THE REPUBLIC OF THE GAMBIA

MINISTRY OF AGRICULTURE

NATIONAL RICE SEED ROAD MAP OF THE GAMBIA

2014-2018

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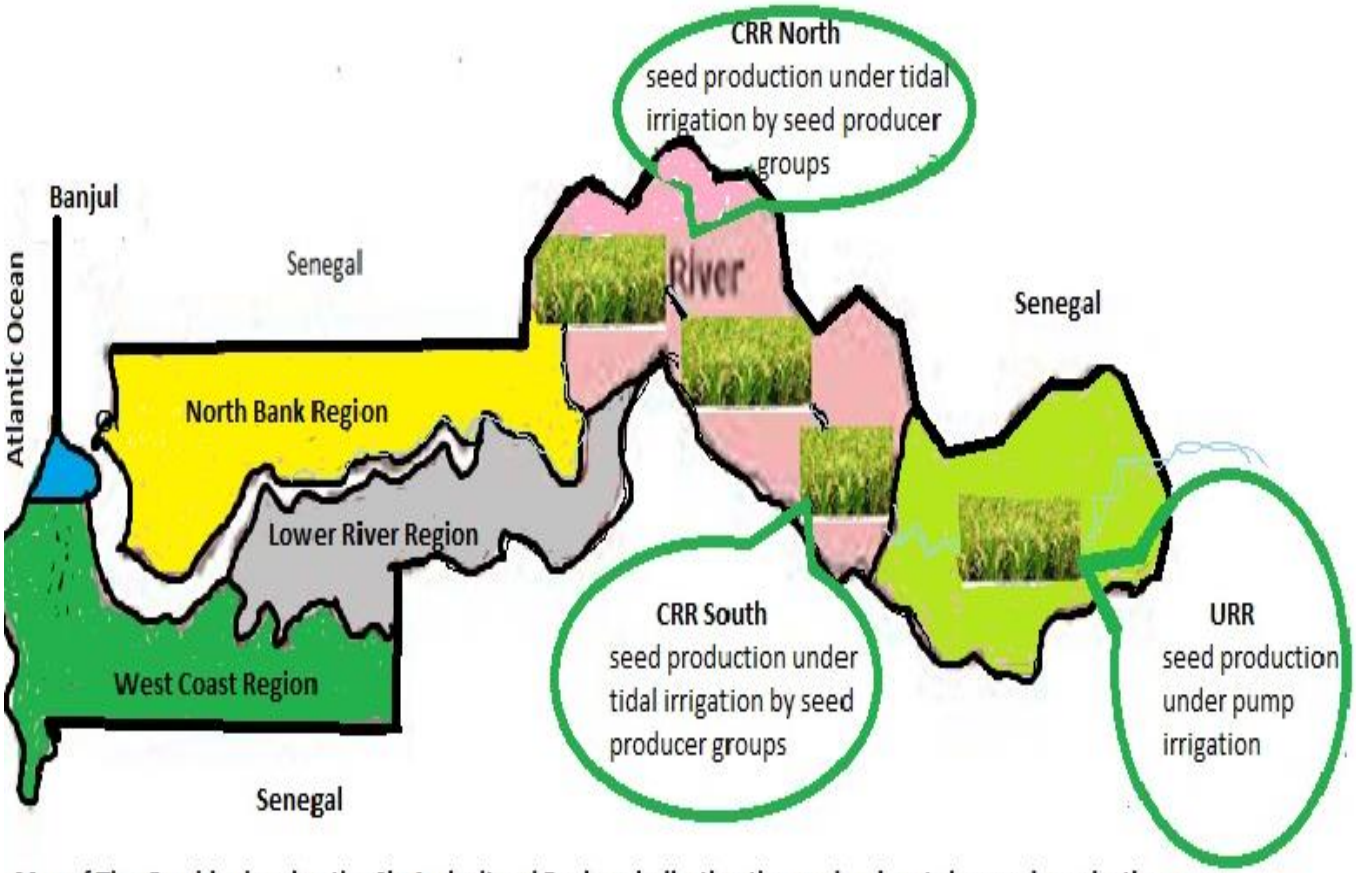
EXECUTIVE SUMMARY

The country produces just about 50 percent of its food needs, exposing it to severe hunger and household vulnerability due to food insecurity. The country's cereal needs have been consistently above local production with the result that the cereal gap has been widening, despite the relative increasing trend of cereal production. The cereal consumption deficit increased from 65,661 MT in 1991 to 150,000 MT in 2007 (GAFSP, 2010). Its national requirements for rice (major staple food) was in the range of 200,000 metric tons (MT) in 2012 while national production of rice was estimated at only 38,800 MTor only 19 percent of the country's needs. The national food deficit is bridged by commercial imports of rice and wheat flour in addition to food aid. High and volatile international food prices regularly affect access to food and hence the living standards of Gambians.

The agricultural sector, however, has a great potential to be an important driver of growth, for reducing poverty, hunger and malnutrition. The Gambian farm sector has yet to tap its potential. To realize its full potential the sector will have to address the challenge of low productivity, which is exacerbated by a combination of structural and institutional constraints such as: (i) low levels of rural infrastructure, including insufficiently developed water management systems, leaving the country's agriculture almost entirely dependent on rainfall, in spite of availability of important inland water resources; (ii) a weak research system (Breeder and Foundation seed development) and limited capacity and efficiency of extension services leading to poor farming practices; (iii) a lack of adequate delivery mechanisms to ensure the provision of good quality farm inputs such as seed, fertilizer and other agricultural goods and services needed by producers and rural enterprises; (iv) high post-harvest losses, paired with low value addition, exacerbated by weak storage, processing, and marketing capabilities; (v) weak institutional capacity of producer organizations (POs) and of agricultural services; (vi) low levels of private investment; (vii) lack of access to short- and long-term financial capital; and (viii) most crucial of all, adverse agro-climatic conditions.

Improved rice production and productivity will have positive rural income-effect and scarce foreign exchange saving-effect. All of these will have positive impact on overall national socioeconomic growth and the ultimate goal of the Government to utilize innovative measures to effect a shift from the subsistence rice production system of today, to a vibrant commercially-oriented production system with an enhanced value addition chain which will be difficult to attain without a concerted National Rice Development Strategy and an operational National Rice Policy and National Rice Seed Road Map in place. A vibrant rice seed sector through a National Rice Seed Road Map will play a very pivotal role in the attainment of the national goals set in the NRDS, therefore, putting in place sound policies and strategies is a prerequisite for the realization of the overall goals of doubling rice production in Africa from the present 14 Million tons to 28 Million tons within a ten year period in CARD countries which Gambia is a member.

MAP OF THE GAMBIA



Map of The Gambia showing the Six Agricultural Regions indicating the predominant rice seed production areas

Acronyms and Abbreviations

ACP	Africa Caribbean and Pacific Countries
ADB	African Development Bank
AGOA	African Growth Opportunities Act
ANR	Agriculture and Natural Resources
AR4D	Agricultural Research for Development
CAADP	Comprehensive Africa Agriculture Development Programme
ARREV	Agricultural Research Review Meetings
CARD	Coalition for African Rice Development
CDC	Commonwealth Development Corporation
CPCU	Central Projects Coordination Unit
DAS	Department of Agricultural Services
EBA	Everything But Arms
ECOWAS	Economic Commission of West African States
ERP	Economic Recovery Programme
FFHC	Freedom From Hunger Campaign
FAO	Food and Agricultural Organization of the United Nations
FASDEP	Food and Agricultural Systems Development Project
GATT	General Agreement on Trade and Tariffs
GCAVP	Gambia Commercial Agriculture and Value Chain Management Project
GIEPA	Gambia Investment and Export Promotion Agency
IBAS	Indigenous Business Advisory Services
IBRD	International Bank for Reconstruction and Development
ICT	Information Communication Technology
IDA	International Development Agency
IFAD	International Fund for Agricultural Development
IRRI	International Rice Research Institute
JIRCAS	Japanese International Research Centre for Agricultural Science
JICA	Japan International Cooperation Agency
LADEP	Lowland Development Project
MDI	Management Development Institute
MOA	Ministry of Agriculture
NARI	National Agricultural Research Institute
NARICT	National Agricultural Research Institute for Chemical Technology
NASS	National Agricultural Sample Survey
NSP	National Seed Policy
NEMA	National Agricultural Land and Water Management Development Project
NERICA	New Rice for Africa
NRDS	National Rice Development Strategy
NRDSC	National Rice Development Steering Committee

PRC	People's Republic of China
PRSP	Poverty Reduction Strategy Paper
PAGE	Programme for Accelerated Growth and Employment
RIDEP	Rice Development Project
RAD	Regional Agricultural Directorate
R&D	Research and Development
RFS	Rice Farm Scheme
RRDSC	Regional Rice Development Steering Committee
SDF	Social Development Fund
SSWCP	Small-Scale Water Control Project
TICAD IV	Fourth Tokyo International Conference on Africa Development
TTAM	Taiwanese Technical Agricultural Mission
TTM	Taiwanese Technical Mission
URR	Upper River Region
VISACA	Village Savings and Credit Association
VPC	VISACA Promotion Centre
WAAPP	West African Agricultural Productivity Programme
WB	World Bank
WFP	World Food Programme
WTO	World Trade Organization
WUA	Water Users Association

1.0 INTRODUCTION

The Gambia is a small country located in the west coast of Africa with a total area of 10,689 square km, a population of 1,722,196(2010 GBOS estimate).About 40% of the population is concentrated in the urban areas while 49% is living in the rural areas with 60% of total population under 25years of age. The Gambia is an agricultural country, with an estimated 70% of the population depending on agriculture for food and income. The country has a total arable land area of 558,000ha and about 323,640ha or 58% is cropped annually. In addition, agriculture accounts for about 32% of Gross Domestic Product (GDP) and approximately 90% of domestic export earnings. The Gambia has a total of 216,121 ha of lowland ecologies suitable for rice production, out of which about 81,120 ha are considered suitable for pump irrigation. Correspondingly per capita rice consumption in The Gambia is 117kg of which over 50% are imported. Out of an annual agricultural import bill of US$86.89 million in 2011, rice imports accounted for 34% thus claiming a large chunk of the national foreign exchange reserves. In the light of this paradox The NRDS is founded on a vision of ‘’*self–sufficiency in rice production’’* by the year 2024. The modalities for achieving this set target will be by closing the identified gaps. This strategy is aimed at identifying these gaps and advancing possible intervention options to ameliorate them

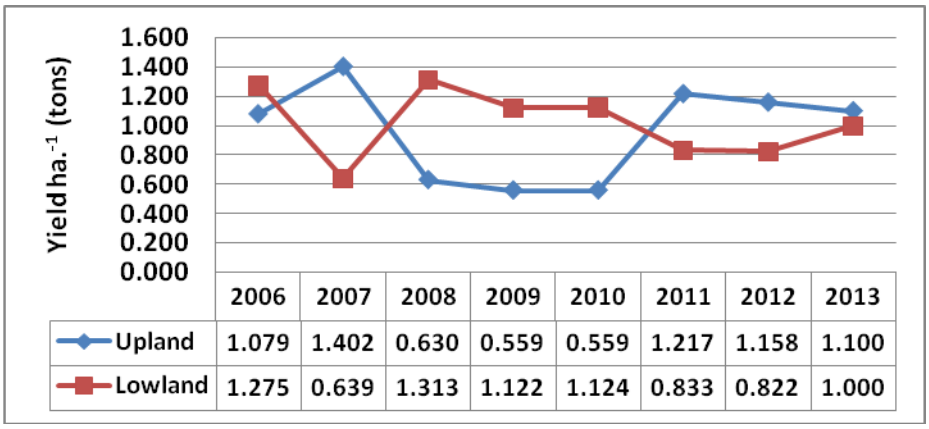
The Gambia lies between latitudes 13o N and 14o N and longitudes 16o W and 14o W except on the Atlantic Coast, the country is surrounded on all sides by Senegal. It is a narrow strip of land, over 400km long and 30 to 50km wide on both sides of The Gambia River, which bisects it. The Gambia is one of the mostly densely populated countries in Africa with approximately 128 inhabitants/km2, with a population growth rate of 2.8%. The climate of The Gambia is characterized by a “Sudano-Sahelian” type of climate with a short rainy season from June to October and long dry season from November to May. Maximum precipitation occurs in August and September. The mean annual rainfall which at its height was 1,100mm (1968),now, stands at 900mm. Water resources comprise seasonal rains, ephemeral ponds and depression storage, inflow of River Gambia and two aquifer systems underlying the entire country. The general agro-ecology is predominantly drought sahelian shrub land.

Crop production is carried out in three agro-ecological zones VIZ; Sahelian (<600mm) confined to the central river north; Sudano-sahelian (600-900mm) occurring in north bank, lower river, central river and upper river regions; and Sudano-Guinean (>900mm) found in western, western north bank and southern upper river regions. Land and soil characteristics influence, to a great extent, crop production choices. It is estimated that proportions of suitable uplands actually cultivated range from 57% in Western Gambia to 100% in Eastern Gambia (DeCose, 1992), with the latter having an additional 37% of farms on marginal lands.

Generally crop production has a wide year to year variation, as it relates to the amount and distribution of rainfall. Groundnut remains the priority cash crop in the Gambia. It is the most

intensely cultivated crop and the production process fairly mechanized using animal-traction. The most important cereal crops grown in the Gambia include rice, millet, maize, and sorghum, as they constitute the staple foods. Rice is the main cereal, because it is consumed in the largest quantity (117kg/person/year) (WARDA, 1993) and is grown along the entire topo sequence (strictly uplands to deep flooded environments). Maize is also an important cereal, because in addition to cash it contributes to amelioration of the acute food shortage during the late summer months, as it matures relatively earlier than rice and millet.

Approximately 300,000ha is put under cultivation for all the major crops. This represents 55% of the total arable land of which groundnuts takes up 40%, followed by millet with 32%, sorghum with 8.6% and maize with 5.6%. The other crops including rice whose importance as a major cereal keeps growing, together accounts for 9% of the total cultivated area. The average total crop production is 337,647 metric tons with groundnuts accounting for 150,000 metric tons in an average year.



	2006	2007	2008	2009	2010	2011	2012	2013
Upland	1.079	1.402	0.630	0.559	0.559	1.217	1.158	1.100
Lowland	1.275	0.639	1.313	1.122	1.124	0.833	0.822	1.000

Figure 1.Relative Upland/Lowland Yields/ha

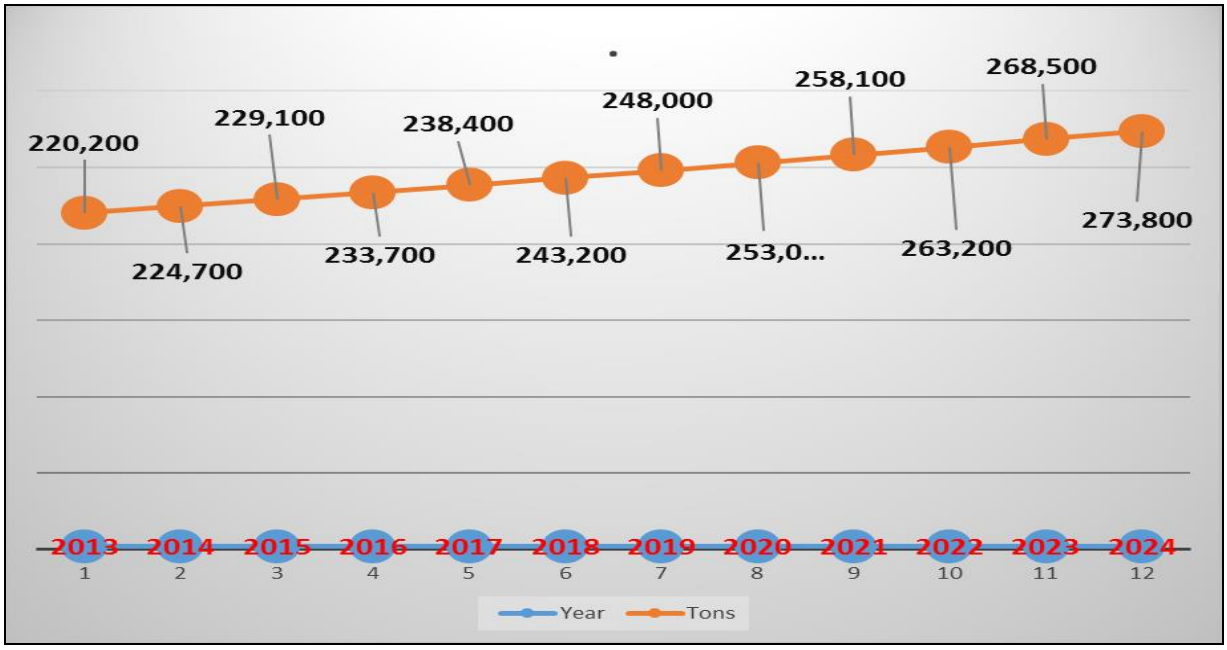


Figure 2. The National Demand for Rice and Projected Values to 2024

2.0 REVIEW OF NATIONAL RICE SEED SECTOR

2.1 Legislation, Policy, Institutions and Planning Aspect

2.1. 1 Legislations

Renewed efforts to resuscitate rice production include the recently terminated four-year Upland Rice Expansion Project by the Taiwanese Mission and the introduction of suitable rice varieties by the National Agricultural Research Institute (NARI) under its NERICA Project supported by the Africa Rice Initiative (ARI) of Africa Rice Centre. The potentials for expanded rice production to make a visible progress towards the ‘’Executive Vision’’ of rice self-sufficiency by the year 2016 are ample. The Government of the Gambia is cognizant of the fact that to resuscitate rice production, a functional and sustainable rice seed system has to be in place that will enhance the availability and affordability of good quality rice seeds to rice growers nationwide at all times. To this effect, a National Seed Policy has been prepared and the first ever seed production and marketing Act, has been enacted by the National Assembly in 2014. This Act, Provides the overall legal framework for the regulation, promotion and control of varietal release, seed production, marketing, and seed import/export and quality assurance of seeds.

2.1.2 Policy

The Government of The Gambia’s strategy to address critical constraints to fast and sustainable development of the agricultural sector includes policy initiatives outlined in the Agricultural and Natural Resources (ANR) sector. One such important initiative is the formulation and validation of the ANR Sector Policy Framework, 2009-2015, which is fully

aligned with national goals of *Vision 2020*, and incorporated as the agricultural pillar of its PRSP-II and Program for Accelerated Growth and Employment (PAGE) 4 for 2012-2017. The policy focuses on key areas that will accelerate the modernization of agriculture, improve productivity and competitiveness, and enhance commercialization, particularly of smallholders, by laying a solid foundation for a sustainable and inclusive growth in agricultural sector. To operationalize this policy the Government has developed the Gambia National Agricultural Investment Plan (GNAIP). Ensuing from the African Union's New Partnership for Africa Development's (NEPAD) Comprehensive Africa Agriculture Development Program (CAADP) framework, GNAIP re-emphasizes national goals for agricultural development and food security while setting a road map, throughout 2011-15, with the objective to attain at least 8 percent growth in the agricultural sector.

The GNAIP is a US$296.7 million program over the period 2011-2015. It is organized around six program areas: (i) improved agricultural land and water management; (ii) improvement of other shared resources (common properties); (iii) development of agricultural value chains and market promotion; (iv) national food and nutrition security; (v) sustainable farm development; and (vi) GNAIP coordination, monitoring and evaluation. The government has also initiated a number of strategies aimed at revitalizing most of the critical sub-sectors to accelerate the achievement of the objectives of the ANR. A National Rice Development Strategy (NRDS) is finalized, under the auspices of the Coalition for African Rice Development (CARD) funded through Japan International Cooperation Agency (JICA), Alliance for Green Revolution in Africa (AGRA) and a consortium of development partners and financial institutions. A seed policy has also been prepared and has received cabinet consideration. And of recent, the first ever National Seed Council (NSC) has been inaugurated by the Honorable Minister of Agriculture on behave of H.E. the President of the Republic of the Gambia in October, 2015.

2.1.3 Institutional Frameworks

In the Gambia, rice seeds are presently produced and distributed through both the formal and informal sectors. Under the formal sector, National Agricultural Research Institute (NARI) serves as the public arm of Government charged with the responsibility of seeds and seed related matters which runs public breeding programs and is solely responsible for generating breeder and foundation seeds. Certified seeds are produced by the informal sector which comprises seed producer groups and the most prominent ones are situated in the Central River Regions of the country where dry season rice multiplication under tidal irrigation over rides wet season rice seed production. Currently, there is no seed certification authority in the country; however the Seed Technology Unit (STU) of The National Agricultural Research Institute (NARI) under takes all the necessary quality assurance aspects in the form of field inspections and seed testing with reports prepared for every activity carried out. The informal rice seed sector accounts for about 93% of rice seeds circulating in the country whilst the formal sector accounts for about 7%.

Rice seed distribution channels are not well developed because of the rudimentary nature of the entire rice seed sector. One can state that presently there are no specialized rice seed dealers operating in the country. Seasonal rice seed distribution as aid to rice farmers by agricultural projects, NGOs and other development partners is the predominant way through

which rice seed circulates or moves from one point to another in the country. Overall, the rice seed sectors both formal and informal have great potentials to be tapped if their capacities are built. However, the quality assurance efforts under taken by NSS have to be crowned with the establishment of a seed certification authority if these efforts are to be meaningful.

2.1.4 Planning

In the absence of clear national projection on demand and supply of breeder, foundation and certified seeds for the rice sub sector to guide the process in the rice seed value chain, there is no budgetary allocation in the annual national budget for rice seed production. Before there was no forum through which dialogue amongst public- and private stakeholders involved in rice seed production could take place. Of recent, the National Seed Council (NSC) was inaugurated officially and it is envisaged that the NSC will greatly enhance public-private partnership in the rice seed sector. The formation of a seed certification agency will also help to a great extent in making national projections on demand and supply of these three seed classes, hence proper planning.

2.1.5 Notable Initiatives

In recent times several interventions were undertaken by various stakeholders in the production, procurement and distribution of rice seeds to farmers as aid e. g. Africarice (Emergency Rice Initiative ERI 2014-2015), provided support to rice seed producer groups in the tidal irrigated perimeters of Central River Region South to produce certified seeds for distribution to rice farmers). IFAD supported projects (LADEP1997-2007) (PIWAMP2007-2012) and (NEMA ongoing) is supporting certified seed producers in CRRN and CRRS (Construction of causeways and bridges for ease of access to mangrove swamps, inter village road network, capacity building for rice certified seed producers.

- AELP(Africa emergency locust project) (2005-)A World Bank funded project to address the locust invasion through building capacities of farmers and provision of vehicles, chemicals, sprayers, protective gears, motor cycles etc.
- Gambia emergency agricultural productivity program) GEAPP (2011-2012) did the rehabilitation of village seed stores and seed centers, provision of inputs (seeds and fertilizer), farm implements and training of operators.
- (Gambia emergency agricultural support program (GEASP) (2013-2015), came in to boost agricultural production and productivity through the provision of agricultural inputs and implements.
- West Africa Agricultural Productivity Program (WAAPP)(2012-ongoing) is assisting the Gambia develop its national seed system (Sourcing of breeder seeds, foundation and Certified seeds, production of foundation seeds locally through NARI and training of certified seed producers) and Supports adaptive research on rice.
- World food program (WFP), Food and Agricultural Organization (FAO), Action aid International (2010-2011) to address crop failure.

Table 1. Institutions Responsible for Rice Seed Production, Inspection and Supply

		Name of institutions	Roles/ Responsibility	Legislations/ Policies determining responsibility	Remarks
Overall	Production	NARI	Sourcing of Breeder and Foundation	National Seed Act and Policy	
	Inspection	NSS	Field inspection and seed testing	National Seed Act and Policy	
	Supply/ distribution	NARI, DOA,NGOs, CBOs, Farmer Organizations and Seed Companies	Provision of Breeder seed and foundation seed (NARI),	National Seed Act and Policy	
Breeder Seed	Production	NARI	Sourcing of breeder seeds, from Africarice, IRRI and NARS	National Seed Act and Policy	
	Inspection	NSS	Purification of improved Breeder seeds	National Seed Policy and seed act	
	Supply/ distribution	NARI	Provision of breeder seed for foundation seed production	National Seed Policy and seed act	
Foundation Seed	Production	NSS	Sourcing and Production	National Seed Policy and seed act	
	Inspection	NSS	Field inspection and laboratory testing	National Seed Policy and seed act	
	Supply/ distribution	NSS	Provision of foundation seeds to registered seed growers	National Seed Policy and seed act	
Registered seed	production	NSS	Provision of registered seeds to certified seed growers	National Seed Policy and seed act	
	inspection	NSS	Field inspection and laboratory testing	National Seed Policy and seed act	
	Supply/distribution	NSS	Provision of registered seeds to certified seeds producers	National Seed Policy and seed act	
Certified Seed	Production	Seed producer groups, Individuals seed producers, NGOs and seed producing companies and farmer's platform	Provision of certified seeds for the general farming public	National seed policy and seed act	

	Inspection	NSS	Field inspection and laboratory testing	National seed policy and seed act	
	Supply/ distribution	Seed producer groups, individual seed producers, agric extension services, seed dealers	Provision of certified seeds	National seed policy and seed act	

2.2. Seed Production

In the Gambia, by virtue of its nature, The National Agricultural Research Institute (NARI) is charged with the responsibility of producing breeder seeds through its breeding activities carried out by the cereals unit and foundation seeds through the seed technology unit at Sapu Research Station under tidal and pump irrigated systems both in the dry and wet season. As there are no private companies that deal in rice seeds currently, there exist organized community based rice seed producer groups who produce bulk of the certified seeds that circulate in the country and the most prominent ones are situated in the tidal irrigated perimeters of Central River Region, North and South, where dry season rice seed production dominates (January-May). Below are the most prominent community based rice seed producer groups;

1. Wellingara Rice Seed Producers Association, CRR, South
2. Jahally Rice Seed Producers Association
3. Madina Nfally Rice Seed Producers Association
4. Saruja Rice Seed Producers Association
5. Sukuta Rice Seed Producers Association
6. URR NERICA Seed Farmers Association
7. NBR Rice Seed Farmer Association

There is no reliable data on the amount of rice seed produced per unit area for rice seed production each year per variety. What is known are the organizations/groups involve, production sites, ecology, seed classes and the varieties produced. Also there is no distinction between varieties by farmers on the bases of varieties for commercial purposes or varieties for subsistence purposes. The varieties are used for both purposes.

Table 2 Technical Capacity of NARI in Breeder Seed Production

	Number of Technical personnel	Capacity of Technical personnel		Size of land covered per Technical personnel	Geographical areas covered per Technical personnel	Means of transport (with Remarks)	Budget per Technical personnel (with Remarks)
		Knowledge(with Remarks)	Experience (with Remarks)				

Researchers	2	MSc and M.phil	20 Yrs and 5 yrs	0.5 ha	Sapu research station	4X4 Double cabin	
Technicians	6	4 HND 2CGA	10-15 Yrs 2YS, 30 yrs	0.5 ha	Sapu Research Station	Motor cycles	
Workers/ Labors	4	N/A	1 (40 yrs) 3 (15-20 yrs)	0.5 ha	Sapu Research Station	N/A	
Total	12						

Table 3 Technical Capacity of NSS in Foundation Seed Production

	Number of Technical personnel	Capacity of Technical personnel		Size of land covered per Technical personnel	Geographical areas covered per Technical personnel	Means of transport (with Remarks)	Budget per Technical personnel (with Remarks)
		Knowledge(with Remarks)	Experience (with Remarks)				
Seed technologist	2	MSc, M.phil	>10 Yrs	20 ha	Sapu research station	4X4 station wagon	N/A
Technicians	8	1 BSc 5 HND 2 CGA	>10 Yrs >10 yrs 5 yrs	20 ha	Sapu Research Station	Motor cycles	N/A
Workers/ Labors	11	N/A	>10 yrs	20 ha	Sapu Research Station	Bicycles	N/A
Total	21						

Table 4 Current Production, Location and Cultivated Area of Rice Seed in the Last 3 Years

Seed Classes	Total production/ procurement amount (MT)	Name of production stations	Production amount per station (MT)	Cultivated area per station (ha)
Breeder Seed	0.031 (Production) 0.006(Sourced)	Sapu	0.031	0.2
Foundation Seed	48	Sapu	48 MT	15 ha
Registered seed	340	Jahally cluster	340	92.7
Certified				

Seed				

<Year 2014>

Seed Classes	Total production/ procurement amount (MT)	Name of production stations	Production amount per station (MT)	Cultivated area per station (ha)
Breeder Seed	0.111 (Production)	Sapu	0.111	
Foundation Seed	15 MT (Production)	Sapu	15 MT	5 ha
Registered seed	600	Jahally Cluster	600	240
Certified seed				

<Year 2013>

	Total production/ procurement amount (MT)	Name of production stations	Production amount per station (MT)	Cultivated area per station (ha)
Breeder Seed	0.111 (Production)	Sapu	0.111	
Foundation Seed	17MT (Production)	Sapu	17 MT	5 ha
Registered seed	410MT (Production)	Jahally cluster	410	66
Certified seed				

<Year 2012>\

NOTE: At the base line (2014) there was no certification agency in Gambia. Most of the seeds produced was registered seed

Table 5 Suitability of Varieties by Ecology

Agro-Ecological Zones	Name of Varieties
Irrigated Lowland	IET 3137
	WAB 105
	TNS 14
	IR 19746
	ITA 212

	Sahel 134
	TCS 10
	WAR 1
	WAR 77
	Jasmine 85
	BG 90-2
Rain-fed Lowland	IET 3137
	BG 90-2
	ITA 212
	TNS 14
	Jasmine 85
	Sahel 134
Rain-fed Upland	WAB 105
	IR 19746
	P 163
	NERICA 1, NERICA 2, NERICA 4,
	NERICA 6, NERICA 14

NOTE: A variety release committee does not exist in the Gambia yet, therefore all the varieties in the above table are popular and adopted by farmers.

Table 6 Popular Varieties Promoted by Government

Agro-Ecological Zones	Name of Varieties
Irrigated Lowland	IET 3137 I
	ITA 212
	WAB 105
	JASMINE 85
	TNS 14
	CK 73
	WAR 1
	WAR 77
Rain-fed Lowland	TCS 10
	P105
	P163
	KANILAI
Rain-fed Upland	P163 NERICA 1
	IR 19746 NERICA 2
	KANILAI NERICA 4
	SAHEL 134 NERICA 6

	NERICA 14

NOTE: The government promotes all the varieties in the table above

Table 7 Varieties seen to be Dual Purpose by farmers (Commercial and Subsistence)

Agro-Ecological Zones	Name of Varieties	Seed Category (Market and/or Subsistence)
Irrigated Lowland	IET 31-37	BOTH
	ITA 212	BOTH
	TNS 14	BOTH
	WAB 105	BOTH
	JASMINE 85	BOTH
Rain-fed Lowland	WAR 1	Both
	WAR 77	BOTH
	Kumbandingo	Both
	CK 73	Both
	ROK 5	Both
Rain-fed Upland	NERICA 1	Both
	NERICA 2	BOTH
	NERICA 4	Both
	NERICA 6	Both
	NERICA 14	Both
	PI63	Both
	IR 19746	Both

NOTE: In the Gambia the farmer does not distinguish between varieties

2.2.1 Quality Assurance

The national seed secretariat (NSS) of the ministry of Agriculture is responsible for quality assurance one part of quality control is field based and the other is laboratory based. The field based quality control activities include seed field inspection (Three times maximum during the crop cycle) to look for (off-types, recommended isolation distances, field sanitation, pests and diseases etc) and seed sampling. The laboratory based ones are seed viability tests (Germination and Moisture Content), seed physical purity tests (Inert Matter, weed seeds, other crop seeds, broken seeds etc).

2.2.2 Methods

Currently, seed quality control is basically based on two methods i.e. field based and laboratory based methods. For the field based methods, field inspection forms the bases of operations. During field inspection, attention is paid on the following key things e.g. presence of off-types, recommended isolation distance, field sanitation, pest and disease incidents, cropping history of the seed field etc. Seed fields are inspected at least three times in the crop cycle (Vegetative phase, Reproductive phase and Maturity phase) and each inspection involves the participation of the quality assurance unit of NSS

Upon arrival at the seed fields of plots, depending on the experience of the staffs, two staff are paired to work together. One person into the plot in a schematic manner to take counts using a one meter stick, while the other staff enters the figures given by the person inside the plot. Basically two counts are made, the first count is on the number of rough panicles or number of off-types per meter square and the second count is on the number of panicles on one meter square. The results from the two counts are used to calculate the percentage varietal purity (VP) of that particular plot on the spot and provide the results to the farmer and advice the owner of the plot accordingly.

Table 8 Name of Institutions and Titles of Officers in Charge of Production and Inspection of Each Class of Seed

		Name of institutions (Please list up all if several institutions are in charge)	Title of officerin charge
Breeder Seed	Production	NARI	Senior Research Officer,
	Inspection	NSS	Principal seed officer,
Foundation Seeds	Production	NSS	Principal seed officer
	Inspection	NSS	Principal seed officer
Registered Seed	Production	Seed growers association	Secretary
	Inspection	NSS	Principal seed officer
Certified Seed	Production	Seed producer groups, Individuals farmers	Secretary/Individuals
	Inspection	NSS	Principal seed officer

Table 9 Varietal Purity Standards

	Physical Purity	Varietal purity	ECOWAS varietal purity
Breeder Seed	98	99.9	99.90
Foundation Seed	98	99.9	99.90
Certified Seed	98	99.7	99.70

Table 10 Field Inspection Procedures and Institutions Responsible

	Organizations/ institutions in charge of inspection	Frequency and timing of Inspections	Items for Inspection	Inspection Methods	Quality Standard for Inspection
Breeder	NSS	At least	Isolation	Use of measuring tapes	5 Meters and

Seed		3 times in the production cycle (Vegetative, Reproductive and Maturity stages)	distant		above
			Plant spacing	Use of planting ropes	
			Field sanitation	Visual assessments	Should be weed free
			Off-types	Visual observation or assessment of off-types (Very good knowledge of the variety is required)	0 % off-type (All off-types are removed)
			Incidences of pests and diseases	Taking scores of pests and disease incidents)	
Foundation Seed	NSS	At least 2-3 times in the production cycle (Vegetative, Reproductive and Maturity stages)	Off-types	Visual observation or assessment of off-types (Very good knowledge of the variety is required)	1.5 to 2 % off-type (all off-types should be removed)
			Isolation distant	Use of measuring tapes	3 meters
			Field sanitation	Visual assessments	99% weed free
Registered Seed	NSS				
Certified Seed	NSS	At least 2-3 times in the production cycle (Vegetative, Reproductive and Maturity stages)	Off-types	Visual assessments	5% off-types(all off-types removed)
			Isolation distant	Use of measuring tapes	3 meters
			Field sanitation	Visual assessments	98% weed free
			Plant spacing	Planting ropes	
			Incidence of pests and diseases	Taking scores of pests and disease incidents)	Consult PMP?

Table 11 Seed Testing Laboratory Procedures and Institutions Responsible

	Organizations / institutions in charge of inspection	Items for Inspection	Inspection Methods	Quality Standard for Inspection
Breeder Seed	NSS	Germination percentage	Laboratory analysis	99%
		Moisture content	Laboratory analysis	14% and below

Foundation Seed	NSS	Germination percent	Laboratory analysis	98%
		Moisture content	Laboratory analysis	14% and below
		Physical purity	Laboratory analysis	98%
		Percentage other crop seeds	Laboratory analysis	1-2%
		Percentage weed seeds	Laboratory analysis	1-2%
Certified Seed	NSS	Germination percent	Laboratory analysis	85%
		Moisture content	Laboratory analysis	14% maximum
		Physical purity	Laboratory analysis	98%
		Percentage other crop seeds	Laboratory analysis	2-3%
		Percentage weed seeds	Laboratory analysis	1-2%

Table 12 Current Capacity for Quality Control (Breeder, Foundation and Certified Seeds)

	Number of inspectors	Capacity of inspectors		Size of land covered per inspector	Geographical areas covered per inspector	Means of transport (with Remarks)	Budget per inspector (with Remarks)
		Knowledge(with Remarks)	Experience (with Remarks)				
Breeder Seed						Motor cycles	
Foundation Seed	8	BSc (1) HND (5) CGA (2)	15-20 yrs 15-20 yrs 1-5 yrs	20 ha	Sapu Resarch Station	Motor cycles	
Certified Seed	8	BSc (1) HND (5) CGA (2)	15-20 yrs 15-20 yrs 1-5 yrs	N/A	CRR South and North Tidal irrigated fields	Motor cycles	
Total	8						

NOTE: The same officers are responsible for inspecting both foundation and certified seed

2.2.3 Human Resources

The Gambia rice seed sector is generally characterized by gross inadequacies in the number of highly trained and skilled human resources for seed inspection, to carry out seed quality assurance operations both in the field and laboratory.

2.2.4 Human Resources for Seed Production

Currently the National Agricultural Research Institute (NARI) through its rice breeding component is responsible for the provision of breeder seeds. Given the present number and qualification of staff working in this unit, and the financial and material resources at their disposal to execute this huge task, it is impossible to achieve the desired results in the provision of breeder seeds.

Table 13 Capacity in Seed Production

	Number of Technical personnel	Capacity of Technical personnel		Size of land covered per Technical personnel	Geographical areas covered per Technical personnel	Means of transport (with Remarks)	Budget per Technical personnel (with Remarks)
		Knowledge(with Remarks)	Experience (with Remarks)				
Researchers	2	MSc and M.Phil	20 Yrs	0.5 ha	Sapu research station	4X4 Double cabin	
Technicians	5	4 HND 2 CGA	10-15 Yrs 30 yrs	0.5 ha	Sapu Research Station	Motor cycles	
Workers/ Labors	4	N/A	1 (40 yrs) 3 (15-20 yrs)	0.5 ha	Sapu Research Station	N/A	
Total	12						

2.2.5 Human Resources for Seed Inspection

The national Seed secretariat (NSS) is an autonomous agency within the ministry of Agriculture is charged with foundation seed production and quality control duties nationwide. The NSS is currently under staffed by virtue of its enormous mandate.

2.3 Supply

Currently, the seed supply chain is not well developed especially for certified seeds largely due to lack of seed companies or seed dealers in the rice seed value chain. The production and supply of breeder seed is done by NAR and foundation seed by NSS. Breeder seeds are sourced from international research organizations like Africarice center, IRRI. The breeder seeds are then passed onto the NSS for on station foundation seed production mainly at Sapu research station under tidal and pump irrigated conditions both in the wet and dry season. The foundation seed in some cases is purchased by projects or NGOs for distribution to seed producers for registered seed multiplication

The registered seed multiplication is normally on contract bases between projects and rice seed producer groups, where the project provides the production inputs like fertilizer,

foundation seeds and ploughing funds on loan to the seed producers and a contract agreement is signed. At the end of the season, the project buys the seeds from the seed producers for onward distribution as seed aid to rice farmers nationwide for grain production. The seed producers also sell seeds to individual rice farmers at farmer to farmer level. Non-governmental organizations also purchase rice seeds from seed growers to distribution as seed aid to rice growers in their intervention areas or sites.
The rice seed supply chain is as follows;

NARI Rice Breeding Unit (Breeder seed) → NSS (Foundation seed) → Registered seed producer groups (Registered seed) → Development partners (NGOs, CBOs, WFP) →Rice growers (Grain production for consumption).

Table 14 Stakeholders and Their Roles in the Rice Seed Value Chain

	Stakeholders			
	Market varieties	Roles played	Subsistence varieties	Roles played
Breeder seed development/ Production/ supply	NARI	Varietal screening, maintenance and purification	NARI	Varietal screening, maintenance and purification
Foundation seed production/ Supply	NSS	On station foundation seed multiplication	NSS	On station foundation seed multiplication
Registered seed production/supply	NSS/Seed producers	On station /on farm registered seed multiplication and quality control	NSS/Seed producers	On station /on farm registered seed multiplication and quality control
Certified seed production				
Distribution of seeds	= 1.NARI => NSS 2. NSS=> Seed producers 3. NSS/Seed producers => Farmers 4. MOA=> DOA=>FARMERS 5. NGOs=> CBOs=>FARMERS 6.FARMERS=>FARMERS	Procurement of seeds for distribution to targeted beneficiaries	Projects, NGOs and Institutions	Procurement of seeds for distribution to targeted beneficiaries
Financing	MOA, Projects, NGOs and Institution	Provision of financial resources	Projects, NGOs and Institution	Provision of financial resources

Others				

Table 15 Constraints of the Rice Seed Value Chain

	Market varieties	Subsistence varieties
Breeder seed development/ Production/ supply	Inadequate human resources Inadequate financial resources Iack of research infrastructures e.g -Cold storage -Screen house -Processing machines -Biotechnology laboratory -Untimely availability of germplasm and in the required -quantities	Inadequate human resource Inadequate financial resources Iack of research infrastructures e.g -Cold storage -Screen house -Processing machines -Biotechnology laboratory -Untimely availability of germplasm - and in the required quantities
Foundation seed production/ Supply	Inadequate human resources Inadequate financial resources inadequate and inappropriate infrastructures e.g - -Inadequate seed testing laboratories -Lack of Seed Processing machines -Lack of farm machinery for land preparation -Inadequate mobility for staff -Inadequate working tools (Office equipment)	Inadequate human resource Inadequate financial resources inadequate and inappropriate infrastructures e.g -Inadequate seed testing laboratories -Lack of Seed Processing machines -Lack of farm machinery for land preparation -Inadequate mobility for staff -Inadequate working tools (Office equipment)
Registered seed production/supply	Inadequate human resources Inadequate financial and material resources for quality assurance	Inadequate human resources Inadequate financial and material resources for quality assurance
Certified seed production/supply	-Lack of a seed certification authority -Inadequate production inputs (Fertilizer) -Inadequate seed processing facilities -Inadequate quality assurance backup -Inadequate extension support to seed producers -Inadequate farm machinery for land preparation -Inadequate labor force -Lack of proper packaging materials	Lack of a seed certification authority -Inadequate production inputs (Fertilizer) -Inadequate seed processing facilities -Inadequate quality assurance backup -Inadequate extension support to seed producers -Inadequate farm machinery for land preparation -Inadequate labor force -Lack of proper packaging materials

	- of inadequate information on seed availability -Unprecedented damage pose by birds	- inadequate of information on seed availability -Unprecedented damage pose by birds
Distribution of seeds	-Poor road net work -Limited specialized seed dealers -Lack of specialized seed transporters (Private Dealers) - Lack of storage facilities at village level - Inappropriate packaging materials - Lack of traceability for seed system - Low demand of seed	Poor road net work -Limited specialized seed dealers -Lack of specialized seed transporters (Private Dealers - Lack of storage facilities at village level - Inappropriate packaging materials - Lack of traceability for seed system - Low demand of seed
Financing	-Lack of credit facilities -High interest rates = lack of budgetary allocation for the production of breeder and foundation seed	Lack of credit facilities -High interest rates = lack of budgetary allocation for the production of breeder and foundation seed
Quality Control/ Standard	-Inadequate human resources -Inadequate financial resources -Inadequate seed processing facilities -Inadequate seed testing laboratories =lack of a functional certification agency	Inadequate human resources -Inadequate financial resources -Inadequate seed processing facilities -Inadequate seed testing laboratories lack of a functional certification agency
Others		

Table 16 Farm Gate Price of Certified Seeds

Currency: (Approximate exchange rate: 1 USD= D40 GMD)		
	Name of Varieties	Price (Information from year 2014)
Irrigated Lowland	IET 31-37	D25
	ITA 212	
	IR 19746	
	WAB 105	
	TNS 14	
Rain-fed Lowland	WAB 105	
	Sahel 134	
	P 163	
	IR 10746	
Rain-fed Upland	WAB 105	
	P163	
	Sahel 134	
	NERICA 1	
	NERICA 2	

Table 17 Market Price of Certified Seeds

Currency: (Approximate exchange rate: 1 USD= GMD40)		
	Name of Varieties	Price/Kg GMD (Information from year 2014)
Irrigated Lowland	IET 31-37	D50
	ITA 212	
	IR 19746	
	WAB 105	
	TNS 14	
Rain-fed Lowland	WAB 105	
	Sahel 134	
	P163	
	IR 19746	
Rain-fed Upland	WAB 105	
	P163	
	Sahel 134	
	NERICA 1	
	NERICA 4	

3.0 Challenges in National Rice Seed Sector

3.1 Legislation

The challenges of the National Rice Seed Sector are broad base as there is no separate specific policy on rice seed sector alone. The present policy framework caters for all crops including rice. The policy and legislative aspects of the sector are been addressed gradually. The National Seed Policy was developed in 2008, the National Seed Production and Marketing Act was passed by the National Assemble in 2014 and of recent in October 2015, The National Seed Council (NSC) was inaugurated by the Honorable Minister of Agriculture on behave of His Excellency the President of the Republic. It is evident that these three giant strides are encouraging as they will serve as the foundation stone on which other efforts will be built on.

3.1.1 Policy

The policy and legislative challenges of the rice seed sector include the following; inadequate sensitization on the existence of the National Seed Policy and Act, late formation and inauguration of the National Seed Council (NSC), non-functional National Seed Certification

Authority and non-existence of budgetary allocation for seed production in the national budget.

3.1.2 Institutional Challenges

Institutional challenges do also exist in the form of inadequate human resources for seed production and certification for all the three classes of seeds (Breeder, Foundation and Certified Seeds),inadequate financial resources for breeder and foundation seed production and seed certification operations, inadequate mobility for staff in the areas of breeder and foundation seed production and seed certification activities and inadequate working tools for breeder and foundation seed production and seed certification activities (Desk top computers, Laptops, GPS, Tablets, Digital Cameras etc., . The rice seed sector also has Infrastructural challenges like lack of state of the art seed testing laboratories (quality control),lack of state of the art seed processing facilities (Breeder, Foundation Seed and Certified Seeds) and lack of state of the art cold storage facilities (Breeder, Foundation and Certified Seeds) etc., etc.

3.1.3 Planning

Planning is very important in the smooth implementation of any seed production system or scheme. The rice seed sector of the Gambia is greatly limited by lack of planning of activities from breeder to certified seed level. A National seed production plan does not exist implying that rice seed production is not guided by any plan, therefore making it almost impossible to allocate a budget line for seed production and certification. The rice seed development strategy (RSDS) upon validation will be the operational document for the rice seed value chain in line with the existing Gambia's NRDS framework document.

Table 18 Issues, Challenges and Suggestions for Policy Makers

ISSUES	**CHALLENGES**	**SUGGESTIONS FOR IMPROVEMENT**
Legislation/Policy	Inadequate sensitization on the existence of the national seed policy and act	-Regional level seminars to create awareness on the existence of the National Seed Policy and Act, the content and functionality -Use of mass media (Television, Radio, posters and fliers)
	Late existence of the national seed council (NSC)	Functionality of a National Seed Council
	Nonfunctional national seed certification authority	Expedite the functionality and a functional National Seed Certification Authority
Institutions	Inadequate human resources	Provision of highly qualified

	for seed production and certification	human resources for seed production and certification
	Inadequate mobility for staff	Provision of more vehicles and motor cycles
	Inadequate working tools (Desktops, Laptops, GPS, Digital cameras)	Provision of working tools (Desktops, Laptops, GPS, Digital cameras)
Infrastructure	Lack of State of the art Seed testing laboratories Lack of State of the art seed processing facilities	Provision of modern seed testing laboratories Provision of modern seed processing facilities
	Lack of state of the art cold storage facilities	Provision of modern cold storage facilities
	Inadequate drying floors	Provide additional drying floors
Planning	Lack of National seed production plan	Develop annual national seed production plan
	Lack of National budget for seed production	Inclusion of seed production budget into National Budget

3.2 Production

Both the formal and informal seed sectors are faced with numerous challenges in rice seed production and can be grouped into; inadequate human resources (number and technical capacity), inadequate financial resources and inadequate infrastructure for seed processing and handling. The formal sector which is the National Agricultural Research Institute (NARI) is responsible for breeder seed while the National seed secretariat (NSS) is responsible for foundation seed production and quality control. The institute's capacity to effectively deliver in these areas is limited by the inadequacies in human resources, financial resources and infrastructure. The informal sector is responsible for certified seed production and its performance is also greatly hampered by similar constraints like the formal sector e.g. limited technical capacity of seed producers in seed production and inadequate financial resources and inadequate infrastructure for seed processing and handling. Most of the challenges faced by the rice seed sector are centered on the following areas;

Technical aspects in production

Land preparation, Nursery management, Weed management, Pest and Disease management, transplanting, and Harvesting and Water management.

Land preparation is a major challenge for both the formal and informal sectors. The number and age of farm machinery are inappropriate for the area to be prepared, does leading to untimely completion of land preparation thereby also affecting other field operations that should follow. Nursery management in certified seed production is a limitation due to low technical capacity of seed producers in nursery management. Weed management is also a big challenge due to scarce hired farm labor to weed the seed fields manually as the usage of herbicides is not a common practice by seed producers. Pests and disease management is another challenge in rice seed production especially for the control of pests like quelae quelae birds that can ravage many hectares of seed fields in a short period of time.

Transplanting is also considered as a challenge due to scarce hired farm labor as it is manually done. Harvesting is manually done using hired farm labor and its scarcity is posing a challenge in rice seed production as this operation is not yet mechanized. Threshing is also another operation that is manually done. A lot of unnecessary time and energy is spent on threshing rice seed because of lack of threshing machines to mechanize the operation that will speed up the process and guarantee the quality of the seeds. Currently most of the rice seed production activities are carried out in the tidal irrigated fields of CRR North and South. The design of the irrigation and drainage system is such that the irrigation canals are also the drainage canals making them dual purpose structures, therefore posing a big challenge in water management in the tidal irrigated rice seed fields.

Table 19 Rice Varieties Already Adapted by Farmers both for Market and Subsistence

Suitable Agro-Ecological Zones	Name of recommended varieties	Seed Category (Market and/or Subsistence)
Irrigated Lowland	IET 3137	Market/Subsistence
	ITA 212	Market/Subsistence
	TNS 14	Market/Subsistence
	WAB 105	Market/Subsistence
	JASMINE 85	Market/Subsistence
Rain-fed Lowland	WAB 105	Market/Subsistence
	IR 19746	Market/Subsistence
	SAHEL 134	Market/Subsistence
Rain-fed Upland	NERICA 14	Market/Subsistence
	NERICA 2	Market/Subsistence
	NERICA 4	Market/Subsistence
	NERICA 6	Market/Subsistence
	WAB 105	Market/Subsistence

Table 20 Required Human Resources for Seed Production

	Number of technical personnel	Capacity of technical personnel		Means and Budget required to be allocated per technical personnel (with Remarks)
		Knowledge	Experience	
Researchers	12	MSc/PhD	>10 years	N/A
Technicians	25	HND/BSc	>10 years	N/A
Workers/ Laborers	37	Certificate	>10 years	N/A

3.2.1 Quality Control

A National Seed Certification Agency is yet to be functional in the Gambia. Currently, the National seed secretariat (NSS) is the custodian of seed quality assurance of all the major field crops that are certifiable including rice. Traditionally, seed quality assurance is done in two parts. One part is field based and the other is laboratory based all geared towards ensuring seed quality standards are met both at the field and in the laboratory. The field based quality assurance operations are basically geared towards enhancing two major parameters i.e. genetic and physical purity of the varieties under seed production through regular field inspections to observe the presence of off-types, isolation distances, general field sanitation, pests and disease incidents etc., etc. Field based quality assurance work requires good background knowledge of the varieties to be inspected (general rice agronomy, morphology, physiology etc.,), field inspection techniques/procedures etc..

The laboratory based quality assurance work is meant to investigate and establish the actual viability and also physical purity status of the seeds at the time of sampling by conducting germination analysis, moisture content analysis, physical purity analysis etc., etc. It is important to note that despite the lack of a seed certification agency to officially certify seeds, the country is to some extent involve in seed quality assurance work thereby laying a foundation on which future efforts can be built.

Table 21 Required Human Resources for Seed Inspection

Geographical area	Required Number of Inspectors	Required Capacity of Inspectors		Means and Budget required to be allocated per Inspector (with Remarks)
		Knowledge(with Remarks)	Experience (with Remarks)	
CRR/S	30	HND/BSc	>5 Years	N/A
CRR/N	20	HND/BSc	>5 Years	N/A
URR	15	HND/BSc	>5 Years	N/A
Total	65			

3.3 Supply

The challenges that face the seed supply system or channels are numerous and greatly affects rice seed circulation or deliver in its right form and quantity. These challenges can be grouped into challenges in the breeder seed development/production, foundation seed production/supply, certified seed production/supply, distribution channels/outlets, financing and quality control.

3.3.1 Challenges in Breeder Seed Production/Supply and Possible Solutions

-Inadequate human resource
-Lack of budgetary allocation in the National budget
- Inadequate research infrastructures (Cold storage, Screen houses etc.)
-Lack of farm machinery (Production and Processing)
-Lack of Biotechnology laboratory
-Inadequate working tools (Office equipment)

The challenges mentioned above in the area of breeder seed production and supply can be address by putting in place the following;

-Provision of a mini gene bank for germ plasm conservation
-Inclusion of budgetary allocation in the National budget
-Provision of a screen house at SAPU research station
-
-Capacity building for staff and recruitment of new personnel
-Procurement of farm machinery (Production and Postharvest operations)
-Procurement of more transport to facilitate field operations
-Provision of office equipment

3.3.2 Challenges in Foundation Seed Production/Supply

Foundation seed production and supply system is limited by numerous factors but key among them are the following;
-Inadequate human resources
-Lack of budgetary allocation in National budget
-
-
-Inadequate seed testing laboratories
-Inadequate Seed Processing machines
-Lack of farm machinery for land preparation
-Inadequate mobility for staff
-Inadequate working tools (Office equipment)

The above challenges can be addressed by considering the following actions;
-Training of more seed technologists and technicians
-Increment of budgetary allocation in National budget
- - -Procurement of new seed processing machines
-Procurement of appropriate power tillers and tractors

-Procurement of field vehicles and motor cycles
-Provision of office equipment

3.3.3 Challenges in Registered Seed Production/Supply

The production and supply of this seed category is carried out by the informal seed sector by community based seed producer groups as there are no private seed companies. Numerous constraints are also limiting the performance of this important link in the value chain in the form of;

-Lack of a functional seed certification authority
-Inadequate production inputs (Fertilizer)
-Inadequate seed processing facilities
-Inadequate quality assurance backup
-Inadequate extension support to seed producers
-Inadequate farm machinery for land preparation
-Inadequate labor force
-Lack of proper packaging materials
-
-Unprecedented damage posed by birds

These limiting factors in certified seed production and supply can be addressed in the following ways;

- ensure a functional seed certification authority
-Creation of links between input dealers and seed producers
-Procurement of seed processing machines
-Recruiting and Training of more seed inspectors
-Recruiting and training of more extension workers
-Creation of credit facilities for seed producers for the purchasing of power tillers and tractors
-Procurement of rice planters and harvesters

3.3.4 Distribution Channels/Mechanisms

This involves the actual physical means through which rice seeds are distributed, accessed or made available to rice growers who need them for planting from seed production sites or ware houses. This portion of the seed supply mechanism is also greatly hampered by the following factors;

-Poor road net work
-Limited specialized seed dealers
-Lack of private seed companies
- Low demand of seed- due to inadequate information on seed availability, high cost of seeds, low quality

The limiting factors of the rice seed distribution mechanism can be ameliorated by taking action on the following;

-Construction of inter village road linkages by the Government
-Encouragement and involvement of private sector participation

-Creating the enabling environment for private seed companies and dealer to operate smoothly

3.4 Financing

This component of seed production and supply value chain is very critical and is considered as the mover or driver of the entire process. Without financial resources, no seed production and supply activities can be carried out. Not only the availability but the timely availability of financial resources for seed production and supply is indeed key if any meaningful results can be achieved. Key among the challenges in financing seed production and supply are as follows;
-Lack of credit facilities
-High interest rates

To remedy this situation of gross under funding of seed production and supply mechanisms the following considerations can help improve the system;

-Creation of credit facilities and make them accessible to seed producers
-Advocacy for the reduction of high interest rates for seed producers/farmers

3.5 Quality Control

Quality control ensures that all stipulated regulations and guidelines are adhered to by the actors in the seed production and supply value chain thereby making the seeds worthy to be seeds. Putting in place a sound and functional quality control mechanism requires a lot of human, material and financial resources. Therefore, lack of the stated resources translates into the constraints of quality control in seed production and supply. The issues to be tackled in seed quality control are;
-Inadequate human resources
- Inadequate budgetary provision
-Inadequate financial resources
-Lack of capacity building
-Inadequate seed processing facilities
-Inadequate seed testing laboratories
- Lack of a functional quality control authority
-lack of a traceability system

And the following action points or suggestion will go a long way in addressing these constraints;

-Recruit and train additional and existing personnel for quality control
-Inclusion of budgetary allocation in National budget for quality assurance
-Construction of new seed testing laboratories
-Creation of a seed certification agency

4.0 Vision and Scope

4.1 Position of Rice Development Strategy

The National Rice Seed Road Map of the Gambia upon validation will be the operational document for the rice seed value chain development in line with the existing Gambia's National Rice Development Strategy (NRDS) framework document. It is clear that the set objectives to be achieved in the NRDS by year 2024 will be difficult to meet in the absence of a sound and functional rice seed production and supply system that will ensure the availability and affordability of good quality rice seeds to rice growers nationwide.

The position of the National Rice Seed Road Map is a very critical and pivotal one in the implementation of the National Rice Development Strategy (NRDS), as it will serve as the operational manual that will guide the execution of the set policies and strategies that will govern the creation of a functional and sustainable seed production and supply system, which will serve the interest of rice farmers, hence catalyze the attainment of the set goals in the National Rice Development Strategy (NRDS) by the year 2024.

4.2 Vision of the National Rice Seed Road Map

The National Rice Seed Road Map of the Gambia is anchored on a vision of self–sufficiency in quality rice seed production by the year 2024.

4.3. Goal and Scope of the National Rice Seed Road Map

To provide a functional and sustainable rice seed production and supply system that will put equal emphasis on the overall rice seed value chain to ensure the availability of quality rice seed. The National Rice Seed Road Map will place emphasis on the lowland production systems

4.4. Objectives of the National Rice Seed Road Map

General objective: To ensure the availability of high quality rice seeds to farmers at all times

Specific objective:

1. To Produce high quality seed that will meet the farmers expectation
- To strengthen capacity of seed producers
- To produce high yielding varieties
- To produce according to the demands of the farmers
- To ensure good agronomic practices

2. To ensure Quality of seeds being produced at all levels
- Strengthen the capacity of quality control officers
- Train farmers on how to maintain quality in the field
- Equip the extension officers with seed production skills
- To ensure routine monitoring and supervision of seed producers
-

3. To maintain a credible supply mechanism

- ensure timely availability of seeds
- ensure proper packaging and labelling
- ensure good transport system
- create seed marketing outlets

4. Institutions
- Ensure strong linkage for planning purposes of seed availability
- Development of enabling laws
- Enforcement of seed laws and policies
5. Human resources
- Strengthen the capacity of actors in the entire value chain
6. To ensure proper post-harvest Processing
- Strengthen capacities of post-harvest processors
7. Policies
- Establish policies to encourage private sector participation in seed business
- Ensure policies that will make finances available at reasonable interest rates

4.5. Implementation Structure of the National Rice Seed Road Map of the Gambia

The implementation structure will be directed by the Ministry of Agriculture (Permanent Secretary) through the national seed council. The executions of the activities will be carried out by the national seed secretariat(NSS)

The National level structures of the governance will include:

1. The ministry of agriculture (Minister)- Chairperson

The ministry has the overall responsibility to see to the development of the rice sector in the Gambia

Terms of reference::

- to lead the formulations of all policy guidelines related to rice development in the Gambia

- mobilization of resources to the implementation of rice related projects

2. National seed council (NSC)-

Terms of reference

- To coordinate all seed and seed related matter vis-à-vis rice seed

- Advice the government on seed related policies especially rice seed

➢ Members:

Permanent secretary ,DG NARI ,DG DOA, DMD-GGC, MD-GHE, RAD-WCR, M&E-WAAPP

3. National seed secretariat

Term of reference

- Leads in the implementation of the seed regulations
- Coordinate, administer and carry out all functions of seed quality control and certification
- Conduct seed development activities

4. National rice liaison desk (NRLD)

Work as secretariat for NSC, NSS

Terms of reference

- Serve as focal point of all rice related activities
- Coordinate and closely communicate with all stakeholders in the rice sector

4.6. Funding Sources

The funding sources for the implementation of the National Rice Seed Road Map of the Gambia will be the government of the Gambia, Development partners and Agricultural Projects.

5.0 Strategies and Priorities

The strategic approach that will be employed in the implementation of the national rice seed road map will be centered on the following strategies and priority areas: legislation, policy, institutions, seed production, supply and inspection

5.1. Strategic Principles and Approaches

The strategy will be demand rather than supply driven, it will focus on increasing the registered seed (informal system) already circulating in the country while working towards establishing the formal system to ensure the production of certified seeds.

i. Irrigated lowland ecology(Tidal irrigation) with the potential for all year round seed production will be upgraded

ii. Access to market will be a determining factor for the choice of the area

iii. Efforts will be made to encourage agro dealers to be engaged in seed marketing

iv. The following varieties will be promoted: WAB 105, Sahel 134, IR1974-6, and WAR 77.

v. Seed inspection officers will be further strengthened to carry out their mandate of seed inspection while efforts will be geared towards ensuring the effectiveness of the newly established seed certification agency

vi. An enabling environment will be created to encourage private seed companies to become interested in seed production, this will speed up the transformation to the formal seed system, this could be through subsidy program for seed production, tax incentives etc)

vii. In the short run the informal system will be strengthened through capacity building of CBOs to continue to fill the gap as currently obtained.

viii. Create awareness on the production and usage of quality seeds this will serve as a catalyst to promote the formal seed system in the long run

5.2. Ecosystem based seed development approach

The irrigated low land (tidal) appears to have a comparative advantage with respect to seed production. Capacity of seed producers in this ecology will be strengthened and infrastructures upgraded, therefore, the strategy will promote seed production in the tidal irrigated perimeters of Central River Region (South and North).

The strategy is aimed at promoting the following very promising varieties namely: WAB 105, Sahel 134, IR 1974-6 and WAR 77 While also promoting the irrigated lowland ecology because of its comparative advantage over others, and geographical location Central river regions (North and South).

5.3. Legislation, Policy and Institutions

Policy

Already established favorable policies will be further promoted such as private sector participation in seed production, marketing and agro dealer's network especially in certified seed, while foundation seeds will also be relinquished to them on the long

Legislation

The enactment and assent of the quality control and marketing regulations and the putting in place of the variety release committee (VRC) are recent progress to move the rice seed sector forward which will be equally promoted under this strategy

Institutions

The recent unbundling of the National agriculture research institute (NARI) leading to the creation of NSC and the technical arm (NSS) is also a strategic approach to accelerate the movement from the informal to the formal seed system. Further capacity building to strengthened the personnel in this department need to be vigorously pursued

5.4. Seed Production and Inspection

The first strategic approach of the National Rice Seed Road Map of the Gambia will be to address the capacity needs of breeder, foundation and certified seed production highlighted earlier in this document. The capacity gaps in quality control also will be addressed. The strategic approach will be to provide the required man power, financial resources and necessary infrastructure to support the establishment of a vibrant, functional, reliable and sustainable rice seed production and supply system through public-private partnerships..

Furthermore, all the four classes of seeds will be given due attention. As stated in seed policy, breeder seeds production will be a public mandate Foundation seed production will also be a public mandate until such a time which the private sector is able to takeover. Registered and certified seed multiplication is a private sector mandate, through individual seed producers, groups and private seed companies. As stipulated in seed quality control and marketing regulations of the Gambia March 2016, only varieties registered in the National Variety Catalogue will be eligible for certification (Varieties that pass both the VCU and DUS tests).

Given the unpredictable nature of rainfall distribution in the sahel region, much emphasis and concentration will be given to irrigated lowland seed production where reliable water supply is guaranteed, be it tidal or pump. Already rice certified seed producer groups in the lowland irrigated perimeters of Central River Region North and South of the Gambia, are leading in the area of rice seed production. These groups if fully supported, have the potential of becoming the rice seed hub of the Gambia, which this strategy will seek to pursue as this perimeter can produce rice seeds for all the rice growing ecologies of the Gambia. Its strategic location in the country is also an added advantage. The strategy seeks to implement a well-designed rice seed production plan that will cater for all the rice growing ecologies in the country (Rainfed upland, Rainfed lowland and Irrigated lowland). Therefore, for seed production emphasis will be placed on the irrigated lowland (tidal), whereas the geographical areas with proximity to market will also be promoted

5.5. Seed Supply/Marketing

Cognizant of the fact that an effective seed supply system will crown all the good efforts put into production and quality control and is supposed to be a private sector led domain. Strategic measures that will create the enabling environment for the private sector to come in and lead in the dispensation of seed supply will be taken. The formation and registration of private seed companies and individual private seed dealers will be highly encourage.

Distribution of seeds

-Low demand- price, lack of information about the availability, lack of awareness on the difference between seed and grains
- Unavailability of required inputs (fertilizers)

5.6. Target Setting and Gap Identification

The Gambia National Rice Development Strategy (NRDS) aims to increase rice production to about 460,000 metric tons of paddy by 2024. An average seed rate of 50 Kg/Ha is recommended. At the current productivity level of 3.5 t/ Ha therefore, a seed-grain ration of 1:70 is observed. Approximate amount of rice seeds currently self-supplied by farmers is 85.5 percent. Target amount of production to be covered by certified seeds is 15 percent. Under the current awareness status, it is assumed that rice farmers would replace the seeds on an average of once in 5 years.

Based on the analysis of the current rice sector in the Gambia, gaps have been identified which cuts across the entire value chain from seed to seed, and collective measures are required to address all the identified gaps . Therefore, a holistic approach to address all the gaps in the value chain is the best option to be pursued if the set target is to be met.

Table 22 Target of National Rice Development Strategy (NRDS) by 2024

NRDS target production by 2024 is: 460,000MT/year		
Average amount of seed used 50 kg/ha, average yield 3.5t/ha, Seed-Grain Ratio 1 : 70 for CS .1:62 for BS & 1:64 for FS		
Approximate amount of seeds currently self-supplied by or among farmers 2,932.8 MT, 85.5 %		
Target amount of production to be covered by certified seeds is 15 %		
Seeds are renewed every 5 years NARI DATA(2014)(Seeds produced by farmers group)= 497.2Tons National paddy production for 2013 is 86,800MT from 68,800HA[1]. @ 50kg/ha it would have required 3,430 Tons of seed for the 68,800ha. Certified seeds usage =497.2/3430*100=14.5%. Self supplied seed(3430-497.2=2,932.8) =85.5%		
	Target amount (MT/year)	Area of land required for production (ha)
Breeder Seed	3.08/62=0.049	0.049/3.4 = 0.0145
Foundation Seed	197/64 =3.08	3.080/3.2 = 0.1

[11] This is the available figure from the NRDS document, it is assumed that this production is an accumulation from both projects from development partners, NGOs and farmers groups.

Registered Seed	460,000/1:70/15%/5yrs 197	197/3.5 = 56.3
Certified seed		

5.6.1 Gap identification

1. Production

As shown in Table 28 a surplus is noticed in the production of registered and foundation seeds, whereas there is a deficit for breeder seeds. The crucial issue will be to concentrate in improving the quality of the foundation and registered seed present in the system and fill the deficit in the breeder seed production.

Procedures for improving the quality of the seed in the system are

(i)**Breeder seeds**

- Adhering to a well-planned cropping calendar
- Provision of good and high yielding varieties
- Capacity building for the researchers Provision of the right research infrastructures
- Using the recommended row spacing and isolation distance rather than broadcasting
- Use of Varietal catalogue by the inspectors
- Provision of suitable farm machineries for production and good post-harvest

(ii)Foundation seeds

- Adhering to a well-planned cropping calendar
- Recruitment and training of personnel for production and inspection
- Provision of suitable farm machineries for production and good post-harvest processing
- Good quality control procedures (Routine field inspection, Laboratory seed testing, creating data base of released varieties for planning purposes)
- Using the recommended row spacing and isolation distance rather than broadcasting
- Good agronomic practices(selection of pure and viable seeds, good nursery and good water management, timely transplanting and harvesting, Pest and disease management, rogueing off-types))

(iii) Registered seeds

- Adhering to a well-planned cropping calendar
- Training of seed producers in basic field quality control
- Training of extension officers in seed production techniques
- Good agronomic practices (good bed preparation, timely planting, fertilizer application, weeding, and field sanitation, observation of isolation distance, rogueing off-types and harvesting.)
- **Post-harvest practices**

- Timely threshing
- Proper drying(14% and below), cleaning, bagging and standardization, labelling and taggin and appropriate storage and handling(on pallets, good ventilation environment, and prevention against rodent attack
    - **Transportation**

- To avoid varietal mixture
- To avoid adulteration/ contamination

Table 23 Annual Gap between Current Production and Targeted Production

	Target amount (MT/year)	Current Production/ supply (MT/year)	Gap (MT/year)
Breeder Seed	49kg	37 kg	12kg
Foundation Seed	3.080	48	44.92(surplus)
Registered Seed	197	340	143(surplus)
Certified seed			

Table 24 Target Area and Quantity of Breeder Seed to be produced per Variety

	Name of recommended varieties	Seed Category (Market and/or Subsistence)	Target Amount of Seed Production (MT/year)	Areas required for production (ha)
Irrigated Lowland	Sahel 134	Market/Subsistence	0.012	0.004
	WAR 77-3	Market/Subsistence	0.012	0.004
	IR 1974-6	Market/Subsistence	0.012	0.004
	WAB 105	Market/Subsistence	0.012	0.004

Table 25. Gap between Required and Available Human Resources for Seed Production(Breeder)

Name of Seed Producing Stations	Researcher		Gap	Technician		Gap	Workers/ Laborers		Gap
	Required	Available		Required	Available		Required	Available	
Sapu	12	2	10	25	5	20	37	4	33
Total	12	2	10	25	5	20	37	4	33

Table 26 Human Resource Development Needs for Seed Production (Breeder)

	Number of technical personnel to be newly employed	Required Budget For employment	Number of technical personnel to be trained	Areas for training	Required Budget for training
Researchers	12	N/A	12	Seed Science, Breeding, Pathology, Entomology , physiology	N/A
Technicians	20	N/A	20	Weed science, pest and disease mgt,	
Workers/ Laborers	33	N/A	33	Crop mgt, field mgt, Post harvest handling	
Total	65		65		

Table 27 Gap between Required and Available Human Resources for Seed Inspection

Geographical area	Number of Inspectors		Gap in number	Gap in Capacity
	Required	Available		
CRR/S	42	9	33	
CRR/N	29	9	20	
Total	71	9	53	

Table 28 Human Resource Development Needs for Seed Inspection

Geographical area	Number of inspectors to be newly employed	Required Budget For employment	Number of Inspectors to be trained	Areas for Training	Required Budget for training
CRR/S	42		42	-Field inspection procedures -Rice Agronomy -Rice Seed Production Techniques -Seed Laboratory procedures etc.	
CRR/N	29		20	Same as above	
Total	71		62		

2. Seed Supply

The ultimate target of the seed supply system is to address all the factors that limit the supply of rice seeds, from seed to seed (Breeder to certified seed production, quality assurance, financial constraints, distribution etc.). The target of the seed supply system is to accomplish the following;

- Inclusion of budgetary allocation in the National budget
- Establish a seed certification authority
- Creation of links between input dealers and seed producers
- Procurement of seed processing machines
- Recruiting and Training of more seed inspectors and extension workers
- Creating the enabling environment for private seed companies and dealers to operate smoothly
- Linking seed producers to financial institutions
- Advocacy for the reduction of high interest rates for seed producers/farmers

- Appropriate bagging and transport system
- Establish well defined channels for the movement of seed
- Establish appropriate database to monitor the availability of seed
- Improving the capacity of NSS for proper field inspection

5.7. Priority Areas for Possible Intervention

5.7.1. Legislation, Policy, Institutions and Planning

For the overall goals of both the National Rice Development Strategy (NRDS) and the National Rice Seed Road Map be achieved, the following points are recommended for action;

Legislation and Policy

- Sensitization on the existence of the new seed policy and act
- Liberalization of foundation seed production to encourage private seed companies

Institutions

- Train and recruit new personnel for seed production and certification
- Procure additional vehicles and motor cycles for field personnel
- Procure desktops, laptops, printers, photocopiers, GPS, mobile phones, tablets and Digital cameras

Infrastructure

- Construct modern seed testing laboratories, seed processing facilities and drying floors

Planning

- Develop annual national seed production plan and include an annual seed production budget into the National Budget

5.7.2. Seed Production and Inspection

Seed production and inspection forms the bases of a seed system that will ensure the availability of good quality seeds tor rice growers at all times. Seed production and inspection aspects are limited by numerous factors that affect the performance of the system from seed to seed. The possible interventions to address the issues that affect the performance of the system are highlighted in the tables below.

Table 29 Areas for possible intervention in seed production

Issue	Suggestions	Priority			Funding Source
		Short Term	Medium Term	Long Term	
Land Preparation	-Provide credit facilities for seed producers to access for the procurement of appropriate farm machinery -Training of machinery operators	✓			Government, Development partners and NGOs
Nursery Management	Training of seed producers on nursery management and on farm demonstrations	✓			Government, Development partners and NGOs
Weed Management	Use of herbicide and timely weeding	✓			Seed producers
Pest and Disease Management	Adhering to cropping calendar, provision of net traps and explosives	✓	✓	✓	Seed producers, development partners and NGOs
Transplanting	Provision of credit facilities for procurement of planters		✓	✓	Government, development partner and NGOs
Harvesting	Provision of credit facilities for		✓	✓	Government, development partners and

	procurement, harvester, threshers, tarpaulin				NGOs
Water Management	Improvement of irrigation and drainage systems	✓	✓		Seed producers, Government, development partners and NGOs

Table 30 Areas for possible intervention in seed inspection

Issue	**Suggestions**	**Priority**			**Funding Source**
		Short term	**Medium term**	**Long term**	
Cropping history	Proper production record keeping by seed producers	✓	✓	✓	Seed producers
Isolation distant	Penalties for noncompliance	✓	✓	✓	Government
Area of seed field	Training of seed producers on proper demarcation of seed fields	✓	✓	✓	Government, Development partners and NGOs
Variety under production	Training of inspectors on basic rice agronomy	✓	✓	✓	Government, Development partners and NGOs

5.7.3. Supply and Marketing

The supply chain of seeds from breeder to certified seeds should operate as one mechanism if the desired results are to be achieved. There are a lot of commonalities in the constraints and challenges faced in the supply of these three classes of seeds, as each class of seed defers

from the other in terms of volume and the institutions that handles the distribution, they will be treated individually in terms of possible interventions in the priority areas as follows;

Table 31 Possible areas of intervention in breeder seed development and supply

Issue	Suggestions	Priority			Funding Agency
		Short term	Medium term	Long term	
Inadequate human resources	Capacity building for staff		✓	✓	Government and development partners
Lack of budgetary allocation in the national budget	Inclusion of budgetary allocation in the national budget	✓	✓	✓	Government and development partners
Lack of infrastructure (Cool storage, Green house)	Provision of gene of mini bank for germplasm conservation		✓	✓	Government and development partners
Lack of farm machinery	Procurement of farm machinery (production and processing)		✓	✓	Government and development partners
Inadequate working tools (office equipment)	Procurement of office equipment		✓	✓	Government, development partners and NGOs
Lack of screen houses	Construction of screen houses		✓	✓	Government and development partners
Inadequate mobility for field	Procurement of vehicles and motor		✓	✓	Government and development

operations	cycles				partners

Table 32 Possible areas of intervention in foundation seed production and supply

Issues	**Suggestion**	**Priority**			**Funding Source**
		Short term	**Medium term**	**Long term**	
Inadequate seed testing laboratories	Building of modern seed testing laboratory	✓	✓	✓	Government and Development partners
Inadequate seed processing machines	Procurement of seed processing machines	✓	✓	✓	Government and Development partners
Lack of cold storage	Construction modern cold storage	✓	✓	✓	Government and Development partners

Table 33 Possible areas of intervention in certified seed production and supply

Issues	Suggestions	Priority			Funding Source
		Short term	Medium term	Long term	
Lack of seed certification authority	Establish a seed certification agency	✓			Government
Inadequate farm machinery for land preparation	Creation of links between credit facilities and seed producers	✓	✓	✓	Government, Development partners, NGOs and private sector
Inadequate seed processing facilities	Procurement of seed processing machines	✓	✓	✓	Government, Development partners, NGOs and private sector
Inadequate production inputs	Creation of links between input dealers and seed producers	✓	✓	✓	Government, Development partners, NGOs and private sector

Table 34 Possible areas of intervention in distribution

Issues	Suggestions	Priority			Funding Source
		Short term	Medium term	Long term	

Poor road net work	Construction of inter village road net work	✓	✓	✓	Government and Development partners
Limited specialized seed dealers	Encouragement and involvement of private sector participation	✓	✓	✓	Government, NGOs and private sector

Table 35 Possible areas of intervention in financing seed supply

Issues	**Suggestions**	**Priority**			**Funding Source**
		Short term	**Medium term**	**Long term**	
Lack of credit facilities	Creation of credit facilities and link them to seed producers	✓	✓	✓	Government, Development partners, NGOs and private sector
High interest rates	Advocacy for reduction of high interest rates	✓	✓	✓	Government, Development partners, NGOs and private sector

Table 36 Possible areas of intervention in seed quality control

Issues	**Suggestions**	**Priority**			**Funding Source**
		Short term	**Medium term**	**Long term**	
Inadequate human resources	Recruit and train existing and additional personnel	✓	✓	✓	Government and Development partners

Inadequate financial resources	Inclusion of budgetary allocation in National Budget for quality control	✓	✓	✓	Government
Inadequate seed testing laboratories	Construction of modern seed testing laboratories	✓	✓	✓	Government and Development partners