

## **Plan for the Maize-Soybean transformation in Nigeria**

### **Part 1: Maize**

#### **Introduction**

Maize has grown from what used to be a back yard crop in the forest zone to a largely commercial crop grown now mostly in the savannas of Nigeria. The release of TZB and TZPB that combine high yield with resistance to lowland rust and blight developed at IITA, spearheaded the first maize revolution in Nigeria in the 1980's (Smith et al., 1997). The release of these varieties combined with the availability of subsidized fertilizer as well as improved infrastructure and extension services, contributed to the phenomenal increase in maize production in the country.

Production figures from FAO (FAOSTAT, 2011) show that the area planted to maize in Nigeria has increased from 438,000 ha in 1981 to 3,335,860 ha in 2009 with associated increase in production from 720,000 tons to 7,338,840 tons during the same period. Grain yield has also increased from 1.6 t/ha in 1981 to 2.0. t/ha in 2009. However, the slow turnover of maize varieties and hybrids on farm coupled with limited availability of good quality improved seed, fertilizer and other inputs have minimized the potential yield gains recorded on farm in Nigeria.

#### **Economic Potential of Maize**

Maize plays a predominant role in the farming systems and diets of millions of Nigerians. It is a very versatile crop since it is used for domestic consumption in addition to its industrial use by flour mills, breweries, confectioneries and animal feed manufacturers. Consequently, increasing maize yields and its cultivation particularly in high production potential areas of the county i.e. areas which enjoy a comparative advantage for maize production, can jumpstart a second maize green revolution in the country.

Some of the factors that make maize an ideal target crop for intensification in high production potential areas of the county include the following:

- Its high yield potential
- Diversified uses,
- Ease of transportation, processing and marketing
- The availability of dependable research products

Nigeria is endowed with such high production potential areas which also have low population diversity making them suitable for expanding maize production. Since the consumption of wheat and rice - both of which are largely imported, is rising in urban centers, , maize can play a major role in import substitution and sub-regional trade.

It follows therefore, that a second maize green revolution in Nigeria will increase GDP and enhance regional trade for Nigeria. It will also result in employment generation and wealth creation, and reduce our foreign exchange expenditure.

#### **Case for the Second Maize Green Revolution in Nigeria**

A second maize green revolution in Nigeria is not only desirable, but also fairly easily achievable and this document outlines the strategies through which it can be actualized.

A key goal of a second maize green revolution will be to increase maize production to 20 million metric tons in Nigeria. This second maize green revolution will focus on the:

1. Commercialization and deployment of high yielding, stress tolerant and nutrient efficient maize hybrids and varieties.
2. Promotion of optimal fertilizer usage along with appropriate crop and resource management practices targeted to maintain the soil base and enhance agricultural productivity
3. Modification of policies which impede the growth of private sector input companies including, seeds, fertilizer and other inputs, as well as the marketing of maize grain both in-country and for export.
4. Identification and development of new uses for maize in order to drive demand for the crop and create additional market.

A key point of note is that system productivity using the maize-soybean rotation is essential to maintaining the natural resource base of the maize production environment. Soybean, especially those high-yielding varieties that can cause suicidal germination to *Striga* seeds in the soil will be grown in rotation with maize. Although soybean production has increase from 160000 m tons in 1995 to 550,000 mm tons in 2010, there is still a national demand gap of 200, 000 m tons being met through importation. Thus a programmed maize–soybean rotation system will assist in meeting national demand for soybean. ot on

The second maize green revolution will build on the experience, results and released maize varieties and hybrids attained under the Presidential Initiative on Doubling Maize Production (PIDOM) in Nigeria, as well as the recent advances made in the development of productive and stress tolerant maize hybrids and varieties at IITA. Results from more than 1000 on-farm trials conducted under PIDOM clearly demonstrated that average yield of 4.2 t/ha can be attained on farm using good quality seeds of improved varieties along with adequate application of fertilizer, appropriate density and weed control. It is thus possible to obtain an average yield of 3 t/ha on farmers fields in the savannas of Nigeria. To achieve this, dependable maize and complementary soybean production technologies are available and a favorable policy environment that promotes growth and creates jobs is being put in place.

### **Proposed Strategies for Achieving the Second Maize Green Revolution**

The second maize green revolution will pursue short, medium and long term strategies in collaboration with local research and development partners, the private sector, farming communities, as well as policy makers. These strategies will:

#### **Short-Term (3 years)**

1. Promote the production and marketing of recently released hybrids and productive varieties under the PIDOM project through the private sector.
2. Provide support to private seed companies to produce and market good quality hybrid maize and soybean seeds
3. Conduct extensive demonstrations of improved seed with fertilizer and other management practices
4. Conduct extensive testing of new high yielding, stress tolerant and nutrient efficient maize hybrids and promiscuously nodulating soybeans in multi-location and on-farm trials

5. Support establishment of private service providers to overcome labour shortages at the time of planting, weeding and harvesting to generate employment for urban and rural youth.
6. Develop market linkages with food and feed industries and other market channels to promote maize-soybean value-chain.

#### **Medium Term (4-6 years)**

1. Accelerate the release and commercialization of new hybrids and varieties identified from the short term strategy with active involvement of seed companies, the national variety release committee, National Seed Council, and the national agricultural research systems
2. Conduct extensive demonstrations of new maize hybrids and soybean varieties along with optimal application of fertilizer and other resource management practices
3. Conduct extensive testing of new generations of high yielding hybrids with enhanced stress tolerance, resistance to *Striga*, improved nutritional quality and reduced toxic substances in multi-location and on-farm trials
4. Develop and test crop and resource management practices that enhance build up of organic matter in the soil and efficiency in fertilizer use.
5. Work with the NASC, variety release committee and other policy makers to remove policies that restrict the development of good quality improved seed supply chains including shortening the time for variety release to speed up access of new products by farming communities.
6. Use strategic grain reserve policies and establishment of warehouses in major maize production zones to minimize the risk associated with high level of price fluctuations for maize due to excess grain produced resulting from adoption of yield enhancing technologies.
7. Support the development of new uses for maize and its derivative products and in particular, explore the possibility of engaging processors involved in the production and marketing of vegetable oil to produce maize oil for local consumption and export.

#### **Long term (7 to 10 years)**

1. Engage the private sector and other national partners to release the new generation of high yielding hybrids with enhanced stress tolerance, resistance to *Striga*, improved nutritional quality and reduced toxic substances as well as new soybean varieties identified from the medium term strategy
2. Conduct extensive testing of more new generation of high yielding maize hybrids with combined resistance to different stresses, higher level of nutrient content and resistance to mycotoxin contamination in multi-location and on-farm trials
3. Conduct extensive demonstrations of new maize hybrids along with optimal application of fertilizer and soybean cultivars together with other resource management practices that promote build up of organic matter in the soil and efficient use of fertilizer.
4. Work with relevant policy makers to promote policies that encourage sustained maize production and marketing

5. Consolidate establishment of private service providers of mechanized operations to overcome labor consultants for maize farmers.
6. Encourage the use of established warehouses to store excess grain by farmer groups for bulk trading and export to neighboring countries at reasonable prices.

### **Expected Outputs/Impact**

#### ***Short term***

- More than 500,000 farmers received support and produced 4.5 million metric tons of maize grain to help attain 9.5 million metric tons of maize in Nigeria.
- A minimum of six seed companies have been strengthened to produce and supply the required quantity of seeds of hybrids and improved maize varieties and marketed
- Additional 300,000 new jobs created for various aspects of maize production alone (planting, fertilizer application, weeding and harvesting), and a similar number of new jobs created through off-farm maize handling activities to give a total of 600,000 new jobs.

#### ***Medium term***

- At least 1 million maize farmers received support and produced 9 million metric tons of maize grain thus boosting the national maize production to 13 million metric tons.
- Additional 600,000 new jobs created for various aspects of maize production alone (planting, fertilizer application, weeding and harvesting)
- At least 600,000 additional new jobs created through off-farm activities including loading, transportation, processing marketing etc.

#### ***Long term***

- More than 20 million metric tons of maize grain produced with active involvement of more than 2 million farmers in Nigeria.
- Additional 1.2 million new jobs created for various aspects of maize production alone (planting, fertilizer application, weeding and harvesting), while a similar amount is created through off-farm handling of maize and maize products to give a total of 2.4 million new jobs.

### **Target Project Implementation Area**

The initiative will be targeted at the major maize producing states of the federation having high and medium production potential. These areas will be selected based on the Maize Suitability Map (Figure 1) and other data generated using GIS. Population density will also be considered as an integral part of choosing the target sites. The first phase of three years will focus on the high and the medium-to-high production potential states namely Kaduna, Niger, Adamawa, Plateau, FCT, Bauchi, Gombe, Bornu, Nasarawa, Kwara and Oyo States. The medium term will add ten additional states to the intervention which will continue to the long term. (Table 1).

Soybean promotion and cultivation will follow closely in the second year of the program. However, adequate quantity of seeds for the proposed 0.2m ha of land will be produced using the available quantity of improved seeds in the first year. It should be noted that participating farmers also cultivate other grain legumes including groundnuts, cowpeas, pigeon peas etc and

oil crops such as Sesame that still contribute to system intensification and help to diversify food base.

Figure 1: Maize production map of Nigeria

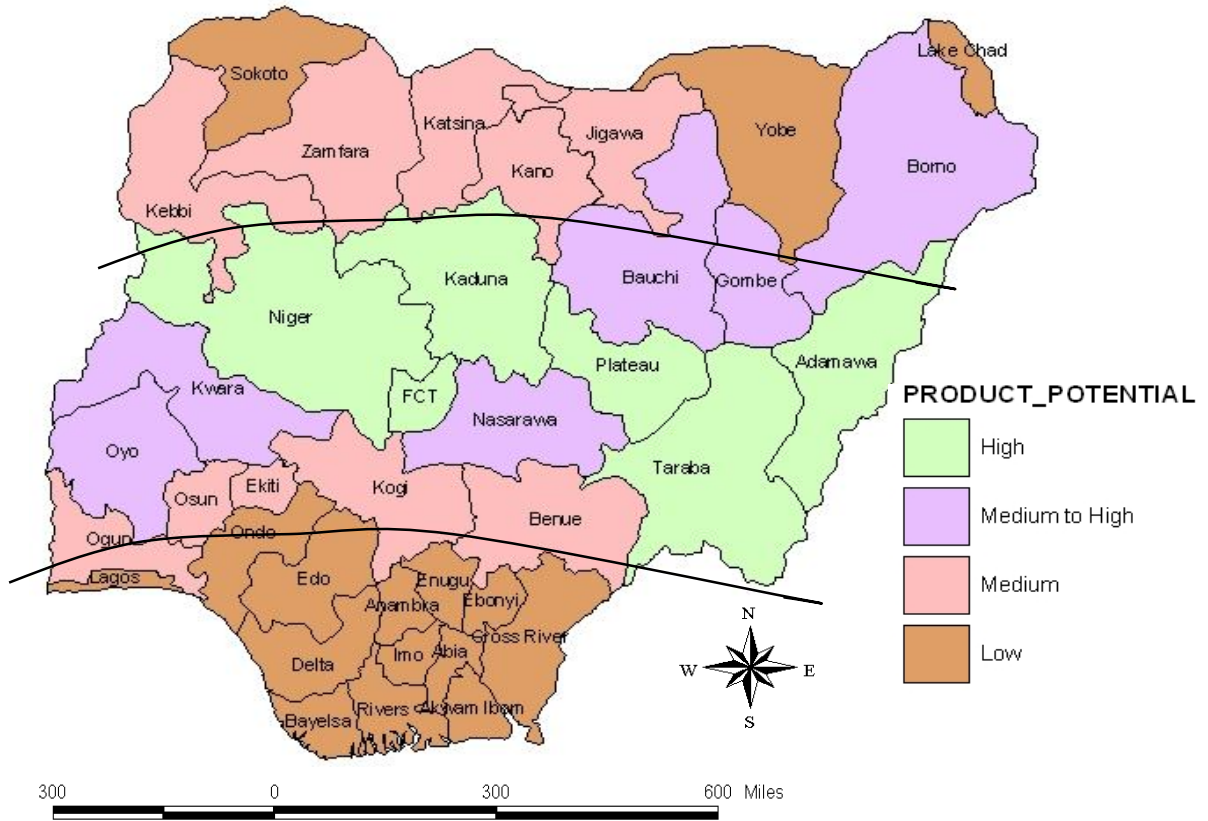


Table 1: Names and maize production potential of selected states in Nigeria and proposed intervention strategies.

State	Production potential	Strategy
Kaduna	High	Short term
Niger	High	Short term
Adamawa	High	Short term
Plateau	High	Short term
FCT	High	Short term
Bauchi	High	Short term
Gombe South	Medium to High	Medium term
Bornu South	Medium to High	Medium term
Taraba	Medium to High	Medium term
Nasarawa	Medium to High	Medium term
Kwara	Medium to High	Medium term
Oyo North	Medium to High	Medium term
Kogi North	Medium	Long term
Kebbi South	Medium	Long term
Zamfara South	Medium	Long term
Katsina South	Medium	Long term
Jigawa South	Medium	Long term
Kano South	Medium	Long term
Osun North	Medium	Long term
Ogun North	Medium	Long term
Benue North	Medium	Long term
Ekiti North	Medium	Long term

It is envisaged that 500,000 farmers each with 3ha land, would have been supported by the short term, increasing to 1.5m and 2m farmers in the medium and long-term respectively. Therefore, a total land area of 1.5m ha will be covered by the intervention in the short term. With an average yield of 3 t/ha, grain yield return of 4.5m metric tons is expected. If the current yield of approximately 2 t/ha is obtained from the remaining 2.5m ha of maize land, an additional 5m metric tons is expected from other areas to give a total of 9.5m metric tons in the short term. This initial effort would have created a level of awareness that will result in more farmers preferring to grow maize. In effect, maize land area can increase to about 6m with an additional maize grain of about 2m metric tons to give a total of 11.5m tons per annum in the short term.

Increasing the number of farmers to support in the medium term to 1m will raise the expected output to 9m metric tons from 3m ha of the growth enhancement support program and additional 4m metric tons from the other 2m land area to give a total of 13m metric tons. This is also excluding the other land areas grown to maize by the support farmers outside the supported 3 ha land. Therefore an estimated annual production of about 15m tons is expected in the medium term.

Supporting only 2m farmers in the long term, after six years, will increase production to more than 20m tons with 18m tons coming from the direct beneficiaries and an additional grain of more than 2m from other maize land. Thus by 2022, Nigeria should be producing 20m metric

tons of maize and the effect of this long term intervention will start manifesting itself in 2019, the second year of that phase. With only 2m farmers aided to competitively produce adequate quantities of maize and soybean for Nigeria on a maximum of about 6m ha of land, a lot more other farmers and land would be made available to produce the other essential crops for the nation thus leading to the expected agricultural transformation.

There shall also be a progressive increase in the number of farmers or farmer groups under each phase. In the short term number of farmers to support will start with 200,000 in the first year, increasing to 300,000 and 500,000 in the second and third year of the first phase, respectively. This is necessary to take maximum advantage of existing facilities and assure proper coordination and monitoring. For example, 1,200 tons of good quality seeds will be required by 200,000 farmers or farmers groups to grow a total of 600,000 ha of land in the first year. This quantity can only be supplied by the very good seed companies with adequate backing of research. Research and seed companies can then expand their facilities as required to cope with the projected increases.

As the program move from short to medium and long-term phases, the capacity of different players including research, seed companies, infrastructure, policy, marketers and end-users to handle expanded phases would have been enhanced and a progressive increase in the number of participating farmers facilitated.

## **Implementation plan**

### **Favorable Support Policies**

1. Total ban of maize importation
2. Policies formulated for the Growth Enhancement Support should be consistent for a minimum of five years to allow for maturity and adequate time to assess the impact.
3. Commitment of Government to buy back the surplus grain
4. Stable and consistent support for the programme
5. Firm commitment of participating States through significant financial and other contribution to the programme

### **Short term**

There is need to increase and sustain access and utilisation of key production inputs (improved maize and soybean seeds, fertiliser and to some extent, machinery) to increase the productivity and competitiveness of maize production and its supply to markets. Input needed for the short, medium and long-term phases of the initiative is presented in Table 2 for maize and Table 3 for soybean. Existing records of maize farmers with the Maize Association of Nigeria (MAAN), an umbrella organization of maize farmers, processors workers etc will be upgraded. State coordinators of MAAN will be encouraged to interact closely with state ADPs and the Extension Officers on ground to identify, select, register, organise and educate/sensitize new maize farmers and farmers groups.

Thereafter, farmers will be supported based on:

- Access to a minimum of 3ha of land,
- Ability to plough own land,
- Willingness to purchase recommended inputs.
- Ability and willingness to follow and carry out production guidelines.

Series of interactive meetings of stakeholders will be held to publicise the effort and sensitise different players thus creating market linkages and sense of ownership of the initiative. Good quality maize grain production will be emphasized and awareness for Aflatoxin control intervention will be encouraged in areas identified prone to such contamination.

An efficient private/public sector linkage is necessary to link agro-input dealers with farmers and farmers with the output markets. Strong and effective linkages will be created between maize producers and the animal feed industry and other industrial users of maize. For example, on-going dialogue with the poultry industry indicates that 3.25m metric tons of maize grain is required annually for poultry feed (Poultry Association of Nigeria–personal communication). Requirements for the other food, feed and pharmaceutical industry are staggering, and strong indications are that whatever can not be sold can be bought by the Abuja Commodity Exchange. Although maize production is far less than the demand, indicating that whatever is produced can be sold, government should also serve as the buyer of last resort through the provision of an efficient buyback system of grains from participating farmers.

In association with reliable seed companies, research will promote the production of recently released hybrids and productive varieties identified under the PIDOM project for marketing by the private sector. Furthermore, extensive demonstrations of improved seed with fertilizer and other management practices and the testing of new high yielding, stress tolerant and nutrient efficient hybrids will be done in multi-location and on-farm trials.

### **Medium term**

The procedure for accessing quality inputs should have matured and production potential enhanced. Furthermore, effective market linkages should have been established. The programme will encourage the establishment of warehouses to store excess grain by farmer groups for bulk trading and possible export to neighboring countries at reasonable prices. In addition to the demonstration of newer hybrids, the programme will accelerate the release of new hybrids identified from the short term strategy with active involvement of seed companies, the national variety release committee, National Agricultural Seed Council (NASC), and the national agricultural research systems. Maize for other specialized markets such as high oil content maize varieties will gradually be introduced for demonstration and adoption and

The NASC, the variety release committee and other policy makers will be encouraged to remove policies that restrict the development of good quality improved seed supply chains including shortening the time for variety release to speed up access of new products by farming communities.

Effective policies formulated to strengthen the strategic grain bank of the country to minimize the risk associated with high level of price fluctuations for maize due to excess grain produced resulting from adoption of yield enhancing technologies. During this phase, dialogue will be initiated with newer partners especially those engaged in processing and marketing of vegetable oil to produce quality maize oil for local consumption and export.

### **Long term**

Availability of improved varieties and production system coupled with consistent policy support of government transformed maize from a food to a cash crop in the early maize revolution in Nigeria. Therefore, the programme will work with relevant policy makers to



promote policies that encourage sustained maize production and marketing. Innovation platforms that consolidate the establishment of private service providers of mechanized operations and link them to farmers to overcome labor constraints, will be encouraged at local levels.

***Initiative beneficiaries, benefits and job creation***

Number of direct beneficiaries will increase from 500000 in the short term to 2m in the long term with an associated input cost of 149 to 647 billion Naira, respectively. Research support will be an additional 3 billion Naira for the period. Cost of breeder and foundation seeds supplied to seed companies will be fully recovered by research. Depending on the level of support derivable from the Growth Enhancement scheme, a sizeable proportion of the investment is expected to come from participating farmers on an annual basis. It is expected that participating farmers will have access to credit from banks under the NIRSAL scheme.

New on-farm job creation will be range 300000 in the short term to 1.2m in the long term. Direct beneficiaries (seed companies, transporters, input supplies etc) will further create new jobs for indirect beneficiaries. For example, each seed company will requires a minimum of thrice its capacity to produce new hybrids by at least ten times its current list of out-growers. Additional hands will also be needed to load and transport extra grain to markets. There will also be an increase in the number of people engaged in processing the grain. Thus an additional 30000 to 1.2m off-farm jobs will be created to give a total of 600000 to 2.4 million new jobs within 3 to 10 years. Other indirect farmer beneficiaries alone can range from 2.0 to 8m for the short and long term phases, respectively assuming that four indirect beneficiaries is influenced by one direct beneficiary.

Detailed economic analysis of maize production is presented in Table 4. Cost scenarios ranging from 30 to 50 Naira per kilogram of grain price were considered. Furthermore, an increase in input price of 10%, a very common phenomenon, a yield reduction of 20% and a combination of the two were considered. It is thus obvious that only a grain yield of 3t/ha and a N40/kg farm gate price will be attractive and profitable for farmers to produce maize. This profit margin will however decrease if cost of borrowing money is to be considered. Nonetheless, a maximum lending rate of 10% with a grain yield of a minimum of 3t/ha will still be profitable, but any slight reduction in grain yield and/or increase in input price will result in a loss or reduced income, respectively . Therefore a grain yield price of N45 is desirable.

Table 2 : Progressive increase in input requirement for maize production and their associated costs

Commodity	Period	Target (m.ha)			Quantity(kg or ltrs)			Unit cost (N)	Costs (b N/year)			Total Cost (bn. N)
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3		Year 1	Year 2	Year 3	
Seed (m tons)	Short	0.6	0.90	1.5	12000000	18000000	30000000	200	2.4	3.6	6	12
	Medium	1.5	2.00	3	30000000	40000000	60000000	200	6	8	12	26
	Long	3	4.00	6	60000000	80000000	120000000	200	12	16	24	52
Fertilizer (bags)	Short	0.6	0.90	1.5	3600000	5400000	9000000	5000	18	27	45	90
	Medium	1.5	2.00	3	9000000	12000000	18000000	5000	45	60	90	195
	Long	3	4.00	6	18000000	24000000	36000000	5000	90	120	180	390
Urea (bags)	Short	0.6	0.90	1.5	1200000	1800000	3000000	5000	6	9	15	30
	Medium	1.5	2.00	3	3000000	4000000	6000000	5000	15	20	30	65
	Long	3	4.00	6	6000000	8000000	1.2E+07	5000	30	40	60	130
Fertilizer/micronutrient (btl)	Short	0.6	0.90	1.5	1800000	2700000	4500000	325	0.6	0.9	1.5	2.9
	Medium	1.5	2.00	3	4500000	6000000	9000000	325	1.5	2	2.9	6.3
	Long	3	4.00	6	9000000	12000000	18000000	325	2.9	3.9	5.9	12.7
Herbicide/Weeding (ltrs)	Short	0.6	0.90	1.5	4800000	7200000	12000000	800	3.8	5.8	9.6	19.2
	Medium	1.5	2.00	3	12000000	16000000	24000000	800	9.6	12.8	19.2	41.6
	Long	3	4.00	6	24000000	32000000	48000000	800	19.2	25.6	38.4	83.2
<b>Total</b>	Short	0.6	0.90	<b>1.5</b>					<b>30.8</b>	<b>46.3</b>	<b>77.1</b>	<b>154.1</b>
	Medium	1.5	2.00	<b>3</b>					<b>77.1</b>	<b>102.8</b>	<b>154.1</b>	<b>333.9</b>
	Long	3	4.00	<b>6</b>					<b>154.1</b>	<b>205.5</b>	<b>308.3</b>	<b>667.9</b>

Table 3 : Progressive increase in input requirement for soybean production and their associated costs

Commodity	Period	Target (m.ha)			Quantity (bags or ltrs)			Unit cost (bn. N)	Costs (b N/year)			Total Cost (b N/yr)
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3		Year 1	Year 2	Year 3	
Seed (m tons)	Short		0.2	1		800000	4000000	200	0	1600000000	8000000000	9.6
	Medium	1	1.5	2	4000000	6000000	8000000	200	8000000000	12000000000	16000000000	36
	Long	2	3	4	8000000	12000000	16000000	200	16000000000	24000000000	32000000000	72
NPK Fertilizer (bags)	Short		0.2	1		60000	300000	5000	0	300000000	1500000000	1.8
	Medium	1	1.5	2	300000	450000	600000	5000	1500000000	2250000000	3000000000	6.8
	Long	2	3	4	600000	900000	1200000	5000	3000000000	4500000000	6000000000	13.5
TSP (fertilizer)	Short		0.2	1		200000	1000000	5000	0	1000000000	5000000000	6
	Medium	1	1.5	2	1000000	1500000	2000000	5000	5000000000	7500000000	10000000000	22.5
	Long	2	3	4	2000000	3000000	4000000	5000	10000000000	15000000000	20000000000	45
Herbicide/Weeding (ltrs)	Short		0.2	1		1000000	5000000	800	0	800000000	4000000000	4.8
	Medium	1	1.5	2	5000000	7500000	10000000	800	4000000000	6000000000	8000000000	18
	Long	2	3	4	10000000	15000000	20000000	800	8000000000	12000000000	16000000000	36
Total	Short		0.2	1					0	3.7	18.5	22.2
	Medium	1	1.5	2					18.5	27.8	37	83.3
	Long	2	3	4					37	55.5	74	166.5

Table 4: Costs and returns in maize production at 3 tons/ha

Variables	Normal	A*	B	C	Normal	A	B	C	Normal	A	B	C	Normal	A	B	C
Maize yield (kg/ha)	3000	2400	3000	2400	3000	2400	3000	2400	3000	2400	3000	2400	3000	2400	3000	2400
Maize price (N/kg)	30	30	30	30	40	40	40	40	45	45	45	45	50	50	50	50
<b>Revenue (N/ha)</b>	<b>90000</b>	<b>72000</b>	<b>90000</b>	<b>72000</b>	<b>120000</b>	<b>96000</b>	<b>120000</b>	<b>96000</b>	<b>135000</b>	<b>108000</b>	<b>135000</b>	<b>108000</b>	<b>150000</b>	<b>120000</b>	<b>150000</b>	<b>120000</b>
Seeds (kg/ha)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
NPK 27:13:13 kg/ha	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Urea Kg/ha	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Total fertilizer kg/ha	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Micronutrient	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
<b>Labour (man-days)</b>																
Land preparation	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Planting	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Fertilizer application	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Weeding	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Harvesting	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Threshing	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Total labour (man-days)	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88
Transportation cost/bag	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Bags for packing	30	24	30	24	30	24	30	24	30	24	30	24	30	24	30	24
Seed price	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Fertilizer price	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Micrnutrient	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325
Labour price	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Bag price	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Cost of seed (N/ha)	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Cost of fert. (N/ha)	40000	40000	44000	44000	40000	40000	44000	44000	40000	40000	44000	44000	40000	40000	44000	44000
Cost of Micro (N/ha)	975	975	1073	1073	975	975	1073	1073	975	975	1073	1073	975	975	1073	1073
Cost of labour (N/ha)	44000	44000	44000	44000	44000	44000	44000	44000	44000	44000	44000	44000	44000	44000	44000	44000
Cost of bags (N)	2400	1920	2400	1920	2400	1920	2400	1920	2400	1920	2400	1920	2400	1920	2400	1920
Cost of transportation	1500	1200	1650	1320	1500	1200	1650	1320	1500	1200	1650	1320	1500	1200	1650	1320
TVC (Nha)	91275	92095	97123	96313	92875	92095	97123	96313	92875	92095	97123	96313	92875	92095	97123	96313
<b>Return (at 0% interest)</b>	<b>-1275</b>	<b>-20095</b>	<b>-7123</b>	<b>-24313</b>	<b>27125</b>	<b>3905</b>	<b>22877</b>	<b>-313</b>	<b>42125</b>	<b>15905</b>	<b>37877</b>	<b>11687</b>	<b>57125</b>	<b>27905</b>	<b>52877</b>	<b>27905</b>
<b>IER</b>	<b>-1%</b>	<b>-22%</b>	<b>-7%</b>	<b>-25%</b>	<b>29%</b>	<b>4%</b>	<b>24%</b>	<b>0%</b>	<b>45%</b>	<b>17%</b>	<b>39%</b>	<b>12%</b>	<b>62%</b>	<b>30%</b>	<b>54%</b>	<b>2%</b>
<b>Revenue/cost ratio</b>	<b>99%</b>	<b>78%</b>	<b>93%</b>	<b>75%</b>	<b>129%</b>	<b>104%</b>	<b>124%</b>	<b>100%</b>	<b>145%</b>	<b>117%</b>	<b>139%</b>	<b>112%</b>	<b>162%</b>	<b>130%</b>	<b>154%</b>	<b>100%</b>
<b>Return at 5% financing</b>	<b>-5838.75</b>	<b>-24699.75</b>	<b>-11979.15</b>	<b>-29128.65</b>	<b>22481.25</b>	<b>-699.75</b>	<b>18020.85</b>	<b>-5128.65</b>	<b>37481.25</b>	<b>11300.25</b>	<b>33020.85</b>	<b>6871.35</b>	<b>52481.25</b>	<b>23300.25</b>	<b>48020.85</b>	<b>11300.25</b>
<b>Return at 7% financing</b>	<b>-7664.25</b>	<b>-26541.65</b>	<b>-13921.61</b>	<b>-31054.91</b>	<b>20623.75</b>	<b>-2541.65</b>	<b>16078.39</b>	<b>-7054.91</b>	<b>35623.75</b>	<b>9458.35</b>	<b>31078.39</b>	<b>4945.09</b>	<b>50623.75</b>	<b>21458.35</b>	<b>46078.39</b>	<b>9458.35</b>
<b>Return at 10% financing</b>	<b>-10402.5</b>	<b>-29304.5</b>	<b>-16835.3</b>	<b>-33944.3</b>	<b>17837.5</b>	<b>-5304.5</b>	<b>13164.7</b>	<b>-9944.3</b>	<b>32837.5</b>	<b>6695.5</b>	<b>28164.7</b>	<b>2055.7</b>	<b>47837.5</b>	<b>18695.5</b>	<b>43164.7</b>	<b>6695.5</b>

## Part 2: Soybean

### NATIONAL AGRICULTURAL TRANSFORMATION: SOYBEAN VALUE CHAIN ACTION PLAN SUMMARY

**INTRODUCTION:** The Nigerian formal soybean processing sector has an installed capacity exceeding 700,000 tons per annum with the main products being soybean oil and the high protein cake that is usually used as an ingredient in poultry feed. Annual production is estimated by the Ministry of Agriculture at around 550,000 tons. The processing firms estimate based on what they are able to procure that annual production is around 350,000 tons. The 200,000 tons difference is probably because large quantities of soybean are eaten at home by the families that produce the crop and also large numbers of small scale processors make wara with soybean every morning for sale. There is a substantial deficit between domestic requirements and production. Soybean is described by industrial players as “like foreign exchange.” Nigerian oil expressing firms send their agents to look for and buy soybeans in neighboring countries, including Benin, Cameroon and Chad and Nigerian firms are paying higher than international prices for soybeans. Average soybean yields are less than 1,000 Kg/ha. When farmers have the needed inputs and knowledge of production techniques, yields can exceed 2,000 Kg/ha. One of the most important reasons that farmers need to grow more soybean using the improved production practices is that this will increase the biomass produced and the nitrogen fixed by the crop. The result of this is improved soil fertility and increases in the yields of the crop grown after soybean. Even though the present situation is that soybean production is less than demand, there is a need to strengthen both the supply side and the demand side of the value chain. Intervention in the soybean sector must build value chains by resolving the key constraints that they face, and create additional demand. It must work up and down the value chain, by emphasizing demand while building reliable supply of soybean to meet the demand; it must be evidence-based, realistic, and adapted to the socio-economic situation of Nigeria. It will be private sector driven and implementation will be by the most experienced and motivated persons. Implementation of the interventions must be flawless. In the short-term, the soybean transformation group will work with existing soybean oil mills and farmer groups in areas where soybean is already produced to create a reliable supply of raw materials by raising farm productivity with groups of farmers. The project will train producers and processors in supply chain management, and remove policy and other constraints to marketing.

**1. GOAL:** To achieve higher incomes for farmers, improved soil fertility, improved family nutrition and improved health by tripling the production, home use, processing, and marketing of soybean through strengthening existing value chains, building new ones, and widespread dissemination of improved production practices in the maize-soybean growing belt of Nigeria

**2. LOCATION:** In the main soybean production areas that include Kano, Kaduna, Plateau, Benue, Bauchi, Nassarawa, Taraba, Katsina and the FCT Abuja. More states may need to be added based on Ministry of Agriculture statistics and as demand for soybean grows.

#### **3. TARGET VALUE-ADDED CHAINS**

Six value chains are considered as having the greatest potential to achieve a tripling of soybean production, home use, processing, and marketing in Nigeria and they are grouped according to a time-line for achievement of measurable impact:

Short-term value chain impacts

1. Oil mills that produce vegetable oil and high protein soybean cake. The availability of the high protein soybean cake directly benefits the poultry producers throughout the Country. This will be 100% implemented by the private sector. The Ministry of Agriculture will ensure

- that government policies are in place to encourage this industry to source their soybean from Nigerian Farmers.
2. Home level utilization designed to improve nutrition of the entire family with special attention given to pregnant and nursing women and children. Appropriate recipes to include soybean into various traditional foods throughout the country are available and there needs to be a massive program to educate homemakers throughout the country on the appropriate processing methods of soybean and related health benefits.
  3. Small scale processing for preparing nutritious foods and income generation. There are numerous products that can be made with soybean that provide affordable and nutritious snacks and foods and provide income to the producers. Some products that can be made include wara, akara and moimoi.

#### Medium –term value chain impacts

1. Incorporate high quality soybean flour into wheat flour for the protein fortification of bread and other products. The incorporation of soybean flour at low rates will not affect the texture and taste of the products while reducing of wheat imports. The higher protein content of these products thus balancing the reduced protein levels cause when cassava flour is added.
2. Production of Textured Vegetable Protein (TVP). This industrial product serves as a meat substitute and is made from the high protein soybean cake. This highly nutritious food will become very popular in both urban and rural areas because of its short cooking time (15 minutes) and low cost
3. A country wide program to provide soymilk, soybean snacks and other foods to all primary and secondary schools.

#### **4. Expected outputs**

1. Double soybean productivity (from 1.0 to 2.0 ton/ha)
2. Triple soybean production home use, cottage industry processing, and marketing in Nigeria.
3. Strengthen existing and new value chains of 1) vegetable oil, high protein soybean cake, use of the high protein soybean cake in poultry feeds, 2) home level utilization, 3) small scale processing, 4) incorporating soybean flour into wheat flour, 5) the production of textured vegetable protein in Nigeria and 6) A country-wide program to provide soybean foods to all primary and secondary schools.
4. Generate of one million jobs in the rural areas of Nigeria over the next four years of the program.
5. Triple the contributions of the soybean sub sector to GDP in Nigeria.
6. Improve soil fertility and yields of maize, sorghum and other crops grown after soybean
7. Reduce the damage to maize and sorghum caused by Striga, a parasitic weed of cereals, and reduce its infestation and invasion of soils.
8. Improve family nutrition and health in both rural and urban areas through the use of soybean and soybean products.
9. A dramatic increase in the use of practical machines to plant and thresh soybean and maize

10. A significant move towards using appropriate herbicides to control weeds
11. Commercialize and apply rhizobial inoculant that results in greater nitrogen fixation, higher soybean yields and increased residual benefits from soybean cultivation.
12. Agricultural input dealers become more knowledgeable about all the inputs required to produce a high yielding soybean crop, and order and stock these inputs at the proper time and quantities.

#### **4. VALUE CHAIN ACTORS/PARTNERS:**

Fortune Oil Mills Nigeria Limited, No. 59 Tafawa Balewa Road, P.O. Box 10024, Kano Telephone 064-645213, 08027371095, 08066501968. Contact person: Abubakar Sadddeeq Gwadabe, Quality Assurance Manager, E-mail [abusaddeeq@yahoo.co.uk](mailto:abusaddeeq@yahoo.co.uk) (Website [www.fortuneoilmillsnigeriaLtd.8k.com](http://www.fortuneoilmillsnigeriaLtd.8k.com)). CEO is the Secretary of Oil Millers Association of Nigeria. Mills 17,000 to 20,000 tons per annum groundnuts and 60,000 tons per annum soybeans (varying from 30,000 to 90,000 tons) depending on relative prices of soybean cake/meal and oil to soybean grain prices and availability. Installed milling capacity of soybeans is 100,000 tons per annum.

Yakasai Oil Mills. No 2 Sharada, Industrial Plots, Phase II, Kano Nigeria. +23464313113. Contact person Mohammed Jafar [jafarnaabba@yahoo.com](mailto:jafarnaabba@yahoo.com); Yahaya M. Yakasai, Managing Director, [yaheebob@yahoo.com](mailto:yaheebob@yahoo.com)). Mills 3,000 tons per annum groundnuts and 1,000 to 3,000 tons per annum soybeans. Planning to install solvent plant 60,000 tons of soybeans per annum. Sells crude oil to Grand Cereals, and soybean cake to poultry feed manufacturers. Sometimes sells raw soybean grain unexpressed to sister companies.

Sunseed Nigeria PLC, Zaria. Contact person: Rajaram Krishnan, General Manager. E-mail [rajaram@afcott.com](mailto:rajaram@afcott.com). One of the largest buyers and users of soybeans, crushing 70,000 tons per year. Reported that major constraint is unavailability of soybeans especially during last 2 years. Argues that even if farmers double production of soybeans there is no problem because consumption/demand is very high. Problem is to increase production (a) increase in per hectare yield from below 1,000 kg/ha to 1,500 kg/ha; (b) stop size of grain from decreasing by improving supply of certified seed of improved varieties; (c) improve oil content of soybean grain.

Grand Cereals Limited, Km. 17, Zawan Roundabout, P.O. Box 13462, Jos, Plateau State, Nigeria. Contact persons: George K. Idiaghe, Supply Chain Manager, Mobile 08037262350, 07043050930 E-mail: [gergeekidiaghe@grandcereals.com](mailto:gergeekidiaghe@grandcereals.com), [idiaghegeorge@yahoo.co.uk](mailto:idiaghegeorge@yahoo.co.uk); Timothy G. Makeri, Special Duties Manager(Procurement), Mobile: 08037009816, 07038626987, 07043050944 E-mail: [timothygmakeri@grandcereals.com](mailto:timothygmakeri@grandcereals.com); [tgmakeri@yahoo.com](mailto:tgmakeri@yahoo.com). The largest buyer and processor of groundnuts and soybeans. Mills 36,000 tons per annum groundnuts (leasing some facilities elsewhere) and 100,000 tons per annum soybeans. All facilities that can crush soybeans can mill groundnuts. If farmers market more groundnuts the company can do 100,000 tons of groundnuts per year. Recently installed fish feed extruding plant to produce high quality surface feeds with capacity of 3 tons per hour times 24 hours/day times 312 days per year (average of 26 days in a month of 30 days) give

annual capacity of 22,500 tons. Representatives argued that major problem is lack of capability to supply raw grains (large volumes, consistency, quality, price). The need is to increase yields and drive down average cost of production and improve market linkages that are currently very basic (sorting, grading, storage, weevils, capacity to warehouse properly) to supply cheaper materials for industry which will enable processors to lower cost of foods.

#### Karma Food Industries Limited

Head Office & Factory: 59/60 Akambi Onitiri Close, Off Eric Moore Road, Surulere, Lagos  
Soya Processing Plant: Gwagwalada Zuba Expressway by Giri Junction, F.C.T. Abuja This partner will soon start processing soybean.

PHONE: (+234) 1 775 5786; (+234) 1 776 3406; (+ 234) 807 200 7550; (+ 234) 803 337 8580

Premier Seeds Nigeria, Chikaji Industrial Estate, P.O.Box 1673, Zaria, Kaduna State, Nigeria. Telephone: 069332791, 334804. Contact Professor A.O. Ogungbele, Director of Technical and Commercial Services, 08037033225. E-mail: [ogungbeleao2000@yahoo.co.uk](mailto:ogungbeleao2000@yahoo.co.uk). J.O. Okanigbe, Production Manager. E-mail: [okanigbejo@yahoo.com](mailto:okanigbejo@yahoo.com). Secretary of the Seed Association of Nigeria. The company representatives explained that the firm produces cereal and legumes seed on demand. Maize seed of hybrids and open-pollinated varieties is the number one choice. Soybean is just coming up because of processors who specialize in this. Annual seed production: maize 2,200 tons of hybrids; cowpeas 120 tons; soybeans 120 tons. No groundnuts seed production because of the lack of market demand. It is easier to produce soybeans than groundnuts seed. Soybean seed demand is coming up because there are factories crushing soybeans for cooking oil and cake and meal for poultry feed. The company has marketing outlets throughout the country for distributing the seed for sale. Premier Seeds is the only company with this capacity.

DA-ALLGREEN Seeds Limited/Alheri Seeds, No. 1 MTD Road, Zaria, Telephone 08037016371, 08057746362, 08028433820. Contact S.D. Yakubu Atar, Vice Chairman/CEO E-mail: [yakubuatar@yahoo.com](mailto:yakubuatar@yahoo.com). The company is convinced that inoculants work and that this technology should be moved from research to farmers' field. This is because the company learned from some "Zimbabwean" farmers that soybean yields can be increased using inoculants. The company would like to collaborate with N2Africa and conduct field days and demonstration plots with farmers. The company has in the past produced and sold seed of the soybean variety TGx-1448-2E. This is because the variety has low shattering of grain at harvest. Currently the company has stopped soybean production because of high carry over seed as it cannot sell seed since uptake is very low. This is because of the low yield of soybeans and farmers preferring to grow maize after maize as it is more profitable. Inoculants raise yields of soybean, which induces more farmers to plant this crop and expand the area cropped to soybeans, thereby increasing the demand for seed and seed sales for the company.

Similar perspectives were also articulated by several seed companies. These include Maina Seeds (Contact person: Mairo Hassan, Manager, Agric. Research Station, P.M.B 3112, Sabo Bakin Zuwo Road, Kano, Nigeria Mobile 0805-509-5516; 0802-304-01730, Email: [mhassan@nigeriamarkets.org](mailto:mhassan@nigeriamarkets.org)); Value Seeds Limited (Contact person: Lady Cassandra George, Vice President, 28/30 Niger Street, GBO Building, P.O. box 10937, Kano, Telephone +234-64-



634841 Mobile 08089828831, E-mail: [Valueseeds@yahoo.com](mailto:Valueseeds@yahoo.com)); The Seed Project Company Limited (Contact person: Grace Job, Marketing Head, 47 Gidan Buhari Shopping Complex, Hadejia, Road, P.O. Box 10937, Kano, Telephone 064-967649, 08035186354, E-mail: [seedprojectcoy@yahoo.com](mailto:seedprojectcoy@yahoo.com), [graceop12@yahoo.com](mailto:graceop12@yahoo.com)); Nagari Seed Nigeria Limited (Contact person: A. Boman, Managing Director, 1 Sokoto Road, P.O. Box 141, Zaria, Mobile 08028431210) and Manoma Seeds (Contact person Abba Amos, CEO, Katsina Road, P.O. Box 103, Funtua, Katsina, E-mail: [manomaagric@yahoo.com](mailto:manomaagric@yahoo.com)). Virtually all seed companies we interviewed are not producing groundnut seed because they cannot sell the seed at a profit. There is not yet effective demand for groundnut seed.

North-West Agro Input Dealer Association (NOWAIDA), KNARDA Office Complex Kilometre 9 Hadeja Road, Kano, Telephone 2347062069472. Contact Adamu Abba Isyaku, Executive Secretary, E-mail: [bbisyaku@yahoo.com](mailto:bbisyaku@yahoo.com); Laure Shuaibu Usman, Association Development Officer and Gender Mainstreaming, E-mail: [usmanlaura@yahoo.com](mailto:usmanlaura@yahoo.com). Association for agricultural input businesses, including suppliers, producers, retailers, and distributors. The association has a membership of 800 individual agro-dealers and 20 companies. The members are drawn from Kano, Kaduna, Jigawa and Katsina states. The association is expanding to Sokoto, Zamfara and Kebi States. The association carries out (a) training of members in business management skills; (b) fertilizer knowledge application; (c) seed production certification; and (d) crop chemicals. At the end of training trainees are awarded a certificate of competence and attendance. The certificate is endorsed by IFDC, NAFDAC (chemicals), NAFRA and CropLife (chemicals). In addition to training, the association assists members in terms of technology transfer. Agro-dealers conduct demonstrations and farmers are able to see the performance of the inputs. Field days are also carried out at the state level. This year 20 agro-dealers out of 800 agro-dealers members carried out field days. The association works with seed companies – Seed Project, Premier Seed, Value Seeds, Alheri Seed, and Masiaha Seed – to provide seed for demonstrations. The association also organizes the testing of farm implements (animal drawn equipment), soil test kits (how to take samples), bucket drip irrigation, and hand-powered tiller. The association facilitates linking of trained agro-dealers with manufactures and microfinance banks through group schemes. The association carries out communication (market information through the IFDC Market Information Regionally MIR+ network), input demand creation and product ordering that can promote agro-dealer businesses. The association carries out advocacy targeted at changing the fertilizer subsidy system to a more transparent and efficient system based on vouchers and agro-dealers distributing fertilizers to farmers. As a result of these interventions the Kano state government is more receptive to voucher-based agricultural inputs subsidies through agro-dealers. N2Africa could make a major impact on the marketing of soybeans, groundnuts and cowpeas by overlaying its interventions on those of NOWAIDA and get the state governments to support seed subsidies for legumes through vouchers redeemable through agro-dealers in order to develop commercial seed markets as in Nigeria.

University of Agriculture Makurdi, Department of Seed Science. Contact Professor L. L. Bello, Mobile 08054485208, 0803544179. E-mail: [lateeflekanbello@yahoo.com](mailto:lateeflekanbello@yahoo.com). Need to tap his knowledge and experience in order to revitalize the National Soybean association (formed in

1987 by Dashiell, Oyekan and Others. He identified, in decreasing order of importance, three research priorities for targeting investments to make more impact (a) inoculants delivery mechanisms; (b) need for Phosphorus; (c) marketing to bring farmers closer to markets (i.e. collecting centers within walking distance of farmers' locations, inspection, grading and sorting, storage, competitive pricing, timely payment).

Mr. Ayo Odebisi, [AYOdebisi@aol.com](mailto:AYOdebisi@aol.com) A farmer and businessman that is planning to build an inoculum production factory in Kaduna

Dr. Mrs. Obatulu (IAR&T) and DR. Mrs. S. Osho (University of Ag. Abeokuta) and Afe Babalola University, respectively have extensive experience with soybean processing and Utilization.

## 5. OBJECTIVES

1. More than double the average yield of soybean and create a reliable supply of soybean.
2. Work with groups of farmers, marketers and soybean oil mills and food processors to improve soybean value chain management.
3. Private companies based in Nigeria produce and sell appropriate machines for planting and threshing soybean and also produce rhizobial inoculants applied to soybean seeds.
4. The increased production of soybean improves soil fertility and increases the yield of maize and sorghum grown in rotation.
5. Increase the incomes of at least 2,000,000 farm families growing soybean.
6. Improve the nutrition and health of women and children in rural and urban areas all over the country because of their regular consumption of foods that contain soybean.
7. Build new value-added chains for soybean with priority given to 1) Incorporate high quality soybean flour into wheat flour for the production of bread and other products, 2) Private businesses are producing Textured Vegetable Protein from soybean and marketing it throughout the country and 3) a country-wide program to provide soybean snacks and foods to all primary and secondary schools.
8. Implement government policies that incentivize use of soybean for import substitutions and create input markets by working closely with the Ministries of Finance and Commerce and the National Assembly.
9. Enhance capacity of actors along the value-added chain and continuously monitor implementation and measure impact.

## 6. ACTIVITIES

The following is a description of activities to achieve the objectives listed above.

### 6.1 Establishment of a Soybean Market and Trade Development Corporation (SMTDC):

Implementation of the value-added chain activities will be driven by the private sector. A Soybean Market and Trade Development Corporation (SMTDC) will be established as the primary vehicle for

implementation of value-added chain activities. Primary activities of SMTDC are market development, including advocacy with potential users of soybean-based products and policy makers, to ensure reliable demand. The corporation will also be charged with establishment of quality standards for the various soybean products.

**6.2 Creation of reliable demand and supply in the various soybean industries.** The unreliable supply and often high cost of soybean as raw material for industrial uses is a major problem within the soybean sub sector. Beginning with existing oil mills, reliable supply of soybean will be created by organizing small and medium sized farms in areas where soybean is already grown or close to these areas. An out-grower scheme will be organized and training in supply chain management will be conducted. A crop campaign to demonstrate the value of chemical fertilizers SSP, TSP and specialized blends, use of inoculum and improved varieties to increased productivity and the importance of following all other recommended production practices will be aggressively pursued with these groups of out-growers. Policies that create demand and interventions that strengthen, both qualitatively and quantitatively, will be pursued in collaboration with SMTDC, existing soybean oil mills and poultry feed producers. Advocacy for the use of soybean to improve nutrition and health of Nigerians will also be pursued. A detailed plan to create reliable demand will be developed within one month of initiation of soybean value chain project.

**6.3 Increasing the use of soybean at the home level and at the small to medium scale processing level for income generation.** This capacity building assignment will utilize several different communication tools such as demonstrations of soybean cooking to various groups such as women groups, market groups, religious groups etc. The use of mass media including radio, TV and news papers should also be used.

**6.4 Making soybean a crop that propels farmers into using appropriate machines and agriculture chemicals to modernize production of several crops.**

The three major activities that soybean farmers state are difficult for them are planting, weeding and threshing. 1) There is simple hand pushed labor saving machines available for planting soybean, maize and sorghum from several companies around the world and possibly some made in Nigeria. 2) There are also threshing machines that can be powered by a small to medium size engines that can thresh soybean, maize and sorghum and 3) there are labor-saving herbicides that are recommended within soybean/cereal rotations. The introduction of these two simple machines and the appropriate herbicides could revolutionize grain production in Nigeria. In one season of adaptive research trials conducted with farmers all across the maize and soybean growing belt in Nigeria, we can identify the best machines and either have them produced by companies in Nigeria or import them and identify the best herbicides. The operation of these two machines and the spraying of the herbicides should be done by small teams of educated youth that are motivated to set up a small business and service small farmers. There are numerous details to work out such as the availability of loans and training of the teams in the correct operation and maintenance of the machines.

First, areas where soybean is already produced will be selected. There will be intensive training of groups of farmers on the recommended production practices. This capacity building assignment will involve conducting field demonstrations in locations where every soybean farmer in the program will be able to visit regularly. Field days will need to be held several times during the growing season to ensure farmers understand the importance of various management practices. The mass media such as radio, TV and newspaper should also be used. Also, teams of educated youth will receive extensive training on the operation of threshers and planters and the proper application of herbicides. A guaranteed minimum price will be set based on the world price of soybean. The extension of the an improved production package of high yield varieties, fertilizer application, use of inoculum and improved cultural practices will be pursued in collaboration with State ADPs, and farmers.

A data-base of production – acreage, yields, and total soybean production, will be developed for the country based using existing sources, for example the AERLS crop survey, and complimented with surveys by the program and new methods of satellite imagery of the entire country.

**6.5 Development of new value-added chains in soybean for** 1) incorporation of soybean flour into wheat flour, 2) Industries making Textured Vegetable Protein (TVP) with soybean and 3) A country-wide program to provide soybean snacks and foods to all primary and secondary schools. Business plans will be put in place plans to attract investors and technical partners to set up factories to produce soybean flour and TVP. Once locations for the proposed plants have been identified, supply chains will be developed based on what supply chain model is most cost-effective. The activities required to implement the program to provide soybean foods to schools cannot be explained here. Probably there will need to be collaboration with the Ministries of Education and Health.

**6.6 Development of new soybean varieties and other enabling technologies.** Innovation is the engine of agricultural development, and drives value-added chain development world-wide. The short-term profitability and long-term sustainability of the soybean value-added chains requires a continued production of high yielding and early soybean varieties, with resistance to potential outbreaks of plant disease, especially soybean rust and with the required quality characteristics for the various value chains. We will invest in producing the varieties of the future that are well adapted to the various ecologies found in Nigeria. The specific breeding objectives will be drawn up in close consultation with farmers, end-users, and processors. Advanced breeding lines that meet these criteria will be tested extensively with farmers while innovative methods of accelerating genetic gain will be implemented for long-term profitability. In addition, disease diagnostic and pest surveys are required to stay a step ahead of pests and disease threats.

**6.7 Policy Development** Important government policy interventions for the implementations of the aforementioned value-added chains include:

1. Legislation of a phased 5% inclusion of soybean flour in wheat flour.
2. Provision of incentives to users of Nigerian produced soybean and a levy on imports of competing products such as poultry, soybean cake, and vegetable oil.
3. Tax breaks to companies that produce soybean-based products.
4. Government policy to ensure availability of fertilizer appropriate for soybean (SSP and TSP and specialized blends), inoculum and herbicides and the credit to farmers to purchase these inputs.
5. Guaranteed minimum price for soybean to ensure reliable supply to the various value chains

**6.8 Capacity Building:** Supply chain management is critical to development of value-added chain. Collaboration along the supply chain as opposed to the traditional adversarial relationships between the supplier of raw material and the processor ensures actors along the value-chain profit and remain in business. Asymmetry of knowledge and power in the supply chain will be ameliorated by encouraging growers to form groups followed by training in supply chain management. Capacity building will be carried out by international agencies in conjunction with local business schools and experienced agricultural entrepreneurs. In addition the program will establish pilot information management systems providing both hardware and software for this purpose.

**6.9 Monitoring and Evaluation** Monitoring and evaluation (M&E) plans will be drawn up and implemented for all activities of the project and tools for the project. An M&E plan will be completed during the first two months of project activity. The monitoring system will build on existing tools used in similar large-scale projects, including on-farm monitoring tools, site surveys, and assessment of

quantitative indicators. Implementing partners will be trained in monitoring tools and reporting requirements and will be responsible for data collection and reporting on achievements against targets. A database will be developed to compile information received from partners at the state ADP levels. Information will be analyzed at all project levels – partner, territory, country and project. To achieve near real-time reporting, a web-based system will be used, with partners uploading data directly.

**7. THE SOYBEAN TRANSFORMATION TEAM:** The soybean transformation effort is a private-public partnership. The public sector will support the private sector, represented by SMTDC, with respect to technology development and transfer, policy, finance/investment, and market/trade development. The Ministry of Agriculture is the implementation agency of the transformation effort and will host a soybean implementation team. The soybean development team will be made up of:

1. A team leader for overall programmatic design and implementation of the soybean value chain project.
2. An Investment/finance specialist responsible for coordinating, in collaboration with SMTDC, an investment/finance package for value chain development.
3. A Policy, M&E, Capacity building specialist responsible for preparation of a package of policy, capacity building and monitoring and evaluation, in support of value-added chain development activities.
4. A market and trade specialist responsible for coordination of market and trade development and the establishment of industry standards.
5. An agro-processing specialist responsible for coordination of efforts to identify/develop small and medium scale capacity for the target value chains.
6. Four production technology transfer specialists including an agronomist responsible for coordination of demonstration, dissemination, and adoption of existing improved soybean production packages, and the development of new technology packages to increase productivity; will also be responsible for building seed multiplication schemes
7. A variety development specialist to coordinate efforts to identify existing varieties that best satisfy variety demands of target value-added chain and develop field-based and biotechnology improvement programs to improve varieties targeted to selected value-added chains.
8. Four Food technologists responsible for coordination of efforts to disseminate home level utilization for an economical way to improve nutrition of the entire family with special attention given to pregnant and nursing women and children