



Republic of Ghana

**MINISTRY OF FOOD AND AGRICULTURE**

**GHANA RICE SEED ROAD MAP  
2014- 2018**

**Revised July 2014**

## Executive summary

Policy strategies recently captured in the Food and Agriculture Sector Development Policy (FASDEP II) 2008 – 2010 and the Medium Term Agriculture Sector Investment Plan (METASIP) 2011-2015 are aiming to promote rice production to address food security and poverty reduction. FASDEP II which is the current sector development policy guideline lists rice as one of the commodities for increased food security and import substitution. Specific measures are specified for varietal improvement and increased seed production and utilization. Formal seed production of popular rice varieties in Ghana is presently done in 3 different phases Breeder, Foundation and Certified seeds. It is estimated that only 20% of the farmers mostly those in the irrigated lowland areas use formal seeds while 80% use informal seeds. The low rate of adoption of formal seeds is a critical challenge in the rice seed sub sector in Ghana this problem seems to have persisted due to (1) lack of awareness on the part of the farmer as to the advantage of formal seed over informal seed. (2) Low quality of seeds in the market. (3) Unavailability, inaccessibility and unaffordability of formal seed. Due to budget constraint on the part of the public sector to meet the anticipated increase in the demand for certified seeds, it is advocated that public companies with the required technical capacities should be allowed to produce foundation seeds.

The proposed strategy for developing the rice seed sub sector intends to raise the users of formal seeds from the present 20% to 40% by 2018 by improving the quality, availability, accessibility and affordability in the irrigated and rain fed lowland ecology. The scope of the strategy shall be the entire rice growing regions of the country while priority and focus will be given to (a) irrigated and rain fed lowland areas, (b) scale of potential and/or actual production and (c) Market access. Based on these criteria the Ghana rice seed road map identified 5 regions and 24 districts while the focus will be on 4 varieties of rice mostly

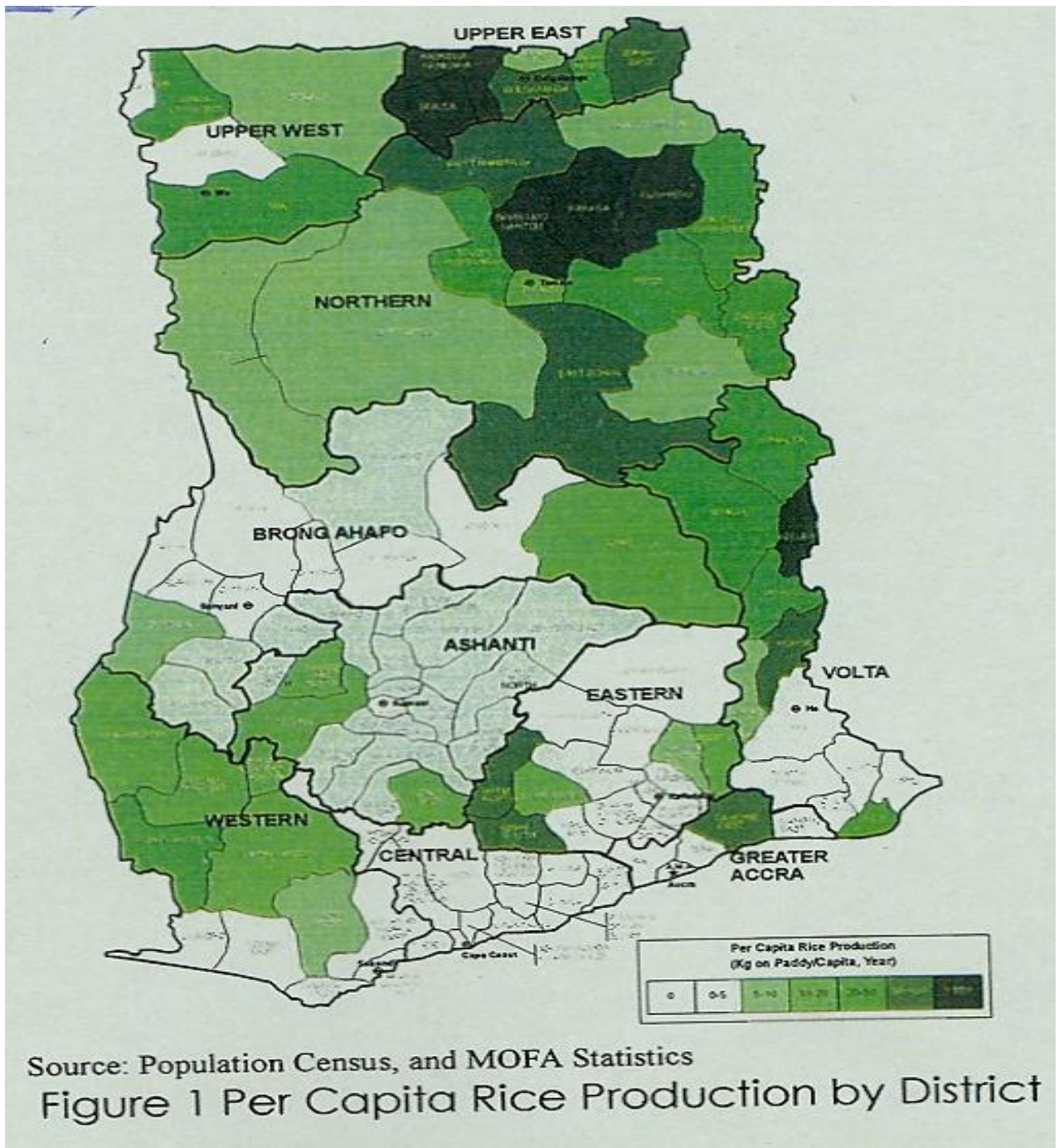
grown by the farmers namely Gbewaa (Jasmine 85), Togo Marshal and Tox 3107 and Agra rice (New variety the government would like to promote)

Since rice is a priority crop in Ghana's agricultural policy documents and as indicated in the National Seed Policy document, all listed crops such as maize, rice, sorghum and millet should have operational and programme applicability. Thus, the proposed Rice Seed Road map can be considered as one of the operationalized programmes for rice.

In this regard, based on the analysis of the current situation of rice seeds in Ghana, this Road Map is focusing on the entire seed value chain by proposing the following actions:

- Sensitization and awareness creation on existing policies, acts and regulations
- Reinforcement of human and logistic capacity for seed production, quality control and certification
- Creation of a platform for exchanges between distribution and supply chain actors (governmental institutions, seed growers, seed companies and development projects / programmes)
- Provision of infrastructure and equipment for seed production (haulage, storage, processing, promotion, packaging, laboratory) through governmental / DPs funding including Public-Private Partnership
- Set up of a National seed stakeholders platform for planning seed need requirements, management and distribution
- Adequate budgetary allocation and timely release of funds to the various research institutes and the Grain and Legumes development Board (GLDB) to produce good quality breeders and foundation seeds.

- Motivation through favorable financial windows to seed growers and seed companies to produce certified seeds.
- Capacity building of seed Producers, seed users, inspectors and certification officers.
- Upgrading of existing processing and storage facilities.



## Abbreviations and Acronyms

- AGRA:** Alliance for Green Revolution in Africa
- CAADP:** Comprehensive African Agriculture Development Programme
- CARD:** Coalition for African Rice Development
- CRI:** Crop Research Institute
- CSIR:** Council for Scientific and Industrial Research
- DAES:** Directorate of Agricultural Extension Services
- DCS:** Directorate of Crop Services
- DUS:** Distinctiveness, Uniformity and Stability
- ECOWAS:** Economic Community of West African States
- FAO:** Food and Agriculture Organization of the United Nations
- FASDEP II:** Food and Agricultural Sector Development Policy II
- FBOs:** Farmer Based Organizations
- FONG:** Farmers' Organization Network of Ghana
- GADD:** Ghana Agro-dealer Development Project
- GAIDA:** Ghana Agro-Input Dealers Association
- GDP:** *Gross Domestic Product*
- GLDB:** Grains and Legumes Development Board
- GMOs:** Genetically Modified Organisms
- GoG:** Government of Ghana
- GRIB:** Ghana Rice inter professional body
- GSC:** Ghana Seed Company
- GSID:** Ghana Seed Inspection Division
- IARCs:** International Agricultural Research Centres
- IFAD:** International Fund for Agricultural Development
- IFDC:** International Centre for Fertilizer and Agricultural Development

**JICA:** Japan International Cooperation Agency

**MESTI:** Ministry of Environment, Science, Technology and Innovation

**METASIP:** Medium Term Agriculture Sector Investment Plan

**MoFA:** Ministry of Food and Agriculture

**NGOs:** Non-Governmental Organizations

**PPMED** : Policy Planning Monitoring and Evaluation Directorate

**PPRSD:** Plant Protection and Regulatory Services Directorate

**SARI:** Savanna Agricultural Research Institute

**SEEDPAG:** Seed Producers Association of Ghana

**USAID:** United States Agency for International Development

**WAAPP:** West Africa Agricultural Productivity Programme

**WASP:** West Africa Seed Programme

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## Introduction

### Review of National Rice Sector

Rice has become the second most important staple food crop after maize in Ghana and its consumption keeps increasing as a result of population growth, urbanization and change in consumer habits. Between 2008 and 2009, paddy production was in the range of 302,000 and 436,000 tons (181,000 to 262,000 tons of milled rice) respectively with large annual fluctuations. The annual production fluctuations are largely due to the changing area (ha) put under rice cultivation in each year, rather than yield variations (t/ha). Rice is cultivated in Ghana both as a food crop and a cash crop. The total rice consumption in 2005 amounted to about 500,000 tons (JICA, 2008),<sup>1</sup> which is equivalent to per capita consumption of 22kg per annum. Ghana depends largely on imported rice to make up the deficit in domestic rice supply. On the average, annual rice import is about 400,000 tons. The self-sufficiency ratio of rice in Ghana has declined from 38% in 1999 to 24% in 2006 (CIRAD, 2007)<sup>2</sup>. It is important for stakeholders in the food and agriculture sector to ensure increased and sustained domestic production of good quality rice for food security, import substitution and savings in foreign exchange.

Consumer's preference of rice is mostly determined by the characteristics of the grain most consumers prefer long grain perfumed rice of good taste, good appearance, and with whole grains, although broken grains have their place in specific local dishes. Health-conscious consumers patronize local brown rice while parboiled rice is preferred in the Northern regions of Ghana. Annual per

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<sup>1</sup> **JICA, 2008.** The Study on the Promotion of Domestic Rice in the Republic of Ghana.

<sup>2</sup> CIRAD, 2007 study of the consumption pattern of rice in Ghana

capita rice consumption during 1999-2001 was 17.5 kg on average, and it has increased to 22.6 kg during 2002-2004 with the growth rate of approximately 8.9% per annum that is higher than the population growth of 2.5% per annum. If the same trend continues, per capita rice consumption would increase to 41.1 kg in 2010 and 63.0 kg in 2015. Taking these growth rates into account, the current annual rice demand of 500,000 tons is expected to increase to approximately 600,000 tons by 2015 with the population growth alone and it could reach 1,680,000 tons, computing both population growth and per capita consumption growth together.

In order to meet the demand projection, the Government of Ghana has made significant efforts to expand the domestic rice production. In addition to government policies and programs, some interventions are made in collaboration with Development Partners, private sector and other relevant stakeholders. Rice sector development in Ghana is directed by the strategic document called National Rice Development Strategy (NRDS) which was formulated in 2009 by the Ministry of Food and Agriculture (MOFA) and is currently being implemented. To make significant progress in increasing production in the short run, it is inevitable to increase the use of modern inputs such as fertilizer and good quality seeds. Nonetheless, the adoption rate of formal seed in Ghana is currently limited to around 20 %, and it constraint the rice yield increase. According to the Ghana NRDS, approximately 10,175 tons of quality seed are required to cultivate 205,000 ha across various ecological zones by 2013, and 18,750 tons will be required for the projected 375,000 ha by 2018 (See the below Table 1).

**Table 1. Projections for Seed Requirement**

Year	Rainfed upland			Rainfed lowland			Irrigated			Total	
	Area ('000ha)	Seed rate (kg/ha)	Total qty rqd (mt)	Area ('000ha)	Seed rate (kg/ha)	Total qty rqd (mt)	Area ('000ha)	Seed rate (kg/ha)	Total qty rqd (mt)	Area ('000ha)	Total seed qty (mt)
<b>2008</b>	7.1	60	<b>426</b>	92.0	50	<b>4,600</b>	18.9	35	<b>661.5</b>	118.0	<b>5,687.5</b>
<b>2013</b>	30.0	60	<b>1,800</b>	150.0	50	<b>7,500</b>	25.0	35	<b>875.0</b>	205.0	<b>10,175</b>
<b>2018</b>	45.0	60	<b>2,700</b>	300.0	50	<b>15,000</b>	30.0	35	<b>1,050.0</b>	375.0	<b>18,750</b>

It is against this background that the Ministry of Food and Agriculture in collaboration with the Coalition for Africa Rice Development (CARD) has elaborated the Ghana Rice Seed Road Map to appropriately address increasing needs of quality rice seeds. This document, therefore, analyzes challenges and constraints in the production and supply of rice seeds, identifies gaps, set targets and articulates strategic interventions that shall lead to the development of rice seed sub sector in Ghana, and subsequently contribute to rice production target set in NRDS.

## **2. Review of National Rice Seed Sector**

### **2.1. Legislation, Policy, Relevant initiatives, Institutions and Planning Aspects**

#### **2.1.1. Legislation**

In Ghana, “Plants and Fertilizer Act (Act 803)” currently governs seeds and other agricultural inputs. The Act 803 was ratified by the Parliament on June 2010 and received Presidential Assent on September 2010, it repealed the previous Seed Act of 1972. The purpose of the Act 803 is to provide protection for plants and control for the handling of seeds and fertilizers and related matters in view of safeguarding public health, agriculture and the environment in the country. The Act is composed of five parts: (i) Plant Protection, (ii) Seeds, (iii) Fertilizer Control, (iv) Plant and Fertilizer Fund and (v) Miscellaneous Matters.

The part two of the Act establishes (a) guidelines for seed growers, cleaners, importers and exporters, (b) a register of varieties that can be marketed and (c) procedures for seed quality control and testing.

Since 2011, the Biosafety Act (Act 831) authorized the use of genetically modified organisms.

The Parliament recently ratified the Seeds Certification and Standards of 2012 which is harmonized with ECOWAS regulation and the Plant Breeders’ Right Bill.

#### **2.1.2. Policies**

The actual general policies related to agriculture are FASDEP II and METASIP. FASDEP II states the long term policy objectives of government in relation to the development of the agriculture sector while METASIP is the national CAADP investment plan to implement the medium term programmes to achieve a target of agricultural GDP growth of at least 6% annually

With regard to seeds, both FASDEP II and METASIP are promoting the use of improved seeds for productivity improvement.

Concerning seed sector, with FAO support, the National Seed Policy has been finalized in May 2013 and is applicable to seeds of all crops grown in Ghana but Rice is among the cereals listed as priority crops along with Maize, Sorghum and Millet. It pointed out seed quality assurance as an important public sector activity but also the possibility of having a seed quality assurance system involving a partnership between public sector in charge of certification and private sector. The national seed policy strategy followed in the early part of the seed sector development was based on public sector investment and subsidized seed suppliers to farmers. The public sector investment and subsidies involved in that approach was based on government desire to achieve widespread use of quality seeds in order to enhance agricultural productivity and an escalation both qualitative and quantitative, in crop production particularly of the main cereal crops.

### **2.1.3. Relevant initiatives related to rice seeds**

There are various initiatives undertaken by development projects, international organizations and funding agencies for rice in general but including rice seeds. Among them the followings can be listed:

- Sustainable Development of Rainfed Lowland Rice Project by Japanese Cooperation
- Japan Emergency Rice Initiative to facilitate access to quality rice seed to vulnerable farmers
- Nerica rice dissemination program
- Inland valley rice development project
- Rice Sector Support Project (RSSP) by French Cooperation
- West Africa Seed Program (WASP) by the West and Central Council for Agricultural Research and Development (CORAF/WECARD)
- West Africa Agricultural Productivity Programme (WAAPP) by World Bank

- Development of Rice Varieties with Enhanced Nitrogen Use Efficiency and Salt Tolerance (NEWEST PROJECT)
- AGRA Programme for African Seed Systems (PASS) supporting breeders and seed companies/entrepreneurs in Ghana.
- Scaling Seeds and Technology Partnership by USAID / IFDC
- Scaling Seeds and Technologies Partnership (SSTP) by USAID / AGRA

The expected outcomes of some of the above initiatives are presented in Table 2 below.

Table 2: selected rice sector initiatives and expected outcome

Initiatives	Expected outcome
<ul style="list-style-type: none"> <li>• Nerica rice dissemination program</li> </ul>	<ul style="list-style-type: none"> <li>- To ensure easy access to quality seeds using CBSS</li> <li>- Food security</li> <li>- Conserve foreign Exchange</li> <li>- Technology Transfer</li> <li>- Capacity building of rice Producer</li> <li>- Production support</li> </ul>
<ul style="list-style-type: none"> <li>• Rice Sector Support Project (RSSP) by French Cooperation</li> </ul>	<ul style="list-style-type: none"> <li>-Improve livelihood of poor farmers</li> <li>-Land development</li> <li>-capacity building for stakeholders</li> <li>-Adapted research experiment on rice production</li> <li>-facilitation of access to credit</li> <li>-</li> </ul>
<ul style="list-style-type: none"> <li>• Sustainable Development of Rainfed Lowland Rice Project by Japanese Cooperation</li> </ul>	<ul style="list-style-type: none"> <li>- Dissemination of the model for sustainable rain fed lowland rice development</li> <li>-</li> </ul>

Inland valley rice development project	<ul style="list-style-type: none"> <li>- Enhance food security</li> <li>- Reduce importation of rice</li> <li>- Increase income of small holders farmers, traders and processors</li> </ul>
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#### 2.1.4. Institutional frameworks

For the production and the distribution of rice seeds, as it is the case in many African countries, two systems coexist in Ghana: the informal system and the formal system.

The first one is composed of three levels: (i) seed savings by farmers, (ii) community-based seed with the support of development projects and NGOs for food security purpose (mainly in the Northern Ghana) and (iii) seed multiplication by farmers for small business in rural market.

The main characteristic of the informal system is the absence of certification process.

The formal seed system is organized in terms of responsibilities for seeds production devoted to the following stakeholders:

- Breeder seeds to public research institutes which belong to MESTI (CSIR-CRI/SARI) and the Universities.
- Foundation seeds to the Grain and Legumes Development Board (GLDB).
- Certified seeds to private seed producers (SeedPAG) and their distribution by seed companies / private agro-input dealers
- Certification and quality control to the Seed Inspectorate Division of the Ministry of Food and Agriculture.



Table 3 shows the institutional framework for production, inspection and distribution of rice seeds in Ghana.

**Table 3: Institutions involved in rice seed production, inspection and supply**

		Name of institutions	Roles/Responsibility	Legislations/Policies determining responsibility	Remarks
Overall	Production	Ministry of Food and Agriculture  CSIR, University of Accra	Planning and supervision of whole process.  Variety Development	Seed Law, (Guidelines for seed production) in Seed Regulation on-going ratification in parliament since 2012	
	Inspection	MOFA - PPRSD	Seed quality control and certification	Seed (certification and standards) regulation Seed Law, Guidelines for seed production	Ghana Seed Inspection Division (Enforcement of regulation)

		Name of institutions	Roles/ Responsibility	Legislations/ Policies determining responsibility	Remarks
	Supply/ distribution	Ministry of Food and Agriculture – GLDB  GAIDA/SEEDPAG/N GOs/Private seed companies	Facilitation and overall management of seed supply  Seed distribution and marketing	Guidelines for seed production.	
Breeder Seed	Production	MESTI (CSIR-CRI/SARI), Universities	Variety Development, Improvement and maintenance	National Seed Policy.  Seed Law Plant breeders' right bill	
	Inspection	Ministry of Food and Agriculture – PPRSD (GSID)	Seed quality control and certification	Plants and Fertilizer Act, 2010 (Act 803) Guidelines for seed production.	
	Supply/ distribution	CSIR-CRI/SARI, Universities	Ensure Availability	Guidelines for seed production.	
Foundation	Production	GLDB,	Multiplication of Breeder	Guidelines for seed production.	

		Name of institutions	Roles/ Responsibility	Legislations/ Policies determining responsibility	Remarks
Seed			to Foundati on seed		
	Inspectio n	Ministry of Food and Agriculture – PPRSD (GSID)	Quality Control and certificati on	Seed (certification and standards) regulations  Guidelines for seed production.	
	Supply/ distributi on	Ministry of Food and Agriculture	Ensure availabilit y of foundati on seeds.	Guidelines for seed production.	
Certifie d Seed	Producti on	Private Sector (registered seed growers)	Produce, condition , store and market to farmers and input dealers	Seed Law and regulations  Guidelines for seed production	
	Inspectio n	Ministry of Food and Agriculture – PPRSD (GSID)	Quality Control and certificati on	Seed Law and regulations  Guidelines for seed production.	
	Supply/	Registered seed	Distributi	Seed Law and	

		Name of institutions	Roles/ Responsibility	Legislations/ Policies determining responsibility	Remarks
	distribution	growers, GAIDA, seed companies	on to farmers and government special projects	regulations  Guidelines for seed production.	

### 2.1.5. Planning aspects

Despite the existence of Rice Platforms Dialogue between public and private sectors such as National Variety Release and Registration Committee (NVRRC) meetings, Seed Taskforce Group Meetings and Ghana Rice Inter- Professional Body (GRIB), there is no annual plan at national level for seed production. Current planning and seed production are ad-hoc and project-base, and it has led to the noticeable disparity between demand and supply of the 3 classes of seeds.

There is total lack of information on the annual seed demand in Ghana. As a result, even the project-based planning of rice seed production is supply-driven rather than demand-driven, and this situation causes serious demand-supply gap.

Public institutions (CSIR-CRI/SARI and GLDB) are usually producing breeder and foundation seeds with the financial support of development projects and funding agencies whereas public funds allocations are mainly for their operating costs such as salaries.

### 2.2. Current seed production

The volumes of production between 2010 and 2013 are shown in table 4.

**Table 4: Production, location, and cultivated area of rice seed in the past 4 years**

<Year 2013>

	Total production (MT)	Name of production stations	Production amount per station (MT)	Total cultivated area (ha)
Breeder Seed	13.7	CSIR-CRI	3	1
		CSIR-SARI	10.7	5
Foundation Seed		Tono irrigation site		
		CSIR-SARI	8 (estimate)	5
Certified Seed	1303.04			

<Year 2012>

X

	Total production (MT)	Name of production stations	Production amount per station (MT)	Total cultivated area (ha)
Breeder Seed	0.32	CSIR-CRI		
		CSIR-SARI	0.32	0.2
Foundation Seed	14.1	Tono irrigation site and Salaga	5.5	2.0
		CSIR-SARI	8.6	4.8
Certified Seed (GSID)	2,370.32			1,409.94

report)				

<Year 2011>

	Total production (MT)	Name of production stations	Production amount per station (MT)	Total cultivated area (ha)
Breeder Seed	0.869	CSIR-CRI		
		CSIR-SARI	0.869	0.4
Foundation Seed	14	Tono irrigation site and Salaga	14	6
Certified Seed(GSID report)	2,367.30			1,344

<Year 2010>

	Total production (MT)	Name of production stations	Production amount per station (MT)	Total cultivated area (ha)
Breeder Seed	0.84	CSIR-CRI		
		CSIR-SARI	0.84	0.4
Foundation Seed	23.5	Tono Irrigation Site and Salaga	23.5	10
Certified Seed(GSID report)	3,907.30			1,654

By comparing the period of seed production during which data are available for all categories of seeds, i.e. from 2010 to 2012, the followings are noted:

- Increase of breeder seed production with a very high level in 2012 (14,1 tons against 0.84 tons in 2010 and 0.869 in 2011)
- Significant decrease of foundation seeds production from 2010 (23.5 tons) to roughly 14 tons in 2011 and 2012
- Large fluctuations of certified seeds production (e.g. significant decrease by more than 1,500 tons from 2010 to 2012).

The above changes mainly derive from the nature of Ghanaian rice seed sector that depends on project-base production by development partners. Seed production can either increase or decrease according to the number of projects and project resources from development partners and it keeps rice seed production and supply in Ghana unstable and unpredictable. For instance, the high production of foundation and certified seeds in 2010 was due to the block farm program<sup>3</sup>.

Another reason for the decrease of both foundation and certified seeds in Table 4 above was caused by the inability of the research institutes to market the breeder seeds produced, since GLDB could not fully utilize what was produced. This is as a result of GLDB limited capacity in the area of human resources particularly in terms of limited number of personnel and obsolete processing and storage facilities. As a result of the above challenges GLDB could not absorb the entire breeder seeds produced by the research Institutes, this led to the decrease in foundation seeds to meet the needs of the seed

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<sup>3</sup> Block farm program was aimed at encouraging the youths to take up farming as a business venture

companies and seed growers. This inability of GLDB also causes a lot of problems for the Research Institutes because research institutions cannot sell all their breeder seeds, consequently they usually have difficulties planning their production for the following year this has led to lack of adequate knowledge of annual national seed requirement. GLDB has the mandate to produce foundation seeds however because of the above constraint; Research Institutes are now allowed to produce foundation seeds.

Although there are about 14 officially released rice varieties (Table 5), only three varieties are mainly cultivated in the different agro-ecological zones (Table 6).

These popular varieties are (i) JASMINE 85 (irrigated low land), (ii) NERICA L-19 (Rain-fed Lowland) and (iii) NERICA 4 (Rain-fed Upland).

All varieties are both for market oriented and / or for subsistence.

Table 5: Officially released rice varieties

Agro-Ecological Zones	Name of Released Varieties
Irrigated Lowland	Gbewaa Rice (JASMINE 85)
	GR18
	TOX 3108
	Digang
	AGRA Rice (IR 841)
	IDSA 85
	Bouake 189
Rain-fed Lowland	Nabogo
	Katanga
	Gbewaa Rice (JASMINE 85)
	Marshal
	Tox 3107
	GR18
	Bouake 189
IR 841 (AGRA Rice)	
Rain-fed Upland	NERICA 1



	NERICA 2
	NERICA 4

Table 6 shows the varieties that are popular and mostly cultivated by the farmers even though they have not been officially released.

**Table 6: Varieties mainly cultivated in the different agro-ecological zones**

Agro-ecologies	Name of Varieties	Cultivated Areas (ha)	Amount produced (MT)
Irrigated Lowland	JASMINE 85	N/A	N/A
Rain-fed Lowland	NERICA L-19	N/A	
Rain-fed Upland	NERICA 4	N/A	

### 2.3. Quality control

Plant Protection and Regulation Services Directorate (PPRSD) is responsible for the overall supervision and control of seed quality and seed certification in the Ghana. Quality control measures at production stages are undertaken by inspectors who belong to PPRSD, through quite strict and appropriate inspection procedures based on high quality standard. However PPRSD is

bedeviled with numerous challenges which reduce their capacity to discharge their duties. These challenges include inadequate field logistics, inadequate number of personnel. Also some inspectors and certifiers do not have sufficient knowledge of the varietal characteristics because of the absence of a detailed seed catalogue. Above all there is inadequate budgetary allocation and untimely release of appropriated fund.

In addition, adulteration is observed in the rice seed supply chain, and all these challenges cause the prevalence of sub-standard rice seeds in the markets.

### **2.3.1. Methods**

The methods and procedures for rice seed production applicable by the Ghana Seed Inspection Division (GSID) are the followings:

- Seed plots are isolated from other plots at least 10 meters in distance in the case of breeder seeds when banded and a larger distance when not banded this is in harmonization with the ECOWAS regulation
- Each seed production plot is assigned to one specific technician who is responsible for seed production in respective plots.
- All rice seed fields are rogued throughout the production period.
- All rice seed fields are inspected and certified
- The standards prescribed according to ECOWAS regulation on purity of the various types of rice seeds are shown in table 7.

- **Table 7: Purity Standard of Seeds**

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

The inspection standards consist of:

- Covering as much area as possible.
- Checking all corners and potential trouble spots.
- Crossing all rows in the field.
- Moving out of the field when necessary to check isolation from contaminating materials.

Tables 8 and 9 describe in details procedures and methods for plot and harvested seed inspection.

**Table 8: Plot seed inspection procedures and methods**

	Organizations/ institutions in charge of inspection	Frequen cy and timing of Inspecti ons	Items for Inspection	Inspection Methods	Quality Standard for Inspection
Breeder Seed	MOFA-PPRSD	At least once (at flowerin g)	Crop performance	Observation Sampling	Varietal characterist ics, standards set in the regulations
			Isolation requirement	Measurement	standards set in the regulations
			Weed control	Observation	Standards set in regulations
			pests and diseases situation	Observation	Standards set in the regulations
			Identification and removal of off-types	Observation Counting	Max off type 0.05%.
			Extent of lodging	Observation Data Collection	N/A
Foundati on Seed	MOFA-PPRSD	At least once (at flowerin g)	Crop performance	Observation Sampling	Varietal characterist ics, standards set in the regulations
			Isolation	Measurement	standards

			requirement		set in the regulations
			Weed control	Observation	Standards set in regulations
			Pests and diseases situation	Observation	Standards set in the regulations
			Identification and removal of off-types	Observation Counting	Max off type 0.05%
			Extent of lodging	Observation Data Collection	N/A
Certified Seed	MOFA-PPRSD	At least once (at flowering)	Crop performance	Observation Sampling	Varietal characteristics, standards set in the regulations
			Isolation requirement		
			Weed control	Observation	Standards set in regulations
			Pests and diseases situation	Observation	Standards set in the regulations
			Identification and removal of	Observation Counting	Max off type 0.3%

			off-types		
			Extent of lodging	Observation Data Collection	

**Table 9: procedures and methods for the inspection of Harvested seed**

	Organizations/ institutions in charge of inspection	Items for Inspection	Inspection Methods	Quality Standard for Inspection
Breeder Seed	PPRSD/GSID	Moisture content	Moisture meter	12% (max)
		Germination rate	Germination Test	80% (min for all classes)
		% Specific purity	Purity Analysis	99.9%

		Contamination by other species	Purity Analysis	98%
		Noxious weed seeds	Observation	0
		Red rice	Lab analysis	0
		Contamination by pests and diseases	Seed Health Test	N/A
Foundation Seed	PPRSD/GSID	Moisture content	Moisture meter	12% (max)
		Germination rate	Germination Test	80% (min for all classes)
		% Specific purity	Purity Analysis	99.9%
		Contamination by other species	Variety Purity Test	98%
		Noxious weed seeds	Observation	0
		Red rice	Lab analysis	0
		Contamination by pests and diseases	Seed Health Test	N/A
Certified Seed	PPRSD/GSID	Moisture content	Moisture meter	12% (max)
		Germination rate	Germination Test	80% (min for all classes)
		% Specific purity	Purity Analysis	99.7%
		Contamination by other species	Variety Purity Test	98%
		Noxious weed seeds	Observation	0
		Red rice	Lab analysis	4seeds/kg

#### 2.4 Human resources for Seed production and inspection

The available human resources for breeder and foundation seed production is presented in table 10

Table 10: Human Resources for Breeder and Foundation seed production

Year	Agricultural Researchers with MSc, MPhil or PhD			Research Technicians			Extension Workers		
	Total	Rice Specialist (full time)	Rice Specialists (part time)	Total	Rice Specialists (full time)	Rice Specialists (part time)	Total	Rice Specialist (full time)	Rice Specialists (part time)
2008	48	28	20	24	15	9	2757	70	2687
2013	55	50	5	110	100	10	4070	100	3970
2018	60	55	5	130	120	10	5630	300	5330

#### 2.4.2. Human resources for seed inspection

The number of currently employed inspectors is 26 for the entire country, and this is far from the ideal staffing with which proper inspection can be carried out. Inadequate field logistics for PPRSD personnel is another issue why inspectors cannot conduct thorough inspection work. These issues result in limited number of field visits and also ineffectiveness in field inspections, and subsequently the certification of sub-standard seeds.



### 2.4.3. Training programmes for seed production actors

With the support of the Ministry of food and Agriculture (MoFA), development partners and NGOs, some training programmes are conducted for inspectors, development and extension staff, technicians of research stations and seed producers. The areas of training and modules are presented in table 11.

**Table 11: Areas of training / Modules**

Areas of training	Modules
Production and maintenance	Site selection, land preparation, seed selection, nursery, planting, weed control, fertilization, rogueing, harvesting
Quality control and certification	Varietal characteristics, conditioning, storage, sampling and testing

### 2.5. Supply

The varietal development is mostly undertaken by Council for Scientific and Industrial Research (CSIR) and the Universities which generally get support from international research institutions and funding agencies. After the approval of the variety by the National Variety Release Committee (NVRC), research institutions are mandated to produce the breeder seed. The breeder seed is then supplied to Grains and Legumes Development Board (GLDB) which has the function to produce foundation seeds. The GLDB mandate was exclusive but due to the increasing demand for foundation seeds, research institutions are now also allowed to produce this category of seeds.

Foundation seeds are bought by seed companies and seed growers to produce certified seeds.

Seed growers in Ghana are organized. A great majority of them belong to Seed Producers Association of Ghana (SEEDPAG). The association is also a platform of dialogue among seed growers and with other stakeholders.

Currently most certified seeds are retailed by seed producers in Ghana while very small quantity is distributed by Ghana Agro Inputs Dealers Association (GAIDA) and SEEDPAG. Both foundation and certified seeds are produced under the supervision of the Ghana Seed Inspection Division of MoFA (inspection at field level, testing the standards of purity and germination and certification process) whose roles include the control and the certification of these two categories of seeds. One critical challenge in seed supply is limited storage capacity which usually affects seed quality (seed health) and increase post harvest losses.

The key roles played by the stakeholders in the rice value chain are summarized in table 12.

**Table 12: Key stakeholders and roles from foundation seed to certified seeds**

	Stakeholders	Roles played		
Foundation seed production/ Supply	MOFA-GLDB	Production, processing, storage, quality maintenance, promotion and marketing		
Certified seed production	Seed growers association and seed companies	Production, processing, storage, promotion and marketing of certified Seeds		
Distribution of seeds	GAIDA, Seed companies	Advertising, transporting and marketing		
Financing	Public and private	Seed subsidy, Credit supply		
Others	Public extension and NGOs	Dissemination		

With regard to seed supply, there are two kinds of support:

➤ **Government support:**

- Sale of subsidized seeds through selected seed companies (Government annual seed subsidy programme).\_ Since 2011\_a subsidy of 25% is applied to seeds (Table 13 and 14). Presently

(2014) the price of certified seed is GHC 2/Kg. the price of certified, foundation and breeder seeds are in the ration of 1:2:4 (GHC 2, 4 and 8 ) respectively. The national seed advisory committee of the national variety release and registration committee determine the price of seeds in collaboration with the private sector (SEEDPAG). Other areas of government support include

- Extension and training support.
- Processing and storage facility support (power charges, storage space, security, etc).

➤ **Support from other stakeholders**

- Direct supply through various donor funded projects such as the Alliance for a Green Revolution in Africa (AGRA) (Grant support to private seed companies) and facilitation of small farmers’ access to certified seeds
- AGRA : Grant support to private seed companies (seeds sold at 25% subsidy).
- NGOs: Facilitating small farmers’ access to certified seeds.

**Table 13: sale price of certified seeds to farmers (2010, 2011, 2012 and 2013)**

Currency _____ cedi (Approximate exchange rate: <u>2.5 cedi</u> 1 = USD _____ )		
	Name of Varieties	Price
Irrigated Lowland	JASMINE 85	Subsidized price for all varieties GHC 1.00/kg
		Actual non subsidized Price GHC 1.45/kg

Rain-fed Lowland	NERICA	
Rain-fed Upland	NERICA	

**Table 14: Purchase price of certified seeds from seed multipliers (2010, 2011, 2012 and 2013)**

Currency: <u>cedi</u> (Approximate exchange rate: <u>2.5</u> 1 = USD )		
	Name of Varieties	Price
Irrigated Lowland	JASMINE 85	GHC 1.38 (GHC 0.68 subsidy)
Rain-fed Lowland	NERICA	GHC 1.38 (GHC 0.68 subsidy)
Rain-fed Upland	NERICA	GHC 1.38 (GHC 0.68 subsidy)

### 3.0 Challenges in National Rice Seed Sector

Even though seed is the major driver of any agricultural transformation agenda and increase in production, the rice seed sub-sector in Ghana faces numerous challenges which have hindered the development of the sector over the years. Unless these constraints are properly addressed, Ghana would have difficulty in achieving the NRDS target of 1.6MT of paddy production by 2018.

To suggest a right set of solutions for better rice seed sector in Ghana, this section identifies and examines challenges the Ghana rice seed sector faces as summarized in Table 15 below.

**Table 15: identification and effect of challenges in the rice seed sub sector**

	<b>ISSUES/CHALLENGES</b>	<b>EFFECTS</b>
LEGISLATION/ POLICY/PROG RAMS/STRATEGY	<ul style="list-style-type: none"> <li>- Inadequate funds for the implementation</li> <li>- Inadequate logistics (e.g. means of transport, equipment, facilities)</li> <li>- Inadequate human resources (limited number, limited capacity)</li> </ul>	Limited implementation of policies, act ,regulations programs, and strategies resulting in limited use of certified seed
	<p>Actors' limited knowledge of existing policies, acts and regulations</p> <ul style="list-style-type: none"> <li>- Seed Users</li>   <li>- Seed Producer</li>   <li>- Seed dealers</li>   <li>- Law enforcement agencies (e.g.. custom office, police officers, quarantine officers, )</li> </ul>	<ul style="list-style-type: none"> <li>- use of seeds which are not officially approved (technically cleared)</li>   <li>- Increase workload of inspectors</li> <li>- Significant amount of sub-standard seeds are produced               <ul style="list-style-type: none"> <li>➔ Decreased production of certified seeds</li> </ul> </li>   <li>- Prevalence of fake seeds</li> <li>- Low patronage by farmers</li>   <li>- Weak Law enforcement</li> </ul>

	<p>Business environment is not conducive enough to attract sufficient private sector participation in rice seed business</p> <ul style="list-style-type: none"> <li>- inadequate financing to private sectors (high interest rate, limited financial services for agricultural sector)</li> <li>- Lengthy and complicated procedures for accessing services</li> <li>- Limited capacity of private sector in seed business</li> </ul>	<p>Insufficient participation of private sector in rice seed business</p> <ul style="list-style-type: none"> <li>-Private sector shy away from bank loans</li> <li>-Private sector reluctance to approach public sector for services</li> <li>- Shortage of certified seed at the right time</li> </ul>
INSTITUTIONS AND PLANNING	<p>For institutions, the key constraints listed are the followings:</p> <ul style="list-style-type: none"> <li>- Low participation of stake holders in existing platforms(Agriculture working groups e.g. GRIB, NVRRRC)</li> <li>- Weak organisation of stakeholders such as GAIDA, SEEDPAG (organisational structure, ineffective leadership)</li> <li>- Lack of information on seed demand</li> <li>- Lack of National Rice seed plan and Seed Planning process</li> </ul>	<ul style="list-style-type: none"> <li>- Weak linkages between Producer/retailers and seed users</li> <li>- There is demand for seed but communication is lacking among the stakeholders</li> <li>- Communication gap among stakeholders</li> <li>- Demand-supply gap of seeds</li> </ul>
PRODUCTION	<p><b>LIMITED FINANCIAL CAPACITY OF SEED PRODUCERS</b></p> <ul style="list-style-type: none"> <li>- BREEDER SEEDS</li> </ul> <p>Untimely disbursement of funds. Insufficient budget allocation to research Institutes</p>	<ul style="list-style-type: none"> <li>- Insufficient production of breeder seeds</li> </ul>

	<p>- FOUNDATION SEEDS</p> <p>Untimely disbursement of funds Insufficient budget allocation to GLDB</p> <p>- CERTIFIED SEEDS</p> <p>Unavailability of concessionary rate on loan for farming activities</p> <p><b>LIMITED HUMAN RESOURCES FOR SEED PRODUCTION</b></p> <p>- BREEDER SEEDS</p> <p>Sufficient but ageing researchers and technicians, therefore need for new recruitment</p> <p>- FOUNDATION SEEDS</p> <p>Limited technical staff of GLDB</p> <p>CERTIFIED SEEDS</p> <p>Limited rice seed producers</p> <p><b>LIMITED TECHNICAL CAPACITY OF SEED PRODUCER</b></p> <p>- BREEDER SEEDS</p> <p>Sufficient but need to be strengthened by recruiting new breeders</p> <p>- FOUNDATION SEEDS</p> <p>Limited technical personnel to produce foundation seeds</p>	<p>- Insufficient production of Foundation seeds</p> <p>- Insufficient production of certified seeds</p> <p>- insufficient and delay in the production of breeder seeds</p> <p>- Insufficient production of Fondation seeds</p> <p>- Insufficient production of certified seeds</p> <p>Quality of breeder seed produced</p> <p>- Limited production of foundation seed</p> <p>- Contamination of foundation seed production at all levels (off types, volunteers, admixtures, seed health)</p>
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	<p>- FOUNDATION LEVEL : Breeder Seeds</p> <p>- CERTIFICATION LEVEL: Foundation seeds. There is room for improvement of quality</p> <p><b>LIMITED WILLINGNESS, MORAL, MOTIVATION</b></p> <p><b>BREEDER SEED</b> Inadequate motivation of breeders</p> <p><b>FOUNDATION SEED</b> Inadequate motivation of staff</p> <p><b>CERTIFIED SEEDS</b> Minimum incentive for certified seed producers</p>	<p>-inappropriate production practices (weed, land preparation, fertilizer application etc.)</p> <p>-Poor quality seeds-contamination at all levels (off types, volunteers, admixtures, seed health) - Inappropriate production practices (weed control, land preparation, fertilizer application etc.)</p> <p>Limited quantity of breeder seed produced</p> <p>Limited quantity of foundation seed produced</p> <p>- Inconsistency in the demand pattern for certified seeds -poor price of certified seeds compared to informal seeds</p>
<p><b>INSPECTION/QUALITY CONTROL</b></p>	<p>-</p> <p>- Inadequate field logistics for PPRSD personnel to carryout a thorough job</p> <p>- Inadequate human resources Number of personnel and regeneration</p>	<p>-</p> <p>- Limited number of field visits for inspection</p> <p>- Ineffectiveness on the field</p> <p>→ certification of sub-standard seeds</p> <p>- Limited number of sampling test in the markets → Adulteration of seeds by input dealers</p>

	<ul style="list-style-type: none"> <li>- Insufficient knowledge of varietal characteristics by some inspectors and Seed certifiers</li> <li>- Inadequate equipment (field testing kits)</li>   <li>-ill-equipped laboratories</li>   <li>- Inadequate Budget</li> <li>- Untimely Disbursement</li>   <li>-Inadequate effective reporting system of sub-standard seeds</li> </ul>	<ul style="list-style-type: none"> <li>- certification of sub-standard seeds</li> <li>- insufficient sampling</li> <li>- Certification of sub-standard seeds</li> <li>- Wrong laboratory diagnosis leading to poor quality seeds</li> <li>- Prevalence of fake seeds in the markets (inability of inspection officers to carryout thorough inspection)</li> </ul> <p>Farmer's adoption rate is slow due to lack of trust</p>
MARKETING	<ul style="list-style-type: none"> <li>- Lack of knowledge of Seed users on benefit of quality seed</li>   <li>- Small profitability of seed used →Market condition, farmers economy, combination with other inputs,</li> <li>- Quality issue</li> <li>- high cost of certified untimely supply (Rain fed lowland in the Northern part)</li> <li>- Limited participation by agro dealers in seed marketing (currently seed Producer retail seeds. When seed production increases , then</li> </ul>	<ul style="list-style-type: none"> <li>- Limited seed demand (Low use of certified seeds )</li> <li>- Limited seed demand (Low use of certified seeds</li> <li>- Limited seed demand (Low use of certified seeds</li> <li>- Insufficient seed market outlets</li> </ul>

	agro dealers should take part in seed sales)	
SUPPLY	<p>- Limited capacity of quality storage</p> <p><b>BREEDER SEED</b></p> <ul style="list-style-type: none"> <li>○ Limited storage capacity</li> <li>○ Limited management capacity (human, technical utility etc.)</li> </ul> <p><b>FOUNDATION SEED</b></p> <ul style="list-style-type: none"> <li>○ Limited storage capacity</li> <li>○ Limited management capacity (human, technical utility etc.)</li> </ul> <p><b>CERTIFIED SEED</b></p> <p><b>Limited good Haulage facility</b></p> <ul style="list-style-type: none"> <li>○ Lack of managerial capacity</li> <li>○ Lack of technical capacity</li> </ul> <p><b>- Limited processing capacity</b></p> <p><b>BREEDER SEED</b></p> <ul style="list-style-type: none"> <li>○ Limited management capacity (human, technical utility etc.)</li> </ul> <p><b>FOUNDATION SEEDS</b></p> <ul style="list-style-type: none"> <li>○ Obsolete facilities in regional processing centres</li> <li>○ Insufficient number of processing centres</li> </ul>	<p>- Affect the seed quality (seed health)</p> <p>- Post-harvest loss</p> <p>-Poor seed quality</p> <p>-Delay in seed production which affect availability FS</p> <p>- Affect the quality of seed (seed health)</p> <p>- Post-harvest loss</p> <p>-Poor seed quality</p> <p>-Delay in seed production which affect availability of foundation seeds</p> <p>- Inadequate proper transport system for the timely movement of seeds from one point to the other especially during production seasons</p> <p>- Poor post harvest handling leading to poor seed quality</p> <p>Poor quality of certified seeds</p> <p>Poor quality of seeds</p> <p>Poor quality of seeds processed</p> <p>Limited and poor quality of</p>

	<p>CERTIFIED SEEDS</p> <ul style="list-style-type: none"> <li>○ Obsolete facilities in regional processing centres</li> <li>○ Insufficient number of processing centres</li> <li>○ Limited access to market information (price, availability location, variety ) by traders and seed users</li> </ul>	<p>seeds processed</p> <p>Poor quality of seeds processed</p> <p>Limited and poor quality of seeds processed</p> <p>Seed glut in some regions while scarcity in others</p>
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Highlights of some of the key issues from table 15 and their effect on the Ghana seed sector.

1 legislation/policy/ program and strategy. There are policies and legislations guiding the seed sub sector in Ghana, but some of the stakeholders in the seed industry have limited knowledge of the existence of these policies and legislations which often result in limited or lack of implementation. This is due to inadequate funds, human resources (number and capacity of personnel) and inadequate logistics (means of transport, equipment and facilities). As a result of the above challenges there is the continuous use of seeds that are not officially released, while there is also the prevalence of fake seeds in the market leading to low patronage of certified seeds. The business environment is considered not conducive enough to attract the private seed Producers this is as a result of inadequate financing, commercial bank loans have high interest rate which is not favourable for agricultural business therefore the private seed companies shy away from approaching the banks for loans, the result is the limited capacity of the private sector in seed business which ultimately leads to shortage of certified seeds at the right time.

2. Institution and planning. There is weak organization of some of the major stakeholders in the seed industry such as Ghana Inputs Dealers Association (GAIDA) and Seed Producers Association of Ghana (SEEDPAG), this weakness is mostly noticeable in the area of the leaders inability to cooperate with one another to pursue a common objective, this has therefore culminated in the low participation of stakeholders in existing platforms such as Ghana Inter Professional Body (GRIB), National Variety release and Registration Committee (NVRRC) etc. the negative impact of this challenge is the weak linkages between the Producers, retailers and seed users hence even when there is demand for seeds in one region but due to the communication gap the information is not readily available to seed owners in another region. Lack of national seed plan and planning process has further heightened the demand-supply gap.

3. Production. There is limited financial capacity in seed production as it relates to the three (3) classes of seeds. for the breeder seed category insufficient budget allocation is a challenge and when the fund is available it is not disbursed to the research institutes on time, this usually leads to the delay in the production of breeder seeds, the same is applicable to foundation seed because the two classes of seeds are produce by the public sector which depend entirely on government budget. The private seed companies are not able to access loan at low interest rate which also lead to limited production of certified seeds

In the area of human resources, the research institutes have sufficient researchers and technicians but the challenge is that they are ageing which usually result in the delay of production of Breeder Seeds, on the other hand Ghana Legume Development Board (GLDB) have limited technical staff which result in the low production of Foundation Seeds. There are very few private seed Producers in Ghana which usually result in limited production of Certified Seeds.

There is also infrastructural challenge in seed production in Ghana, the research institutes are contending with the challenge of land encroachment by the villagers which progressively limit the area of land available for Breeder Seed production. There is limited land and poor irrigation facilities for the production of Foundation Seeds which result in the contamination of seeds due to poor isolation (off-types, volunteers, admixtures etc). Another challenge is in logistics, where there are inadequate vehicles and other field observation instruments which usually result in limited number of field visits and low production of quality foundation and certified seeds. There are minimum incentives for certified seed Producer which usually lead to the inconsistency in demand and poor price of certified seed compared to informal seeds.

4. Inspection and quality control. Plant protection and regulatory services directorate (PPRSD) is the government agency responsible for inspection and quality control. PPRSD lack adequate human resources to carry out a thorough job in the field, therefore resulting in limited number of field visits for inspections this usually leads to certification of sub standard seeds. Some of the inspectors and seed certifiers lack sufficient knowledge of varietal characteristics, because the varietal catalogue lack sufficient information hence there is the certification of substandard seeds. Some seed testing laboratories are ill –equipped giving rise to wrong laboratory diagnosis and poor quality seeds. There is also the inadequate effective reporting system of sub standard seed by the farmers which usually lead to slow rate of adoption because the farmers do not trust the source of the seeds in the market.

5. Marketing. In Ghana there is the limited participation of agro dealers in seed marketing, majority of the seed producers retail their seeds, this has affected the market over the years, however it is envisaged that with the increase of certified seeds under the strategy agro dealers will take active part in seed marketing. Poor quality and high cost of certified seeds is a critical issue in marketing of seeds which result in limited demand and slow adoption by seed users. Majority of the farmers are not even aware of the benefit of using formal seeds hence the low demand of certified seeds.

6. Supply. There is limited capacity of quality storage for seeds in Ghana which usually affect the seed health and also result in post harvest losses. The processing facilities are limited and obsolete, the available ones lack the required human capacity to manage them, and this usually results in poor quality of processed seeds. Another critical issue is the limited access to market information by traders and seed users in terms of price, availability and location, this normally lead to seed glut in some region while in other regions there is scarcity



## **4.0 Vision and Scope**

### **4.1. Position of Rice Seed Development Strategy**

Rice sector development in Ghana is directed by the strategic document called National Rice Development Strategy (NRDS) which was formulated in 2009 by the Ministry of Food and Agriculture with the support of the Coalition for African Rice Development (CARD). The seed development strategy is in line with the national seed policy which aimed to improve the rice seed sub sector and contribute to the overall objective of the NRDS,

### **4.2. Vision**

The vision is to establish an efficient and sustainable national rice seed system that will contribute to enhance quality rice production to meet national and international standards.

### **4.3 Goal and Scope**

The goal of this Rice Seed Development Strategy is to promote the use of quality rice seed for increased productivity that will contribute to national food security, poverty reduction and improved livelihood.

### **4.4 Objectives**

The general objective is to ensure national self-sufficiency in quality rice seed production by 2018, whereas the specific objectives are:

- To build technical capacity of actors along the rice seed value chain (production, quality control and certification, processing, storage, marketing)
- Increase the adoption rate of certified seeds to 40% by 2018.
- To provide the needed infrastructure along the rice seed value chain (production, quality control and certification, processing, storage, marketing) through a PPP arrangement
- To create demand for quality seeds through promotion and provision of research and development support

#### 4.5 Implementation Structure

The implementation will involve both public and private stakeholders with regard to their functions and their activities related to the seed sector. It will be done in correspondence to the following interventions indicated in the Seed Road Map:

**Table 16: showing implementation structure**

functions	Agencies
Fund mobilisation	Lead Directorate: MOFA,DCS, Collaborating Directorare: PPRSD,DAES, PPMED, AESD,

	CSIR  Private Sector: NGOs, SEEDPAG, GAIDA, SEED COMPANIES  Development Partners: FAO,IFDC,AGRA.CARD.IFAD,JICA,AfDB
Legislation & policy(Review, Enforcement, Awareness creation)	PPRSD, DCS.PPMED, AG, police Service, DAES,Association of seed companies and growers
Harmonisation	SRID
Seed Production/quality control & Certification	PPRSD, DCS, CSIR, GLDB, DAES. GAIDA AESD, Seed Companies
Adoption of Improved Seeds	DAES, DCS, PPRSD, AESD, NGOs, SEED COMPANIES
Monitoring & evaluation	PPMED, SRID, PROJECT M&E. PRIVATE SECTOR

- The set up of a Steering committee including representatives of all stakeholders will be considered.

## 5.0 Strategies and Priority.

The strategy of the rice seed development will ensure that it is demand rather than supply driven and this could be achieved by ensuring that the seeds produced and marketed are of the right quality, available and accessible and should be supplied when the farmer demand it. This will help boost the farmer's confidence in adopting the use of formal seed.

### 5.1. Strategic approach

In line with the National Seed Policy, the following strategic principles will be adopted:

- The Rice Seed Road Map will have geographical focus on increasing seed use, based on these criteria; i) irrigated and rain-fed agro-ecologies, ii) Scale of potential and/or actual production and iii) Market accessibility. Based on the above criteria priority districts where the use of certified seed shall be intensified in the Rice Seed Road Map are selected (see annex)
- The seed production is expected to take place in the areas seeds are used, therefore the efforts for increasing seed production will be made in the above-mentioned areas.
- Even though the majority of rice seeds are currently retailed by seed producers themselves, agro dealers are expected to take over seed retailing, since increased amount of seed produced will go beyond the retail capacity of seed producers. Support measures will be taken for agro dealers in the above- mentioned target areas to encourage active participation of private sector in seed trading.

- The following rice varieties will be promoted; Gbewaa(Jasmine 85),Togo Marshal and Tox 3107 (most commonly grown varieties) and Agra rice (New variety the government would like to promote)
- Seed quality assurance will be strengthened through capacity development, improvement and distribution of variety catalogues, and establishment of reporting system on sub-standard seed in combination with strengthened traceability and severe sanctions against adulteration.
- Given the resource constraints the Ghanaian seed sector has, the interventions on quality control will be prioritized at the higher stages of seed production and distribution systems (such as breeder and foundation seeds) considering their large influence on the seed quality as a whole.
- The private sector will be encouraged to continue certified seed production and marketing where it has interest and capacity. The private sector will have access to breeder and foundation seed produced by the public sector institutions under agreed arrangements. In the medium to long term, the private sector may be accredited to produce breeder and foundation seeds in conformity with established quality assurance processes.
- An enabling environment will be created to encourage private sector investments in the seed value chain (through institutionalization of subsidy program, tax incentives, duty concessions, royalty payments, outright grants) in line with the existing investment laws.
- Government will accelerate its efforts towards the establishment of structured private seed companies including PPP in rice seed enterprise

development (e.g. provision of infrastructure, utility services, shareholding, sole proprietorship, etc.)

- The needed platform for seed growers, seed companies, financial institutions and government will be created to enhance credit availability to the private sector.
- Government will vigorously promote the establishment and growth of an umbrella national association of private seed companies which will foster the development of their members and to effectively partner Government in its seed development efforts.
- To promote pluralistic extension services, seed certification under licensing arrangements and eventually to research and variety development.

## **5.2. Target Setting**

### **5.2.1. Background**

To achieve the goals and objectives set under the proposed strategy, targets for the various types of seeds are set.

The target setting is based on the following parameters:

- NRDS target paddy production by 2018 : 1.6 Million MT
- Average amount of seed used: 50 kg/ha with an average yield of 2.5 t/ha, 3.0t/ha and 3.5t/ha for breeder, foundation and certified seeds respectively and so a Seed-Grain Ratio of 1:50 , 1:60 and 1:70 is observed
- Approximate amount of seeds currently self-supplied by or among farmers \_\_8,140 MT (80 %)

- Target amount of production to be covered by certified seeds: 40 %, (20% currently)
- Seed renewal : every 3 years

Based on these parameters, the target amount (MT/year) with the area of land required for production (ha) is: (i) Breeder seed: 2.539 MT for 1.01ha, (ii) Foundation seed: 126.98 MT for 51.03 ha and (iii) Certified seed: 7,619.04MT for 3,047.33 ha.

### 5.2.2. Gap identification -Production

As shown in Table 17, a surplus is noted for breeder seeds whereas there is a deficit for both foundation and certified seeds. Therefore, the crucial issue is the availability of foundation seeds which constitute the inescapable passage for producing certified seeds.

**Table 17: Gap between target amount of seeds and current seeds production**

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	Target amount (MT/year)	Current Production/ supply (MT/year)	Gap (MT/year)
Breeder Seed	2.539	13 (2013)	Surplus
Foundation Seed	126.98	10.7 (2013)	- 116.28
Certified Seed	7,619.04	2,370.12 (2012)	- 5,248.92 MT

<sup>4</sup> Savana Agricultural Research Institute(SARI)

**Calculation of target annual production per class of seed and the gap to be filled**

Paddy requirement by 2018 is 1.6 MT

$$1,600,000/3 = 5,333\text{MT}$$

**Seed: grain ration**

- I. Breeder seed 1:50
- II. Foundation seed 1:60
- III. Certified seed 1:70

$$5,333/70 = 7,619.04 \text{ (Certified Seed)}$$

$$7,619.04/60 = 126.98 \text{ (Foundation seed)}$$

$$126.98/50 = 2.539 \text{ (Breeder seed)}$$

Table 18: Target annual production per class of seed and the gap to be filled

	Target amount (MT/Year)	Current production/supply (MT/Year) in 2013	Gap (MT/Year)
Breeder	2.539	13.0	Surplus



Foundation seed	$126.98 - 10.7 = 116.28 * 20\% = 23.26\text{t}$ 10.7 t in 2013 (+ 20%) 33.94 t in 2014 (+20%) 57.2 t in 2015 (+ 20%) 80.46 t in 2016 (+ 20%) 103.72 t in 2017 (+20%) 126.98 t in 2018	10.7t	116.28 t 23.26 t/yr
Certified seed	$7,619.04 - 2,370.12 = 5,248.92 * 20\% = 1049.78\text{ t}$ 2,370.12 t in 2013 (+ 20%) 3,419.92 t in 2014 (+20%) 4,469.7 t in 2015 (+ 20%)	2,370.12 t	5,248.92 t 1049.78 t/yr

	5,519.46 t in 2016 (+ 20%) 6,569.26 t in 2017 (+ 20%) 7,619.04 t in 2018		
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### 5.2.3. Gap identification – Area

Apparently, there is no problem for breeder seeds since a surplus is recorded (Table 18).

Concerning foundation seed and certified seed for which there is a need of additional areas to cultivate, considering the existence of two agro-ecologies suitable for seed production: irrigated and rain-fed lowland. In this regard seed companies and growers will be encouraged to access parcels of land in those ecologies for seed multiplication. It is therefore proposed that at least 40% of areas under seed production should be irrigated fields and the remaining 60% allocated to rain-fed lowland areas.

**Table 19: Gap between land required and current cultivated area**

	Area of land required to achieve target production (ha)	Current cultivated area for seed production	Gap (ha)
Breeder Seed	1.01	6 ha (2013) 0,2 ha (2012)	+ 4.99 for 2013 & - 0.81 ha for 2012
Foundation Seed	51.03	6.8 ha (2012)	- 44.23 for 2012

Certified Seed	3,047.33	1,409.94 ha (2012) 1,344 (2011) 1,654 ha (2010)	-1,637.39 for 2012 - 1,703.33 for 2011 -1,393.33 for 2010
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#### 5.2.4. Gap identification –Human resources for breeder and foundation.

Table 20 shows the human resources available in each of the research stations and GLDB and identifies the gaps that need to be filled in order to achieve the objective of the strategy.

**Table 20: Gap identification for human resources –breeder and foundation seeds**

Name of Seed Producing Stations	Researcher		Gap	Technician		Gap	Workers/Laborers		Gap
	Required	Available		Required	Available		Required	Available	
SARI (breeder seed)	3	1	2	5	2	3	3 full time	No full time	3
							17 casual		
CRI (breeder seed)	3	1	2	5	1	4	5 full time	2 full time	3
							17 casual		
GLDB (two stations) (foundation seed)	6	2	4*	4	2	2*		20 casual	
								workers	

Total	12	4	8	14	5	9	8	2	6
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\*This is the number of required researchers to cover two new stations

\*\* This is the number of required technicians to cover two new stations

### 5.2.5. Gap identification –Human resources for inspection

Table 21 shows the number of inspectors per region and the gaps that need to be filled in order to achieve an effective coverage for field inspection and seed certification.

**Table 21: Human resources gap for seed inspection.**

Geographical area (Region)	Number of Inspectors		Gap in number
	Required	Available	
Northern	7	4	3
Upper East	6	2	4
Upper West	5	2	3
Greater Accra	4	1	3
Volta	6	3	3
Ashanti	8	5	3
Eastern	4	1	3
Central	7	5	2
Brong Ahafo	6	3	3
Western	3	-	3
<b>Total</b>	<b>56</b>	<b>26</b>	<b>30</b>

### 5.3. Possible interventions

The approaches described in the document require several concrete interventions from the stakeholders. Table 22 shows recommended strategic

actions and solutions that shall lead to achieving the objectives under the proposed strategy. The document has gone a step further to list possible government departments, private sectors and development partners and NGOs that would assist in the proposed interventions.

**Table 23: Analysis of Issues and possible intervention options and responsible agencies, NGOs and DPs**

	ISSUES/CHALLENGES	EFFECTS	SOLUTIONS	RESPONSIBLE AGENCY
LEGISLATION/ POLICY/PROGRAMS/ STRATEGY	<ul style="list-style-type: none"> <li>- Inadequate funds for the implementation</li> <li>- Inadequate logistics (e.g. means of transport, equipment, facilities)</li> <li>- Inadequate human resources (limited number, limited capacity)</li> </ul>	Limited implementation of policies, act ,regulations programs, and strategies resulting in limited use of certified seed	<ul style="list-style-type: none"> <li>-Increase funding</li> <li>- Recruitment</li> <li>-Capacity building ( Training, technical Assistance)</li> </ul>	<p>MOFA/MOF/DPs</p> <p>MOFA/MOF/MESTI MOFA/MESTI/DPs</p>
	<p>Actors' limited knowledge of existing policies, acts and regulations</p> <ul style="list-style-type: none"> <li>- Seed Users</li> <li>- Seed Producer</li> <li>- Seed dealers</li> <li>- Law enforcement agencies (e.g.. custom office, police officers, quarantine officers, )</li> </ul>	<ul style="list-style-type: none"> <li>- Use of seeds which are not officially approved (technically cleared)</li> <li>- Increase workload of inspectors</li> <li>- Significant amount of sub-standard seeds are produced → Decreased production of certified seeds</li> <li>- Prevalence of fake seeds</li> <li>- Low patronage by farmers</li> <li>- Weak Law enforcement</li> </ul>	<ul style="list-style-type: none"> <li>-Awareness creation radio, TV Newspapers</li> <li>- Training</li> <li>- Awareness creation radio, TV Newspapers</li> <li>- Training</li> <li>- Awareness creation radio, TV Newspapers Joint Taskforce</li> <li>- Training</li> <li>- Awareness creation</li> </ul>	<p>MOFA/SEEDPAG/NGO/DP</p> <p>MOFA/SEEDPAG/NGO/DP</p> <p>MOFA/GAIDA/SEEDPAG</p> <p>MOFA/DP/MOI</p>
	<p>Business environment is not conducive enough to attract sufficient private sector participation in rice seed business</p> <ul style="list-style-type: none"> <li>- inadequate financing to private sectors (high interest rate, limited financial services for agricultural</li> </ul>	<p>Insufficient participation of private sector in rice seed business</p> <p>-Private sector shy away</p>	<p>Negotiate with financial institutions (e.g. banks., micro credit, saving unions ) to set up favourable financing schemes for stakeholder in rice seed sector</p> <p>Up-scaling of Agric Insurance scheme</p>	<p>MOFA/ MOF/DP/ ARB Apex/ other bank</p> <p>MOF/MOFA/ NIC/ DPs/ARB Apex and ADB</p>

	<p>sector)</p> <ul style="list-style-type: none"> <li>- Lengthy and complicated procedures for accessing services</li> <li>- Limited capacity of private sector in seed business</li> </ul>	<p>from bank loans</p> <ul style="list-style-type: none"> <li>-Private sector reluctance to approach public sector for services</li> <li>- Shortage of certified seed at the right time</li> </ul>	<ul style="list-style-type: none"> <li>- Streamlining procedures for accessing services</li> <li>- Shortening and simplifying the procedures.</li> <li>- Capacity building (Technical backstopping/ training) in business management, technical areas, and service provision.</li> </ul>	<p>MOFA/NIC</p> <p>MOFA</p> <p>MOFA/DP/GAIDA/SEEDPAG/MOTI</p>
<p>INSTITUTIONS AND PLANNING</p>	<p>For institutions, the key constraints listed are the followings:</p> <ul style="list-style-type: none"> <li>- Low participation of stake holders in existing platforms(Agriculture working groups e.g. GRIB, NVRRC)</li> <li>- Weak organisation of stakeholders such as GAIDA, SEEDPAG (organisational structure, ineffective leadership)</li> <li>- Lack of information on seed demand</li> <li>- Lack of National Rice seed plan and Seed Planning process</li> </ul>	<ul style="list-style-type: none"> <li>- Weak linkages between Producer/retailers and seed users</li> <li>- There is demand for seed but communication is lacking among the stakeholders</li> <li>- Communication gap among stakeholders</li> <li>- Demand-supply gap of seeds</li> </ul>	<ul style="list-style-type: none"> <li>-Sensitization</li> <li>-Making stakeholders platforms more effective so that they can deliver tangible results</li> </ul> <p>Strengthening the organisational structures</p> <p>Seed demand surveys (together with other crops)</p> <p>Development of National Rice Seed Strategy(Ongoing)</p>	<p>MOFA/The chairs and members of platform</p> <p>Umbrella organisations / DAES of MOFA</p> <p>SRID of MOFA/SEEDPAG/GAIDA</p> <p>Technical Team of NRSDS</p>

			<p>-Educate the end users(farmers) on the advantage and profitability of the use of certified seeds</p> <p>-establish demonstration farms to showcase the field performance of certified seeds</p>	<p>MOFA/GAIDA/SEEDPAG/PPRSD</p> <p>MOFA/NGOs/DPs</p>
PRODUCTION	<p><b>LIMITED FINANCIAL CAPACITY OF SEED PRODUCERS</b></p> <p>- BREEDER SEEDS</p> <p>Untimely disbursement of funds. Insufficient budget allocation to research Institutes</p> <p>- FOUNDATION SEEDS</p> <p>Untimely disbursement of funds Insufficient budget allocation to GLDB</p>	<p>- Insufficient production of breeder seeds</p> <p>- Insufficient production of Foundation seeds</p>	<p>Increase budgetary allocation for breeder seed production and timely release of funds</p> <p>Increase budgetary allocation for foundation seeds production and timely release</p>	<p>MOFA/MOF/DP</p> <p>MOFA/MOF/DP</p>



	<p>- CERTIFIED SEEDS</p> <p>Unavailability of concessionary rate on loan for farming activities</p> <p><b>LIMITED HUMAN RESOURCES FOR SEED PRODUCTION</b></p> <p>- BREEDER SEEDS</p> <p>Sufficient but ageing researchers and technicians, therefore need for new recruitment</p> <p>- FOUNDATION SEEDS</p> <p>Limited technical staff of GLDB</p> <p>CERTIFIED SEEDS Limited rice seed producers</p> <p><b>LIMITED TECHNICAL CAPACITY OF SEED PRODUCER</b></p> <p>- BREEDER SEEDS</p> <p>Sufficient but need to be strengthened by recruiting new breeders</p>	<p>- Insufficient production of certified seeds</p> <p>- Insufficient and delay in the production of breeder seeds</p> <p>- Insufficient production of Foundation seeds</p> <p>- Insufficient production of certified seeds</p> <p>Quality of breeder seed produced</p>	<p>of funds Support seed SMEs and seed companies to produce foundation seed of newly released varieties</p> <p>Make concessionary rates on loans available to farmers</p> <p>Provide enough technical support staff. Attract and train young researchers</p> <p>Provide enough technical support staff.</p> <p>Whip up the interest of private seed Producers through subsidy and training</p> <p>Build capacity of newly</p>	<p>MOFA/MOF to facilitate</p> <p>MOFA/Research Institute</p> <p>MOFA/Research Institutes</p> <p>MOFA/SEEDPAG/GAIDA</p> <p>MOFA/SARI/CRI/KIP</p>
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	<p>- FOUNDATION SEEDS Limited technical personnel to produce foundation seeds</p>	<p>- Limited production of foundation seed - Contamination of foundation seed production at all levels (off types, volunteers, admixtures, seed health)</p>	<p>recruited and old staff in quality breeder seed production Training in hybrid seed production</p>	
	<p>CERTIFIED SEEDS Limited capacity in the production of certified seeds</p>	<p>- Inefficient production of certified seeds due to the contamination at all levels (off types, volunteers, admixtures, seed health)</p> <p>- Inappropriate production practices (weed control, land preparation, fertilizer application etc.)</p>	<p>Capacity building for staff</p> <p>Capacity building for private seed producers</p>	<p>GLDB</p> <p>MOFA/SEEDPAG</p>
	<p>LIMITED LOGISTICAL CAPACITY FOR SEED PRODUCTION (inadequate vehicles for field trips and field instrument)</p>		<p>Capacity building for staff</p>	<p>GLDB</p>
	<p>- FOUNDATION SEEDS</p> <p>- CERTIFIED SEEDS</p>	<p>Low production of quality foundation seeds</p> <p>-inappropriate site selection - Inappropriate seed bed preparation</p>	<p>Enhance capacity in the area of mobility to field for inspection</p> <p>-Training and Capacity building for private seed producers</p>	<p>GLDB/PPRSD</p> <p>MOFA to facilitate/SEEDPAG</p>

	<p>LIMITED INFRASTRUCTURE FOR SEED PRODUCTION</p> <ul style="list-style-type: none"> <li>- BREEDER SEEDS Encroachment on research Land by the locals</li> <li>- FOUNDATION SEEDS Limited Land and Irrigation</li> </ul> <p>CERTIFIED SEEDS</p> <p><b>QUALITY OF SEEDS USED FOR SEED PRODUCTION</b></p> <ul style="list-style-type: none"> <li>- FOUNDATION LEVEL : Breeder Seeds</li> <li>- CERTIFICATION LEVEL: Foundation seeds. There is room for improvement of quality</li> </ul>	<ul style="list-style-type: none"> <li>- Insufficient production of seeds due to limited land area</li> <li>- contamination at all levels due to poor isolation (off types, volunteers, admixtures, seed health),</li> <li>-inappropriate production practices (weed, land preparation, fertilizer application etc.)</li> <li>-Poor quality seeds- contamination at all levels (off types, volunteers, admixtures, seed health)</li> <li>- Inappropriate production</li> </ul>	<p>-Provide simple equipment like moisture testing equipment for seed testing</p> <p>Negotiations with the locals and mapping out of research land area</p> <p>Select appropriate sites for production and storage of seeds like mobile storage equipment threshers</p> <p>Training on GAP (seed handling, packaging and labelling)</p> <p>Promote linkage between breeders/foundation/certified seed producers</p> <p>Training on GAP</p>	<p>Research Institutes</p> <p>MOFA</p> <p>GLDB</p> <p>SEEDPAG/GLDB/MOFA to facilitate</p> <p>SEEDPAG/MOFA to facilitate/DPs</p>
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	<p><b>LIMITED WILLINGNESS, MORAL, MOTIVATION</b></p> <p><b>BREEDER SEED</b> Inadequate motivation of breeders</p> <p><b>FOUNDATION SEED</b> Inadequate motivation of staff</p> <p><b>CERTIFIED SEEDS</b> Minimum incentive for certified seed producers</p>	<p>practices (weed control, land preparation, fertilizer application etc.)</p> <p>Limited quantity of breeder seed produced</p> <p>Limited quantity of foundation seed produced</p> <p>- Inconsistency in the demand pattern for certified seeds -poor price of certified seeds compared to informal seeds</p>	<p>Good working environment especially availability and accessibility of working tools</p> <p>Good working environment especially availability and accessibility of working tools</p> <p>Promote the use of certified seeds</p> <p>Establishment of minimum price regime for certified seeds</p>	<p>SEEDPAG/MOFA to facilitate/DPs</p> <p>Research Institutes</p> <p>GLDB</p> <p>MOFA/SEEDPAG/GAIDA</p>
<p><b>INSPECTION/QUALITY CONTROL</b></p>	<ul style="list-style-type: none"> <li>- Inadequate field logistics for PPRSD personnel to carryout a thorough job</li> <li>- Inadequate human resources Number of personnel and regeneration</li> </ul>	<ul style="list-style-type: none"> <li>- Limited number of field visits for inspection</li> <li>- Ineffectiveness on the field</li> </ul> <p>→ certification of sub-standard seeds</p> <ul style="list-style-type: none"> <li>- Limited number of sampling test in the markets</li> </ul>	<p>Provide Means of transportation( vehicles for H/Q staff and motor bikes for field)</p> <p>Provide field tools such as moisture meter ,GPS and protective clothing) for thorough field inspection</p> <p>Capacity Building for field inspectors and certification officers Recruitment of new staff</p>	<p>MOFA</p> <p>MOFA/PPRSD/DPs</p> <p>MOFA/PPRSD/GAIDA/SEEDPAG</p>

		→ Adulteration of seeds by input dealers		
	<ul style="list-style-type: none"> <li>- Insufficient knowledge of varietal characteristics by some inspectors and Seed certifiers</li> <li>- Inadequate equipment (field testing kits)</li> <li>-ill-equipped laboratories</li> <li>- Inadequate Budget</li> <li>- Untimely Disbursement</li> <li>-Inadequate effective reporting system of sub-standard seeds</li> </ul>	<ul style="list-style-type: none"> <li>- certification of sub-standard seeds</li> <li>- Insufficient sampling</li> <li>- Certification of sub-standard seeds</li> <li>- Wrong laboratory diagnosis leading to poor quality seeds</li> <li>- Prevalence of fake seeds in the markets (inability of inspection officers to carryout thorough inspection)</li> <li>Farmer's adoption rate is slow due to lack of trust</li> </ul>	<ul style="list-style-type: none"> <li>provide crop catalogues</li> <li>Provide field tools (such as moisture meter ,GPS and protective clothing) for thorough field inspection</li> <li>-Upgrade existing laboratory</li> <li>-Provide satellite laboratory for simple tests</li> <li>Timely release of budget</li> <li>Promote and encourage farmers to report sources of bad seeds to field inspectors</li> </ul>	<ul style="list-style-type: none"> <li>MOFA/PPRSD/DCS</li> <li>MOFA/PPRSD</li> <li>MOFA/PPRSD/DPs</li> <li>MOFA</li> <li>PPRSD</li> </ul>
MARKETING	<ul style="list-style-type: none"> <li>- Lack of knowledge of Seed users on benefit of quality seed</li> </ul>	<ul style="list-style-type: none"> <li>- Limited seed demand (Low use of certified seeds )</li> </ul>	<ul style="list-style-type: none"> <li>-Changing the mindset of private sector</li> <li>- show the increase in profit margin as a result of the use of Certified seeds</li> <li>- Promotional activities that will target farmers using certified seeds ( )</li> </ul>	<ul style="list-style-type: none"> <li>SEEDPAG/GAIDA/MOFA/GRIB</li> <li>MOFA/SEEDPAG</li> <li>MOFA/DAES</li> </ul>

	<ul style="list-style-type: none"> <li>- Small profitability of seed used →Market condition, farmers economy, combination with other inputs,</li> <li>- Quality issue</li> <li>- high cost of certified untimely supply (Rain fed lowland in the Northern part)</li> <li>- Limited participation by agro dealers in seed marketing (currently seed Producer retail seeds. When seed production increases , then agro dealers should take part in seed sales)</li> </ul>	<ul style="list-style-type: none"> <li>- Limited seed demand (Low use of certified seeds</li> <li>- Limited seed demand (Low use of certified seeds</li> <li>- Insufficient seed market outlets</li> </ul>	<ul style="list-style-type: none"> <li>- Various methods of promotion to be employed (handbills, radio, TV, Newspapers)</li> </ul> <p>Create awareness to proof the superior result of the use of CS over informal seeds</p> <p>Create awareness for superiority of improved seeds over informal seeds</p> <p>Encourage more agro dealers to participate in sales of seeds</p>	<p>DAES</p> <p>MOFA/SEEDPAG/GAIDA/DAES</p> <p>MOFA/ GAIDA/SEEDPAG/GAIDA/DAES</p> <p>MOFA/ GAIDA/SEEDPAG/GAIDA</p>
SUPPLY	<ul style="list-style-type: none"> <li>- Limited capacity of quality storage</li> </ul> <p><b>BREEDER SEED</b></p> <ul style="list-style-type: none"> <li>○ Limited storage capacity</li> <li>○ Limited management capacity (human, technical utility etc.)</li> </ul> <p><b>FOUNDATION SEED</b></p> <ul style="list-style-type: none"> <li>○ Limited storage capacity</li> </ul>	<ul style="list-style-type: none"> <li>- Affect the seed quality (seed health)</li> <li>- Post-harvest loss</li> <li>-Poor seed quality</li> <li>-Delay in seed production which affect availability FS</li> <li>- Affect the quality of seed (seed health)</li> </ul>	<p>Upgrade storage facilities and provision of generators</p> <p>Capacity building, training and retraining</p> <p>Upgrade storage facilities and</p>	<p>MOFA/SARI/DPs/NGOs</p> <p>MOFA/Research Institutes</p> <p>MOFA/GLDB</p>

	<ul style="list-style-type: none"> <li>○ Limited management capacity (human, technical utility etc.)</li> </ul> <p>CERTIFIED SEED</p> <p><b>Limited good Haulage facility</b></p> <ul style="list-style-type: none"> <li>○ Lack of managerial capacity</li> <li>○ Lack of technical capacity</li> </ul> <p><b>- Limited processing capacity</b></p> <p>BREEDER SEED</p> <ul style="list-style-type: none"> <li>○ Limited management capacity (human, technical utility etc.)</li> </ul> <p>FOUNDATION SEEDS</p> <ul style="list-style-type: none"> <li>○ Obsolete facilities in regional processing centres</li> <li>○ Insufficient number of processing centres</li> </ul> <p>CERTIFIED SEEDS</p> <ul style="list-style-type: none"> <li>○ Obsolete facilities in regional</li> </ul>	<p>- Post-harvest loss</p> <p>-Poor seed quality -Delay in seed production which affect availability of foundation seeds</p> <p>- Inadequate proper transport system for the timely movement of seeds from one point to the other especially during production seasons</p> <p>- Poor post harvest handling leading to poor seed quality</p> <p>Poor quality of certified seeds</p> <p>Poor quality of seeds</p> <p>Poor quality of seeds processed</p> <p>Limited and poor quality of seeds processed</p>	<p>provision of generators</p> <p>Capacity building, training and retraining</p> <p>Employ the services of Ghana private road transport union</p> <p>Capacity building of post-harvest handling staff</p> <p>Capacity building of seed producers</p> <p>Capacity building and logistics provision for breeders</p> <p>Upgrade processing facilities in the Northern, Volta and Upper East Region</p> <p>Build processing centers in Eastern and Greater Accra</p>	<p>MOFA/GLDB</p> <p>SEEDPAG/GAIDA</p> <p>SEEDPAG/GAIDA</p> <p>SEEDPAG/GAIDA</p> <p>MOFA/Research Institutes</p> <p>MOFA/DPs</p> <p>MOFA/DPs</p>
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	<p>processing centres</p> <ul style="list-style-type: none"> <li>○ Insufficient number of processing centres</li> <li>○ Limited access to market information (price, availability location, variety ) by traders and seed users</li> </ul>	<p>Poor quality of seeds processed</p> <p>Limited and poor quality of seeds processed</p> <p>Seed glut in some regions while scarcity in others</p>	<p>Upgrade processing facilities in the Northern, Volta and Upper East Region</p> <p>Build new processing centers in the Eastern and Greater Accra Region</p> <p>Establish good communication system between actors in the seed value chain</p>	<p>MOFA/DPs</p> <p>MOFA/DPs</p> <p>SEEDPAG/GAIDA/MOFA</p>
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## Highlights of some of the solutions presented in table 23

1. Legislation and policy. The knowledge of the various actors on the existence of the legislations and policies governing the rice seed sub sector can be enhanced by increase funding of the relevant agencies to recruit, build capacity of their personnel and create awareness in the mass media (radio, TV and newspapers). To increase the participation of the private sector in seed business the government should negotiate with financial institutions for a favorable financing scheme for rice seed sub sector, there should be up scaling of agric insurance scheme to take care of losses of the seed producers. Awareness should be created among the law enforcement agents on the existence of the various seed policies and legislations and they should be trained to properly enforce the laws.
2. Institutions and planning. There should be a strengthening of the various organizational structures of the actors in the seed value chains through capacity building of the leaders. Seed demand survey should be carried out and the end users should be educated on the benefit of using certified seeds through the establishment of demonstration farms.
3. Production. There should be increase budgetary allocation and timely release of funds to the various research institutes and GLDB for the production of Breeder and Foundation seeds respectively. The private seed companies should be supported through concessionary loan rate to be able to produce good quality certified seeds. There should be gradual replacement of ageing staffs of the research institutes and technical capacity of seed Producers should be enhanced through training. There should be logistic support (vehicles and field inspection instruments) for the personnel of PPRSD to ensure that the recommended number of trips to the field is carried out for

effective inspection. Research land should be properly mapped out through negotiations with the land owners. There should be training on good agricultural practice (seed handling, packaging and labeling). Linkages between breeders, foundation and certified seeds Producer should be promoted.

4. Inspection and Quality control. Means of transportation should be provided for the staff of PPRSD. New inspectors and seed certifiers should be recruited; there should be capacity building of the newly recruited and existing staff. Updated crop catalogues should be made available for seed Producer while the inspectors should be provided with field tools such as moisture meters and GPS. The existing laboratories should be upgraded while satellite laboratories should be built in rice producing regions for simple tests. Farmers should be educated and encouraged to report sources of bad seeds to the inspectors.
5. Marketing. There should be promotional activities that will show the increase in the profit margin as a result of using certified seeds compared to the use of informal seeds; this could be done through handbills, radio, television and newspapers. More agro dealers should be encouraged to participate in the sale of certified seeds which will increase availability and accessibility of certified seeds.
6. Supply. The existing storage facilities should be upgraded and provided with generating sets, there should be capacity building for the technical and post harvest handling personnel to properly manage the facilities. The obsolete Processing facilities in Northern, Volta and Upper East Regions should be upgraded while new ones should be built in Eastern and Greater Accra Regions. There should be good communication channels between the actors in the seed value chain

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**ANNEX**

**Annex 1: Regions of interventions of the strategy showing leading districts for rice production (MT)**

<b>Region</b>	<b>Districts</b>	<b>Grand total</b>
<b>Volta Region</b>	<b>Hohoe</b>	<b>101,761.5</b>
	<b>Ketu</b>	<b>61,046.1</b>
	<b>Kadjebi</b>	<b>34,538.38</b>
	<b>Jasikam</b>	<b>34,057.035</b>
	<b>Nkwata</b>	<b>32,476.592</b>
<b>Eastern Region</b>	<b>Burim south</b>	<b>60,563.25</b>
	<b>Burim north</b>	<b>35,255.585</b>
	<b>Kwabiborem</b>	<b>19,808.85</b>
<b>Northern Region</b>	<u><a href="#">Tamale Metro</a></u>	<b>207,555.646</b>
	<u><a href="#">Tolon/Kumbur</a></u>	<b>181,213.62</b>
	<u><a href="#">Savelagu/Nga</a></u>	<b>110,468.433</b>
	<u><a href="#">West Mampru</a></u>	<b>99,350.4031</b>
	<u><a href="#">East Gonja</a></u>	<b>60,548.32</b>
<b>Greater Accra</b>	<u><a href="#">Dangme west</a></u>	<b>42,454,220</b>
	<u><a href="#">Tama</a></u>	
	<u><a href="#">Da west</a></u>	

<b>Upper East</b>	<b>Kasin Nankan</b>	<b>136,890.85</b>
	<b>Builsa</b>	<b>116,802.55</b>
	<b>Bawku West</b>	<b>76,186.96</b>
	<b>Bolga Munici</b>	<b>69,671.59</b>
	<b>Bawku Munici</b>	<b>67,631.1</b>

**ANNEX 21: Questionnaire on methods and procedures for Rice Seed Production**

**Questionnaire for Rice Seed Production**

<b>Name of organization (including details such as branch/laboratory name)</b>	CSIR-Savanna Agricultural Research Institute Rice Research and Development Programme		
<b>Location</b>	Nyankpala, Tamale		
<b>Name of Reporter</b>	Wilson Dogbe		
<b>Title of Reporter</b>	Head of Programme		
<b>Type of seeds</b>	Breeder seed		
<b>Name of the variety</b>			
<b>Methods/ Procedures for rice seed production</b>	<b>Persons in charge of work</b>	<b>Procedure for supervision</b>	<b>Persons in charge of Supervision</b>
<b>&lt;Plot and Personnel&gt;</b> - Indicate the distance between a seed production plot and adjacent plots - <b>2 – 3 meters</b>	Technician	Field inspection/monitoring	Breeder

<ul style="list-style-type: none"> <li>- Indicate the size of land allocated for production of this respective seed variety <ul style="list-style-type: none"> <li>- <b>Varies (depends on demand) 0.05 – 1 Ha</b></li> </ul> </li>   <li>- Indicate the number of people work on production of this respective seed variety <ul style="list-style-type: none"> <li>i) Person in-charge: <u>1</u></li> <li>.</li> <li>ii) Workers: <u>5</u>.</li> </ul> </li>   <li>- Indicate the size of plots for seed production the each person in charge and each worker are responsible for. <ul style="list-style-type: none"> <li>i) Person in-charge: <u>max 3 Ha</u>.</li> <li>ii) Worker: <u>Max 0.6 Ha</u></li> <li>.</li> </ul> </li>   <li>- Select an option which is most applicable to you, regarding the balance between quantity and quality of seeds. <ul style="list-style-type: none"> <li>i) <b>Quality matters more than production quantity</b></li> <li>ii) Quality is important, while some production quantity should be secured</li> <li>iii) If no obvious issues in quality, I pursue maximize the production.</li> <li>iv) Other (Please specify)</li> </ul> </li>   <li><b>&lt;Seed Pre-Treatment&gt;</b> <ul style="list-style-type: none"> <li>- Describe the source of seeds</li> </ul> </li> </ul>	<p>Technician</p>		
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<p>- Do you practice seed selection [<b>Yes</b> / No ] in case Yes, describe the procedure and methods of seed selection in details.</p> <p><b>Well-filled Uniform Panicles are selected from a demarcated well-managed and rouged area of the field. Panicles are dried, threshed and winnowed. The seed is then cleaned off partially filled grains by floatation method. The seed is then dried to a moisture content of 12% and stored in sealed sacks or containers. Before planting, trained women are engaged to pick the seeds ensuring genetic purity and uniformity in size. Germination test is then conducted to make sure that the seed meets the 80% minimum germination standard.</b></p> <ul style="list-style-type: none"> <li>• Seed selected must be pure, uniform in size, viable meeting minimum germination and vigorous.</li> </ul> <p>- Do you practice seed disinfection [ Yes / No ] in case Yes, describe the methods and procedures of disinfection in details.</p> <ul style="list-style-type: none"> <li>• Selected seeds are treated with seed dressing chemicals before sewing.</li> </ul>			
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<p><b>&lt;Seedling preparation&gt; (if applicable)</b></p> <ul style="list-style-type: none"> <li>- Describe in details how soil and plot for nursery bed are prepared <ul style="list-style-type: none"> <li>• Involves ploughing and harrowing to “till” or dig-up, mix and overturn the soil and leveling is done.</li> </ul> </li>   <li>- Describe in details the seeding methods used in nursery beds (seeding rate and seeding methods such as broadcasting and drilling ) <ul style="list-style-type: none"> <li>• Drilling: 20cm×20cm : 50-60kg/ha</li> <li>• Drilling: 25cm×30cm : 75-80kg/ha</li> <li>• Broadcasting : 80-100kg/ha</li> </ul> </li>   <li>- Indicate seedling age at transplanting. <ul style="list-style-type: none"> <li>• 25-30 day after sowing.</li> </ul> </li> </ul> <p><b>&lt;Seeding/ Transplanting&gt;</b></p> <ul style="list-style-type: none"> <li>- Select planting methods <ol style="list-style-type: none"> <li>i) Direct Seeding on upland plot,</li> <li>ii) Line planting on upland plot,</li> <li>iii) Direct seeding on lowland plot</li> <li>iv) Line transplanting on lowland plot</li> </ol> </li> <li>Remarks (if any):</li> </ul> <ul style="list-style-type: none"> <li>- Select seeding methods in</li> </ul>			
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<p>case of <b>direct seeding</b>  <u>Dibbling/ Drilling/</u>  <u>Broadcasting</u>  Remarks (if any):</p> <ul style="list-style-type: none"> <li>• Dibbling: Reduces the seed rate even though is labor intensive.</li> </ul> <p>- Indicate the seed rate in case of <b>direct seeding</b>  Seed Rate: <u>20-30</u> kg/ha  Remarks (if any):</p> <ul style="list-style-type: none"> <li>- Select spacing applied for rice seed production, in case of <b>line planting</b>. <ul style="list-style-type: none"> <li>i) Same spacing as ordinary rice production methods</li> <li>✓ ii) <b>Wider spacing than ordinary rice production methods</b></li> </ul> </li> </ul> <p>Remarks (if any):</p> <ul style="list-style-type: none"> <li>• It allows for easy roughening and inspection of fields.</li> </ul> <p>- Select the number of seedlings in case of <b>transplanting</b>.</p> <ul style="list-style-type: none"> <li>✓ i) Single seedling per hill</li> <li>ii) 2 seedlings per hill</li> <li>iii) 3 seedlings per hill</li> <li>iv) No standard methods</li> </ul> <p>Remarks (if any):</p> <ul style="list-style-type: none"> <li>• Seeds selected are vigorous.</li> </ul> <p>- Select the number of seeds in case of direct seeding.</p> <ul style="list-style-type: none"> <li>i) Adjust the number of seeds after germination</li> </ul>			
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<p>ii) Single seeding per hill  iii) 2 seeding per hill  iv) 3 seeding per hill  v) <b>No standard method</b>  Remarks (if any):</p> <ul style="list-style-type: none"> <li>• <b>Normally is between 3-4 seeds per hill and later thinned to 2 or 1 seed per hill.</b></li> </ul> <p>- Indicate planting density applied for rice seed production in <b>direct seeding</b>.  Density: <u>20</u> hills/ m<sup>2</sup> (in case of <b>dibbling</b>)  [planting space: <u>25</u> cm X <u>30</u> cm &amp; <u>1</u> grains /hill]  Planting density: _____cm between lows (in case of <b>drilling</b>)  Remarks (if any):</p> <p>- Indicate planting density applied for rice seed production in <b>transplanting</b>.  Density: _____hills/ m<sup>2</sup>  [planting space: <u>20</u> cm X <u>20</u> cm &amp; ___grains /hill]  Planting density: _____cm between lows  Remarks (if any):</p> <p>- Describe how and when complementary planting for missing hills are done.</p> <ul style="list-style-type: none"> <li>- <b>Thinned seedlings are used to refill missing hills between 3 and 4 WAP</b></li> </ul> <p><b>&lt;Fertilizer application&gt;</b>  - Indicate the frequency of</p>			
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<p>fertilizer application:  <u>3</u> Times</p> <p>- Describe details of <u>1<sup>st</sup></u> application</p> <p>i) Kind of fertilizer:</p> <ul style="list-style-type: none"> <li>• NPK compound fertilizer</li> </ul> <p>ii) Timing of the fertilizer application</p> <ul style="list-style-type: none"> <li>• Two weeks after emergence.</li> </ul> <p>iii) Dose of the fertilizer</p> <ul style="list-style-type: none"> <li>• Acidic soils-30kgN and 30kg P<sub>2</sub>O<sub>5</sub> and 30kg K<sub>2</sub>O/ha</li> </ul> <p>iv) How to apply (application methods)</p> <ul style="list-style-type: none"> <li>• Broadcast</li> </ul> <p>- Describe details of <u>2<sup>nd</sup></u> application</p> <p>i) Kind of fertilizer:</p> <ul style="list-style-type: none"> <li>• Urea</li> </ul> <p>ii) Timing of the fertilizer application</p> <ul style="list-style-type: none"> <li>• After weeding, at the onset of tilling.</li> </ul> <p>iii) Dose of the fertilizer</p> <ul style="list-style-type: none"> <li>• 30kgN/ha.</li> </ul> <p>iv) How to apply (application methods)</p> <p>Broadcast</p> <p>- Describe details of <u>3<sup>rd</sup></u> application</p> <p>i) Kind of fertilizer:</p>			
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<ul style="list-style-type: none"> <li>• Urea</li> </ul> <p>ii) Timing of the fertilizer application</p> <ul style="list-style-type: none"> <li>• Just after panicle initiation.</li> </ul> <p>iii) Dose of the fertilizer</p> <ul style="list-style-type: none"> <li>• 30kgN/ha.</li> </ul> <p>iv) How to apply (application methods)</p> <p style="text-align: center;"><b>Broadcast</b></p> <p>- Describe details of <u>4<sup>th</sup></u> application</p> <p>i) Kind of fertilizer:</p> <p>ii) Timing of the fertilizer application</p> <p>iii) Dose of the fertilizer</p> <p>iv) How to apply (application methods)</p> <p><b>&lt;Weeding&gt;</b></p> <p>- Indicate the frequency of weeding :</p> <p style="text-align: center;"><u>2</u> Times in addition to pre-emergence hebicide</p> <p>Remarks (if any):</p> <ul style="list-style-type: none"> <li>• Third weeding is done when necessary.</li> </ul> <p>- Indicate the timing and methods of weeding</p>			
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<p>1<sup>st</sup> weeding [when: 2-3 weeks ]  [How: Hand weeding]  2<sup>nd</sup> weeding [when: 6-7 weeks]  [How: Hand weeding]  3<sup>rd</sup> weeding [when:                    ]  [How:  ]  4<sup>th</sup> weeding [when:                    ]  [How:  ]</p> <p><b>&lt;Removal of Off-type/ Rouging&gt;</b>  - Indicate the frequency of removal of off-type:  <u>      1      </u> Times per  week/ month/ <u>whole growth</u>  <u>period</u></p> <p>Describe in details if the frequency changes depending on different growth stages of rice:</p> <p>- Indicate the timing of removal of off-type</p> <p>1<sup>st</sup> Removal [when:                    ]  2<sup>nd</sup> Removal [when:                    ]  3<sup>rd</sup> Removal [when:                    ]  4<sup>th</sup> Removal [when:                    ]</p> <p>- Select how to spot the off-type</p> <p>i) Observe plots from roads or ridges and spot off-types  ii) Observes hills row by row from inside plots, and spot off-types</p> <p>✓ <b>iii) Combine two methods mentioned above.</b>  iv) By other methods  (Describe in details):</p>			
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<ul style="list-style-type: none"> <li>- Select the timing to check off-type <ul style="list-style-type: none"> <li>i) Mainly during nursery stage and vegetative growth period</li> <li>ii) Mainly between to ear emergence to maturing period</li> <li>✓ iii) <b>Throughout growing period</b></li> <li>iv) By other method (Describe in details):</li> </ul> </li>   <li>- Do you strip off husk to check the color of grain? Select answers applicable to you. <ul style="list-style-type: none"> <li>i) <b>Never on the plot</b></li> <li>ii) Yes, sometime</li> <li>iii) Yes. Always when the suspicious hills are found.</li> <li>iv) Other (Describe in details):</li> </ul> </li>   <li>- Select how to deal with off-type when it is spotted <ul style="list-style-type: none"> <li>i) Remove it immediately, if it is obviously the off-type</li> <li>✓ ii) <b>Remove immediately, both obvious and suspicious off-type</b></li> <li>iii) Leave them for all off-type to be removed together later</li> <li>iv) By other method (Describe in details):</li> </ul> </li>   <li>- Select how to deal with hills on or close to border to next plot. <ul style="list-style-type: none"> <li>i) <b>Handle them together with other hills which are</b></li> </ul> </li> </ul>			
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not off-type (No special handling).

- ii) A few rows from the border are excluded from other seed, thus harvested earlier than other hills. (Handled differently)
- iii) No special handling, if the timing of maturity is different from rice planted in next plots
- iv) By other method (Describe in details):

**<Countermeasures against pests and/or diseases>**

In isolated cases fields are sprayed against fungal infections and sucking bugs especially during grain filling stage

**<Harvesting >**

- Indicate the timing for Harvesting
  - Harvesting is done at physiological maturity.
- Describe in details the procedures for rice seed harvesting
  - Harvesting is usually done by panicle for breeder seeds and usually to prevent damage and mechanical mixtures.
  - Whole plots are sickled and threshed on tarpaulin where plot sizes exceed 0.1 Ha. Where large

acres (>0.4 Ha) are cropped, a combine harvester is used.

**<Post Harvesting>**

- Describe in details how seeds are dried
  - Seeds are dried on floors free from other seeds and foreign materials.
  
- Describe how seeds are processed/ treated after the harvest
  - Cleaning, grading and treatment applied.
    - Seeds are initially winnowed after which they are cleaned by soaking in water to remove all unfilled grains. The seed is re dried to a 12% moisture before storage. Samples are later taken by the GSID for inspection and certification
  
- Describe in details where seeds are stored (Name of facility, quality of facility, and who manages it)
  - Seeds are stored in cold storage facilities.
  - Seeds are stored sacks packed on pallets in well ventilated rooms
  
- Describe in details how seeds



<p>are stored, including the temperature control, moisture control, and preventive measures from being mixed with other seeds).</p> <p>- Seeds stored in well labeled sacks packed on pallets in rooms without control of temperature and humidity. The seeds are protected from rodents and bags of different varieties are packed separately some distance apart</p>			
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