

People's Republic of Mozambique



**Rice Seed Value Chain Development  
Strategy of Mozambique  
(2016-2019)**

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Ministry of Agriculture and Food Security  
Maputo

## EXECUTIVE SUMMARY

Rice is an important cereal food crop with socio economic significance in achieving Mozambique's millennium development goals. Rice is largely produced by smallholder farmers under irrigated lowland, rain fed lowland and rain fed upland environments under substantial climatic risks. Local rice production has been on the rise in the recent past due mainly to the physical expansion of land area under rice cultivation. On-farm rice crop productivity in the country however has long stagnated at  $1.0 \pm 0.2$  t/Ha; lagging behind the average rice yield levels (2.2 t/ Ha) observed across Sub-Saharan Africa.

Government of Mozambique has tagged rice as a priority crop under its Strategic Plan for Agricultural Development (PEDSA) and has enumerated the development of rice sector under the National Agriculture Investment Plan (PNISA); in the context of Comprehensive African Agriculture Development Program (CAADP). Recently a National Rice Development Program (NRDP) has been developed to comprehensively address a myriad of challenges along the rice value chain.

Quality seed is one of the essential productivity enhancing facets of rice sector development. This document assesses the current modes of operation and the various challenges confronting the rice seed value chain development in the country; and proposes strategic interventions for enhancing the production, supply and accessibility of quality seeds; which could sustainably augment the NRDP's goals on rice sector development and the overarching national poverty reduction and economic growth strategies.

Under the formal system, rice seed in Mozambique is produced through a series of multiplication steps involving breeder seed, pre-basic seed and basic seed; and sold in the market after inspection and certification by the Department of Seeds. However, since rice is a self-pollinated crop; farmers in reality often tend to overlook the genetic erosion and the ensuing reduction in crop productivity; and informally use grains as seeds. In the recent years, a semi-formal community based quality declared seed system is emerging in which seeds are produced by rice farming communities and their quality is declared through a process of nominal scrutiny and disseminated amongst fellow-farmers.

Mozambique's Seed Regulations (2013) outline the standards and procedures to be adhered during seed production, inspection and marketing under its formal system. However, Seed Act (1994) governing the legislative framework for the seed industry is outdated and national seed policies guiding the stakeholders are yet to be drawn. While IIAM is responsible for production of early generation rice seed (breeder and pre-basic) classes; USEBA is responsible for the pivotal basic seed production of all registered rice varieties. Due to low demand under direct marketing, only a few private companies produce certified rice seeds and thrive under the scopes of governmental and non-governmental organization's procurement plans. Hence the institutional framework for rice seed production, inspection and supply is largely dependent on the public domain.

Constraints in financial, institutional, human and technical resources and lack of synergy with seed related extension services however limit IIAM-USEBA from efficiently orienting its production and marketing towards creating and in meeting the effective demand amongst rice farmers. Insufficient human resources and logistical support facilities such as transportation affect timely inspection and certification processes. Besides low demand; inadequate finance, insufficient infrastructures for seed production, processing and storage, and weak technical support services dampen the quality and volumes of production and supply of certified seed and quality declared seed by private sector.

The objective of the proposed strategies in this document is to facilitate transformation in use of quality seeds amongst rice growers through various interventions along the seed value chain. Given the socio-economic diversity amongst the rice producers under the three production environments, it is proposed that private sector will be actively promoted in seed production and marketing under irrigated production environment; while the government will play a catalytic role in providing inspection, technical and policy support along the value chain. Under the rain fed lowland and rain fed upland environments however, the government shall play a leading role in organizing production of quality declared seeds by encouraging farmer organizations/communities and rural entrepreneurs in production and marketing through capacity building and technical and financial support services.

Seed Laws and policies that will mainstream and sustain the social and economic viability of the different stakeholders along the rice seed value chain will be proposed for parliamentary approval. Public-private partnerships will be sought in establishing infrastructures for production, processing and storage across all production environments. Demand for quality seeds will be promoted through demonstrations, farmer field schools and awareness creation through multi-media. Technical training on seed production, internal quality control measures and seed processing will be provided to seed producing farmer organizations and companies. By actively engaging agro-dealer networks in direct marketing and provincial directorates in indirect (disaster/emergency relief services) marketing; accessibility to certified and quality declared seeds will be increased in rice growing areas.

Implementation of the proposed strategic interventions by the relevant public and private organizations will be guided and monitored by MASA with technical advice from Consultative Group on Rice. Funds for the interventions will be sought from the government and the various development partners by proposing concept notes. By increasing the productivity of rice crop, it is conceivable that the implementation of the suggested measures will lead to a significant increase in rice production and help achieve food security and poverty reduction in Mozambique.

## ADMINISTRATIVE MAP OF MOZAMBIQUE



### ABBREVIATIONS AND ACRONYMS

AGRA: ALLIANCE FOR GREEN REVOLUTION IN AFRICA  
 CEPAGRI: CENTRO DE PROMOÇÃO DA AGRICULTURA  
 CNS; COMITÉ NACIONAL DE SEMENTES  
 DINAS: NATIONAL DIRECTORATE FOR AGRICULTURAL SERVICES  
 DNEA: NATIONAL DIRECTORATE OF AGRICULTURAL EXTENSION  
 DPA: DIRECÇÕES PROVINCIAIS DE AGRICULTURA  
 DPASA: DIRRECCAO DE AGRICULTURA E SEGURANÇA ALIMENTAR  
 DPIC: PROVINCIAL DIRECTORATE INDUSTRY AND TRADE  
 FAO: FOOD AND AGRICULTURE ORGANIZATION  
 JICA: JAPAN INTERNATIONAL COOPERATION AGENCY  
 GCR: CONSULTATIVE GROUP FOR RICE  
 IIAM: INSTITUTO DE INVESTIGAÇÃO AGRÁRIA DE MOÇAMBIQUE  
 IRRI: INTERNATIONAL RICE RESEARCH INSTITUTE  
 ISSD: INTEGRATED SEED SECTOR DEVELOPMENT  
 MASA: MINISTRY OF AGRICULTURE AND FOOD SECURITY  
 NGO: NON GOVERNMENT ORGANIZATION  
 NRDP: NATIONAL RICE DEVELOPMENT PROGRAM

OECD: ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT  
PAPA: ACTION PLAN FOR THE PRODUCTION OF FOOD  
PEDSA: STRATEGIC PLAN FOR AGRICULTURAL DEVELOPMENT  
PNISA: NATIONAL AGRICULTURE INVESTMENT PLAN  
SADC: SOUTHERN AFRICAN DEVELOPMENT COMMUNITY  
SDAE: DISTRICT SERVICES OF ECONOMIC AFFAIRS  
UNAC: UNIÃO NACIONAL DE CAMPONESES  
UPOV: INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS  
USEBA: UNIDADE DE SEMENTE BASICA

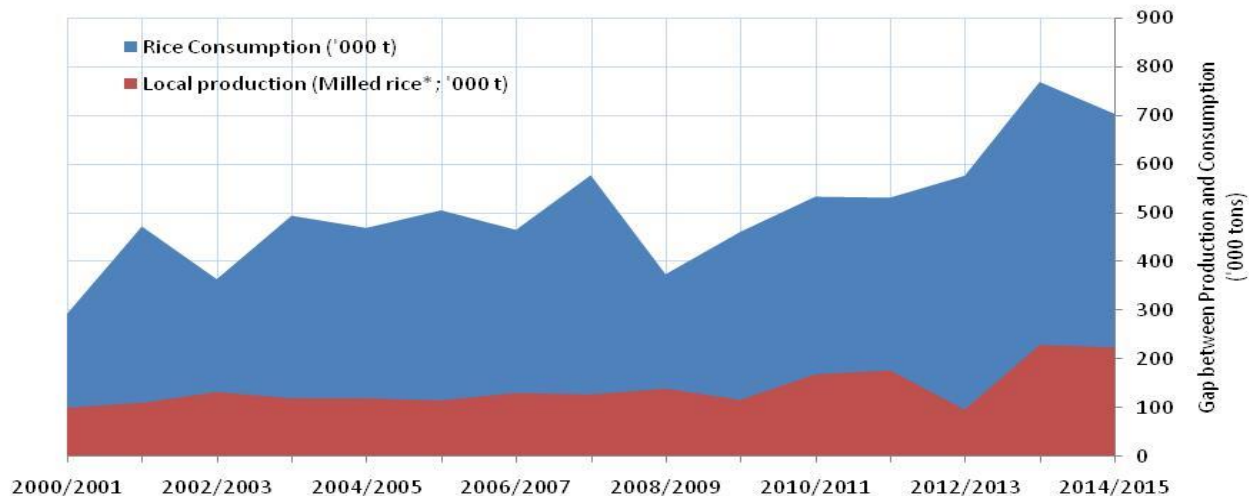
## Contents

EXECUTIVE SUMMARY .....	2
ADMINISTRATIVE MAP OF MOZAMBIQUE .....	4
ABBREVIATIONS AND ACRONYMS.....	4
1. INTRODUCTION.....	7
2. REVIEW OF NATIONAL RICE SEED SUB-SECTOR .....	9
2.1. LEGISLATION AND POLICY ASPECTS.....	9
2.2. INSTITUTIONS AND PLANNING .....	10
2.3. PRODUCTION .....	13
2.4. QUALITY CONTROL .....	14
2.4.1. METHODS.....	14
2.4.2. HUMAN RESOURCES .....	16
2.5. SEED SUPPLY .....	16
3. CHALLENGES IN RICE SEED VALUE CHAIN DEVELOPMENT .....	18
3.1. LEGISLATION, POLICY, INSTITUTIONS AND PLANNING .....	18
3.3. SEED SUPPLY .....	21
4. RICE SEED VALUE CHAIN DEVELOPMENT .....	22
4.1. POSITION OF RICE SEED DEVELOPMENT STRATEGY .....	22
4.2. VISION AND SCOPE .....	22
4.3. GOAL & OBJECTIVES .....	23
4.4. IMPLEMENTATION STRUCTURE .....	23
5. STRATEGIES .....	24
5.1. STRATEGIC PRINCIPLES AND APPROACHES .....	24
5.1.1. IRRIGATED ECOSYSTEM.....	24
5.1.2. RAIN FED ECOSYSTEMS .....	24
5.2. TARGET SETTING.....	25
5.3. HUMAN RESOURCES .....	27
5.4. INTERVENTION OPTIONS .....	28
5.4.1. LEGISLATION, POLICY, INSTITUTIONS AND PLANNING .....	28
5.4.2. PRODUCTION AND INSPECTION .....	29
5.4.3. SUPPLY AND MARKETING .....	30
6. ANNEXURE.....	32
6.1. WORKING TOOL (QUESTIONNAIRE) ON MOZAMBIQUE’S SEED SUB-SECTOR .....	32

## 1. INTRODUCTION

Rice is an important cereal food commodity in Mozambique. It is largely produced by smallholder farm families in Sofala, Zambezia, Nampula, Cabo Delgado, Nampula, Gaza and Maputo provinces. Since 2000, the area under rice cultivation has increased from 167,000 Ha to 433,752 Ha in 2014 and paddy (rough rice) production has increased from 178,000 tons to 394,320 tons. It is however estimated that Mozambique has an area of about 900,000 hectares of land suitable for rice production.<sup>1</sup> In an effort to tap the potential land space; the government of Mozambique has recently invited private sector investments in rice production, processing and marketing. Subsequently, the commercial rice production has gained traction in large farms where import substitution and/or exports have become the prime objectives.<sup>2</sup>

Consumption of rice is growing expeditiously at a rate of 6.34% per year in Mozambique<sup>3</sup>; creating significant gaps between local production and consumption demand (Fig. 1). Hence, despite the recent growth in local rice production, the self sufficiency level has stagnated at an average of 28.1 ( $\pm 5.9$ ) % since 2000. The rapid shift in market demand for rice has consequently propelled the local markets to import milled rice grains from other rice growing countries in Asia at an average of 365,800 tons per year<sup>4</sup>. Besides exerting strain on trade imbalance and foreign exchange, the imported rice adds further pressure on the marketability of locally produced rice by virtues of their competitive prices and qualitative features that are preferred by the consumers. Given the vulnerability of Mozambique's poverty growth rate to external food price shocks<sup>5</sup>, the growing dependence on rice imports constantly puts food security under threat.



*Fig. 1: Quantitative deficiency in local rice production against the consumption demand.<sup>6</sup>*

<sup>1</sup> Agribusiness Opportunities in Mozambique (2009) Ministry of Agriculture; Agriculture Promotion Center (CEPAGRI)

<sup>2</sup> Arlindo and Keyer (2009) Awakening Africa's Sleeping Giant: Prospects for Commercial Agriculture – Mozambique country case study by World Bank

<sup>3</sup> Ecobank (2015) Middle Africa Market Update: Soft commodities

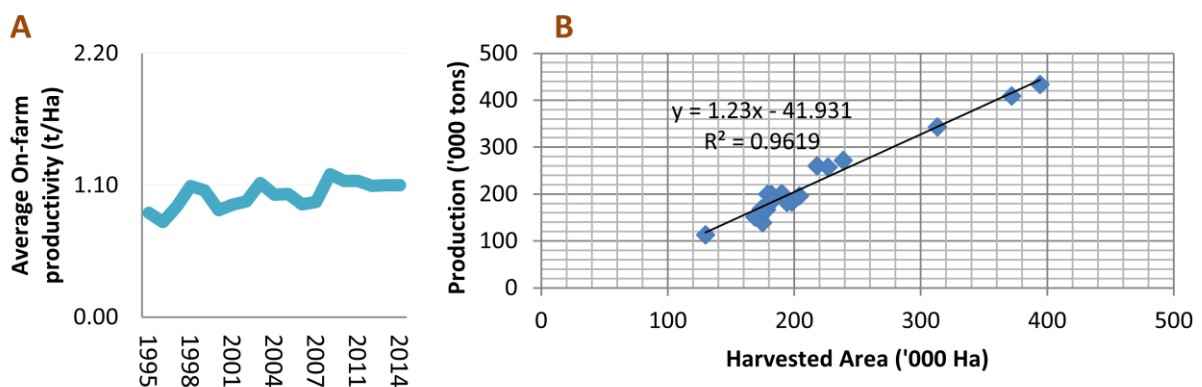
<sup>4</sup> FAO database on imports; faostat3.fao.org

<sup>5</sup> Arndt et al. (2011) Explaining Poverty Evolution: The Case of Mozambique. UNU-WIDER Working Paper No. 2011/17

<sup>6</sup> Data sourced from USDA Foreign Agricultural Services; <http://apps.fas.usda.gov/psdonline/psdQuery.aspx>

Most of the rice in Mozambique is produced in Central and Northern provinces where population density is coincidentally higher. The crop is cultivated under irrigated, rain fed lowland and rain fed upland ecosystems. Rice thus provides a viable avenue to poverty reduction and economic development through agriculture transformation in Mozambique. Nevertheless, owing to several significant threats from climate, the smallholder farm families manage rice production by resorting to low-input low-risk farming systems. For instance, the rice farmers in Zambezi's floodplains utilize low or receding water levels along the banks of the river; subjecting the crop to unpredictable climatic extremities such as flood and drought.

Such low input rice farming by smallholder family sector has however kept the on-farm productivity of the rice crop chronically at  $1.0 \pm 0.2$  t/Ha (Fig. 2A) which is significantly lower than the average rice yield levels obtained in Sub-Saharan Africa (2.2 t/ Ha).<sup>7</sup> Due to the stagnation of productivity enhancement; the country's total rice production presently largely depends on the extension of land area under rice cultivation. Recent trends in data reveal a strong coefficient of determination (0.961) of correlation between area under rice cultivation and total paddy production (Fig. 2B); suggesting that the physical expansion of area has been the only major driver for increasing rice production in Mozambique. Since rice is a natural resource (water, labor) intensive crop; it is less sustainable to expect continuous and consistent expansion of land area under rice cultivation. Given the gaps between production and domestic consumption; other means of increasing on-farm rice productivity therefore remains to be augmented along the value chain to boost local rice production.



*Fig. 2: Stagnation of rice yield (A) and tight correlation between local production and physical expansion of land area under rice cultivation in Mozambique since 1995 (B)*

Evidences from green revolution in Asia reveal that quality seed is one of the major inputs that have boosted total productivity gains in smallholder rice farms.<sup>8</sup> Seeds can also play a pivotal role in improving the quality and market competitiveness of locally produced rice. Government of Mozambique has recently drafted a National Rice Development Program (NRDP); which is set to embark upon a cohesive improvement of rice value chain factors in the country. Improving access to quality rice seed to smallholder farmers is ear marked as one of the major interventions under the

<sup>7</sup> Saito K et al (2015) Rice yield growth analysis for 24 African countries over 1960–2012; Global Food Security 10/2014; DOI: 10.1016/j.gfs.2014.10.006

<sup>8</sup> Hazell PBR (2009) The Asian Green Revolution, IFPRI, Washington DC



NRDP. This document analyzes the present state of rice seed value chain segment, identifies the various challenges faced by the stakeholders and proposes strategic approaches for improving the production and supply of quality rice seeds in the country.

## 2. REVIEW OF NATIONAL RICE SEED SUB-SECTOR

### 2.1. LEGISLATION AND POLICY ASPECTS

Seed Act<sup>9</sup>, which was passed as a Decree Law by the Council of Ministers in 1994, serves as the basic legal instrument that regulates the various aspects of the national seed system including variety improvement, variety listing, seed production, processing, storage, analysis, certification and trade including import and export. The decree establishes the mechanisms for the development of a national seed industry, including guidelines for the production and marketing of different categories of seeds in Mozambique. The decree assigned the Ministry of Agriculture and Food Security (MASA) with the responsibility for implementing this law, and creating and enforcing other complementary regulations relating to the seed sector. A new Seed Law draft has long been held in discussion stage under the spirit of G8 New Alliance for Food Security and Nutrition, which seeks to open new vistas for seed business and trade in Africa.

In 2001; Ministerial Diploma<sup>10</sup> assigned the Seed Department of MASA with the responsibilities of overseeing the registration of seed companies, variety release, seed quality control, and the certification of seed lots. Business opportunities in seed production and distribution were subsequently elaborated by MASA in consultation with stakeholders.<sup>11, 12</sup> In 2006, law on the Standards of Protection on New Varieties of Plants<sup>13</sup> outlined the norms for protection of new plant varieties) includes legislation on plant variety protection. The Minister of Agriculture nominates a Variety Release Committee is composed of the National Director of Agriculture as the President, and representatives from Instituto de Investigação Agrária de Moçambique (IIAM), extension, research, farmers' associations, seed growers' associations, seed companies, MASA policy and planning and the national seed services. The role of this technical committee is to assist the Registration Authority in the decision-making for conceding the breeder's rights on released varieties. In 2011, in an effort to increase the availability of quality seeds of important food and cash crops, the government of Mozambique launched a national program for strengthening of the seed value chains in 2011.<sup>14</sup>

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<sup>9</sup> Decree No. 41/1994

<sup>10</sup> Ministerial Diploma No. 184/2001

<sup>11</sup> Rohrbach DD et al (2001) Investment priorities for the development of Mozambique's seed system; ICRISAT Research Report No. 44E

<sup>12</sup> Howard J et al (2001) Constraints and strategies for the development of the seed system in Mozambique, Directorate of Economics, Ministry of Agriculture and Rural Development: Maputo

<sup>13</sup> Decree No. 58/2006

<sup>14</sup> National Directorate of Agrarian Services (2011) National Programme for Strengthening of The Seed Chain

In 2013, seed regulations<sup>15</sup> providing norms for seed production and trade in the country were formulated. Besides outlining the roles of the public and private sector in implementation of the above mentioned decrees and diplomas; it also stipulates the standards for registration, seed production, inspection, quality control, certification, marketing and inspection of processing plants and seed warehouses. Mozambique's seed regulations are integrated with Southern African Development Community (SADC)'s regionally harmonized seed regulatory system which includes Malawi, Tanzania, Swaziland, Zambia and Zimbabwe. However, Mozambique has not yet registered as a member of the International Seed Testing Association (ISTA) or the International Union for the Protection of New Varieties of Plants (UPOV).

## 2.2. INSTITUTIONS AND PLANNING

The Instituto de Investigação Agrária de Moçambique (IIAM) is responsible for improving and conducting rice variety trials in the country. Until recently, the presence of International Rice Research Institute (IRRI)'s Regional Center for Southern and Eastern Africa within the IIAM campus has contributed to the release of several international accessions that are adapted to local production environments through introduction and participatory varietal selection. Although other independent institutions such as Universities may also submit their own data from variety trials for variety release; the trials, conducted by the institute, have provide data for all the released rice varieties so far. Tests on Distinctness, Uniformity and Stability (DUS) and Value for Cultivation and Use (VCU) are carried out for a minimum of two seasons. The DUS tests may be carried out for one season if the breeder can provide the description of the candidate variety to supplement the DUS tests. The Department of Seed verifies the data from the independent institutions before it is presented to the Variety Release Committee.

Breeder and pre-basic seeds of all the released rice varieties are presently produced by IIAM. Production of basic seeds is organized by Unidade de Semente Basica (USEBA) in coordination with IIAM. While most of the basic seeds of rice varieties are produced at USEBA's farms, USEBA also resorts to outsourcing of basic seed production by registered seed producers where necessary. Although some of the large-scale seed companies, PANNAR and Mozseeds, have their own breeding and variety selection programs; they are currently not engaged in production of breeder, pre-basic and basic seeds. The registered seed (both large and small-scales) companies acquire basic seeds of improved varieties from USEBA, and produce certified seeds using out-growers' fields and/or their own farms. Department of Seeds is responsible for inspection of seed production in the fields and conducting laboratory tests on the seeds by the registered seed producer. The certified seeds are then marketed directly to farmers. Under the decentralization process, the local government's initiatives engage community based rice seed production which are inspected by the provincial authorities are supplied to farmers through public seed distribution networks. Key stakeholders engaged in various steps of seed production and supply chain are shown in table 1.

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<sup>15</sup> Decree No. 12/2013

Table 1: Institutions and/or Departments responsible for rice seed production, inspection and supply

		Name of institutions	Roles/ Responsibility	Legislations/Policies determining responsibility
Overall	Production	IIAM, USEBA, Private sector, Farmer groups, Farmers	Planning and Supervision of the whole process	Seed Regulations (2013)
	Inspection	Ministry of Agriculture and Food Security-Seed Department	Planning and overall management of inspection Implementation of inspection	Seed Regulations (2013)
	Supply/ distribution	Private sector; Registered farmer groups, Provincial Directorates, Agro-dealers, Non-government organizations	Planning and overall management of seed supply	Seed Regulations (2013)
Breeder Seed	Production	IIAM	Production and maintenance of Pre-basic seeds	Seed Regulations (2013)
	Inspection	Not applicable (Self inspection)	Not applicable (Self inspection)	Seed Regulations (2013)
	Supply/ distribution	IIAM	Supply of breeder seed to units producing Basic Seed	Seed Regulations (2013)
Pre-Basic (Breeder) Seed	Production	IIAM	Production and maintenance of Pre-basic seeds	Seed Regulations (2013)
	Inspection	Not applicable (Self inspection)	Not applicable (Self inspection)	Seed Regulations (2013)
	Supply/ distribution	IIAM	Supply of pre-basic seed to units producing Basic Seed	Seed Regulations (2013)
Basic Seed	Production	Coordinated by IIAM-USEBA (Unit for Basic Seed Production); Produced by private sector under "contract" with USEBA; Private Companies	Production and maintenance of Basic seeds	Seed Regulations (2013)
	Inspection	Ministry of Agriculture and Food Security – Seed Department	Quality Control of produced Seeds	Seed Regulations (2013)
	Supply/ distribution	USEBA	Supply of basic seed to certified seed producers	Seed Regulations (2013)
Certified Seed	Production	Private Sector, Registered Rice Farmers' Association – APROSEL, Munda Munda, Intabo	Certified seed production	Seed Regulations (2013)
	Inspection	Ministry of Agriculture		Seed Regulations (2013)

		Name of institutions	Roles/ Responsibility	Legislations/Policies determining responsibility
		and Food Security-Seed Department	Quality Control and Seed certification	
	Supply/ distribution	Private Sector, Registered Rice Farmer Association – APROSEL, Munda Munda, Intabo	Agro-dealers, Direct distribution from the companies and APROSEL	Seed Regulations (2013)
Community Seed (Semi- formal)	Production	Non-registered seed producer farmer associations in Zambezia	Production	Local Seed Production Initiative (guaranteed seed)
	Inspection	Provincial seed department	Inspection, Quality declaration	
	Distribution	Direct distribution	Supply	
Community seed (informal)	Production	Non-registered seed producer farmer associations in Sofala, Nampula and Maputo	Production	N/A
	Inspection	Self declared	Self declared	N/A
	Distribution	Direct distribution to community members and other farmer associations	Supply	N/A

Planning process on public rice seed production and distribution is largely centralized. Based on the necessity/request of seeds (quantity, varieties); MASA sets the crucial plans for basic seed production by USEBA. The requirements are collected through (i) annual meeting with potential stakeholders (companies, directorates who are producing certified seed) and (ii) taking into account the needs expressed by private companies, private farmers, provincial directorates and irrigation schemes. Production of early generation classes (breeder and pre-basic seeds) of the desired varieties is accordingly planned and managed by IIAM. This process is further reinforced by the USEBA's estimate of demand through regional seed forums and communication with zones and DPAs. Based on the budget allocation for seeds by MASA, which is often variable, USEBA sets out plans for production and distribution.

Development partners and non-government organizations (NGOs) support the community-based rice seed system through projects. For instance, Japan International Cooperation Agency (JICA)'s Project for improvement of rice productivity in Zambezia province (ProAPA), World Bank's Agriculture Productivity Program for Southern Africa (APPSA) and International Rice Research Institute (IRRI)'s projects project focus on production of quality rice seeds. Netherland's Integrated Seed Sector Development (ISSD) project focuses on developing local seed business by promoting entrepreneurship as an incentive amongst seed producers. NGOs focus is primarily on promotion and the organization of farmers in community-based or producer organizations. The NGOs also facilitate some interaction between community seed producers and registered seed producing companies, in order to improve access the marketability of quality seed. During flood or drought (emergencies), many NGOs provide rice seed and farm inputs to rice seed producers. Development

Partners provide technical and market-oriented advisory services to farmers and their organizations. In the recent years, a few projects by development partners also assist in distribution of seed vouchers for emergency situations.

Public-private dialogues on policies, interventions, challenges and opportunities in rice seed sub-sector takes place in Mozambique largely through National Dialogue Seed Platforms. These platforms exist in rice growing regions viz., Northern and Central and Southern provinces. The platforms have interim committees representing various stakeholders at regional and federal levels, representatives of seed department, IIAM, USEBA, seed organizations, national farmers union (União Nacional de Camponeses; UNAC). The interim committee meet once in every 3 months and discuss plans for seed production, amongst other agendas. Consultative Group on Rice, which meets once in 6 months, also reviews the progress and plans on rice seed production and distribution.

### 2.3. PRODUCTION

Rice seed production in Mozambique can be broadly classified in to formal, semi-formal and informal sector. Under the **formal seed system**, the certified seeds are multiplied from basic seeds obtained from authentic public/private sources. The certified seeds are produced by registered seed producers, including farmers, farmer associations, agriculture cooperatives and private companies. Standards of production are inspected on the field and in laboratories. The product (seed) is officially certified by the Department of Seeds before it is supplied through markets. Volumes of the various seed classes produced by the public and private institutions for the period between 2012 and 2014 are shown in table 2.

*Table 2: Current production (or procurement), location, and cultivated area of rice seed*

Seed Class	Name of production stations	2014		2013		2012	
		Production amount per station (ton)	Cultivated area per station (Ha)	Production amount per station (ton)	Cultivated area per station (Ha)	Production amount per station (ton)	Cultivated area per station (Ha)
Breeder Seed	IIAM	n/a	n/a	n/a	n/a	n/a	n/a
Pre-Basic Seed	IIAM	n/a	n/a	3	n/a	n/a	n/a
Basic Seed	USEBA-IIAM	94	34	46	17	100	29
Certified Seed	Private Sector and Agriculture cooperatives	690	253	681	227	733	209

Although a major portion of the grain production is consumed by farm families; farmers generally also resort to selling of grains directly in local markets or through rural traders. Thus, rice can be classified as both market and subsistence crop. While a clear estimate of the share of production sold in the markets is not presently available, it is largely assumed that farmers under irrigated ecosystem produce more and also sell more grains in the market. Hence, most of the certified seed production is also generally targeted for cultivation under irrigated lowland ecosystem. The names of the popular varieties for which certified seeds were multiplied are shown in table 3.

*Table 3: Areas and amount of rice seed production under irrigated lowland ecosystem*

Year 2014	Name of Varieties	Cultivated Areas (Ha)	Amount produced (tons)
Irrigated Lowland	ITA 312	172	470
	Limpopo	72	196
	Macassana	43	118

Under the **informal system**, rice farmers and in some cases communities bulk the grains and exchange amongst each other. Official inspection and certification processes are typically absent; and no record of sales (if any) is maintained. The **semi-formal system** involves rice seed production under the guidance of non-registered farmer associations/agriculture cooperatives, NGO projects and/or local governments. Such seeds often referred to as guaranteed or self declared seeds are subject to minimal inspection and germination test by the provincial directorates of agriculture (DPAs). Since the germination of these seeds is tested and verified, these seeds are distributed as guaranteed seeds during periods of emergency situation.

## 2.4. QUALITY CONTROL

### 2.4.1. METHODS

Production of early generation seed classes such as breeder, pre-basic and basic seeds are subject to internal control measures by the institutional breeder and the technical staff. Only the certified seed production is subject to inspection and certification by the Department of Seeds. For this purpose, the seed Regulations (2013) have established minimum standards for the production of various rice seed classes and quality control procedures for on-field inspection and laboratory testing of the seeds for certification. The various terms and conditions for production and inspection are summarized below:

#### Land Requirements:

Field offered for certification must not have grown rice for the previous two years unless-

- (a) The rice grown on the land previously was of the same variety and class as the one being offered for certification
- (b) The rice grown on the land previously was field inspected and approved for varietal purity

#### Principles for inspections during field inspection for rice:-

All field inspections must be made by a qualified inspector. The protocol includes the following:

1. The procedures and technique of field inspection and the number of inspections specified should be strictly adhered to
2. Inspection of cross-pollinated crops (maize) during flowering stage should be made without prior notice
3. The seed inspector should achieve full co-operation from the seed grower, even in the case of rejection a field (this is possible if the inspector possesses good conduct and good manners, which is necessary for smooth operation)
4. Upon arrival at the seed farm, the inspector should check all information about Cultivars, Variety, Class of seed, Seed origin, Cropping history and isolation
5. Back field and its boundaries must be pointed by the seed grower or his representative

6. The inspector should do his inspection in the cinematic pattern so that the maximum area possible can be covered
7. During work in the field, the inspector must make estimates of varieties, impurities, diseased plants and general conditions of the crop
8. Barren rows or long gaps encountered during counts should be skipped and not considered as part of the row steps
9. While counting patches and rows containing off-types, diseased plants and impurities not covered in the counts may be observed, and observation recorded separately in the inspection report, for further remedial steps
10. For dwarf varieties; squat or bend periodically during inspection so that eye level observation can be made

At least 1000 plant counts are to be made per hectare of seed production land. After the inspector has made a thorough examination of the crop in the manner described in the booklet, the report form should be checked to see that all the required information is given. This report form must be complete in every detail and all calculations made before leaving the crop. Information that has been recorded correctly on form should not be erased or altered.

#### Recommendation for acceptance or rejection of crops following inspection

- a. If the inspection results show that any of the Standard or Reject Values has been exceeded, the crop must be recommended for rejection
- b. If the crop fails to meet a standard for a reason which can be remedied, e.g. its isolation from another crop or a small number of impurities in excess of the standards which can be removed easily by remedial measures on the report form. The crop may then be second or third inspection results noted on the form
- c. Where it is obvious that a crop will not meet the standard before the inspection has been completed, the inspector must support his recommendation for rejection with adequate evidence
- d. Each inspector will sign the report form for each inspection signifying that the reported crop was inspected in accordance with the required technique and that the report form contains a true record of the inspection
- e. The data of each inspection must be entered on the report form
- f. If the quality control is dissatisfied with the way in which a report form has been completed or a crop inspection carried out, the crop will either have to be re-inspected or it will be rejected
- g. The inspector will send the completed inspection report forms to the quality control immediately after each inspection
- h. The Acceptance/Rejection of a field depends on the standard prescribed for certification

While the genetic/variety purity percentage accepted or rejected is not specified in Seed regulations (2013), the on-field criteria and laboratory parameters for seed certifications is shown below:

*Table 4: Standards set under Mozambique's Seed Regulations (2013) for rice seed production<sup>16</sup>*

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<sup>16</sup> Decreto n.º 12/2013 Regulamento de semente; page 232

Seed Class	On-field Inspection			Laboratory testing (Minimum Lot Size = 25 Kg)		
	Isolation distance (m)	Specific Purity (%)	Number of inspections	Purity (%)	Germination (%)	Moisture Content (%)
Basic	5	0.2	3	98	80	12.5
Certified (C1)	5	0.3	3	98	80	13
Certified (C2)	5	1	3	98	80	13

#### 2.4.2. HUMAN RESOURCES

Researchers and technicians engaged in production of early generation (breeder and pre-basic) seed classes are concentrated at the IIAM and its associated IRRRI projects and facilities. Furthermore, the basic seed production is centralized at USEBA-IIAM. Hence the human and technical resources are efficiently utilized in the production of these early generation seed classes. The number of technical personnel currently employed in seed production, their technical capacities in terms of knowledge and experience and geographical coverage areas and size of seed producing land are shown in table 5. However, the human resources for certified seed production and the community seed production are not adequately quantified.

*Table 5: Human resources engaged in early generation seed classes and their capacity and coverage*

Position	Number of Technical personnel	Capacity of Technical personnel		Size of land covered per technical personnel	Geographic areas covered per technical personnel	Means of transport (with Remarks)	Budget per Technical personnel (with Remarks)
		Knowledge (with Remarks)	Experience (with Remarks)				
Researchers	11	5 M Sc, 6 B SC	>2 years	100 Ha	Provincial	By foot and/or car	n/a
Technicians	22	Diplomas	>2 years	100 Ha	Provincial	By foot and/or car	n/a

Training for the various rice seed value chain actors and supporters is presently provided by the Department of Seeds and development projects. Department of Seeds provide training on field inspection and laboratory testing to its inspectors with support from development projects such as that of Food and Agriculture Organization (FAO) and Alliance for Green Revolution in Africa (AGRA). While the in-country trainings for the inspectors are organized twice a year; training for inspectors and certified seed producers are also arranged overseas and/or through training visits to other rice seed producing countries in the region.

#### 2.5. SEED SUPPLY

Several public- and private stakeholders play important roles in Mozambique's rice seed value chain. The key value chain actors include producers of the different seed classes and seed users. The value chain is propped by several supporters including government's regulatory services on quality control along the supply chain, research and extension services on uptake and usage, training services, finance providers, agro-dealers, marketing agents and federal and local government authorities. Although several multi-national and local private seed companies are engaged in production of seed



of several often pollinated cash crops such as maize; only a few local private seed companies are engaged in certified seed production and supply on the basis of established demand. Financial services along the rice supply chain are largely provided by commercial banks, micro credit banks and cooperation partners

MASA executes several emergency response programs after any natural disaster in rice growing regions, by distributing guaranteed seeds. MASA also organizes a voucher based subsidy program under which seeds are distributed along with other productivity enhancing inputs such as fertilizers. Besides MASA, private seed companies and marketing agents are also engaged in supplying rice seed to rice farmers in Mozambique. A list of stakeholders and their roles in rice seed value chain are illustrated in table 6.

*Table 6: Stakeholders in seed supply chain*

	Stakeholders	
	Market varieties	Roles played
Breeder seed development/ Production/ supply	IIAM	Production and maintenance of breeder seeds
Pre- Basic seed production/ Supply	IIAM	Production and maintenance of Pre-basic seeds
Basic seed production/ Supply	IIAM	Production, maintenance and supply of basic seeds
Certified seed production/ Supply	Private sector and agriculture cooperative	Production and Marketing of certified seed
Distribution of seeds	Agro-dealers	Seed sales/trade
Financing	Commercial and Micro Credits Banks, Cooperation partners	Funding seed chain
Others	Department of Seeds	Implementation of overall regulatory control measures

The route for the supply of certified seeds to the end-users begins from the basic seed production at USEBA. The basic seeds are procured by the certified seed producers for the multiplication of seeds that are sold or distributed. The two major distribution channels for the certified seeds include main markets that deliver seeds through agro-dealers and the District Services of Economic Affairs (SDAE) which distribute the seeds under public programs. In the absence of any rice seed specific forum for communication between public and private stakeholders; national seed committee and a general seed dialogue platform serve as platforms for technical and strategic discussions related to rice seeds along with other propagative materials.

Although analytical surveys assessing the seed usage pattern amongst farmers, it is believed that progressive rice farmers under irrigated lowland ecosystem replace their seed source after 3 crop seasons. It is also believed that rice farmers generally cultivate one variety in their landholdings in a season. ITA-312, Limpopo, Macassana and C4-63 are the popular varieties for which certified seed supply/marketing is prevalent under the irrigated lowland rice grain production areas. Price of basic rice seed is solely determined by USEBA based on costs of production during the season. Price of certified seed however is freely determined by market at the discretion of factors such as demand

and supply. The government generally does not interfere with the price movements of certified rice seed in the market; although occasional supply through public distribution system indirectly exerts pressure on marketing and pricing. Market price of the seeds of popular rice varieties under irrigated lowland ecosystem in 2015 is shown in table 7.

*Table 7: Purchase price from seed multipliers and sales price of certified seed*

Currency: Mozambican Metical (Approximate exchange rate: 40 MT = 1 USD)		
Ecosystem	Name of Varieties	Market Price (Information from the year of 2015)
Irrigated Lowland	ITA-312	50
	Limpopo	50
	Macassana	50
	C4-63	50

### 3. CHALLENGES IN RICE SEED VALUE CHAIN DEVELOPMENT

#### 3.1. LEGISLATION, POLICY, INSTITUTIONS AND PLANNING

Since quality seed is the primary input for rice production, appropriate national seed legislation is essential to create an enabling environment for the development of the seed sector. Mozambique's current Seed Act<sup>9</sup>, drawn in 1994, does not bear a significant clout in catalyzing the development of rice seed industry. The obsolescence of the seed laws creates ambiguity in segregating formal and informal processes of seed production and supply. Mozambique's seed regulations (2013) represent the only active legal tool referred by the stakeholders. Although it does not explicit harmonization with SADC region; the regulations embark upon the commonly agreed technical standards, rules and procedures on seed variety release, seed certification and quality assurance, and quarantine and phytosanitary measures. However the seed related legislative provisions for regional seed policy alignment processes remain to be revised. Seed regulations (2013) imply internal quality control measures for early generation seed classes such as breeder and pre-basic seeds of rice and hence have not set standards. However, this leaves a vacuum in imposing external quality control of the critical source seeds.

A national seed policy outlining a shared vision for the advancement of the sector and guidelines on the various means of developing the seed sector through seed quality control and variety release procedures, recognition of formal and semi-formal seed systems, enforcement, extension services, manpower development, credit and subsidies, taxation and international cooperation have not yet been finalized. Although a national program for strengthening seed chain (2011-15)<sup>14</sup> was developed with an objective of improving the development of seed business; the program has expired and not yet renewed. Provision of seeds after natural disaster under the emergency management programs by government and non-government agencies is referred to as 'guaranteed seed'. Although this term is loosely used from the perspective of germination, the terminology is somewhat misleading as it gives an impression that the seeds are guaranteed for all of its quality standards including purity and health perspectives. However in reality, the seeds are sourced from both formal and semi-formal production and inspection channels by a range of heterogeneous supporting actors.

Macro policies enabling the competitiveness of locally produced rice over imported rice such as incentives for use of productivity enhancing inputs and processing also indirectly affect the demand for quality seed by farmers. Although presently there are 41 registered seed production companies<sup>17</sup>; due to the unpredictable nature of market demand for rice seeds, the private seed companies generally find rice seed production as economically less viable for investments. The private seed producers face financial constraints in improving seed production, processing, storage and marketing capacities. Policies enabling seed entrepreneurs by improving access to finance by small, medium and large scale seed producers at subsidized interest rates from commercial banks and microfinance institutions are not presently available. Presently the private companies engaged in rice seed production largely rely on the federal and local governments' procurement plans and emergency response needs. The private sector also lacks effective linkages with institutions that would transparently exchange seasonal production plans, capacity, background data on available seed stocks and financial commitments. The private seed producing companies and registered seed producing agricultural cooperatives suffer from inadequate technical training on seed production practices and internal seed quality management.

Lack of clarity on accessibility of early generation seeds to private seed producers limit the production of basic seed production by private seed companies. Given the pivotal role of USEBA in the production and supply chain of rice seeds therefore; the inadequate human capacities and its shortage in efficiency affects the vital coordination role in streamlining the supply of certified seeds to the end-users. Being a service oriented public entity; USEBA lacks the commercial instinct that is required to improve its planning, production and distribution/marketing. The current seed production planning process is largely centralized in which USEBA relies on non-committal demand from DPAs. Due to its weak communication with end-users, farmers' associations and seed department; DPA's estimation of demand is often based on tentative area under rice cultivation and is not based on affirmative surveys and/or assured financial/budget resources. This often leads to over production of seeds by USEBA and hence the institutional process is often tamed by poor sales.

Public private dialogue process about seed system development remains limited in Mozambique. Information about seed sector performance is not adequately collected, and accessibility to existing public sector data is often difficult for private sectors. The retarded functionality of multi-stakeholder National Seed Committee (CNS; Comité Nacional de Sementes), established by law, affects the implementation of national strategic action plans on seed sector development. The Northern, Central and Southern regional seed platforms which cover all crops do take discussions on rice seed with their corresponding provincial stakeholders. However the integration of these discussions at national level policy discussions is found lacking. The Consultative Group on Rice which have technical representations lack adequate representations from private seed producers and provincial directorates to comprehensively address a gamut of issues related to planning and implementation of seed production and supply/marketing.

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<sup>17</sup> CEPAGRI (2013) Stimulating Private Sector Agricultural Investment in Mozambique - Seed Registration Process

### 3.2. PRODUCTION AND QUALITY CONTROL

Following the introduction of improved rice cultivars with local adaptation, the varietal choices for rice farmers have in the recent years widened under all the three production environments (irrigated lowland, rain fed lowland and rain fed upland). However, pace of progress in developing hybrids and superior yielding inbred varieties is constrained by the lack of engagement of private sector in research and development of rice genetic resources. Absence of external quality control measures and inadequate internal quality management practices during the production of breeder and pre-basic seeds affect the quality of certified seeds through amplification along the multiplication cycles. Access to breeder and pre-basic seeds by private seed companies presently is largely limited within IIAM, USEBA and other public institutions. This solely places the responsibility on USEBA in meeting the demand by certified seed producers and during emergency relief operations.

However inconsistent and insufficient budget allocation for basic seed production affects the regularity in seed production activities at USEBA. Consequently, private seed companies and farmers associations don't necessarily buy basic seeds from USEBA and instead resort to several cycles of certified seed production from previous certified seeds. In several seed production areas, the irrigation facilities are not adequately arranged and/or maintained to ensure the efficiency and quality of basic seed production. Infrastructures for storage and seed processing (including pre-cleaning and grading) are not adequately distributed at USEBA's production sites. Where exists, such facilities are not adequately shared with other certified seed producers. Lack of technical training and experience of human resources engaged in rice seed production under USEBA and transportation means for staff engaged in seed production in farmers' fields affect the quantity and quality of basic seed production.

The effective demand for seeds representing the actual level of demand by farmers with the real means to buy rice seeds remains unknown in rice growing areas. The demand and hence the production of formally certified seeds is presently more widespread for varieties grown under irrigated lowland ecosystem than in other rice production ecosystems. While this has begun to help farmers enhance the productivity and use of quality seeds in irrigated rice production environments, the progress in rain fed lowland and rain fed upland ecosystems is contrastingly minimal. Due to sluggish extension services on dissemination of knowledge on the advantages of usage of quality seeds and low marketability in rain fed environments; the involvement of private sector in quality seed production is conceivably minimal. Complementary public institutional support in filling the production and dissemination of certified seeds through local entrepreneurs in these marginal environments thus remains to be heightened.

With the recent momentum in quality declared seed production; several farmer associations have begun to produce rice seeds of their preferred varieties. However with shortage in human resources for inspection and clarity on the role of local government in the production of semi-formal rice seeds, some of the farmer associations (such as that Sofala (Buzi), Nampula and Maputo) have not yet been authorized/registered. Furthermore, project activities of NGOs and some development partner also have long been informally engaging farmer associations in rice seed production and dissemination. With a window of opportunity for converting such activities into entrepreneurial quality seed production and marketing now available, individual seed producing farmers and farmer associations

require to be actively encouraged in local seed businesses. Lack of active and direct communications amongst seed department, provincial directorates, farmer associations and IIAM/USEBA hamper the knowledge on the formalization and registration processes; and thereby slow the promotion of quality declared seed production.

Inadequate logistics such as transportation and hand tools/kits for field inspection and insufficient infrastructures for provincial seed testing laboratories affects the timeliness of the certification processes. Lack of accreditation of national seed testing services by the internationally recognized Organization for Economic Cooperation and Development (OECD) hinders the regional seed trade which has the potential to increase local rice seed production in Mozambique. Lack of timely release of budget and associated funds for the inspection activities affects the seasonableness of the certification process; which in turn affects the planning process on seed production by registered seed producing companies.

### 3.3. SEED SUPPLY

Supply of breeder and pre-basic seeds of released varieties from IIAM's research arm to USEBA is usually not limited; although choices of rice varieties have not been widened enough to suit profitable cultivation by smallholder farmers in several of the microclimatic environments which demand several abiotic and biotic stress tolerances. Some of the locally popular traditional varieties amongst farmers and consumers in Mozambique represent mixtures of lines for which pedigree is not clearly understood. Pure and/or mass line research that can facilitate production and supply of quality seeds of such varieties remain to be carried out.

Renewed stocks of basic seeds of all the varieties however are not available to certified seed producers throughout the year. This is because USEBA produces basic seeds only on request and/or its own planning and budgeting. Thus the supply of basic seeds of available varieties to certified seed producers require mid-term planning by certified seed producers. However given the weak business planning capacities of farmer associations and small scale seed producing entrepreneurs and companies; the range of varieties for which the supply of certified seeds of varieties is available is often narrow. Lack of forecasting on the demand levels for certified and community based quality declared seeds of the different rice varieties affect the planning process in supply and delivery chain for rice seeds to farmers.

Private companies and non-government organizations who request for the supply of basic seeds from USEBA often do not oblige by buying the seeds after the production in effect. Although reasons such as finance and change of preferences are cited by the expected buyers of the basic seeds, the refusal to buy after the basic seeds are produced by USEBA often affects the supply of seeds of other varieties in the following seasons. The timing of request for basic seeds from private seed producers is sometimes too short ahead of their certified seed production for USEBA to assure supply of the desired varieties. Moreover, the monopolistic basic seed production by basic production has also further aggravated constraints in the dynamics of the supply and ready availability of certain varieties in the market.

Government initiatives in promoting the uptake of seeds of improved varieties and/or to raise productivity and/or during natural disaster and emergency relief operations have also met with several challenges. Seeds distributed through the government's supply route are generally sourced from the private seed producers through a bidding process. Such indirect marketed seeds often however do not match the needs or preferences of farmers. The long time required in procuring and mobilizing/transporting seeds along the government's supply chain to the various sites and the inefficient targeting of farmers under such supply routes have not only increased the losses and costs; but have also led rice growers in some places to opt for informal seed system by prompting them to use grains as seed.

Inadequate feeder roads and transportation logistics around some of the certified seed production areas hinder the supply of certified and quality declared seeds to wider markets. Lack of rural electricity and storage infrastructures with the required hygiene to ward off pest and disease infestation of the seed stocks also discourage private seed companies and farmer associations from ensuring stocks of adequate quantities of rice seeds. This hence also affects timely distribution of seeds to farmers through markets during normal seasons and through emergency relief service providers during disaster struck seasons.

#### **4. RICE SEED VALUE CHAIN DEVELOPMENT**

Despite the several challenges confronting rice seed value chain development, the gaps between the local rice grain production and the demand for rice consumption offers immense opportunity for the development of the rice seed industry in Mozambique. The various strategic approaches and intervention options that the stakeholders could adopt in developing the rice seed value chain development are presented below:

##### 4.1. POSITION OF RICE SEED DEVELOPMENT STRATEGY

The strategies proposed in this document augur well with the government of Mozambique's long-term goal of achieving self sufficiency in rice production envisaged under the National Rice Development Program (NRDP). Since the NRDP is already fitted within the overarching agricultural development and poverty reduction strategies such as the Action Plan for the production of food (PAPA), agrarian mechanization, strengthening the chain of seeds and fertilizers under Strategic Plan for Agricultural Development (PEDSA) AND National Agriculture Investment Plan (PNISA); the position of the strategies described in this document can be fitted into the larger national framework of poverty reduction and economic development strategies.

##### 4.2. VISION AND SCOPE

The strategies outlined envisage transforming the rice seed sector so as to develop a sustainable and competitive rice industry in Mozambique. The scope of the strategic approaches includes the entire rice seed value chain; and hence covers the following elements:-

- development and promotion of improved varieties,
- seed production,
- seed storage,
- seed processing and
- marketing of quality rice seeds

#### 4.3. GOAL & OBJECTIVES

The goal of the strategy is to increase “on-farm productivity of rice” through increased supply and improved access to quality seeds of rice varieties. While the general objective of the development of the rice seed value chain through the proposed strategies is to facilitate transformation of rice seed sector from the present level of predominantly informal (grain as seed) system to semi-formal (quality declared seed) and formal (certified) seed systems; the specific objectives include the following:-

- i. Promote private sector involvement in certified rice seed production and marketing in irrigated ecosystem;
- ii. Promote community based quality declared seed production and marketing by farmer associations in rain fed lowland and rain fed upland ecosystems;
- iii. Increase the demand and accessibility of quality rice seeds amongst smallholder rice producers; and
- iv. Strengthen the institutional capacities for the
  - a. development and promotion of improved varieties and
  - b. production and inspection of seeds

#### 4.4. IMPLEMENTATION STRUCTURE

The proposed rice seed development strategies will be implemented by National Directorate for Agricultural Services (DINAS). Consultative Group for Rice (GCR) and Seed department will provide the required technical assistance on the seed interventions to DINAS. DINAS will execute in close coordination with the IIAM, National Directorate of Agricultural Extension (DNEA), Center for Agriculture Promotion (CEPAGRI), Directorates for Agriculture and Food Security (DPASA), SDAE and private stakeholders. The DINAS has the responsibility of institutional Advisory Committee for monitoring the production by involving various institutions direct and indirectly in the program under the MASA and other ministries as well as private institutions, associations and cooperatives. This will be followed by the following actions:

- mobilize investors and financial resources that are to be allocated with a focus on access to technologies and marketing, technical assistance and methodologies;
- establish contracts for promotion and provision of services with various public and private entities;
- establish program contracts with credit institutions for the management of special lines of credit and guarantee funds for the promotion
- accompany, supervise, monitor the implementation of all the activities under the proposed strategy based on progress reports and basic indicators;
- promote the installation of service centers consisting of agro-dealers of seeds, marketing centers, technical assistance;
- creation of cooperatives of production on the basis of models and business plans that seeks the profitability of seed producers; and
- study and recommend policy changes with annual adjustment and intervene in order to maintain the strategic stock to regulate prices and safeguard the periods of disasters



## 5. STRATEGIES

### 5.1. STRATEGIC PRINCIPLES AND APPROACHES

Given the diverse ecosystems (irrigated lowland, rain fed lowland and rain fed upland) and the socio-economic perspectives with which rice grain is produced in Mozambique, the usage of certified seed by farmers also differ under these ecosystems. It is estimated that about 60% of the farmers under irrigated ecosystem presently; while community based quality declared seed system is more prevalent in rain fed lowlands (35%) and the informal seed system (95%) is widely adopted in rain fed upland ecosystem.

#### 5.1.1. IRRIGATED ECOSYSTEM

The strategic principle under irrigated ecosystem will involve a greater role for private sector in production and supply of seeds. The government and public institutions will play a catalytic role in promoting the uptake of seeds along with other productivity enhancing technologies in the irrigated ecosystem. It is proposed that the government shall

- provide incentives for improving the use of certified seeds
- improve access to finance for private rice seed producers
- expand agro-dealer marketing network and
- build capacities for timely seed inspection

Under this strategic principle, the interventions will focus on such geographical areas as Chokwe, Xai-Xai, Macia and Manjacaze in Gaza; Matutuine and Marracuene in Maputo; and Buzi, Dondo in Sofala.

#### 5.1.2. RAIN FED ECOSYSTEMS

The key strategic principle under rain fed ecosystems (rain fed lowland and rain fed upland) will involve engagement of farmer associations and rural entrepreneurs in production and supply of seeds. Unlike in the case of irrigated ecosystem, the government will play a proactive role under these ecosystems by:-

- providing the necessary institutional support in establishing, registering and training farmer associations and entrepreneurs
- engaging Seed departments at the provincial and central levels in
  - providing quick and easy access to inspection and testing services for the seed producers and
  - improving the uptake (demand) of quality seed through incentives and emergency seed services
- promoting extension services that are focused on:-
  - production and use of quality rice seed
  - good agricultural practices
- training seed producers and farmer associations on quality seed production



The rain fed lowland areas such as Macia and Manjacaze in Gaza; Manganja de costa, Namacurra, Nicoadala and Mopeia in Zambezia; and Buzi and Dondo in Sofala; and rain fed upland areas such as Cabo Delgado and Nampula will be covered through this strategic approach.

## 5.2. TARGET SETTING

Keeping the overall area under rice cultivation and grain production targets of NRDP; targets for the production of the various seed classes are accordingly set as shown in table 8. It is assumed that the national average in usage of certified seed (across all ecosystems and rice growing areas) will increase from the present level of 2.8% to 8.5% of rice growers by 2019; and that farmers will refresh the source of their seeds at least once in 3 years. The total volume of seeds of the various classes and the area required for the production of the corresponding seeds are shown in the table below:

*Table 8: Targets for certified rice seed production in Mozambique*

Seed Class	Target amount (g or Kg or MT/year)		Area of land required for production (Sq. m or Ha)	
	2016	2019	2016	2019
Breeder Seed (Kg or Sq. m)	4.4	28.3	279.7	1839.1
Pre-basic Seed (Kg or Sq.m)	234.7	1488.2	491.9	3178.0
Basic Seed (tons or Ha)	27.1	171.7	7.2	45.8
Certified Seed (tons or Ha)	2538.3	16098.0	1599.3	10239.1

Since the varietal choices are different under the three rice growing ecosystems, the volume of the breeder (table 9), pre-basic (table 10), basic (table 11) and certified seed (table 12) and the requirement of land area for production are estimated as shown in tables 9 through 12. It shall be noted that since the varietal preferences of farmers are subject to dynamics in availability of future varieties; it is assumed that names of varieties may be replaced without any significant change in the overall equilibrium.

*Table 9: Required volumes of breeder seed for different varieties and the area for production*

Ecosystem/Varieties	Share (%)	Amount (Kg)		Area (Sq. m)	
		2016	2019	2016	2019
<u>Irrigated</u>					
Macassane	20%	0.066	0.290	2.21	9.68
IITA 312	20%	0.066	0.290	2.21	9.68
Simao	15%	0.050	0.218	1.66	7.26
Limpopo	15%	0.050	0.218	1.66	7.26
IRGA 417	10%	0.033	0.145	1.11	4.84
Others (future varieties)	20%	0.066	0.290	2.21	9.68
Sub-total	100%	0.332	1.452	11.07	48.39
<u>Rain fed Lowland</u>					
Chupa	40%	1.594	10.702	106.26	713.44
Nene	40%	1.594	10.702	106.26	713.44
Muziva	5%	0.199	1.338	13.28	89.18
Others (future)	15%	0.598	4.013	39.85	267.54

Ecosystem/Varieties	Share (%)	Amount (Kg)		Area (Sq. m)	
		2016	2019	2016	2019
<u>Irrigated</u>					
Sub-total	100%	3.985	26.754	265.65	1783.60
<u>Rain fed Upland</u>					
All (including future)	100%	0.044	0.106	2.95	7.08
	Total	4.4	28.3	279.7	1839.1

Table 10: Required volumes of pre-basic seed for different varieties and the area for production

Ecosystem/Varieties	Share (%)	Amount (Kg)		Area (Sq. m)	
		2016	2019	2016	2019
<u>Irrigated</u>					
Macassane	20%	6.6	29.0	8.9	38.7
IITA 312	20%	6.6	29.0	8.9	38.7
Simao	15%	5.0	21.8	6.6	29.0
Limpopo	15%	5.0	21.8	6.6	29.0
IRGA 417	10%	3.3	14.5	4.4	19.4
Others (future varieties)	20%	6.6	29.0	8.9	38.7
Sub-total	100%	33.2	145.2	44.3	193.6
<u>Rain fed Lowland</u>					
Chupa	40%	79.7	535.1	177.1	1189.1
Nene	40%	79.7	535.1	177.1	1189.1
Muziva	5%	10.0	66.9	22.1	148.6
Others (future)	15%	29.9	200.7	66.4	445.9
Sub-total	100%	199.2	1337.7	442.7	2972.7
<u>Rain fed Upland</u>					
All (including future)	100%	2.2	5.3	4.9	11.8
	Total	234.7	1488.2	491.9	3178.0

Table 11: Required volumes of basic seed for different varieties and the area for production

Ecosystem/Varieties	Share (%)	Amount (tons)		Area (Ha)	
		2016	2019	2016	2019
<u>Irrigated</u>					
Macassane	20%	0.8	3.3	0.2	0.9
IITA 312	20%	0.8	3.3	0.2	0.9
Simao	15%	0.6	2.5	0.2	0.7
Limpopo	15%	0.6	2.5	0.2	0.7
IRGA 417	10%	0.4	1.7	0.1	0.4
Others (future varieties)	20%	0.8	3.3	0.2	0.9
Sub-total	100%	3.8	16.7	1.0	4.5
<u>Rain fed Lowland</u>					
Chupa	40%	9.2	61.7	2.5	16.5
Nene	40%	9.2	61.7	2.5	16.5
Muziva	5%	1.1	7.7	0.3	2.1

Ecosystem/Varieties	Share (%)	Amount (tons)		Area (Ha)	
		2016	2019	2016	2019
Irrigated					
Others (future)	15%	3.4	23.2	0.9	6.2
Sub-total	100%	23.0	154.4	6.1	41.2
Rain fed Upland					
All (including future)	100%	0.3	0.6	0.1	0.2
	Total	27.1	171.7	7.2	45.8

Table 12: Required volumes of certified seed for different varieties and the area for production

Ecosystem/Varieties	Share (%)	Amount (tons)		Area (Ha)	
		2016	2019	2016	2019
Irrigated					
Macassane	20%	71.8	314.1	20.5	89.7
IITA 312	20%	71.8	314.1	20.5	89.7
Simao	15%	53.9	235.5	15.4	67.3
Limpopo	15%	53.9	235.5	15.4	67.3
IRGA 417	10%	35.9	157.0	10.3	44.9
Others (future varieties)	20%	71.8	314.1	20.5	89.7
Sub-total	100%	359.2	1570.3	102.6	448.7
Rain fed Lowland					
Chupa	40%	862.1	5788.1	574.7	3858.8
Nene	40%	862.1	5788.1	574.7	3858.8
Muziva	5%	107.8	723.5	71.8	482.3
Others (future)	15%	323.3	2170.5	215.5	1447.0
Sub-total	100%	2155.2	14470.3	1436.8	9646.9
Rain fed Upland					
All (including future)	100%	23.9	57.4	59.9	143.6
	Total	2538.3	16098.0	1599.3	10239.1

### 5.3. HUMAN RESOURCES

It is conceivable that the number and technical capacities of current human resources engaged in production and inspection are not sufficient to ensure the quality of the targeted volumes of production shown in tables 9 through 12. The required number of human resources for breeder, pre-basic and basic seed production at various stations and the gaps between existing and the required number of staff are shown in table 13.

Table 13: Gaps in human resources for production of the early generation seed classes

Name of Seed Producing Stations	Researcher		Gap	Technician		Gap
	Required	Available		Required	Available	
Zambezia	5	3	2	10	6	4
Nampula	2	1	1	4	2	2
Cabo Delgado	2	1	1	4	2	2
Gaza	4	3	1	8	6	2
Maputo	4	3	1	8	6	2

Total	17	11	6	34	22	12
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Technical capacities of existing staff require to be upgraded and that of future recruitments need to be built so as to assure the quality and efficiency in production of the various seed classes. The number of staffs that require training and the technical areas in which the capacity of existing staff and the new recruits need to be built are shown in table 14.

*Table 14: Gaps in technical capacities of human resources on early generation seed production*

Job title	Number of technical personnel to be newly employed	Number of technical personnel to be trained	Areas of training
Researchers	6	11	Maintenance breeding, pure line selection
Technicians	12	22	Seed production and crop management (including post harvest handling)

The projected increase in production of certified seeds will also require adequate human resources for on-field inspection and laboratory based seed testing. The gaps between the existing human resource strength and the required number of human resources, and the required areas of capacity building are shown in table 15.

*Table 15: Gaps in human resources and their technical capacities for seed inspection*

Geographical area	Number of Inspectors		Gap in number	Gap in Capacity
	Required	Available		
Chokwe	4	2	2	Knowledge on rice seed production stages, varietal characteristics, seed testing
Zambezia	4	2	2	
Nampula	4	3	1	
Chimoio (covers Sofala)	4	3	1	
Maputo	7	7	0	
Total	23	17	6	

#### 5.4. INTERVENTION OPTIONS

Implementation of the proposed strategies requires several interventions that could effectively and cohesively address the issues along the rice seed value chain. The intervention options under the various segments of the value chain are presented below:

##### 5.4.1. LEGISLATION, POLICY, INSTITUTIONS AND PLANNING

- Review the existing Seed Act (1994) and propose legislative changes for parliamentary approval of the Amendments or new Act
- Develop national policy framework for seed industry and draft strategic principles for the development of seed sector
- Review the seed regulations (2013) in the light of the required changes for the improvement of quality of breeder and pre-basic seeds

- Enhance the mode of operations at USEBA by increasing commercial activities of USEBA in
  - marketing/promotion of rice seed uptake
  - improving the planning efficiency so as to match the effective demand
  - strengthening institutional structure (by bringing private style operations)
- Establish and communicate with the stakeholders on the minimal standards for community based quality declared rice seeds
- Policies on importation of rice should be reviewed so as to create an enabling environment for enhancing the competitiveness and marketing of locally produce rice
- Engage all relevant institutions (DPIC, DINAS, IIAM-USEBA, Provincial Directorates) and stakeholders (Farmer associations, private seed companies, seed traders, non-government organizations and development partners engaged in seed production) during the planning for mid-term and long-term targets
- Promote functional integration between rice grain processors, seed producers and rice growers so as to enable synergistic supply of quality seeds
- Strengthen institutional linkages between USEBA, provincial directorate and seed producing farmer associations and private seed companies
- Accelerate the process of OECD accreditation of seed testing laboratories in order to improve the import and export of quality rice seeds
- Increased finance for stakeholders engaged in rice seed production through special windows at commercial banks and microfinance institutions at softer interest rates

#### 5.4.2. PRODUCTION AND INSPECTION

- Increase budget allocation and improve the timeliness of release of funds for breeder, pre-basic, basic and certified emergency relief stocks of seed production
- Disseminate varietal characteristics and unique features amongst quality declared seed and certified seed producers and seed users
- Streamline quality declared seed production by non-registered farmer associations (e.g. Zambezia) into an organized semi-formal seed system by enabling registration and providing inspection and declaration services
- Share the required quality standards and production and inspection guidelines under 'seed regulations (2013) amongst certified rice seed producers (including farmer associations) and other stakeholders
- Increase the annual budget allocation for logistics (transportation, data recording systems and backpack kits) for field inspection so as to fulfil the required number of on field inspection efficiently
- Upgrade and decentralize infrastructures for laboratory based seed testing in order to adequately cover all the rice seed producing regions
- Promote internal seed quality control measures by private seed producers (including farmer associations) through training and support services

- Encourage private seed companies and farmers associations to refresh source seeds from USEBA through incentives and improved inspection services so as to discourage repeated cycling of certified seeds
- Promote public-private partnerships through additional investments and improved maintenance of infrastructures for pre-cleaning and grading
- Create state-of-art storage and seed processing facilities at IIAM/USEBA stations and share the cost of services with certified and quality declared seed producers on the basis of use
- Rehabilitate irrigation facilities in seed producing areas so as to reduce the risks from climate change on productivity
- Increase the human resources and build technical capacities of public staff engaged in rice seed production and inspection
- Organize training and demonstrations for quality declared seed producers and certified seed producers under irrigated lowland, rain fed lowland and rain fed upland ecosystems

#### 5.4.3. SUPPLY AND MARKETING

- Establish effective demand through analytical field surveys on use of seed, varieties, seasonal preference, affordability and influence of traditional seed selection and storage practice in different seasons
- Intensify public and private extension services in order to sensitize rice growers on the advantages of quality seeds in raising on-farm productivity and revenues from rice farming through various extension methods such as:
  - farmer field school,
  - on-farm demonstrations and
  - multi-media
- Routine refreshment and improvement of the stocking of 'basic seeds and pre-basic seeds' of all rice varieties
- Increase the awareness on the importance of planning and timing the planning process in seed multiplication amongst quality declared seed producers and certified seed producers
- Promote abiding of contractual obligations between certified seed producers and USEBA on the procurement
- Improve the planning of rice seed production by engaging grass root level administrators (SDASA or Administrative Post), farmer associations and extension agents
- Decentralization of seed distribution process to the provincial directorates (DPASA) during normal and disaster/emergency situations with a supervisor role for the central government in planning, procurement and dissemination
- Establish an interactive database on rice seed availability (stocks, certification details and sources) and accessibility (for placing orders and payment)
- Improve communication between farmer associations, provincial directorates and seed departments through a 'specialized group on rice seed' under the Consultative Group on Rice meetings
- Promote and strengthen agro-dealer networks for
  - direct marketing of certified and quality declared rice seeds through rural outlets

- providing quality seeds as incentives for selling other productivity enhancing technologies and/or inputs
- Provide quality assurance in seed marketing through active monitoring and evaluation of distribution practices and services by seed department

## 6. ANNEXURE

### 6.1. WORKING TOOL (QUESTIONNAIRE) ON MOZAMBIQUE'S SEED SUB-SECTOR