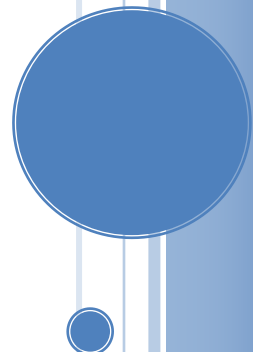


RICE SEED DEVELOPMENT STRATEGY OF NIGERIA

**FEDERAL MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
REVISED JUNE2014**



Executive Summary

Rice is an important strategic food commodity in Nigeria, being one of the largest rice consuming countries in the world. Nigeria's food security is intricately linked to its developments in rice value chain. Rice Transformation Agenda (RTA) is a major vehicle through which the National Rice Development Strategy (NRDS) is implemented in Nigeria. Nigeria's National Rice Development Strategy (NRDS) desires to boost local paddy production by 3.9 fold between 2007 (3.4 million tons) and 2018 (13.265 million). One of the major strategic elements envisaged under NRDS is increased availability of quality rice seeds. This document outlines the various approaches through which the rice seed value chain shall be strengthened.

Formal seed production of popular rice cultivars in Nigeria is presently done in 3 different phases. First the breeder seed is produced by multiplying the stocks of nucleus seeds sourced from the National Cereals Research Institute (NCRI) and Africarice, these seeds are then multiplied to produce foundation seeds from which certified seeds are produced. While the breeder seeds and some quantity of foundation seeds is produced by National Cereal Research Institute (NCRI), the foundation- and certified seeds are largely produced by licensed private seed producers and Community Based Organizations (CBOs). The quality of seeds produced through these phases are inspected and certified by National Agriculture Seed Council (NASC).

One of the major interventions under ATA includes the Government's Growth Enhancement Support Scheme (GESS which was initiated to deliver subsidized farm inputs directly to the farmers using their mobile phones. Under GESS the farmers receive e-wallet vouchers which they use to redeem fertilizers and seed from private agro dealers. The GESS program has increased not only the farmers' knowledge on the importance of using certified seeds but also the purchasing power for inputs,¹ thus increased the adoption rate over the past few years. The redemption centers usually located in the farmers neighborhood where often popularize through the mass media. Despite the remarkable increase of the use of certified seed by GESS, however, the adoption rate of formal seeds is still approximately 20% among rice growers because of limited unavailability and inaccessibility. The majority of rice farmers therefore depend on informal seed production system whereby a portion of paddy grains produced from their fields are used as seeds for the subsequent season. Since the quality of such informally produced seeds suffer from poor genetic integrity, admixtures and low viability; it is largely believed that the productivity of crop raised from such informal seeds is substantially lower than that from seeds produced under the formal system

¹ Under GESS, certified seeds are distributed for free while the fertilizer is subsidized by 50% of the price. Increased use of fertilizer resulted in increased return from the use of certified seeds, thus demonstrated the effect of certified seeds.

Quality assurance is regarded as most critical challenge Nigeria faces. Nigeria has good quality control mechanism that is composed of right and strict procedures and high quality standard aligned to that of ECOWAS. However, some seed producers, inspectors and certifiers do not have sufficient capacity to perfectly differentiate off-types, this results in the prevalence of sub-standard seeds, even though there is proper traceability mechanism in place but sometimes some of the farmers are reluctant to report to the appropriate authorities. Awareness creation for proper reporting system through the various states ADPs will be given attention in this strategy. Therefore varietal catalogue will be made available to both the inspectors and seeds Producers. While the involvement of private seed companies in Nigeria's rice seed sub sector has recently gained momentum due largely to the introduction of GESS, however the delay in the enactment of national seed law and promulgation of national seed policies has created dilemmas on the roles and scopes of local and regional trades and volumes of locally produced seeds. Due to the weakening of Agriculture Development Programs (ADPs) in several rice growing states, the coordination between the various stakeholders along the rice seed value chain has become less tenable as the planning process for efficient seed production and supply has suffered.

Awareness creation programs and training of seed users, seed producers and seed inspectors are not sufficient enough to boost the demand for quality seeds. Inadequate public and private investments in establishing the logistics have further reduced the efficiency of supply and marketing of quality rice seeds. The inefficient communication channel between the public and the private stakeholders engaged in certified rice seed production and distribution has led to the slow pace of progress made so far, whereby NASC forecasted a higher demand for certified rice seeds for GESS to private seed companies in 2012, FMARD purchased only a significantly small proportion of the forecasted amounts in 2013 leading to a glut in some private certified seeds producing companies. Therefore ensuring that the private seed producers are part of the weekly GESS planning meeting is advocated.

The proposed strategy for developing rice seed sub sector intends to raise the users of formal rice seeds to 40% from the present 20% by improving the availability, accessibility and affordability under the formal seed systems, being aligned to the RTA action plan in its basic approaches including the target areas and focuses.

Since rice is grown under diverse ecosystems in Nigeria, different strategic approaches shall be adopted. The incremental amount of seed is expected to be used in irrigated ecosystem (50%), rain-fed lowland (35%) and rain-fed upland (15%), and a private based seed production and distribution system shall be solicited for the market oriented rice production environments under irrigated ecosystems. While a mix of both the Community Based Seed System (CBSS) and private based seed production and

distribution system shall be reckoned for the rain fed lowland and rain fed upland production environments.

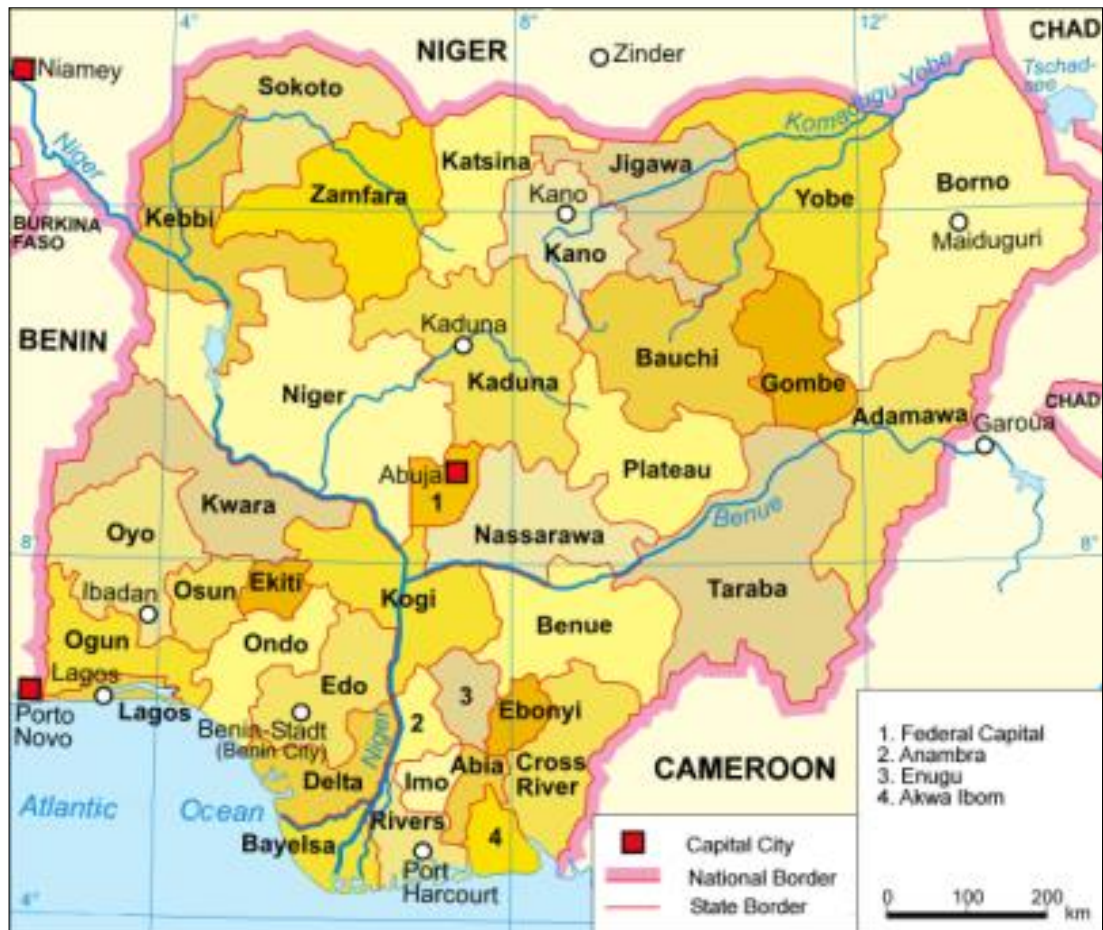
The strategy aspires to improve the roles of public institutions in breeder and foundation seed production; varietal maintenance (preservation of germplasm); varietal development through building human and financial capacities, establishing the required infrastructure for varietal development, and storage, and methodical planning.

Seed quality assurance is another critical aspect the strategy pays strong attention to. The strategy suggests strengthening the capacity of producers and inspectors for seed quality assurance through training and improvement and distribution of variety catalogues. In addition, the awareness creation will be emphasized on the reporting of sub-standard seeds, so that adulteration will be prevented, in combination with traceability system and punishment measures.

In addition, the strategy emphasizes facilitating private company based breeder, foundation and certified rice seed production and marketing through training technical skills in managing their internal quality control, and expanding private sector's access to finance, accreditation of national seed testing laboratories and modern technologies. Where appropriate, leveraging on public-private partnerships (PPP) in developing infrastructures for irrigation, storage, processing and marketing, and the enactment of favorable policies shall improve the production and supply of quality rice seeds.

Improving technical and business management skills of community based seed production and distribution systems shall improve the flow of quality seeds from Cooperatives, Non Government Organizations and entrepreneurial farmers. Regular training programs for all registered seed producers, incentives for production and marketing of seeds will be emphasized. Awareness creation, extension services, incentives (based on the priority needs of the production area), expansion of agro-dealer networks to the village level even though expensive logistically will be encouraged, improved coordination and planning at grass root levels will be emphasized to drive the shifting of rice growers towards a more formal and certified seed system from informal seed system. It is conceivable that the proposed strategies shall help raise productivity and thereby help achieve the goal of more than tripling the rice production; as envisaged under Nigeria's NRDS and RTA.

Map of Nigeria²



Acronyms and abbreviations

- ADP: Agricultural Development Program
- ATA: Agriculture Transformation Agenda
- AGRA: Alliance for a Green Revolution in Africa
- CARD: Coalition for African Rice Development
- CBO: Community Based Organization
- CVRC: Crop Variety Release Committee
- ECOWAS: Economic Community of West African States
- FAO: Food and Agriculture Organization
- GESS: Growth Enhancement Support Scheme
- GPS: Geo-Positioning Satellite
- FMARD: Federal Ministry of Agriculture and Rural Development
- MTRM: Monthly Technical Review Meetings
- NASC: National Agricultural Seed Council

² Source: en.wikipedia.org/wiki/Nigeria

NACGRAB: National Center for Genetic Resources and Biotechnology
NCRI: National Cereals Research Institute
NEEDS: National Economic Empowerment and Development Strategy
NIRSAL: Nigeria Incentive Based Risk Sharing for Agricultural Lending
NRDS: National Rice Development Strategy
NSS: National Seed Service
NGO: Non-Government Organization
PRSP: Poverty Reduction Strategy Paper
RIFAN: Rice Farmers' Association of Nigeria
RTA: Rice Transformation Agenda
SCPZ: Staple Crop Processing Zone
SSCC: State Seed Coordination Committee
SEDAN: Seed Entrepreneur Association of Nigeria
SPEAR: Seed Policy Enhancement Project in Africa Region
WAAPP: West Africa Agricultural Productivity Program
WASP: West African Agricultural Seeds Program

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1. Introduction

Nigeria is one of the few African countries where rice is traditionally cultivated and improved rice varieties were introduced in Nigeria as early as 1970s³.

Subsequently both the production and consumption of rice has steadily been increasing in Nigeria. Available data suggests that paddy production has increased from 4.179 million tons in 2008 to about 4.567 million tons in 2011. This increase appears due mainly to a corresponding increase in area under production from 2.382 million hectares in 2008 to about 2.579 million hectares in 2011 (table 1). Hence the national average on-farm yield of rice crop has remained low at 1.8 t/ Ha.

Table 1: Recent trends in rice production in Nigeria (FAO⁴)

	2008	2009	2010	2011
Area (Ha)	2,382,000	1,836,880	2,432,630	2,579,540
Production; paddy (t)	4,179,000	3,546,250	4,472,520	4,567,320
Yield (t/Ha)	1.8	1.9	1.8	1.8

Nigeria is the largest rice consuming country in Africa⁵. USAID predicts that at a consumption rate of 35 Kg/person/per year; Nigeria would require about 6 million tons of milled rice per year. The gap between production and consumption had recently rendered Nigeria as one of the largest rice importers in the world in 2012⁶, with imports amounting to over 3.0 million tons in 2011-12; sourced mostly from countries such as Thailand, India, Brazil and United States.

Rice in Nigeria is predominantly produced by smallholder farmers under rain fed and irrigated environments. About 77% of the total rice area is under rain-fed, of which 47 percent are classified as lowland and 30 percent as upland⁷. The remaining area under rice cultivation is irrigated with supplementary water resources. A few farmers occasionally grow rice also under deep water and mangrove swamp ecologies.

Since rice crop covers about 10.6% of the cultivable land area of Nigeria and consumed widely by the rural and urban population; rice farming represents an important avenue for income generation and rural employment. Estimates suggest that more than 90% of the rice is produced by resource poor small-scale farmers, and about 95% of processors are small-scale rural entrepreneurs⁸. Rural women play more proactive roles in rice

³ Akande T (2010) An overview of the Nigerian rice economy (2010)

⁴ FAOSTAT (2013) Recent trends in rice production in Nigeria

⁵ USAID (2010) Rice Investment and Processing In Nigeria

⁶ USDA (2014) World Agricultural Supply and Demand Estimates; WASDE - 526

⁷ FAO (2013) Analysis of incentives and disincentives for rice in Nigeria

⁸ Federal Ministry of Agriculture and Rural Development (2010) National Rice Development Strategy

sector by engaging in production and processing of rice. Hence the development of rice sector as an important strategy for food security and poverty alleviation is amply recognized by the government and development partners in Nigeria.

In 2010, Nigeria formulated National Rice Development Strategy (NRDS) to improve the efficiency of rice value chain. It aims to increase paddy production from 3.4 million tons in 2007 to 13.27 million tons by 2018. The major strategic thrust areas outlined in the strategy include development of (i) seed production; (ii) inputs supply system for seeds, fertilizer and farming equipments; (iii) processing and marketing; and (iv) irrigation infrastructure. Such NRDS elements are in good alignment with the overarching strategies of the Agriculture Transformation Agenda (ATA) envisaged by the government of Nigeria. Hence NRDS is broadly implemented through the ATA framework; under which Rice Transformation Agenda (RTA) is drawn. The action plans for rice value chain transformation of RTA is largely drawn upon the strategic approaches outlined under NRDS.

Under a regional initiative on developing rice seed production and supply systems in Sub-Saharan Africa, the Coalition for African Rice Development (CARD) has identified Nigeria as one of the 10 target countries. This document explores the challenges and constraints in the production and supply of seeds that will help achieve the goals of the Agriculture Transformation Agenda (ATA) through which the NRDS is implemented, it also identifies the gaps, and sets targets and strategic interventions that shall lead to development of rice seed sub-sector.

2. Review of National Rice Seed Sector

2.1. Legislation, Policy, Institutions and Planning Aspect

Nigeria's formal efforts on streamlining the seed sub-sector started as early as 1975; by institutionalizing the production and supply of seeds under National Seed Service (NSS). NSS was responsible for production of foundation- and certified seeds; and yet was also involved in certification of seeds. With increase in awareness and demand for improved seeds from the various Agricultural Development Programs (ADPs) instituted by the various State governments; NSS could not adequately meet the expectations.

Subsequently in 1992, the Ministry of Agriculture declared National Agricultural Seed Decree⁹; which established provisions for setting up a 'National Agricultural Seed Council (NASC)'. NASC is responsible for administering the inspection, certification and overall quality control of seeds supplied in the country. The Ministerial decree of 1992 also provided the legal framework for national seed policies which were formulated in 1992. The national seed policy outlines guiding principles on re-orientation of institutions

⁹ National Agricultural Seeds Decree (1992) Supplementary to Official Gazette No. 71, Vol. 79, 31st December 1992

engaged in production and quality control, varietal development, and encourages private sector participation in the seed sub-sector. Following the transformation of NSS into NASC, these became obsolete. The national seed policy is presently being reviewed with technical consultations from Food and Agriculture Organization (FAO) and Bill and Melinda Gates Foundation through Seed Policy Enhancement Project in Africa Region (SPEAR).

In 2008, the government of Nigeria formally committed to the integration of its national seed policies with that of Economic Community of West African States (ECOWAS) by signing 'regulations¹⁰ on harmonization of rules governing quality control, certification and marketing of plant seeds and seedlings in ECOWAS region'. This regional agreement has facilitated compliance of Nigeria's current national seed regulations on production, certification and varietal release with that of the region; and has thus broadened the scopes for regional trade on seed¹¹. Subsequently the government of Nigeria is presently engaged in drafting a new national seed policy and has tabled the revised Ministerial decree of 1992 for approval in the upper house (senate) of national parliament. Upon presidential assent of the bill, the new seed law shall pave ways for effective implementation of the harmonized seed policies.

Support to seed sub-sector in Nigeria is received through such initiatives as West Africa Agricultural Productivity Program (WAAPP), West African Agricultural Seeds Program (WASP), SPEAR (Bill and Melinda Gates Foundation) and Seed Support Program by Alliance for a Green Revolution in Africa (AGRA). Through rice value chain activities under ATA; rice farmers in different rice growing states receive support. Under the RTA; seeds of improved varieties are distributed to rice farmers through the Growth Enhancement Support Scheme (GESS) in collaboration with ADPs of rice growing states. With the GESS program there is transformation of about 60-70% of the registered farmers who now have good knowledge about formal seeds and are willing to renew their seeds whenever they are available. Due to 100% subsidy on certified seeds through the GESS program and the intensive campaign of the benefit of formal seeds by the government through the electronic media, the production and the use of formal seeds has increased over the past few years as can be seen in Table 4. Even though most farmers used informal seeds in the past due to lack of awareness and unavailability, inaccessibility and unaffordability of the formal seeds, the circumstance has changed by the introduction of the GESS program, and adoption rate of certified rice seed increased to approximately 20%.

Presently the states engaged in rice production do not draw annual plans for seed production on a regular basis giving rise to the inconsistencies that exist between demand and supply especially regarding certified seeds. Furthermore, such plans are subject to vagaries in budget allocation by the federal and state governments for seed production.

¹⁰ ECOWAS (2008) C/REG.4/05/2008 Sixtieth Ordinary Session of the Council of Ministers

¹¹ National Agricultural Seed Council (2009) National harmonized seed rules and regulations

The key stakeholders engaged in rice seed value chain are shown in table 2. National Cereals Research Institute (NCRI) is responsible for the production of breeder seeds of public varieties. AfricaRice also play a major role in producing and supplying most of the popular improved varieties in Nigeria. Registered private Seed Companies with the requisite facilities shall engage in foundation and certified seed production. Certified seeds are also produced by Community Based Organizations (CBOs) and cooperatives under the guidance of ADPs. NASC is responsible for inspection and certification of all classes of seeds produced and supplied in the country. In addition, NASC also analyzes and formulates programs, policies and actions regarding development of the seed industry. These include research on issues relating to seed testing, registration, release, production, importation, marketing, distribution, certification, quality control, supply, use and exportation of seeds in Nigeria.

Table 2: Institutions and/or Departments responsible for rice seed production, inspection and supply:

		Name of institutions	Roles/ Responsibility	Legislations/ Policies determining responsibility	Remarks
Overall	Production	Mandate Research Institutes (NCRI), AfricaRice Private seed companies NASC	Production of breeder- & foundation Seeds Production of foundation- and certified seeds Planning, coordination, supervision	National Agricultural Seeds Decree (1992) National Harmonized Seed Rules and Regulations 2009	
	Inspection	NASC	Regulatory, supervision and coordination, of the whole process of production, quality control and certification		
	Supply/ distribution	NCRI, AfricaRice and private seed companies NASC	Direct distribution of seeds to users Coordinates the distribution of all classes of seeds in the country		
Breeder Seed	Production	NCRI, and AfricaRice	Production of breeder seeds		

		NASC	Planning, coordination, supervision and seed promotion.		
	Inspection	NASC	Quality control and certification		
	Supply/distribution	NCRI, and AfricaRice NASC	Breeder seed sales/Distribution to companies licensed to produce FS Coordinates the sales/Distribution of breeder seed		
Foundation Seeds	Production	NCRI, AfricaRice and Licensed/Accredited private seed companies NASC (public)	Production of foundation seeds Planning, coordination, supervision and seed promotion		
	Inspection	NASC	Quality Control and Certification		
	Supply/distribution	NCRI, AfricaRice and Licensed/Accredited private seed companies NASC	Direct distribution/Sales of foundation to certified seed producers Coordinates the sales/Distribution of foundation seeds produced by public institutions		
Certified Seed	Production	Seed companies, Community Based Organizations, Cooperatives NASC	Production of certified seeds Planning, coordination, supervision and seed promotion		
	Inspection	NASC	Quality control and certification		
	Supply/distribution	Seed companies Agro dealers	Seed sales/Distribution to the farmers and agro dealers (under the GESS) Distributes the seeds to farmers		

		Supply chain Managers	(under the GESS) State level coordination of the seeds distribution to farmers (under the GESS) – maps farmers (beneficiaries) & redemption centers for subsidized seed distribution		
		NASC	Coordinates the overall process of Seed distribution		

Table 3: Budget allocation for seed production/procurement from NCRI

Currency: (Approximate exchange rate: USD 1 =)					
	2009	2010	2011	2012	2013
Breeder Seed				5.97m	2.97m
Foundation seed					
Certified Seed					

2.2. Production

Breeders seeds (G0) of improved varieties are largely produced at NCRI headquarter. The NCRI sub stations located at Badeggi (Niger state) and Yandev (Benue State) cover North Central rice production zones. Sub-station located at Ibadan (Oyo state) covers rice production areas in South West. The Amakama station located in Abia state covers South East, while the substations in Uyo (Akwa Ibom State) and Warri (Delta State) cover South-South production zones. The NCRI sub- station in Birnin Kebbi (Kebbi State) cover rice production areas in the North West zone. In addition, the government of Nigeria also procured breeder seeds of improved varieties from AfricaRice in 2010 and 2011. Table 4 shows that the total production of all the breeder, foundation and certified seeds of rice varieties has increased significantly in the last 3 years.

Table 4: Current production (or procurement), location, and cultivated area of rice seed in Nigeria

	Total production/ procurement amount (MT)	Name of production stations	Production amount per station (MT)	Cultivated area per station (ha)
Breeder Seed	10	NCRI H/Q at Badeggi,		
Foundation Seed	311	AfricaRice	32.6	
		NCRI	86.4	
		Private Companies	192	
Certified Seed	18,850	CBO's (ADP's);	1,209	
		Cooperatives		
		Seed Companies	17,641	

<Year 2012>

	Total production/ procurement amount (MT)	Name of production stations	Production amount per station (MT)	Cultivated area per station (ha)
Breeder Seed	23	NCRI, Badeggi	15	
		AfricaRice	8	
Foundation Seed	234.6	NCRIs	37.4	
		ADPs/CBOs	184.7	
		NASC	4.5	
		Seed Companies	8	
Certified Seed	6,829.7	Seed Companies	5640.6	
		ADP's (Public; including projects)	636.1	
		CBO's (Private Out-growers)	553.0	

<Year 2011>

	Total production/ procurement amount (MT)	Name of production stations	Production amount per station (MT)	Cultivated area per station (ha)
Breeder Seed	7.880	AfricaRice	1,380	
		NCRI	6,500	3
Foundation Seed	327.94	NASC Reg. Offices	327.94	
Certified Seed	2,155.18	Seed Companies	1,403.07	
		ADP's	766.08	
		CBO's	167.20	

<Year 2010>

At NCRI, breeder seeds are generally produced by sourcing the seeds from both NCRI and AfricaRice. Foundation seeds (G1-G2) are multiplied from breeder seed by a range of entities including NCRI, licensed private seed companies and occasionally by ADP based activities/projects/schemes. Certified seeds (R1) are produced from foundation seeds by registered seed companies, community based organizations (CBOs) and farmer cooperatives. NCRI is generally not involved in production of certified seeds. NASC undertakes field inspection, seed testing and certification of all classes of rice seeds produced in the country.

Rice varieties that are available to farmers for cultivation in Nigeria generally are national public varieties. Several land races (unregistered varieties) of *Oryza glaberrima* are also cultivated by rice farmers in Nigeria. However the seeds of such land races are not covered under the formal seed production systems. The varieties that are officially recommended for cultivation by the government are shown in table 5. Although the rice produced by rice farmers is consumed by farmers' families; farmers also set aside a portion of their production for market. Thus rice is generally grown as a food- and cash crop.

Table 5: Agro-Ecological based cultivated areas and varieties of rice seed production

Agro-Ecological Zones	Name of Varieties	Seed Category (Market and/or Subsistence)
Irrigated Lowland	FARO 44	Market and Subsistence
	FARO 52	Market and Subsistence
	FARO 60	Market and Subsistence
	FARO 61	Market and Subsistence
	FARO 57	Market and Subsistence
Rain-fed Lowland	FARO 44	Market and Subsistence
	FARO 52	Market and Subsistence
	FARO 60	Market and Subsistence
	FARO 61	Market and Subsistence
Rain-fed Upland	FARO 55	Market and Subsistence
	FARO 58	Market and Subsistence
	FARO 59	Market and Subsistence

National Agricultural seed policy encourages private seed companies' participation in varietal development, varietal testing and production of breeder, foundation and certified seeds. Presently however, the private companies are not engaged in production of breeder seeds of rice varieties. Syngenta Nigeria Ltd. is however presently conducting evaluation of its own inbred and hybrid rice varieties in Nigeria. A few private seed companies are licensed to produce foundation seeds of public varieties. Several local and international seed companies are involved in the production of certified seeds.

2.3. Quality Control

1. In the area of quality control NASC has set up high quality standard that is aligned to ECOWAS seed standard and appropriate and strict seed production and inspection procedures. NASC also has a good traceability system with the use of seed tags containing all the basic information which enable NASC to trace producers and inspectors who are in charge of respective seeds in the market. Nigeria also has a good reporting system on low-quality certified seeds where farmers report to the ADP staff at the village level, when farmers found sub-standard seeds, and ADP communicate with NASC to trace back the seed chain to identify those who are responsible for sub-standard seeds. Despite the existence of good quality control measures, seed traceability and reporting systems, sub-standard seeds still persist in the markets because; (i) some farmers do not know the existence of reporting system on sub-standard seeds, while other farmers simply do not bother to take time to report due to the mistrust on the effectiveness of the reporting system, and (ii) those that have the knowledge of whom to report usually fail to do so ascribing their loss as a risk which a farmer must bear.
2. Some seed Producers and inspectors lack the capacity to perfectly tell the differences among the

varieties due to the fact that the variety catalogue used by NASC does not contain necessary information on varietal characteristics.

2.3.1. Methods

NASC is responsible for the overall supervision of seed quality control and seed inspection in the country. It has a total of seven stations equipped with seed testing laboratories. These stations are spread across the country to effectively serve the seed inspection and certification in the different production zones. NASC also analyzes and formulates seed programs, policies and actions related to research and quality control.

NASC also emphasizes that the private seed companies engaged in foundation seed production should have ‘internal quality control mechanisms’ for effective liaison with NASC. Besides minimizing the workload, such mechanisms also help improve the timeliness of certification by NASC.

The minimum purity standards set by NASC which has been harmonized according to ECOWAS regulation for all the three classes of rice seeds is presented in (table 6).

The varietal characteristics of all the rice varieties released by the government of Nigeria are verified during seed production.

Table 6: Minimum purity standard of rice seeds in Nigeria

	Purity Standard	Varietal purity test	% specific purity
Breeder Seed	99.9%	99.9%	98
Foundation seed	99.9%	98%	98
Certified Seed	99.7%	98%	98

NASC follows the methods and procedures prescribed by Organization for Economic Co-operation and Development (OECD) for rice seed production while inspecting the fields and harvested seeds. One of the major regulatory prerequisite that is observed during field inspections involves rouging of off types in the seed production plots. The off types are usually removed to prevent out-crossing and mechanical mixtures. Isolation distance is also usually observed during field inspection to prevent physical mixing during the harvest of foundation and certified seeds. Certification of the seed production fields are authorized by NASC at the start of the season after inspecting such fields; wherein cropping history and use of limited generation of rice seeds are observed in order to avoid over recycling of seed lots of the given rice variety by the seed producers. The agronomic methods and managerial procedures for rice seed production and maintenance of rice seed purity are summarized in table 7.

Table: 7 Procedure and methods of on-plot seed inspection followed by NASC

	Organizations/ institutions in charge of inspection	Frequency and timing of Inspections	Items for Inspection	Inspection Methods	Quality Standard for Inspection
Breeder Seed	National Agricultural Seeds Council (NASC)	Minimum of 2 (depending on the crop) Timing: Pre-Planting, Planting Stage (Flowering State), Vegetative Stage, Pre Harvest Stage, Harvesting Stage.	Growth condition	Observation Sampling	Standard set in the Certification manual
			Weed condition	Observation	
			Pests and disease condition	Observation	
			Existence of Off-type and removal	Observation Counting	Maximum off type 0.05%
Foundation Seed		Minimum of 2 (depending on the crop) Timing: Pre-Planting, Planting Stage (Flowering State), Vegetative Stage, Pre Harvest Stage, Harvesting Stage.	Growth condition	Observation Sampling	Standard set in the cultivation manual
			Weed condition	Observation	
			Pests and disease condition	Observation	
			Existence of Off-type and removal	Observation Counting	Maximum off type 0.05%
Certified Seed		Minimum of 2 (depending on the crop) Timing: Pre-Planting, Planting Stage (Flowering State), Vegetative Stage, Pre Harvest Stage, Harvesting Stage.	Growth condition	Observation Sampling	Standard set in the cultivation manual
			Weed condition	Observation	
			Pests and disease condition	Observation	
			Existence of Off-type and removal	Observation Counting	maximum off type 0.3%

NASC has published ‘seed production manual’ for the producers and ‘seed certification manual’ for the inspectors outlining the procedures and methods to be followed. Inspection of harvested seeds is done by sampling the seed lots and subjecting them to testing in NASC’s seed testing laboratories. The procedures and methods of inspecting harvested seeds are separately published as ‘seed testing manual’. The key items of

inspection and the method employed by NASC for all the classes of rice seeds are summarized in table 8.

Table: 8 Procedure and methods of harvested seed inspection in Nigeria

	Organization s/ institutions in charge of inspection	Items for Inspection	Inspection Methods	Quality Standard for Inspection
Breeder- Foundation and Certified Seeds	National Agricultural Seeds Council (NASC)	Germination rate	Determination of Germination rate which done in the seed testing labs	Minimum acceptable 90 %
		Purity Rate	Determined in the seed testing lab by seed analysts. The determination may be on whole submitted sample for purity test and is made by count and expressed as numbers of Seeds found in the quantity examined or in %basis. Sample testing. working samples are taken from randomly collected samples and checks for other crop seeds, weed seeds and inert materials	99% or above
		Contamination by other varieties	Observation Sample counting Randomly pick pieces of plots and count the contaminated hills	2% or less
		Contamination by other species	By GOT- (Grow out test)	1% or less
		Contamination by pests and diseases	Observation, Chemical test: Check the virus and diseases	1% or less

2.3.2. Human Resources

NASC organizes training programs for seed producers and inspectors in Nigeria. Although inconsistent and often irregular due largely to budget constraint; the training program for seed producers involves training of trainer approach. The direct beneficiaries of such training include seed production technicians/officers and internal quality controllers of private seed companies, and lead out-growers of rice seeds under state ADPs. The secondary beneficiaries of the training involve other producers engaged under GESS, CBOs and Cooperatives. Basic production issues such as isolation distance, roguing, pests and disease identification and control, physiological maturity for harvesting, use of geo-positioning satellite (GPS) technology, fertilizer usages and other good agricultural practices (GAP) are covered under such training programs.

Training for inspectors engaged in certification processes is done twice a year. The training programs provide description of varieties, inspection protocols, identification of pests and diseases during field inspection and seed sampling methods. In addition, key parameters influencing quality control measures at processing and storage, and laboratory testing protocols for examining purity, moisture content, germination, seed vigor and seed health are also elaborated. The beneficiaries of the training program include both the public sector seed inspectors and internal quality control officers of private seed companies.

Despite these training opportunities, some seed producers and inspectors lack the capacity to perfectly tell the differences among some varieties. This is partially because the variety catalogue used by NASC does not contain necessary information on varietal characteristics. Also the timing of such trainings often coincides with mid-season and post-harvest season of seed production, thus making it difficult for trainees to participate in training programs.

2.4. Supply

Both public and private institutions are engage in supply of rice seeds to farmers. In recent years, seeds are distributed at free of cost by the federal government of Nigeria under the subsidy package involving fertilizers. Since 50% of fertilizer costs are subsidized by federal and state governments (25% each); farmers have to pay 50% of the fertilizer cost at the redemption centers¹² to collect fertilizers. Through such redemption centers, seeds are supplied by the government. Private seed companies, CBOs and Cooperatives are the major sources of the seeds. Beside supplying seeds through the public programs, the private seed companies also supply seeds through independent agro-dealer networks, while the CBOs and Cooperatives supply seeds through development projects organized by development partners, Non-Government Organizations (NGOs) and ADPs.

¹² At the redemption center the farmer present his voucher number to the redemption officer, the officer cross check the authenticity of the number and then release the inputs to the farmer

On a seasonal basis, the ATA-Rice Value Chain program plays a major role assessing the needs of seeds, suitability of cultivars and availability of stocks, and coordinates the sourcing of certified seeds from private seed companies, CBOs and Cooperatives with the supply chain managers of the GESS program. Agro-dealers who supply seeds and fertilizers to farmers through the redemption centers are important stakeholders along the supply chain of seeds; as they create close rapport with seed users (farmers) and accentuate the demand for quality seeds on a competitive basis. However, most of the agro dealers have their outlets only in the major cities, with little presence in rural areas, thus causing inaccessibility for rural rice producers. Therefore village based agro dealership shall be encouraged. The key stakeholders involved in the distribution of rice seeds are shown in table 9.

Table: 9 Stakeholders in seed supply chain

	Market varieties	Roles played
Breeder seed Production/ procurement	NCRI, FMARD through the NASC	Production of breeder seed Procurement of breeder seed in the case of shortage
How it is supplied to foundation seed producers	NCRI Sub-stations, NASC	Foundation seed producers buy directly from NCRI and in most cases the NASC takes possession of what was produced and allocate to seed Companies who produce foundation seed
Foundation seed Production	NCRI Sub-stations, Private seed Companies	Produce foundation seed
How it is supplied to certified seed producers	NCRI, NASC, Private seed companies	Distribution of foundation seed for certified seed production
Certified seed production	Private seed companies, ADPs, CBOs, Cooperatives	Produce certified seed

Presently, a few platforms and forums exist in Nigeria through which the various stakeholders under rice seed sub-sector hold dialogues on issues and policy options. These include Rice Farmers' Association of Nigeria (RIFAN) and Seed Entrepreneur Association of Nigeria (SEDAN). At the state level, State Seed Coordination Committees provide a direct linkage between the stakeholders at state and federal level. In addition, NASC coordinates seed plan meetings at federal and state levels on an annual basis. These forums create a viable avenue for the stakeholders to discuss the various opportunities, challenges and constraints along the rice seed value chain at grass root

level. Nigeria Rice Corporation and Nigeria rice council also provides additional forums for all stakeholders to discuss and formulate policies on rice sub-sector.

The sales price of seeds (Table 10) is determined primarily based on the cost of production and the dynamics of supply and demand for the various rice varieties. Other costs that indirectly influence cost of rice seeds include management costs, taxes, insurances, maintenance/storage costs, and currency depreciation. Although the sales prices are subject to prevailing market forces; it is the government who procures most of the seeds produced in the country and the seed is given free of charge as subsidy to the registered farmers under the GESS, hence the tremendous success the program has enjoyed since inception. Thus the time and purchase volumes of the federal government indirectly influence the prices in the open market. In general, most of the rice farmers do not renew their seed stocks as they often use the saved portion of the harvest from the previous season. However, with the annual supply of seeds through the government's GESS program; the registered farmers renew their seeds whenever they become available under the GESS program.

Table:10 Purchase price from seed multipliers and sales price of certified seed

Currency: (Approximate exchange rate: N130 =1 USD)			
	Name of Varieties	Purchase price	Sales price
Irrigated Lowland	FARO 44	1562.5	
	FARO 52	1562.5	
	FARO 60	1562.5	
	FARO 61	1562.5	
Rain-fed Lowland	FARO 44	1562.5	
	FARO 52	1562.5	
	FARO 60	1562.5	
	FARO 61	1562.5	
Rain-fed Upland	FARO 57	1562.5	
	FARO 58	1562.5	
	FARO 59	1562.5	

(Information from the year of (2013))

3. Challenges in National Rice Seed Sector

3.1. Legislation, Policy, Institutions and Planning

The long standing bill that proposes enactment of a new seed law that renews and empowers the Ministerial decree of 1992 was passed into law by the senate of the Federal Republic of Nigeria, it was however returned to the Senate before presidential assent for a few amendments especially the inclusion of stiff penalty for offenders which is aimed at discouraging malpractices in the seed industry. This has therefore delayed the revival of national seed policies that shall enable the various stakeholders to fully explore their scopes and limitations. The institutionalization of seed policies has also hence become less certain to the stakeholders as formal institutions engaged in seed sub-sector lack empowerment. These challenges have partially contributed to the weak implementation of national seed policies. Moreover, changes in governments at the state and federal level have led to inconsistencies in the understanding of policies and their impact on the target beneficiaries. Such changes also leave the sustainability of the momentum created by the present ATA on rice seed production and distribution uncertain; hence the campaign is needed to legislate the GESS program and others like NIRSAL which have revolutionized the Agricultural sector in the last few years.

Presently, national strategy outlining the various approaches by which the seed sub-sector shall be coherently developed has not yet been formulated. While the local private seed companies are encouraged to engage in seed trade, the lack of accreditation of national seed testing laboratories has hindered the opportunities for the national and international seed companies to actively participate and expand their businesses in the region. Following the discontinuation of World Bank's support for ADPs, the extension network has caved in; and hence their important roles in training CBOs and Cooperatives in seed production have stagnated. The lack of awareness amongst rice farmers on the importance of the usage of quality seeds on the crop productivity has led to low adoption of rice seeds produced under the formal seed production system. In the absence of government interventions through GESS, there had been very low adoption of quality seeds by rice farmers in Nigeria in the past.

The inadequate technical capacities of NCRI and NASC have long remained a major challenge for the development of Nigeria's rice seed sub-sector. Lack of appropriate and adequate infrastructures such as glass/screen houses, seed storage facilities, and seed/variety testing equipments is impeding the quality of production and supply chains of rice seed. This is mainly due to inadequate allocation of budget for upgrading seed production and testing facilities. The sudden increase in the need for higher volumes of quality rice seed for distribution through GESS has hence heightened the dependence of the government on AfricaRice for the production of breeder and foundation seeds.

The absence of clear data on the demand for quality rice seeds in various parts of the country has affected the professionals engaged in breeder and foundation seed production. The lack of accurate projections on demand has caused problems at supply

end. For instance, NASC communicated a very high projection of seed requirement to the private seed companies for 2013, and based on the demand projection, one of the private seed companies produced as high as 8,000MT of certified seeds. However the government through RTA purchased only 400MT from that company and most produced seed became stock. The inconsistency in budgeting for breeder, foundation, and certified seeds production has also affected the planning process of the stakeholders in the rice seed sub-sector. The seasonal procurement of seeds by GESS which depends on the annual targets for fertilizer distribution does not reflect the actual demand. Furthermore, since the annual planning and budgeting of seeds under GESS are subject to fund allocation from the federal and state governments, the planning and budgeting by the public and private seed producers are subject to large variations.

Although 187 private seed companies are registered in Nigeria, only 63 companies are licensed. The remaining registered companies are waiting for accreditation by NASC. Several of these companies do not have a clear understanding of the pre-requisites that a seed company must fulfill in order to be licensed. In the absence of any special provision of finance, the private seed companies find it difficult to access finance. The reliance of private seed companies on commercial banks for credit constantly exposes the private seed companies to financial risks due to high interest charged by the commercial banks; therefore the setting up of the Nigeria Incentive Based Risk Sharing for Agricultural Lending (NIRSAL) is a welcome development.

Penalty against adulteration is another issue. Currently the penalty for production and distribution of sub-standard rice seeds is the fine of five thousand Naira (N5, 000) and it is not severe enough to discourage malpractices in the seed industry. The proposed new seed law will fix this, once it is enacted.

3.2. Production and Quality Control

Because of the recent surge in need for seed production and distribution through GESS; several sites where paddy seed production is presently being managed are not of appropriate soil type and fertility status. Site selection based on cropping history and ecological system is not being observed in some areas. Some seed producers do not strictly adhere to the recommended agronomic practices such as application of pre-emergence herbicides, leveling of land, roguing of off-types and isolation distance. In some seed production sites; broadcasting of seeds is practiced instead of row planting. Quality control is still a critical challenge. Firstly, there are only 35 inspectors for the entire country, even though NASC has established a well-defined traceability system with tags through which they can trace the source of the seeds and inspectors. The farmer can report on sub-standard seed to government officials (ADP) who in turn report such occurrences to NASC. This system of reporting is less expensive but most at times the farmer do not use it, because either; (i) they do not know the existence of reporting system, or (ii) they are not sure of the effectiveness of the system. Greater attention will be paid to awareness creation so that the farmer can promptly report such incidence to

the ADP staff. NASC has developed a tagging system, but limited financial capacity and inadequate number of staff tend to hamper their effectiveness therefore increase budgetary allocation to NASC and increase in staff strength is advocated in the strategy.

Due to insufficient and untimely availability of breeder and foundation seeds, it has also become difficult for NASC to verify the authenticity of such seeds from which certified seeds are produced. Lack of adequate seed processing and seed storage facilities in seed production areas has also lead to reduction in purity and viability of certified seed lots available to farmers. Recent observation of debris in seed packets distributed to farmers under GESS also affects the trust amongst farmers.

Under the national seed rules and regulations, the CBOs who are engaged in rice seed production are required to formally register as a business entity with the Corporate Affairs Commission (CAC). Due to lack of awareness and knowledge in business administration and management skills, several of the CBOs and Cooperatives find it difficult to get official recognition by NASC. Lack of access to such key resources as finance, inputs and technologies also contributes to the sub-standard seed production conditions by CBOs and Cooperatives. The inconsistent and insufficient budget allocation and human capacities have restrained NASC from organizing training programs for seed producers on a routine basis. These factors provide a breeding ground for proliferation of several informal seed production and distribution outlets in the country. The laborious and time consuming process of tagging has also lead to poor adoption of packaging standards by CBOs and Cooperatives.

The inconsistencies in implementation of production practices are mainly due to human capacity constraints in ensuring thorough inspection by NASC. Furthermore, the insufficient availability of vehicles for movement of inspectors to various production sites is also hindering the coverage frequencies and areas under inspection by NASC. The perceived risks and threats to field inspectors from seed producers also affect the performance of NASC inspectors.

Due to insufficient funds, NASC could not upgrade their field and seed testing equipments and infrastructures. With the continued weakening of ADPs in different states, the coordination between NASC and state bodies responsible for extension on seed production and quality control has become a serious challenge for the seed sub-sector.

3.3. Supply

The continuous re-cycling of certified seeds by farmers contributes to the degradation of purity of existing varieties. Even though the mechanism of traceability is in place but the farmers do not utilize this opportunity to report to the appropriate government organs for sanctioning defaulting seed companies. This has also affected the monitoring and evaluation of rice seeds available under the GESS. While part of this challenge stems from the human capacity constraints at NASC, the limited technical capacities of private

seed companies, CBOs and Cooperatives also contributes to the lack of clear records of sources of seeds.

Constant non availability of sufficient quantities of breeder seed stocks of the various rice varieties at NCRI is a major bottleneck along the seed supply chain. This is due to lack of adequate human capacity and inconsistent funding for renewing the breeder stocks through maintenance breeding protocols. Lack of clear projection of demands of seeds on a seasonal or annual basis is also affecting the planning process for the supply of seeds through formal systems. The reliance of GESS on AfricaRice for the supply of foundation seeds to the private seed companies has in the past affected the timeliness of supply of certified seeds to the farmers

Inadequate infrastructures such as seed processing facilities, storage houses, feeder roads, rural electricity and packaging machineries are also affecting the supply of certified seeds in rice production areas. The lack of sufficient coordination between ADPs, agro-dealers and the seed producers also affects the efficiency of the logistical arrangements and hence the timeliness and turn-over of certified seeds distributed under GESS

4. Vision and Scope

4.1. Position of Rice Seed Development Strategy

Strategic development of the rice seed sub-sector is in consistence with the medium term action plans of RTA. The rice seed development strategies form an integral part of NRD, as the NRDS envisages improving rice productivity through enhanced use of quality rice seed. The NRDS and rice value chain are aligned with Agriculture Transformation Agenda (ATA) which represents Nigeria's investment framework under Comprehensive African Agriculture Development Program (CAADP) investment framework. Since ATA is in alignment with the National Economic Empowerment and Development Strategy (NEEDS), the Nigeria's poverty reduction strategy paper (PRSP); the rice seed development strategies are well positioned within the overarching national strategies on economic development through agriculture. In addition, the seed development strategies shall also become a part of any national seed development strategy that might be developed in the future.

4.2. Vision for rice seed sector

The vision of the proposed strategies on rice seed sub-sector development involves 'Ensuring timely and sufficient availability, accessibility and affordability of formal seeds of improved varieties for Nigerian rice farmers'.

4.3. Goal and Scope

The goal of the rice seed development strategies is 'to provide access to formal seeds of improved varieties to 40% (75, 800 metric tons of certified seeds) to rice growers by 2018'.

The scope of this strategy covers the entire rice seed value chain – (i) production of all seed classes (breeder-, foundation- & certified seeds); (ii) inspection and quality assurance; and (iii) processing and storage of rice seeds.

4.4. Objectives

The specific objectives of the proposed rice development strategies are:-

- i. To enhance the supply of Breeder and Foundation seeds through the public system;
- ii. To encourage private companies with the relevant capacities and technologies to be engaged in producing Breeder, Foundation and Certified seeds
- iii. To encourage the private sector participation in rice seed production, supply and marketing;
- iv. To promote community based seed production systems in order to bridge the gaps in production and supply of rice seeds;
- v. To create a favorable environment for all stakeholders engaged in rice seed production and distribution through enabling policies, institutional development, capacity building, public-private partnerships and finance; and
- vi. To encourage participation of development partners, financial institutions, Non-Government Organizations, regional- and international research institutions in Nigeria's rice seed sub-sector development

4.5. Implementation Structure

The implementation of rice seed development strategies will largely be based on the same structure as for the NRDS implementation. The NRDS and ATA taskforce will play an instrumental role in monitoring and evaluation of the implementation of the proposed strategies. In addition, the NRDS taskforce will also be involved in mobilization of funds for projects that will help put the strategy into practice. Other parallel structures such as RTA (ATA-rice value chain), National Center for Genetic Resources and Biotechnology (NACGRAB)/Crop Variety Release Committee (CVRC), National Rice-Maize Center, NCRI and NASC will also be involved in executing the projects that shall be mobilized for the implementation of the strategies. NASC shall also play an important role in coordinating the various stakeholders engaged in rice seed sub-sector, and provide necessary feed-backs for constant fine-tuning of the proposed strategies.

5. Strategies and Priorities

5.1. Strategic Principles and Approaches.

The rice seed development strategy will be aligned to the RTA action plan in its basic approaches including the target areas and focus. The strategy aims that 50% of the target seed production will be used in irrigated lowland ecology while other 35% and 15% of the target seed production are expected to be used under the rainfed lowland and the rain fed upland ecology respectively.

The quality and timeliness of supply of adequate quantities of rice seeds produced under the formal seed production system need to be substantially improved; while users of seeds under informal system need to be educated of the advantages of formal production system so that the productivity and profitability of rice farmers in Nigeria are significantly increased. This forms the principle of rice seed development strategy proposed in this document.

To achieve the goals and objectives of the strategy; the following pillars and approaches are envisaged:-

1. Promoting public based Breeder and Foundation seed production; varietal maintenance; varietal development (formal production system)
Under this pillar, capacity building, infrastructure development for varietal development, varietal maintenance and storage, increase in budgeting and methodical planning will be emphasized.
2. Enabling private companies to participate in Breeder, Foundation and Certified rice seed production and marketing. Capacity to enhance internal quality control and investments of private seed producers, their access to finance, accreditation of national seed testing labs, modern technologies, seed trade, public-private partnerships in developing infrastructures in irrigation, storage, processing and marketing, and policy options will be focused under this pillar.
3. Improving the professionalism of community based seed production and distribution systems under CBOs, Cooperatives, NGOs and farmer based seed production. Traceability of sources of seeds, regular training programs for all registered seed producers, incentives and marketing of seeds will be stressed.
4. Steering informal seed producers and seed users to adopt formally certified seeds.
Awareness creation, extension services, incentives, expansion of agro-dealer networks and improved coordination and planning at grass root levels will be emphasized.

5.2. Ecosystem based seed development approaches

The appropriateness of the strategic approaches shall vary under different ecosystems in which rice is produced. Since rice production under irrigated lowland ecosystems is generally profitable and market oriented; the rice growers shall afford purchase of certified seeds and adopt formal seed systems more readily. Hence, private based seed production and distribution will be prioritized under irrigated lowland production environments.

Rice production in rain fed lowland ecosystems are subject to vagaries of weather and climate change. Although a significant portion of the paddy produced under rain fed environments is consumed by the farm families; the surplus production is usually sold in the markets. Hence formal (public and private based) and semi-formal (CBOs and cooperatives) seed production and distribution systems will be emphasized under rain fed lowland production environments.

Under upland production environments, rice is most often grown for subsistence living, whereby almost all or a majority of the production is consumed by farm families. Therefore public based (formal), community based, and informal farmer saved seed production and distribution systems will be targeted under upland rice ecosystem.

5.3. Legislation, Policy and Institution

As described in the section 3, there is a communication gap between the public and the private sector, particularly in the planning and implementation of GESS. It is therefore recommended that a representative of SEDAN should be present in the weekly GESS meeting to bridge the communication gap between the public and private sector. Accelerating the process of enactment of national seed law and finalization of national seed policies is an important activity under the proposed strategy. It is also important that the new seed law and policies enable private seed companies to actively participate in varietal development, multi-location testing and release of improved rice cultivars. Allowing private seed companies to produce breeder seeds of public varieties under close monitoring of NASC/NCRI shall increase the supply volume and quality of seeds. Since rice is a self-pollinated crop and shall regenerate without a significant lapse in genetic integrity over a period of at least 3 production cycles; new policies shall allow production of 'certified seeds-1' (R1) and 'certified seeds-2' (R2) by rice seed companies and other accredited community seed producers.

Policy environments will need to encourage private investments in rice seed production and distribution. Public-private partnerships (PPP) in developing irrigation infrastructure, feeder roads, electricity, seed processing and storage facilities will be actively promoted in seed production areas. Capacity building for the appropriate organizational and institutional structures with a focus on implementation of policies is an important strategic element for the improvement of rice seed sub-sector in Nigeria. Emphasis will

be laid on improving the manpower and financial resources of institutions engaged in rice seed production, inspection and distribution. Provision of logistics to public professionals engaged in inspection will need to be enriched so as to effectively cover their responsibilities in the field.

Planning and budgeting will need to be regularized and meetings of stakeholders should be held regularly on a seasonal basis for effective deliberations and decision-making along the rice seed value chain. The key Crop Variety Registration and Release Committee shall be brought under the purview of NASC in order to strengthen the efficiency of varietal inspection and seed supply. Traceability of available seed stocks in the country will be improved by establishing an interactive database that is accessible to producers, inspectors and distributors of seeds throughout the country.

5.4. Production and Inspection

Establishing a clear projection on the demand for certified seeds and the various factors that influence the demand by farmer's, and a survey of seed users is an important strategic approach for the development of rice seed industry. Knowing the real demand and their determinants will improve the planning and budgeting process of all the stakeholders engaged in production, inspection and supply of rice seeds through dissemination of technologies. Manuals and the recommended seed production procedures should be made available to the public and private registered seed Producer. The technical skills of both the public and private seed producers need to be improved as well as inspectors. Variety catalogues describing detailed morphological features of the released rice seed varieties should be made available to field inspectors and private seed companies for their practical use. Upgrading the varietal catalogue and distributing it to seed inspectors and those involved in seed production (Breeder, Foundation and Certified seeds) and provision of training will be emphasized in this strategy. Increasing the number of trained manpower and funding for production and inspection will represent important approaches under the proposed strategy. Facilitating the logistics for the inspectors and equipping them adequately with the required field inspection kits are important for ensuring the sustainability of quality seed production in the country. NCRI Staffs engaged in production and NASC inspectors also need to be motivated through appropriate incentive mechanisms.

Upgrading of national seed testing laboratories for accreditation by ISTA¹³ and seed inspection services is paramount for improving the trade of locally produced seeds in Nigeria. Given the self- pollinated nature of rice crop, seed entrepreneurs perceive the market for rice seeds as relatively less attractive than for other high value, low volume cash crops. Hence it becomes important to encourage local rural entrepreneurs in rice seed business. Building technical and financial support to rural entrepreneurs will

¹³ Being undertaken by FAO in their initiative "Strengthening National Seed Systems in Nigeria and AFDB support program for ATA

therefore represent an important strategic element. Creating awareness on seed production methods and technologies amongst producers through periodic training programs will be important for increasing the quality of seeds produced in the country. The presently active financial schemes such as Nigeria Incentive Based Risk Sharing for Agricultural Lending (NIRSAL) do not have exclusive window for private seed producers. Provision of financial support through special schemes and/or windows under NIRSAL will be assessed and promoted.

5.5. Supply and Market

Raising the demand for quality rice seeds amongst smallholder rice farmers is an important strategy for improving the market in Nigeria. Generating awareness on the benefits of using certified seeds through various extension approaches is essential for developing rice seed sub-sector in the country. The purpose is to mobilize farmers for adopting formally produced and certified seeds. Establishing on-farm trials amongst rice growing communities and demonstration plots along the high-ways will be emphasized. Exhibiting the linkage between the quality seed usage and the profitability will be the focus of such promotional activities. Targeting of farmers under GESS and other public distribution systems need to be improved by focusing on smallholder rice farmers who are experiencing lower productivity due to use of informal seeds. Promoting the use of quality seeds through print and multi-media, field days and regular training programs will be important for increasing the adoption and shifting of farmers from informal seed usage to formal seed systems. Taking account of the successful increase in certified seed adoption under the GESS program, its scaling up and scaling out is worth considering.

Sustaining the momentum of seed supply through independent private agro-dealer networks is paramount for adoption of quality rice seeds. Encouraging private companies to open seed outlets in all the capital cities of every rice growing state and appointing village agro dealers shall improve the timeliness and consistency of supply of seeds.

Constraints of human- and financial capacities of NASC need to be addressed effectively in order to ensure their quality control coverage of rice seed markets in the country. Proposed joint monitoring and evaluation of supply chain activities and marketing of seeds are imperative for improving the credibility amongst seed users. In addition, the participation of seed users in monitoring adulteration in seed markets will be encouraged through awareness creation so that sub-standard seeds are reported by seed users through existing reporting channel, and the origin of issues are traced back through traceability system.

5.6 Target Setting and Gap Identification

To achieve the goals and objectives set under the proposed strategy, targets for the various types of seeds and varieties are set under the proposed strategy. Existing gaps in human and organizational capacities are identified and strategies to address the gaps are discussed.

5.6.1 Production and Inspection

Although precise estimates of yields during breeder, foundation and certified seeds production stages are not yet available; the required seed quantities shall be estimated based on the targeted paddy production under NRDS. Nigeria's NRDS aims to produce 13,265,000 tons of paddy per year by 2018. Given the current national average on-farm productivity of 3.5 t/Ha; a seed: grain ratio of 1: 70 is observed at certified seed usage level. Owing to an increased need for care; seed yields during foundation and breeder seed production levels could be expected to be relatively lesser at 3.0 t/ Ha and 2.5 t/ Ha respectively; and hence seed: grain ratios of 1:60 and 1:50 respectively.

It is estimated that only about 20% of rice farmers are replacing their source of seeds with certified seeds (formal seed system); and that about 80% of the rice farmers are currently using their own saved grains as seeds (informal seed system). The proposed rice seed development strategy aims to increase the proportion of farmers using certified seeds to 40% by 2018. This would imply that 75,800 t of certified seeds, 1,263.3 t of foundation seeds and 25.27 t of breeder seeds need to be produced by 2018. In 2012, 18,850 tons of certified seeds, 311 tons of foundation seeds and 10.0 tons of breeder seeds were produced. The gaps between the current production and the targeted production under the strategy are shown in table 11.

Table: 11 Target annual production per class of seed and gaps to be filled

	Target amount (MT/year)	Current Production/ supply (MT/year) in 2012	Gap (MT/year)
Breeder Seed	12.254 t in 2014 (+20%) 15.508 t in 2015 (+20%) 18.762 t in 2016 (+20%) 22.016 t 2017 (+20%) 25.27t by 2018 (+20%)	10.0	3.254

Foundation Seed	501.46 t in 2014 (+20%) 691.92 t in 2015 (+20%) 882.38 t in 2016 (+20%) 1072.84 t 2017 (+20%) 1,263.3 t by 2018	311 t	190.46 t/year
Certified Seed	30,240 t in 2014 (+20%) 41,630 t in 2015 (+20%) 53,020 t in 2016 (+20%) 64,410 t in 2017 (+20%) 75,800 t by 2018 (+20%)	18,850 t	56,950 t 11,390 t/year

About 50% of the targeted seed production will involve varieties that are popular in irrigated ecosystem, 35% of the production will engage seeds of varieties recommended under rain fed irrigated lowland ecosystem, and 15% of the targets will include varieties that are demanded under the rain fed upland production environments. The varietal preferences by farmers under the three rice growing ecosystems will be prioritized as shown in tables 12, 13 and 14. The targeted breeder, foundation and certified seeds production and the gaps to be filled annually is shown in table 11.

Table: 12 Target annual breeder seed production per variety and gap to be filled

	Name of recommended varieties	Seed Category (Market and/or Subsistence)	Target Amount of Seed Production (MT/year)					Areas required for production (Ha)
			2014	2015	2016	2017	2018	
Irrigated Lowland (50%)	<i>FARO 44 (30% of 50%)</i>	Market and Subsistence	1.96	2.42	2.87	3.33	3.79	1.52
	<i>FARO 52 (30% of 50%)</i>	Market and Subsistence	1.96	2.42	2.87	3.33	3.79	1.52
	<i>FARO 60 (20% of 50%)</i>	Market and Subsistence	1.31	1.61	1.92	2.22	2.53	1.01
	<i>FARO 61 (20% of 50%)</i>	Market and	1.31	1.61	1.92	2.22	2.53	1.01

	50%)	Subsistence						
Rain-fed Lowland (35%)	FARO 44 (30% of 35%)	Market and Subsistence	1.37	1.69	2.01	2.33	2.65	1.06
	FARO 52 (30% of 35%)	Market and Subsistence	1.37	1.69	2.01	2.33	2.65	1.06
	FARO 60 (20% of 35%)	Market and Subsistence	0.91	1.13	1.34	1.56	1.77	0.71
	FARO 61 (20% of 35%)	Market and Subsistence	0.91	1.13	1.34	1.56	1.77	0.71
Rain-fed Upland (15%)	FARO 55 (60% of 15%)	Market and Subsistence	1.17	1.45	1.72	2.00	2.27	0.91
	FARO 58 (20% of 15%)	Market and Subsistence	0.39	0.48	0.57	0.67	0.76	0.30
	FARO 59 (20% of 15%)	Market and Subsistence	0.39	0.48	0.57	0.67	0.76	0.30
Total	100%		13.05	16.11	19.16	22.22	25.27	10.11

Table 13: Target annual foundation seed production per variety and gap to be filled

	Name of recommended varieties	Seed Category (Market and/or Subsistence)	Target Amount of Seed Production (MT/year)					Areas required for production (Ha)
			2014	2015	2016	2017	2018	
Irrigated lowland (50%)	FARO 44 (30% OF 50%)	Market and Subsistence	75.2	103.8	132.4	160.9	189.5	75.8
	FARO 52 (30% of 50%)	Market and Subsistence	75.2	103.8	132.4	160.9	189.5	75.8
	FARO 57(20% of 50%)	Market and Subsistence	50.1	69.2	88.2	107.3	126.3	50.5
	FARO 60 (20%of 50%)	Market and Subsistence	50.1	69.2	88.2	107.3	126.3	50.5
Rain fed Lowland 35%	FARO 44 (30% Of 35%)	Market and Subsistence	52.7	72.7	92.6	112.6	132.6	53.1
	FARO 52 (20% Of 35%)	Market Subsistence	52.7	72.7	92.6	112.6	132.6	53.1
	FARO 60 (20% Of 35%)	Market and Subsistence	35.1	48.4	61.8	75.1	88.4	35.4

Rain fed upland	FARO 61 (20% Of 35%)	Market and Subsistence	35.1	48.4	61.8	75.1	88.4	35.4
	FARO 57 (60% of 15%)	Market and Subsistence	45.1	62.3	79.4	96.6	113.7	45.5
	FARO 58 (20% OF 15%)	Market and Subsistence	15.0	20.8	26.5	32.2	37.9	15.2
	FARO 59 (20% of 15%)	Market and Subsistence	15.0	20.8	26.5	32.2	37.9	15.2
Total	100%		501.5	691.9	882.4	1072.8	1263.3	505.3

Table 14: Target annual certified seed production per variety and gap to be filled

	Name of recommended varieties	Seed Category (Market and/or Subsistence)	Target Amount of Seed Production (MT/year)					Areas required for production (ha)
			2014	2015	2016	2017	2018	
Irrigated Lowland (50%)	FARO 44 (30% of 50%)	Market and Subsistence	4536	6244.5	7953	9661.5	11370	3248.6
	FARO 52 (30% of 50%)	Market and Subsistence	4536	6244.5	7953	9661.5	11370	3248.6
	FARO 60 (20% of 50%)	Market and Subsistence	3024	4163	5302	6441	7580	2165.7
	FARO 61 (20% of 50%)	Market and Subsistence	3024	4163	5302	6441	7580	2165.7
Rain-fed Lowland (35%)	FARO 44 (30% of 35%)	Market and Subsistence	3175.2	4371.15	5567.1	6763.05	7959	2274.0
	FARO 52 (30% of 35%)	Market and Subsistence	3175.2	4371.15	5567.1	6763.05	7959	2274.0
	FARO 60 (20% of 35%)	Market and Subsistence	2116.8	2914.1	3711.4	4508.7	5306	1516.0
	FARO 61 (20% of 35%)	Market and Subsistence	2116.8	2914.1	3711.4	4508.7	5306	1516.0
Rain-fed Upland (15%)	FARO 57 (60% of 15%)	Market and Subsistence	2721.6	3746.7	4771.8	5796.9	6822	1949.1
	FARO 58 (20% of 15%)	Market and Subsistence	907.2	1248.9	1590.6	1932.3	2274	649.7
	FARO 59 (20% of 15%)	Market and Subsistence	907.2	1248.9	1590.6	1932.3	2274	649.7

	of 15%)	Subsistence						
Total	100%		30240	41630	53020	64410	75800	21657.1

The foundation seeds of targeted rice varieties will be produced at NCRI's sub stations located at Amakama (Abia), Birnin Kebbi (Kebbi), Warri (Delta), Bachita (Kwara) and Yandev (Benue). The breeder seed is produced at the Headquarter (Loguma, sabo Daga and Badeggi). The distribution of responsibilities of the breeder and foundation seeds production in these stations is shown in table 15

Table 15; Required area for production (Identification of locations per variety)

Name of seed producing stations	Name of recommended varieties	Breeder seed (MT/ year)	Areas required for production (Ha)	Foundation Seed (MT/year)	Areas required for production (Ha)
Amakama (Abia)	FARO 52			2	1
	FARO 58				
	FARO 59				
Birnin Kebbi (Kebbi)	FARO 57			4	2
	FARO 52			4	2
Warri (Delta)	FARO 57			2	1
Bachita (Kwara)	FARO 52			2	1
Yandev (Benue)	FARO 58			0.5	1
	FARO 59			0.5	1
	FARO 44			2	2
H/Q Loguma					
	FARO 44,52,60,61	18	9		
Sabo Daga Badeggi	FARO 62	1.5	3		
	FARO 55,58,59	30	15		

Production of targeted rice seed volumes will require significant enhancement of human resource capacities. The required human capacities and the means and budget that are required to fill the gaps between the requirement and the currently available resources at production and inspection are shown in tables 16 and 17 respectively.

Table 16: Required human resources in production and gap to be filled

	Number of technical personnel to be newly employed	Required Budget For employment	Number of technical personnel to be trained	Areas for training	Required Budget for training
Researchers	10	20.5m	15	Seed production technology	
Technicians	20	50.0m	30	Crop production /seed processing	
Workers/Laborers					
Total	30+	70.5m+	45+		

Table 17: Required human resources in inspection and gap to be filled

Geographical area	Required Number of Inspectors	Required Capacity of Inspectors		Means and Budget required to be allocated per Inspector
		Knowledge	Experience	
Entire country (1 per state)	32 Seed Law Enforcement Officers	B. Sc	>0 years	Fresh: 32 (14.44 million Naira = 9,000 USD/year) = 288,000 USD; recurring
Entire country (6 regional seed testing labs + 1 central lab)	22 Seed analysts	B. Sc	>0 years	Fresh: 22 (14.44 million Naira = 9,000 USD/year) = 198,000 USD; recurring
Entire country	55 inspectors (at 1 inspector/400 Ha of certified rice seed production area)	10 Ph D	>0 years	Fresh: 3 (3.6 million Naira = 22,500 USD/year) = 67,500 USD; recurring Upgrading of existing staff: 7
		10 M Sc	>0 years	Fresh: 10 (3.36 million Naira = 21,000 USD/year) = 210,000 USD; recurring
		35 B Sc	>0 years	Fresh: 35 (14.44 million Naira = 9,000 USD/year) = 315,000 USD; recurring

				Sub-total: 592,500 USD/year recurring
Total		1,078,500 USD/year recurring		

In order to improve the quality of seeds produced; the technical skills of both the existing staffs and the staffs that will be recruited need to be upgraded (table 18).

Table 18: Technical Gaps that need to be filled for improving the inspection of seed production

Geographical area	Number of inspectors to be newly employed	Required Budget For employment	Number of Inspectors to be trained	Areas for Training	Required Budget for training
Entire country	55 Inspectors	592,500 USD/year recurring	In-country training for existing inspectors	Seed technology course (2-weeks; Varietal characteristics, morphological identification, rice seed production technologies)	=58 x 2weeks x 2550/head =147,900 USD Admin: \$1000/head Logistics: \$50/head Transport: \$100/head Allowances: \$1400/head
			Overseas Courses for 25 staff	Seed technology course (3-weeks) including Varietal characteristics, morphological identification, rice seed production technologies	\$2000/person (IRRI)+ travel costs + allowances =25 x (2000 + 2000 + (100*21)) = 25 x 6100 =152,500
			Upgrading educational qualifications of 7 existing M Sc staff	Ph. D in seed technology	= 1 million Naira/person/year = 7 million x 4 years = 43,750/year x 4 =175,000 USD
Entire country	22 Seed analysts	198,000 USD/year			
Entire country	32 Seed Law	288,000 USD/year			

	Enforcement Officers				
Total		1,078,500 USD/year recurring			475,400 USD

5.6.2. Supply

Improving the quantity and timeliness of supply of quality rice seeds in Nigeria requires consistent availability of breeder seeds of the recommended varieties. Maintenance breeding of all the improved cultivars will be emphasized under the proposed strategy. The necessary human- and financial capacities that are required for maintaining the genetic purity of all the public varieties will be emphasized. Capacity constraints on inspecting the production of seeds will be improved. Tagging and bagging protocols for certified rice seeds and the implementation of the practices will be improved through increased monitoring. There will be awareness creation on the part of the farmer to promptly report incidence of sub standard seeds to the government agents (ADP staff) in their locality who will then communicate same to NASC for prompt action.

Establishing well defined channels and records of breeder-, foundation- and certified seeds is essential for tracking the supply routes of seeds in the country. The database on rice seeds will serve as an important tool in ensuring the inventorying and timely supply of seeds. Surveys on the demand and varietal preferences of rice growers will be made on a regular basis to ensure sufficient production and supply of seeds. Enhancing the capacities of NASC in ensuring the assessment of quality of the seeds supplied in the markets is an important strategic element of the road to improving the seed development in Nigeria. Scaling up of the seed processing capacities in rice production areas will improve the supply of quality seeds in the markets.

Emphasis will be laid on upgrading existing seed processing facilities and creating newer facilities in different rice production zones and states (Nine processing centres are already being constructed in the rice production areas across the country couple with the ones being constructed by a few private companies). Improving the logistics of seed supply chain will be emphasized under the proposed strategy. Encouraging private stakeholders to play a proactive role in setting up more outlets and creating conducive environments for growth in demand will be emphasized. Public-private partnerships in improving the infrastructure for irrigation, transportation, rural energy and seed storage will be stressed.

5.7. Possible Intervention Options and Priority Areas

- The approaches described in the document require several concrete interventions from the stakeholders. Targeting of activities for developing the seed sector under the strategy shall be aligned with the geographical priorities (states) in which RTA

activities are concentrated. Rice production under rain fed lowland and irrigated lowland conditions will be the main priority but attention will be paid to rain fed upland rice in some states where potential exist . The recommended strategic actions that will lead to achieving the objectives under the proposed strategy are listed below:

5.7.1. Legislation, Policy, Institutions and Planning (Recommendations)

- Accelerate the enactment process of new seed law
- Taking account of the success of GESS in increasing the certified seed adoption rate, up-scaling of GESS is recommended. Also legislation of GESS and other national programs that help rice value chain activities such as NIRSAL should be institutionalized so that changes of government cannot affect seed related programs
- Finalization and endorsement of national seed policy
- Since rice is a self pollinated crop and shall regenerate without a significant lapse in genetic integrity over a period of at least 3 production cycles; the policy shall allow rice seed companies and other accredited seed producers to explicitly allow production of ‘certified seeds-1’ and ‘certified seeds-2’
- Empowering private seed companies in varietal development and maintenance by providing access to breeder stocks, parental lines and other germplasm
- Registered private seed companies be allowed to produce breeder seed and maintenance breeding of existing varieties under close monitoring of NASC and NCRI
- Increased access to finance by private seed companies by creating special financial windows under NIRSAL
- Reduction of sales tax rates, liberalized import and export policies, and incentives/rewards for rice seed producers
- Establishment of a ‘Rice Seed Trust Fund’ that will allow public institutions to plough the sales money back into production
- Establish a modern, interactive, network based database at NCRI and NASC on all rice seeds produced and distributed by all stakeholders (public- and private)
- Streamlining of seed related activities of ATA with NCRI, NASC and other permanent public institutions engaged in seed sub-sector

5.7.2. Production and Inspection

- Building of human resources engaged in seed production, field inspection and seed certification processes through fresh recruitments and upgrading of technical skills of existing staffs
- Variety catalogues should be improved so that they cover detailed morphological features of the released rice seed varieties with quality photos for the practical use in identification of off types.

- Improved variety catalogues should be made available to field inspectors, private seed companies, researchers, technicians and field workers who are involved in the production of formal seed for their practical use.
 - Customized maintenance breeding of land races, parental lines and all released rice cultivars
 - Improved logistics for field inspection by providing vehicles, hand-held equipments and sophisticated field inspection kits
 - Public-private partnerships in research and development of varieties, maintenance breeding of existing varieties, multi-location testing and breeder seed production
 - The secretariat for Crop Variety Registration and Release Committee be domiciled under NASC
 - Increased annual budget for production and inspection of rice seeds
 - Timely release of budget
 - Increased investments in irrigation, transportation, rural energy, seed processing and seed storage by federal/state governments and through public-private partnerships
 - Regular training programs for seed producers and seed inspectors
 - Increased regional and international collaboration with advanced research institutes on varietal improvement and seed production
 - Upgrading of infrastructure and analytical facilities in the 7 existing national seed laboratories
 - Awareness creation for seed users of the existing reporting channels on sub-standard seeds, traceability and punishment against adulteration, in order to encourage them to join the market monitoring.
 - Awareness creation for seed producers, processors and traders of the penalty on adulteration in seed business to prevent the misconducts of relevant stakeholder
 - Setting up of new seed testing laboratories in regional offices.
 - Research stations at Jos (Plateau) and Kano (Kano) shall be assigned with additional responsibilities of producing breeder- and foundation seeds of rice varieties suited for North Western and North Eastern states
 - Enhanced extension services for seed users, seed producers and other actors engaged in rice seed value chain
-
- 5.7.3. [Supply and Marketing](#)
 - Periodical surveys on varietal preferences, demand for certified seeds and issues faced by stakeholders along the rice seed value chain
 - Establishment of clearly defined 'channels' and 'records' of supply of rice seeds in the country,
 - Creating awareness on appropriate seed production methods through multi-media and other extension approaches
 - Establishment of community based/high-way trials/demonstration plots

- Training of seed users, extension service personnel and agro-input dealers on the importance of genuinely certified seeds
- Usage of ICT tools for dissemination of market information and availability of inputs
- Resuscitation of Monthly Technical Review Meetings (MTRM) under ADPs; State Seed Coordination Committee (SSCC)
- Increased recognition of community based organizations through registration and incentivizing the supply and marketing of seeds through CBOs
- Encouraging more and active participation of private stakeholders in supply and marketing of rice seeds in remote rice production areas
- Increased investments in rural infrastructure and seed processing through public-private partnerships
- Scaling-up and upgrading of existing seed processing facilities
- Improved access to materials and technologies in tagging and tamper proof packing of certified seeds

6. Attachments