) makes further urea investment attractive	• Government policy regarding urea movement hampers local supply • Fears about price of fertilizer to farmers lead to policies that reduce profitability • Other Government interventions to push availability constrain brand building (and market developing) activities
Importer	• Access to finance • Relationship with the international fertilizer community • Strong Government relationships • Good relationships with wholesalers	• Very little value-addition locally • Excessive interest in Government programmes • Short-term market approach – seasonal interest only • No farmer relationship	• With PFI, invest in blending and start the development of a distribution network • Link input supply with the farm output chain • The regulatory bill and regulations will control quality	• Government policy on import substitution (use of local raw materials) and reduced fertilizer cost • Forex scarcity or control
Blender		• Blending technology • Lack of technical knowledge of soils, blends and blender management • Farmer relationship	• Specialty blends to improve productivity with the introduction of micro-nutrients • Brand building • Regulatory bill and regulations will control quality	• The position of most blenders in the chain is precarious; they are maintained by the PFI initiative which selects clients and suppliers
Distributor	• Agro Dealer relationship • Manufacturer relationship • Government relationship	• Product knowledge • Governance (management systems and capacity) • Weak working capital	• Agro dealer finance • Retail (last mile) development	• Government interventions to reduce farm gate prices • Crop specific blending will shorten the distribution chain
Agro Dealer	• Farmer interaction / relationships	• Lack of working capital • Product knowledge and retail management • Absence of technology in business	• Farmer education • Specialty blends could improve profitability	• Development of last-mile retail outlets
Processor	• Demand for finished product	• Lack of working capital • No controlled aggregation structure • Low utilisation of equipment	• Silo concession could integrate aggregation • Specialty blends could improve production	• Weak Profitability (primarily from lack of feedstock)

Key Takeaways:

1. Nigeria is able to produce / bring in sufficient fertilizer to meet current demand, buoyed by increased production capacity, the PFI and the ambition of OCP
2. Manufacturers and importers are creating and driving more farmer (market) development activities
3. Blending is being resuscitated by the PFI but it is dependent on the PFI who is the client and the supplier
4. Distribution is opaque, lacks management capacity, and suffers from an absence of relationship (and trust) with upstream and downstream partners
5. Processing capacity is underutilised as it continues to compete with consumption rather than benefit from surplus
6. The regulatory bill could potentially improve product quality which will lead to an increase in farmer productivity and profitability
7. Majority of farmers do not appreciate the relationship between fertilisers and yields

Figure 2. Value chain SWOT analysis for Nigeria

Supply

There has been a consistent fertilizer supply shortfall in Nigeria, either in absolute volumes supplied or in the timing of supply. Recently however, investments of circa $4.5B in the production of urea is the largest investment in the history of agriculture in Nigeria. Currently, a number of companies are investing in NPK blending plants, spurred by both the PFI and obvious opportunities to build brands (by large manufacturers) through better quality fertilizers.

There are 33 NPK blending plants currently in the country. Most are outdated and were not functional until the PFI. Currently, 60% are apparently functional, rehabilitated with support from the PFI. A large majority lack the technical knowledge to blend, and combined with outdated equipment, are unlikely to be able to produce consistent and good quality products.

NPK supply in Nigeria has historically been of generic (20-10-10 blends and 15-15-15 compounds) and artisanal (unlabelled) blends, and the quality of products getting to the farmer has been shown be several surveys and random checks to be very poor.

The distribution channels in the country are immature, and depend on subsidy and Government programs rather than building capacity to service the farmer. The distribution structure is also usually inflated by suppliers seeking value (or rent) from the current government intervention.

Within the supply chain, the working capital is inadequate and there is a lack of credit to fund stock. A reason for the lack of credit is the inadequate trust in the distribution system to support credit.

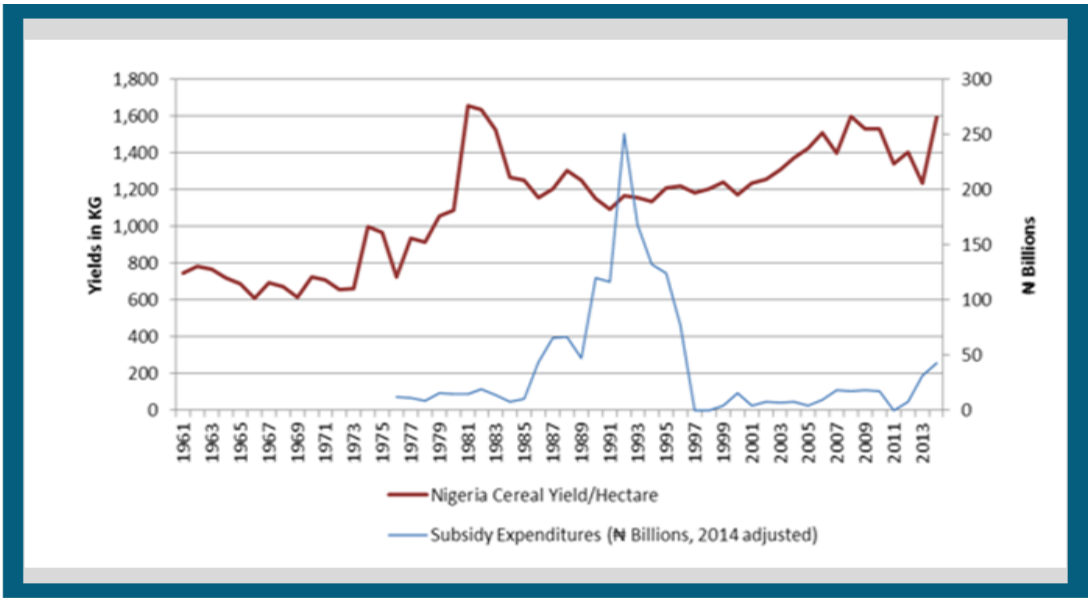
Policy contribution and outcomes

Fertilizer policy has ostensibly been driven by the concern for food security and the need for increased agricultural productivity. These fears have led to Government interventions to try to:

- improve availability of product to the farmer.
- reduce the cost of product to the farmer.
- educate the farmer about the need for and proper use of inputs.
- regulate the quality of products getting to the farmer.
- increase financing available in the supply chain.

The net effect of constant government interventions is farmer productivity that is static (Figure 3) and therefore still as much a concern as it was in the 1970s.

Historically, fertilizer was the core of the Agriculture budget, and the leakages within the fertilizer spend have been a source of political funding. Government controlled the whole supply chain; Government was therefore the client of the industry and not the farmer. The sector was ridden with corruption: products not supplied, round tripping, poor quality, and availability are perennial problems. Moreover, the amount and type of subsidy was inconsistent, and this aggravated the availability problem.



YEILD SOURCE- World Bank; INFLATION SOURCE - IMF; SUBSIDY SOURCE - IFDC

Figure 3. Relationship between cereal yields and fertilizer subsidy expenditures, 1961-2013

Finally, there is no fertilizer regulatory structure. The fertilizer department of FMARD, now changed to farm inputs and support services department (FISS), only procured and distributed products. With AGRA's support, a fertilizer regulatory bill has been drafted and it is awaiting the approval of the Senate. The bill is however just a start in the process of establishing a fertilizer regulatory structure.

The Presidential Fertilizer Initiative (PFI)

The PFI is the current Government fertilizer program in the country. The principles of the PFI were to:

- increase fertilizer consumption by getting fertilizers to farmers at a more affordable price without subsidy thereby reducing Government expense.
- import only raw materials rather than compounds to improve the balance of trade.
- use blending facilities (most would have to be resuscitated under the program) to add value locally, create jobs and provide more adequate blends than generics.

With affordable fertilizer interpreted as price of fertilizer per bag, the PFI was constrained by the Presidency to sell fertilizers at USD 306/ MT to the farmer. This constraint shaped the design of the PFI in the following manner:

- Bulk procurement was considered essential. The King of Morocco gave the initiative a boost by promising a discount on 1M MT of DAP to support the initiative.
- Funding for the initiative could not be at commercial Nigerian interest rates (+25%) so the Nigerian Sovereign Wealth Fund management company (NSIA) was solicited.
- The choice of product was conditioned by cost (of nutrients) and custom (known blends in the country were given priority).

- The margins of supply chain actors had to be controlled. Participants were therefore paid as service providers to the scheme; the client for the supply chain actors was the PFI.
- Blending plants were resuscitated to provide the blending capacity required to fulfill demand.
- States were invited to participate in the last-mile distribution to farmers.

The outcome of the PFI was such that rather than complementing private fertilizer systems, it competed against and disrupted them. The relationships between majority of supply chain actors were suspended for the PFI, the drive to differentiate products by producing differentiated blends was stymied, importation of compounds and urea was discouraged with difficult permit processes, and the concern for farmer availability was abandoned by the supply chain actors for the PFI. Moreover, the volumes of fertilizers anticipated through the PFI could not be achieved, primarily because of the constrained design.

With the PFI, it is unlikely that the fertilizer quality has improved. To the contrary, the absence of a strong quality control system coupled with the weakness of the technical capacities of the blenders is likely to have yielded products of doubtful quality.

Finally, given that the NSIA was unlikely to have made any returns from the PFI, and given that the prices of PFI NPKs in most markets were between USD 333/MT and USD261/MT, and given that the PFI was unable to service farmers directly, it appears most of the subsidy (NSIA losses) was consumed within the PFI – farmer distribution structure.

The Anchor Borrowers Program (ABP)

ABP, a typical, Anchor Bulk Procurement System, started in 2016 with a pilot with rice in Kebbi State but quickly grew to 15 States with States and private sector anchors, and across more value chains. The program was conceptualized and executed (funding and project management) by the Central Bank of Nigeria (CBN) but has now been transitioned to NIRSAL.

The initial implementation of the program bypassed the distribution network – the CBN procured inputs directly from manufacturers into rented warehouses and supplied directly to farmers on credit, guaranteed by BVN (Bank Verification Numbers) since farmers were excluded from the formal banking system. The farmers output was expected to be sold to designated anchors at pre-agreed prices. The anchors would purchase the output and pay back farmers less the credit from CBN for the inputs. The anchors remitted the inputs credit to CBN. A large number of farmers did not honor the contract to sell to anchors and therefore did not repay the loan; they were effectively subsidized by the CBN.

The ABP was attractive to most importers and manufacturers because purchase was in bulk and prices were much better than they would have paid to dealers.

Ongoing Efforts or Investments that are Promoting the Availability of Appropriate Blended Fertilizers that AGRA Can Leverage in the Target Countries

Blender Investments. There are a few announced blending plant investments in Nigeria. The most notable are those of OCP (3 plants), Notore (1 plant), FMN (1 plant), TAK Group (1 plant), and the BUA Group (1 plant). Most of the new blenders are brand conscious and have projects promoting either good agronomic practices or good quality fertilizers.

These blenders are for the most part capable of employing the competences required to promote their brands through product and service differentiation. Already, some of the blenders have specific plans around crops and regions. The investments and investors in blends could make the blending sub-sector of the industry competitive with the right level of regulation.

Anchor businesses. These businesses, the most notable being Babangona and One Acre Fund, purchase and offer good quality inputs to farmers on credit. The business model relies on the increased output from the farmers from using better quality inputs, to deliver the additional revenues necessary to justify the increased cost of inputs and the cost of the credit. Yield consistency is therefore important to the sustainability of the network and becomes the central preoccupation of the Anchor.

OCP Agribooster project. The Agribooster project forms a consortium of a microfinance bank, an aggregator of farmers (Anchor), a Seed and CPP company, and OCP. The objective is to get good quality and the right quantity of inputs to farmers at the right time, solve the problems of financing and quality of inputs for the farmer. Stock is delivered to the aggregator, who then supplies MFB-accredited farmers within the network. The supply of farmers triggers the payment of OCP and a record of a loan in the MFB books. At harvest, the aggregator purchases the farmers' output with the difference between the loan and the market price and pays the bank loan.

OCP School Lab project. The OCP School Lab is a mobile laboratory that aims to improve small holder farmer productivity with better fertilizer recommendation. The project employs mobile laboratory to take and analyze soil samples, and to give recommendations using Nutrient Expert, a nutrient management decision support tool. The project targets 10,000 smallholder farmers.

Maize Belt soil mapping. OCP in conjunction with IITA and AFSIS is creating soil nutrient maps of the maize belt of the country. With the maps, OCP has developed a blend for maize and that maintains the health of the soil in the belt. The blend is currently being trialed in the belt, and OCP has 18 months of commercial exclusivity to the results of the trials.

Indorama Extension program and mobile soil testing. Indorama has an ambitious plan to train 2.6 million farmers by 2022, starting with 200,000 farmers in 2017. Indorama has developed an app and is employing over 31 agronomists for agricultural extension services. The agronomists are equipped with mobile soil testing kits and crop management folders containing agronomic practices for 9 crops. Soil testing activities and fertilizer recommendations for 1000 farms were conducted in the first quarter of 2017. Included in the advisory package is an SMS-based weather advisory service offered in partnership with Ignitia.

Notore last mile retail distribution development. Notore is developing a franchise of one-stop shops for good quality agricultural inputs. These shops, 20m containers, are being placed as close to the farmer as possible and will be manned by Village Promoters (VPs) who would have been re-trained. The shops are also expected to become aggregation centers for farmer harvest.

TAK and FMN silo concession. TAK Agro and FMN are in the process of contracting to take over, on concession, clusters of grain silos previously managed by the Government. The intention of these companies is to complete their vertical integration process and to further improve the total production within their network, primarily with yield increases. FMN, for example, has the largest poultry feed capacity in Nigeria, represents Monsanto Seeds in Nigeria, owns blending plants and also cultivates cereals (maize and sorghum). FMN therefore has enough value chain presence to be able to influence a large population of farmers to improve FMN's overall financial performance.

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

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

Of the 33 blending plants in the country (Table 4), 16 are in AGRA target geographies. Four of the 16 plants are not functional and there is at least one blending plant in each of the States.

Table 4. List of fertilizer blending units in Nigeria, their locations, and capacities

SN	Fertilizer Plant	Installed Capacity (MT/annual)	Location	Ownership	Current Status
1	Federal Super Sulphate Fertilizer Co (FSFC)	100,000.00	Kaduna	Privatized Government	Functional
2	Notore Chemical Industries Ltd	300,000.00	Onne, P/Harcourt River State	Privatized Government	Functional
3	Fertilizers and Chemicals Ltd	200,000.00	Kaduna, Kaduna State	Private	Functional
4	Morris Nigeria Limited	200,000.00	Minna, Niger State	Private	Functional
5	Agro-Nutrients & Chemicals Co	300,000.00	Kano, Kano State	Private	Non Functional
6	Kano State Agricultural Supply Co (KASCO)	100,000.00	Kano, Kano State	State Government	Functional
7	Funtua Fertilizer Company	100,000.00	Funtua, Kastina State	State Government	Functional
8	Bauchi Fertilizer Company	100,000.00	Bauchi, Bauchi State	State Government	Functional
9	Gombe Fertilizer Company	100,000.00	Gombe, Gombe State	State Government (leased to Affcott)	Functional
10	Borno Fertilizer Company	100,000.00	Maiduguri, Borno State	State Government	Non Functional
11	Edo Blending Plant	-	Edo State	State Government	Functional
12	Zamfara Blending Plant	84,000.00	Gusau, Zamfara State	State Government	Non Functional

SN	Fertilizer Plant	Installed Capacity (MT/annual)	Location	Ownership	Current Status
13	Gaskiya Fertilizer Company	54,000.00	Kano, Kano State	Private	Non Functional
14	Sasisa Fertilizer Company	62,000.00	Kano, Kano State	Private	Non Functional
15	Golden Fertilizer Company Limited	300,000.00	Lagos State	Private	Functional
16	Shamrock Fertilizer Company Limited	75,000.00	Sokoto State	Private/Sokoto Government	Non Functional
17	Yobe State Fertilizer Blending Plant	70,000.00	Yobe State	State Government	Non Functional
18	Benue State Fertilizer Blending Plant	75,000.00	Benue State	Private	Non Functional
19	Citizen Fertilizers & Chemicals Company Limited	75,000.00	Kano, Kano State	Private	Non Functional
20	Prime Gold Fertilizer	70,000.00	Port Harcourt, Rivers State	Private	Functional
21	Nasara Fertilizer Blending Plant	50,000.00	Lafia, Nasarawa State	State Government (operated by Agtho)	Functional
22	MFB Fertilizers & Chemical Co	-	Kaduna, Kaduna State	Private	Functional
23	Abdulazeez Fertilizer Co	20,000.00	Kano, Kano State	Private	Functional
24	Ebonyi Fertilizer & Chemicals Co	-	Abakaliki, Ebonyi State	State Government`	Functional
25	Avina Industries Limited	-	Port Harcourt, Rivers State	Private	Functional
26	Indorama Fertilizers & Polymers		Port Harcourt, Rivers State	Private	Functional
27	Kaffo Mines Limited		Kwakuti, Niger State	Private	Functional
28	Cybernetics Nigeria Limited		Barnawa, Kaduna State	Private	Functional
29	MBS Merchants Limited		Doka, Kaduna State	Private	Functional
30	Crystalizer Nigeria Limited		Mariga, Niger State	Private	Functional
31	Danyaro Ventures Nigeria Limited			Private	Functional
32	Al-Yuma Fertilizer & Chemicals Co	200,000.00	Kano, Kano State	Private	Functional
33	Bejefta	200,000.00	Jos, Pleateu	Private	Functional

Policy and Regulatory Bottlenecks that are or may Affect the Availability of Blended Fertilizers, and Interventions that AGRA and its Partners Could Design and Advocate for Implementation to Help Farmers Access the Appropriate Blended Fertilizers

Supply chain constraints

Fundamentally, the fertilizer systems in Nigeria have evolved from Government nurturing through interventions. Because of the interventions, the value to be extracted within the industry was from Government and the need for relationships beyond Government was discounted heavily. The outcome is fertilizer systems that are constrained from being efficient due to the following:

- The value chain is opaque – not enough information on chain to guide decisions.
- Markets are inefficient – they are still heavily influenced by Government interventions.
- Majority of blenders lack blending management expertise and do not have a farmer transformation vision.
- Distribution is immature – supply chain participants have poor relationships with one another and are managed by inadequately trained personnel.
- Products are not adapted to crops and they are also not optimized.
- Research institutions are poor contributors to the development of the industry.
- The majority of farmers do not understand the link between quality fertilizers and yields.
- Blenders and distributors are not offered credit and do not have sufficient working capital to make products available to the consumer. Availability depends on stocking up before the season, an activity that requires considerable funding.

Policy constraints

- The Civil Service is weak, and Government has an interventionist mindset.
- The current Government program, the PFI, is yet another supply chain intervention with Government as the supplier as well as client, reinforcing the poor functioning of market systems.
- By paying the blender as a service provider, PFI disrupts supplier-client relationships in distribution.
- It is not clear yet if the subsidies introduced by the PFI were not mostly consumed within distribution.
- The ABP, yet another subsidy intervention, circumvented the usual distribution channel, creating temporary distribution structures to the farmer.
- The Government has neither set up fertilizer testing labs nor checked the nutrient quality of any of the fertilizer quality of either its interventions or the private system.
- Research institutions are underfunded and probably poorly led. They do not appear to be capable of contributing to the development of the sector.

Summary of constraints to achieving efficient fertilizer systems

Fertilizer systems are efficient when manufacturers and importers, under regulatory guidance and control, continually partner with downstream participants within the supply chain to create and exploit value from the chain by developing innovative products and by improving delivery systems.

The Nigerian fertilizer systems have suffered historical Government program interventions which compete against and disrupt private sector activities. Furthermore, the fertilizer systems have been left unregulated – products, processes and activities. With an absence of regulation, the research institutions have been unable, and have not been equipped with material and human resources, to contribute to the improvement of the sector. The outcome is a scarcity of technical and managerial knowledge (of fair competition) across the fertilizer value chain – product determination, blending and distribution – and a lack of transparency on activities within the chain.

AGRA Intervention Options

Given the current culture within the fertilizer sector, the sustainability of the production and distribution of appropriate blends in Nigeria will depend on: 1) the development of an institutional structure – regulatory system, fertilizer competence in the country, and soil analysis and mapping competence; 2) strengthening of the implementation capacities of AGRA partners; 3) investing in best-bet trials and commercialization of optimized products within the AGRA geographies.

Development of an institutional structure

1. Regulatory System

The fertilizer regulatory bill has been drafted and is at the final reading at the Legislature. Subsequent to the passage of the bill, regulations need to be drawn up and policies enacted to enable the execution of the regulations. These decisions and technical documents, though necessary, will not in themselves be sufficient to trigger a quality consciousness in fertilizer systems that were never unregulated. Moreover, the Ministry of Agriculture, which has the core regulatory function, is completely unprepared (resources and attitude) for the role: the Ministry will need assistance with planning, training and handholding throughout the drafting phase and within the initial stages of execution.

The drafting phase will require the coordination and facilitation the development of a progressive regulatory structure that commits all stakeholders to first an appraisal of current status and, thereafter, a continuous improvement process. The Government will require assistance with recruitment, internal policies regarding regulatory control processes, and specifications (and probably budget support) for equipment and tools required to effectively discharge the responsibility.

FEPSAN, which is currently representing manufacturers (including blenders), will need to be supported in the journey towards self-regulation. Members will probably need to be certified and audited (equipment, material, processes and staff competence) yearly.

The current dealer associations will require a revision of their charters to reflect the spirit of the new regulatory system. Members of associations will need to be trained and also certified.

A fundamental objective of the regulatory system will be to enable transparent fertilizer systems.

2. Fertilizer Competence Within the Country

To improve fertilizer competence within the country, AGRA could consider the following options:

- Support a plan to develop the capacity of National Research Institutions to implement balanced crop nutrition research.
- Identify and train potential fertilizer experts within both the public and private sectors.
- Create and facilitate a regional network of fertilizer expertise.

3. Soil Mapping

A series of soil mapping activities have already been launched in Nigeria. AGRA could:

- Support investments in soil maps of AGRA priority areas with recommendation expertise.
- Facilitate of the efficient (time and quality of recommendation) conversion of the on-going mapping exercise (AFSIS) into blend recommendations.

Strengthening of the capacities of implementation partners

- Development of an evaluation structure and improvement plans for local implementation partners, including 360 appraisal, audit reports, etc.
- Investment in the improvement plans of local implementation partners.

Commercialization of optimized products

AGRA has already decided on target crops and geographies. The optimization of the current bread and butter blends will improve farmer productivity significantly when the new blends are taken through responsible fertilizer systems.

- Decision on best-bet blends for crops and geographies.
- Simultaneous review of current NPK efficiency and proposal of optimized basal and top dress formulations.
- Selection of partners for commercialization.

AGRA Strategic Planning

Getting good quality blends sustainably to the smallholder farmer will probably require a 3-phase approach that has some immediate actions, complementary actions after the initial have gained traction and a structural effect is realized, and the transition into maturity. The duration from starting to maturity is estimated to be 5 years (Figure 4).

Each phase has a blend of the intervention options and is dependent on geography, but the principles can be applied to multiple locations at the same time.

Figure 4. Proposed 3-phase strategic approach

The first phase of proposed AGRA options has two parts:

1. Building partnerships between Anchors and the PFI to optimize and distribute blends. The structure will require that the partners show an economic interest in the farmer (extension service, soil testing, marketing communication, distribution structures, aggregators…) and that that management information systems are introduced to track product movement, farmer processes and markets. Trials of completely new products also start in this phase.
2. The gradual building of the institutional base for the sustainability of the sector. The regulatory system is developed in this stage and there is a lot of investment in the human capital required to regulate, blend and distribute fertilizers, including fertilizer related research institutions. Appropriate management information systems are also built into this option.

The objective of the first phase is to improve immediately the quality of blends while building the foundation for transparency and regulation of the fertilizer sector

The second phase builds on the gains of the first phase – better distribution discipline and improved farmer yields – and starts to demand changes in the principal supply chain actors and Government. In the second phase for example, should any Government want to continue with fertilize support, the case will be made for better quality products. The institutional actions of the first phase continue and it is complemented with the organization of existing agro-dealer associations, improved with technical support and mentoring.

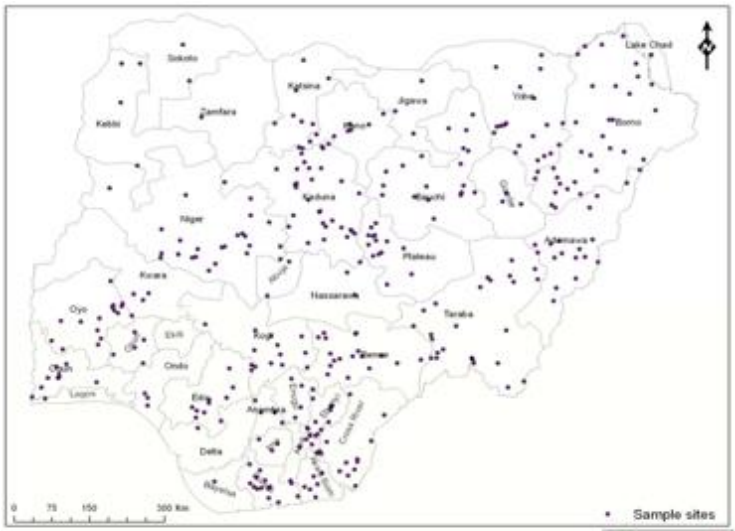
In addition, still within this phase, AGRA could start moving to other staples within the identified geographies and also incorporating seed programs.

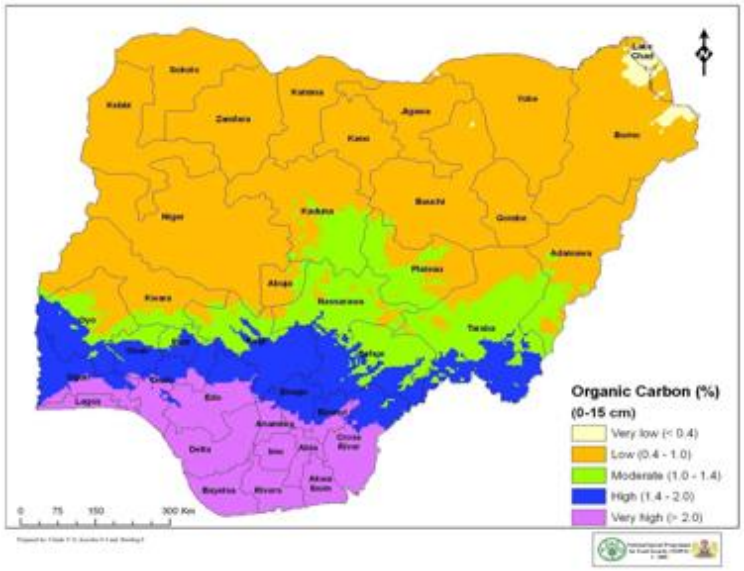
Most activities would be maturing, and the landscape significantly modified by the third phase of AGRA's options. Fertilizer systems will be significantly more transparent from the importer/manufacturer to the farmer. Farmer yields would have shown significant increases and the value chain would have benefitted from the increase. The anticipation is also that

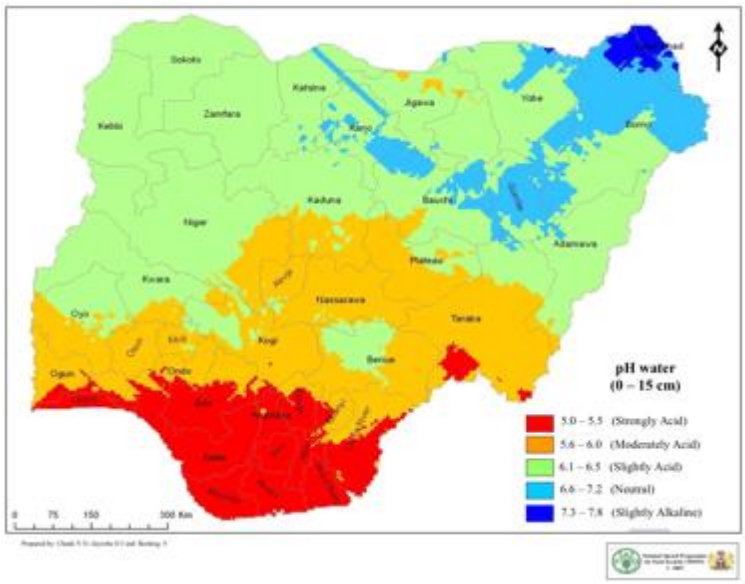
Government fertilizer support would have reduced significantly so as not to be of any serious consequence to the sector. With increased productivity and credit support both upstream and downstream, the farmer is motivated to want to grow his business. The most important activity AGRA can therefore focus on then will be farmer financing.

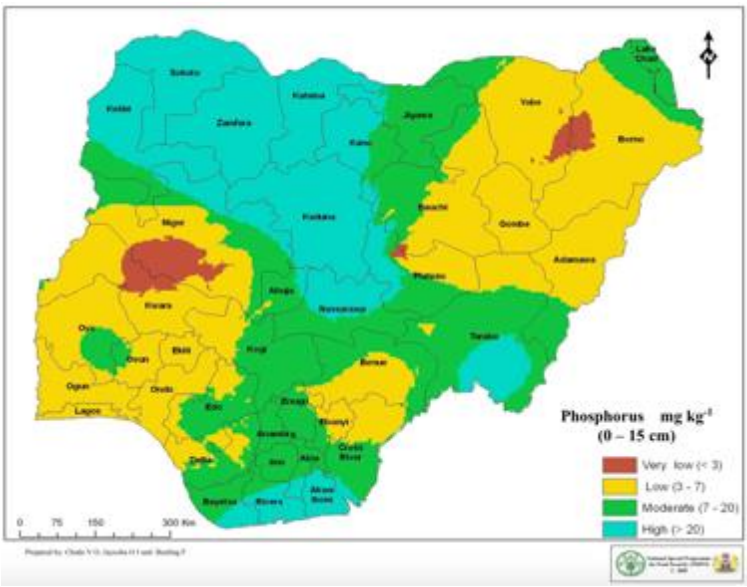
Appendix I.
Nutrient and Soil Property Maps from Nigeria

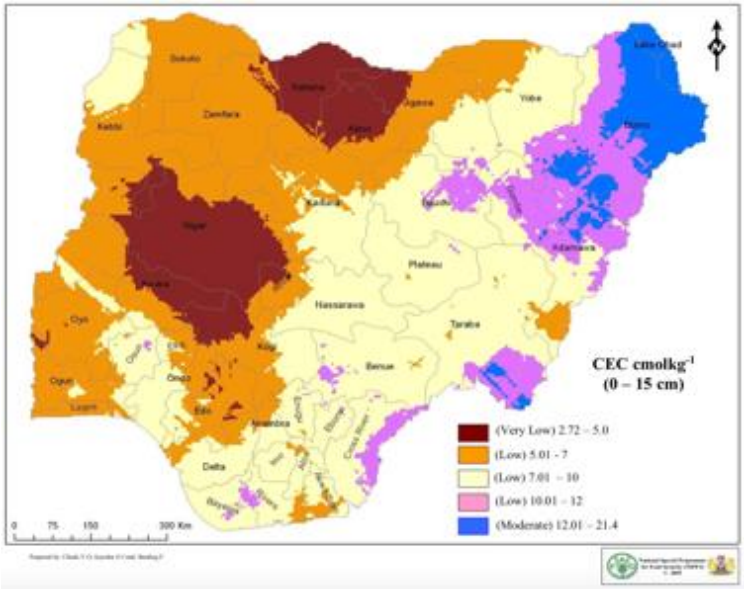
Extracted from Chude, V.O, S.O. Olayiwola, A.O. Osho and C.K. Daudu (eds.) 2011. Fertilizer Use and Management Practices for Crops in Nigeria. 4th edition. Federal Ministry of Agriculture and Rural Development, Abuja.



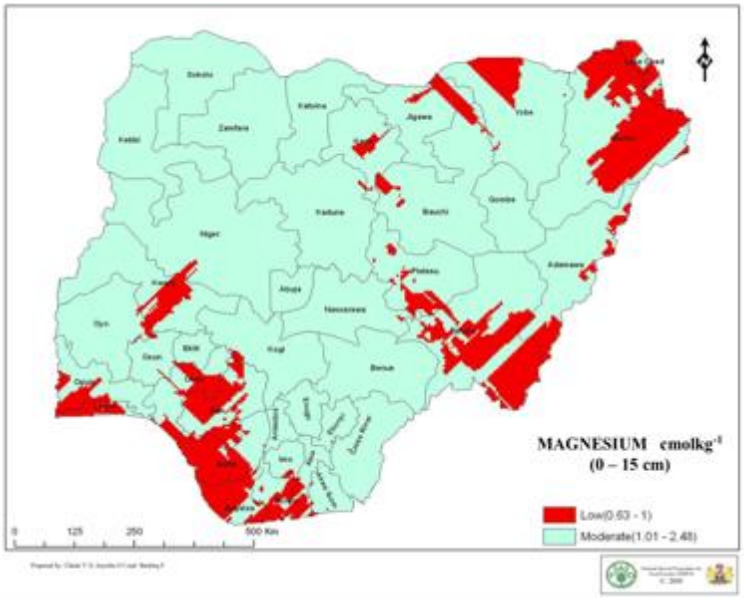


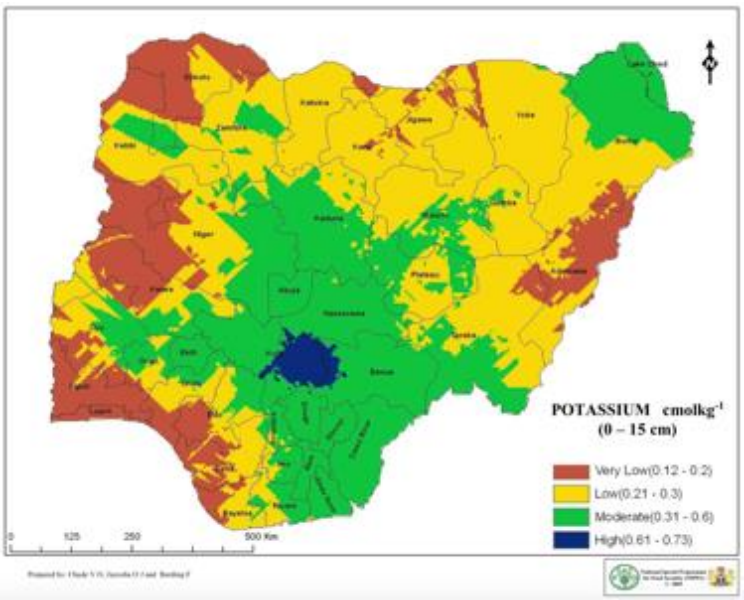


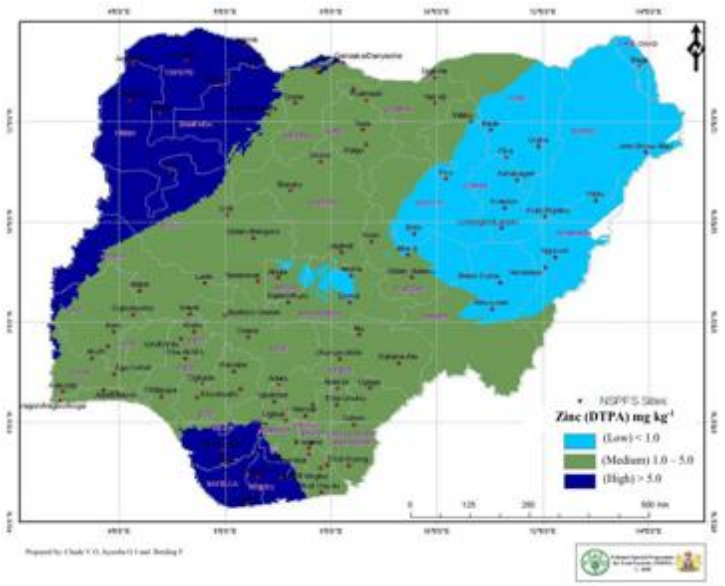


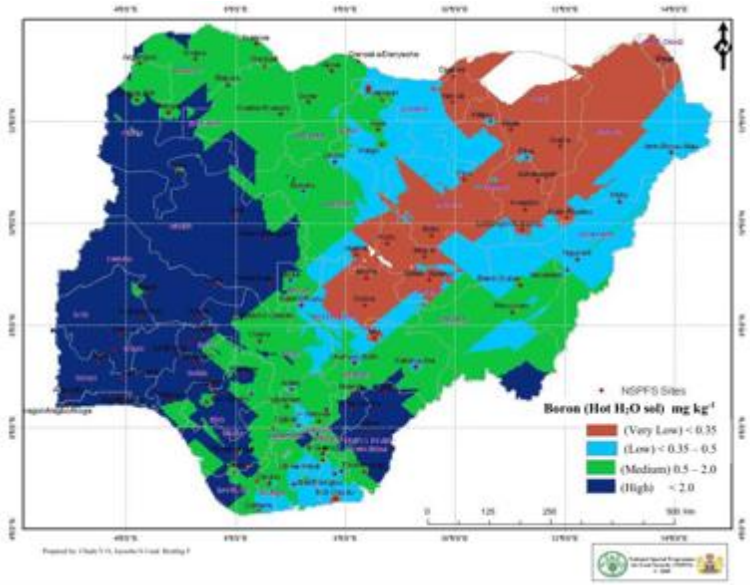

CEC cmolkg-1
(0 – 15 cm)
(Very Low) 2.72 – 5.0
(Low) 5.01 - 7
(Low) 7.01 – 10
(Low) 10.01 – 12
(Moderate) 12.01 – 21.4
0 75 150 300 Km


CALCIUM cmolkg-1
(0 – 15 cm)
Very Low(0.65 - 2)
Low(2.01 - 5)
Moderate(5.01 - 5.42)
0 125 250 500 Km


MAGNESIUM cmolkg-1
(0 – 15 cm)
Low(0.63 - 1)
Moderate(1.01 - 2.48)
0 125 250 500 Km


POTASSIUM cmolkg-1
(0 – 15 cm)
Very Low(0.12 - 0.2)
Low(0.21 - 0.3)
Moderate(0.31 - 0.6)
High(0.61 - 0.73)
0 125 250 500 Km


NSPFS Sites
Zinc (DTPA) mg kg-1
(Low) < 1.0
(Medium) 1.0 – 5.0
(High) > 5.0
0 125 250 500 Km


NSPFS Sites
Boron (Hot H2O sol) mg kg-1
(Very Low) < 0.35
(Low) < 0.35 – 0.5
(Medium) 0.5 – 2.0
(High) < 2.0
0 125 250 500 Km

Appendix II.
Potential Partners and Key Country Contacts in Nigeria

Organization and Contact Details of Key Personnel	Regions or States of activity	Brief Description of Activities as Related to AGRA Priority Crops
IFPRI John Mazunda Country Program Manager j.mazunda@cgiar.org +23408090765454	Throughout the country	IFPRI provides research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition in developing countries.
NAERLS Prof. Chris Daudu A. Director chrisdaudu@yahoo.com +2347063330321	Throughout the country	They coordinate the overall planning and development of extension liaison activities throughout the country, NAERLS established 6 Zonal Offices. These are located in each of the 6 coordinating Research Institutes – National Root Crop Research Institute, Umudike; Institute for Agricultural Research and Training, Ibadan; National Cereals Research Institute, Badeggi; Lake Chad Research Institute, Maiduguri; Institute for Agricultural Research, Zaria.
FEPSAN Alhaji Ahamed Rabiu Kwa Executive Secretary fepsannigeria@yahoo.com +23408033174409	Throughout the country	FEPSAN is the umbrella body for majority of the fertilizer producers, blenders and distributor and its members would be a critical part of formulation and distribution of blends to the target crop. They are currently working with AGRA on the fertilizer quality control bill
IITA Ucheibe George Business Development Officer G.Ucheibe@cgiar.org 08032703696, 08023101542	Throughout the country	Have conducted research in different part of the country and would be able to provide assistance research development for the priority crop
NBS Akande T. Bamidele Foreign Trade Unit btakande@nigerianstat.gov.ng 08023203089, 08032389591	Throughout the country	Collate and gather information across the country including data for the AGRA priority crops and States

Organization and Contact Details of Key Personnel	Regions or States of activity	Brief Description of Activities as Related to AGRA Priority Crops
AFAN Arch Kabir Ibrahim President kebramgroup@gmail.com 08037873326	Throughout the country	The umbrella body of all producing farmers and their members produce the target crops in the target areas with the current available fertilizers in the market
IFDC Mohammed Salasi Idris Country Representative sidris@ifdc.org +2348170199333	Throughout the country	IFDC has been working in Nigeria to develop the agricultural value chain in Nigeria, they have worked with other organization to develop soil specific fertilizers using soil test conducted. They have also worked with OCP on maize in Kaduna state to develop crop specific fertilizers. There major projects are 2SCALE, Feed the Future Nigeria Agro-Inputs Project, MARKETS II, the Nigeria Fertilizer Voucher Program, SMS
National Cereals Research Institute, Badeggi info@ncribadeggi.org.ng 08069314862	Throughout the country	
NPFS Prof. Victor Chude Head Agric. Productivity Enhancement vchude@yahoo.co.uk +234 803 315 4400	Throughout the country	Conducted the soil mapping for the country by collating various soil test analysis based on which the fertilizer recommended rate formulations was done, including the AGRA target locations
OCP Caleb Usoh Country Manager, Nigeria Deputy Managing Director c.usoh@ocpafrica.com +23407031781113, +23408073100235	Throughout the country	OCP has conducted soil test, field trials and research on maize which is one of the priority crops for AGRA. The field trial was also conducted in one of the AGRA targeted states
RIFAN Illiasu Awodi National Secretary, Awodie123@gmail.com +2348082105947	Throughout the country	This is the association of rice farmers, which is one of AGRA priority crops. These farmers would be quite experienced in the AGRA target crops and States
MAAN Mr. Bello Abubakar-Annur President +23409033200003	Throughout the country	Maize association is a national of maize farmer, which is one of the most farmed crop in Nigeria as compared to others. Maize is also among AGRA target crops

Organization and Contact Details of Key Personnel	Regions or States of activity	Brief Description of Activities as Related to AGRA Priority Crops
Nigeria Agribusiness Group (NABG) Dr. Emmanuel Ijewere Vice President eiijewere@yahoo.com +2348034030012	Throughout the country	Agribusiness Group comprises of members who are active in the entire agricultural value chain including fertilizers and seeds. They are currently the coordinators for the Micro Reforms In African Agribusiness (MIRA), supported by AGRA
SEEDAN Mr. Richard Olafare President adigunoludapo@gmail.com +2348067523028	Throughout the country	SEEDAN is the foremost private seed body registered in Nigeria and a member of the Africa Seed Trade Association (AFSTA). Currently, SEEDAN has over 67 registered members who are private entrepreneurs with a reputation for integrity, quality and excellence in business management, engaged in the production and marketing of quality seed across Nigeria and West Africa.
AFEX Ayodeji Balogun Country Manager abalogun@afexnigeria.com +234 813 933 9000	Majorly Northern part of Nigeria	Afex has a wide range of farmers which they have worked with and are still working with in the northern part of the country including the AGRA targeted crops and states.
PROPCOM Maikarfi Abdullahi Umar Regional Coordinator/ Intervention Manager AUmar@propcommaikarfi.org +2348054796142	Throughout the country	Propcom Mai-karfi aims to increase the incomes of 650,000 poor men and women in northern Nigeria by: (a) stimulating sustainable, pro-poor growth in selected rural markets; and, (b) improving the position of poor men and women within these market systems, to make them more inclusive for poor people. It will build on the positive experience of its predecessor programme called Propcom. The programme will work in at least eight rural markets, both agricultural and non-agricultural, and in each the programme will use in-depth analysis to identify priority constraints, and develop and implement interventions that address them. Propcom Mai-karfi is currently working in Agriculture mechanization, Agric inputs, Agribusiness franchise (Babban Gona), Poultry health, Shea nut, electronic warehouse receipting, soap and hand washing markets

Organization and Contact Details of Key Personnel	Regions or States of activity	Brief Description of Activities as Related to AGRA Priority Crops
Internationale Zusammenarbeit (GIZ) (Nigeria Competitive Africa Rice Initiative) Dr. Andrew A. Efisue Country Operations Manager Andrew.efisue@giz.de +2348067496035	Northern part of Nigeria	Objective: African rice producers with an income below US$2/day increase their income substantially through integration into competitive and sustainable business models. Up to 100,000 farmer benefitting in Nigeria, ~25% women Focus on sustainable business models for farmers and farmer based organizations, sustainable rice production and diversification, improved linkages, efficiency of milling, competitive marketing, quality standards, access to finance, enabling environment, advocacy
International Fund for Agricultural Development (IFAD) Muhammed Idah National Programme Coordinator	Niger, Taraba, Abuja, Benue, Ogun, Anambra, Eboyin, Kebbi, Sokoto, Zamfara, Kastina, Jigawa, Yobe, Borno	The International Fund for Agricultural Development is an international financial institution and a specialized agency of the United Nations dedicated to eradicating poverty and hunger in rural areas of developing countries The specific objective is to develop and strengthen existing Micro Finance Institutions (Microfinance Banks, financial NGOs and financial cooperatives) to work in the rural areas and enhance financial inclusion of the rural population.
Golden Fertilizers Olusegun Falade Head, Agro Input sfalade@fmnplc.com +234 81 13 39 44 72	Throughout the country	Golden have been doing soil analysis which they used for some of their blending formulation for specific client demanding for specific crops and soil blends. They are also planning on establishing another blending plant in Kaduna which is one of the AGRA targeted area.

Organization and Contact Details of Key Personnel	Regions or States of activity	Brief Description of Activities as Related to AGRA Priority Crops
Japan International Cooperation Agency (JICA)	Throughout the country	CARD (Coalition for African Rice Development) was launched at TICAD IV (the 4th Tokyo International Conference for African Development) in May 2008 to promote donors' investment and harmonization for rice development in Africa with a goal of doubling rice production in Africa by 2018. CARD has assisted FMARD and relevant parastatals to develop a Rice Seed Development Strategy, which examines the challenges of the rice seed supply chain, and developed concept notes for relevant projects. JICA, as a member of CARD, has been facilitating the process, in particularly the development of concept notes for funds matching.
FISS Engr. Badams Jato Director b.jatto@yahoo.com +2348035530731	Throughout the country	Farm input support service department is responsible for developing and monitoring the input sector in Nigeria especially the fertilizers. They have worked with key stakeholders to develop the formulations for blending soil specific and crop specific fertilizers.