

Mapping of Poverty Reduction
Strategy Papers (PRSPs), Sector
Strategies and Policies related to
Rice Development in Rwanda

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List of Abbreviations and Acronyms:

AGF: agricultural guarantee facility
ASIP: Agriculture Sector Investment Plan
BPR: Banque Populaire du Rwanda
BNR: National Bank of Rwanda
BRD: Rwanda Development Bank
CAADP: Comprehensive Africa Agriculture Development Programme
CARD: Coalition for Africa Rice Development
CIP: Crop Intensification Program
COMESA: Common Market for East and Southern Africa
EAC: East African Community
EDPRS: Economic Development and Poverty Reduction Strategies
FOREDEM: Fund for the Strengthening and Development of Micro finance
GDI: Gross Domestic Investments
GDP: Gross Domestic Product
ICM: Inter City Mills
IFAD: International Fund for Agricultural Development
ISAR: Institut des Sciences Agronomiques du Rwanda
MTEF: Medium Term Expenditure Frame work
MDG: Millennium Development Goal
MFI: Micro Finance Institutions
MINECOFIN: Ministry of Economic planning and Finance
MINAGRI: Ministry of Agriculture and Animal Resources
MINELA: Ministry of Lands, Water, Forestry and Environment
MINIFRA: Ministry of Infrastructure
MINALOC: Ministry of Local administration
MINICOM: Ministry of Commerce and Trade
MIGEPROFE: Ministry of Gender and Women in Development
NAP: National Agricultural Policy
NEPAD: New Economic Partnership for Africa's Development
NERICA: New Rice for Africa
NGO: Non Government Organizations
NRDS: National Rice Development Strategies
NIS: National Investment Strategy
PAPSTA: Support Project to the Strategic Plan for the Transformation of Agriculture
PRSP: Poverty Reduction Strategy Plans
PSTA: Strategic Plan for Agricultural Transformation
RADA: Rwanda Agricultural Development Authority
RBS: Rwanda Bureau of Standards
REC: Regional Economic Communities
REMA: Rwanda Environmental Management Authority

RIF: Rural Investment Facility

RSSP: Rural Sector Support Project

SNS: National Seed Services

SP: Sub-program

SWAp: Sector-Wide Approach

SQMT: Standardization, Quality Assurance, Metrology and Testing

Executive Summary

Rice is a 'priority crop' in Rwanda. Since the introduction of rice in 1960s through various missions from China and South Korea, rice has steadily become a popular food in Rwanda. Owing to the rugged nature of terrain and the constant demographic pressure on hills and slopes however, rice is almost exclusively grown in valley swamps (marshlands).

The favourable climatic conditions, abundant water resources and the natural soil fertility in marshland ecosystem in Rwanda provide a highly conducive ecosystem for growing rice. As a result, the total rice production in Rwanda has increased by 6-fold in the past 10 years. However the trends suggest that it is mainly due to a parallel increase in area under rice cultivation. Thus reclamation of marshlands is currently the only effective strategy engaged by the local government.

In 2008, Rwanda produced 64,794 tonnes of paddy grains from 14,083.5 Ha of marshlands, with an average yield of 4.6 t / Ha. Despite the impressive above-Asian average yield performance however, the country has not yet attained self-sufficiency in rice production. This is mainly due to the surging demand for rice in local markets. The country annually imports 21,000 t of milled rice grains from elsewhere. Furthermore, on-farm yield gaps and yield trends in old marshlands suggest that productivity is steadily declining due to low input (low risk) rice farming.

The NRDS for Rwanda hence involves multi-pronged strategies to double its rice production. These strategies are in line with overarching development goals and strategies set for Rwanda by the national and regional programs in agriculture sector. The sustainable expansion of land, improvement of marketability, increase in productivity and capacity building in research and extension envisioned under the NRDS align with the four pillars of CAADP respectively.

Through its Vision 2020, the government of Rwanda aspires to transform subsistence agriculture into a viable, market-oriented agriculture. The Economic Development and Poverty Reduction Strategies (EDPRS) which describe the medium term frame work (2008-2012) of Vision 2020 set marshland development for rice cultivation as an important strategy in revamping agriculture sector. Acknowledging the low level of input technology, EDPRS seeks to promote value chains by assigning greater roles to markets and the private sector in policy implementation.

By taking a sector wide approach, the EDPRS is implemented by MINAGRI through four main programs under Strategic Plan for Agriculture Transformation (PSTA II). NRDS is aligned with these programs which aim at sustainable diversification of production systems, improvement in productivity of small holder farms, development of commodity chains, and strengthening of institutional linkages. The National Agricultural Policy (NAP) recognizes that rice offers a potential market in the country and in the EAC region. To accomplish this goal, the government recently developed rice policies to address sector-wide issues pertaining to self sufficiency and

competitiveness of locally produced rice in domestic and regional markets. These policy and regulatory frameworks favor the implementation of the strategies proposed under NRDS.

The governance and institutional frameworks in Rwanda are well established to implement the NRDS. The ministries involved in economic planning, finance, commerce, land, environmental management, infrastructure and local governance provide the horizontal linkages at the central level. MINAGRI, the champion at the central level, provides the vertical linkage between these ministries and beneficiaries (rice growers and consumers) through projects and programs. Rwanda Agricultural Development Authority (RADA) which coordinates the delivery of outputs of various programs and projects to the rice farmers represents the champion at decentralized level. RADA in association with other institutions/organizations such as ISAR, NGOs, and rice farmers' cooperatives and unions provide the crucial horizontal and vertical linkages at the grass root level.

The government of Rwanda and the various institutions involved in rice sector exhibit strong will to advance rice production in the country. The lack of human capacities in research, extension and coordination of strategies and activities at the national level however can pose serious challenges to the implementation of NRDS. The country requires assistance in developing its research and extension system to effectively address the challenges in the marshland ecosystem. The inadequate management of soil and water resources and farmers' inability in tackling the growing pressure from biotic- and abiotic stresses represent serious threats to the sustainability of rice production in Rwanda. The quality and marketability of locally produced rice require investments in rural infrastructures such as feeder roads, energy and mechanization. It is estimated that about 139 million USD will be required to double the rice production in Rwanda.

Nevertheless, the high yield potential of rice crop under Rwandan marshland ecosystem, presence of specialized niches for the production of premium rice such as Basmati, and the growing consumer demand for rice open new vistas for Rwanda to become a major 'rice bowl' in Africa.

1. Introduction

1.1. Priorities, Rationale and Context

Rice has become an important staple food crop in Rwanda. It is almost exclusively grown in reclaimed valley swamps, referred to as marshlands, in Rwanda. Marshlands in Rwanda are highly conducive for growing rice crop. In some marshlands, rice is the only crop that thrives well and produces better yield than any other traditional crops during main season. National estimates show that farmers obtained yield of 3.354 tons per Ha on an average, the highest in the East African Community (EAC) region, in 2008¹.

Having recognized the importance of the rice crop, the government of Rwanda has declared rice as a 'priority crop' under its agriculture sector. Both the area under cultivation and the overall rice production in the country have rapidly risen by six-fold in the past decade (Fig. 1). However, the demand for rice consumption has surpassed the local production in the country. Several inherent features of rice grains such as the nutritive value, the long shelf-life of rice grains, the fuel efficient cooking ability, and the many different ways in which rice can be consumed has raised the popularity and demand for rice in local markets. Rice has now become the most preferred food in Rwandan public programs, schools, restaurants and homes.

Since the quantities and quality of local produced rice do not sufficiently meet the consumer demand, the country currently imports rice at an average of 21,340 t per annum. The import of milled rice grains from countries in EAC and Asia has begun to put strenuous pressure on country's foreign exchange reserves, trade balance, and overall profitability of the rice sub-sector in the country.

Through a number of high profile agricultural development projects, the Ministry of Agriculture and Animal Resources (MINAGRI) has revamped and rendered several marshlands to farmers for rice cultivation. The government has also facilitated the delivery of inputs such as seeds, fertilizers and pesticides. With the help of some modest outputs from international research collaborations, the farmers are able to tap the benefits of new rice cultivars and production conditions under marshland ecosystem. However the Rwanda rice sector does not yet have a clear set of goals and comprehensive strategy through which it can accomplish self sufficiency.

¹ Agriculture Sector Performance Report (2010) Ministry of Agriculture and Animal Resources, p 66

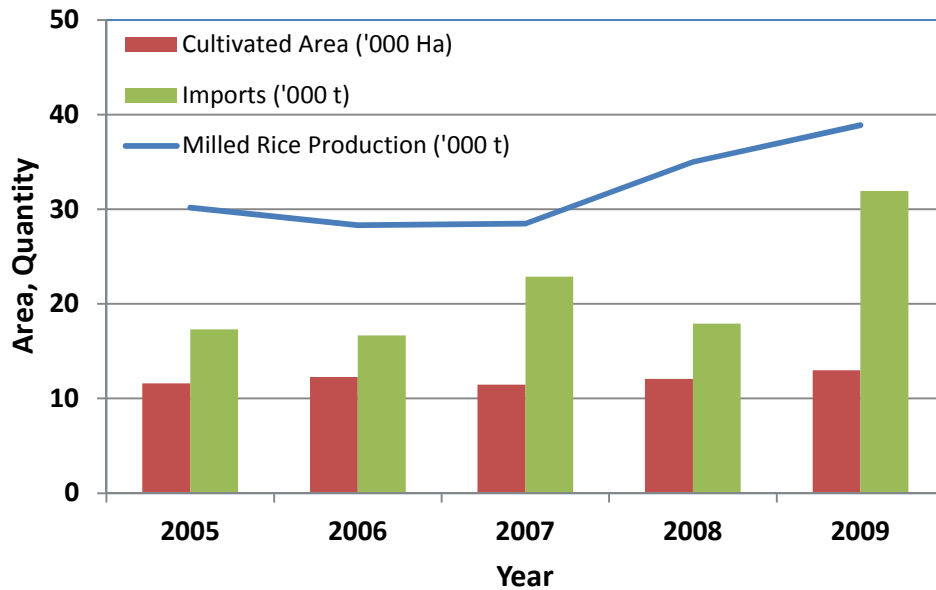


Fig.1. Recent trends in area under cultivation, local production and importation of rice in Rwanda

It is therefore timely that the Coalition for Africa Rice Development (CARD) has led an initiative to develop a strategic framework for development of rice sector in Rwanda. The National Rice Development Strategies (NRDS) lay emphasis on the following approaches:

- Facilitation of research for development of rice value chain
- Expansion and diversification of land area under rice cultivation
- Improvement in productivity of small holder farms through efficient distribution and use of inputs
- Establishment of new- and rehabilitation/maintenance of old infrastructures in marshlands
- Enhancement of quality and competitiveness of locally produced grains in domestic and regional markets
- Creation of favourable environments for the sustenance of rice sub-sector through effective policy and regulatory frameworks

Implementation of the above mentioned NRDS involve addressing of important cross-cutting issues such as gender, health (HIV/AIDS, malaria) and environmental protection through sustainable management of natural resources. The general purpose of this report is to determine the alignment of the various approaches stated under NRDS with the strategic frameworks, policies, budgets and programs of sectors and institutions that are focused on achieving the objectives of national poverty reduction strategy plan (PRSP). Such mapping exercises are paramount in generating synergies and reinforcing the focus on the development of rice sub-sector in order to attain the goals set under NRDS.

1.2. Specific objectives and Methodology

The report in effect aims (i) to enhance the integration of NRDS with the strategic pillars of the various national poverty reduction approaches and the regional Comprehensive Africa Agriculture Development Programme (CAADP) developed by the African Union's New Economic Partnership for Africa's Development (NEPAD), and (ii) to provide a basis for the sustainable implementation of NRDS by identifying gaps and opportunities for a broader support from national and donor agencies.

The mode of analyses includes review of data and documents that were available with the various ministries and departments that are relevant to rice value chain and that bear direct implications on the above mentioned NRDS. International programs and donors that are directly involved in the development of rice sub-sector and indirectly involved in the implementation of the various components of NRDS such as infrastructure for instance were also consulted in the process. Formal discussions were held, wherever appropriate, with personnel who are involved in key decision making, budget allocations, and spearheading of the national and international programs (Annex 1).

2. Strategies, Policies, Programs and Expenditure Frameworks

By setting rice as a priority crop, the government of Rwanda has sensitized the importance of the development of rice sector amongst farmers, local administrative authorities, research and developmental agencies in the country, non-governmental organizations and developmental partners. The government has helped farmers set up rice cooperatives in all rice production areas. The government treat cooperatives as 'delivery nodes' of various inputs and services meant for the development of rice sector. Although the government has put extension workers in place to deliver the technical guidance to farmers, the network of extension services is insufficient and does not provide a strong linkage with farmers. To increase the efficiency of reaching out to the farmers, the government provides the technical and financial provisions also to the local district authorities and non-governmental organizations. Rwanda Agriculture Development Authority (RADA) is responsible for introducing and promoting technologies on rice production and post harvest processing amongst rice growers. The research functions are largely carried out by a specialized rice unit of Institut des Sciences Agronomiques du Rwanda (ISAR) through various regional and international collaborations.

At the national level, the monitoring and evaluation of developments in the rice sector is carried out by Ministry of Agriculture and Animal Resources (MINAGRI). MINAGRI is responsible for streamlining external and internal budgets for the rice sector. Through its four main programs (described under section 3.4.1), MINAGRI coordinates and implements various activities within the rice sector. Crop Intensification Program (CIP) is a flagship program of MINAGRI that focuses on the intensification of rice crop. CIP aims to significantly increase total production of rice in the country by raising productivity in small holder farms. It intends to accomplish this goal by facilitating access to inputs (seeds and fertilizers), consolidation of land use, proximity extension services and post harvest handling and storage. In general, the

initiatives of the MINAGRI on development of rice sub-sector and that of the various national economic development and poverty reduction strategies are consistent with NRDS. The activities and targets stated under NRDS are also in agreement with major development orientations envisaged at the national and international level.

2.1. National Strategies – Poverty Reduction Strategy Plans (PRSP)

The government acknowledges that Rwandans can no longer subsist on land. The government has devised ways and means to transform agriculture into a productive, high value, market oriented sector, with forward linkages to other sectors.

2.1.1. Vision 2020

To accomplish the millennium development goal (MDG) of halving the number of people under poverty, the country aspires to fundamentally transform Rwanda into a middle income economy (with a per capita income of 900 USD) by the year 2020. It recognizes that low productivity and the traditional peasant-based subsistence farming as the most important issues. It demands overhauling of policies that will promote crop intensification and increase productivity. The lack of knowledge and training in its human resources is acknowledged in Vision 2020 as one of the impeding factor in transforming agriculture. Vision 2020 also aims to develop an efficient private sector in agriculture and expects it to be driven by the spirits of competitiveness and entrepreneurship. The government believes that the entrepreneurship in agriculture will produce spin-off effects on other sectors of rural economy.

These above visions are also reflected in NRDS wherein the improvement of rice productivity in small holder farms represents an important pillar of rice development. Furthermore, the facilitation and dissemination of rice production technologies and entrepreneurship in processing, trading and value addition set forth in NRDS are consistent with the national long term visions.

2.1.2. Economic Development and Poverty Reduction Strategies (EDPRS)

The mid-term framework (2008-2012) for achieving the long-term goals set in Vision 2020 has been described under Economic Development and Poverty Reduction Strategies (EDPRS). Acknowledging that agriculture as a major engine of economic growth, the EDPRS identifies rice as a high value crop in Rwanda. EDPRS emphasizes that rice intensification in marshlands after a through environmental impact assessment, will ease the demographic pressure on the hills and slopes. It envisages that the transformation of agriculture aspired in the Vision 2020 shall be accomplished through;

- intensification of sustainable production systems
- building of technical and organizational capacities
- promotion of commodity chains and agribusiness, and
- strengthening of institutional frameworks

The latest figures show that Rwanda is close to completion of development of 13,000 Ha of marshlands so far. Rwanda is thus well on its way to achieving the revised EDPRS target of reclaiming 16,442 Ha of marshlands and provide for rice cultivation by 2012. Acknowledging that increase in utilization of inputs shall increase farm productivity, the EDPRS has set the following orientations:

- EDPRS targets to increase fertilizer inputs from average of 4 kg per Ha (2005) to 20 Kg per Ha by 2012 by raising the total use of fertilizers from 14000 t in 2005 to 56000 t by 2012
- The EDPRS marks to raise the annual import of fertilizers from 8,405 t in 2005 to 38,000 t by 2012
- EDPRS aims to increase the use of improved seeds from 10% to 30% by 2012.
- EDPRS encourages involvement of private sector in distribution of inputs

Most of the rice farmers in new marshlands do not have sufficient access to major inputs such as seeds and fertilizers. Hence the above targets set under EDPRS bode well for improved use of inputs and therefore the productivity in small holder farms envisioned under NRDS. The NRDS proposes that the co-operatives need to be treated as input delivery points for the farmers. EDPRS intends to facilitate capacities of organizations which include farmers' cooperatives. Improving the efficiency of organizational functions should hence facilitate effective delivery of inputs such as seeds, fertilizers, insecticides, irrigation, and farm tools at individual farmer levels, and thereby improve the productivity in small holder farms. Thus the approaches embraced under the NRDS of Rwanda align with the country's overarching strategies for poverty reduction and economic development (Table 1).

Table 1: Matrix showing linkages between Rwanda's NRDS subsectors and its overarching Economic Development and Poverty Reduction Strategies (EDPRS)

Pillars of Economic Development and Poverty Reduction Strategies (EDPRS)	NRDS Sub-sectors
1. Intensification of sustainable production systems	<ul style="list-style-type: none"> • Increasing productivity • Expansion of area under rice cultivation • Diversification of Ecosystems
2. Building of technical and organizational capacities	<ul style="list-style-type: none"> • Facilitation of research capacities • Invigoration of extension services
3. Promotion of commodity chains and agribusiness	<ul style="list-style-type: none"> • Enhancing quality and competitiveness • Stimulating participation of private sector in development of rice value chain
4. Strengthening of institutional frameworks	<ul style="list-style-type: none"> • Capacity building • Creation of favorable policy and regulatory environments

2.1.3. Comprehensive Africa Agriculture Development Program (CAADP)

Rwanda was the first country to sign CAADP COMPACT. The focus of the CAADP process in Rwanda is to build value to the Strategic Plan for Agricultural Transformation (PSTA) under the ongoing EDPRS. The ultimate goal is to (i) help identify a coherent long term framework of programs under the Vision 2020, (ii) choose strategic options for the agricultural sector, and (iii) generate strategy analysis and knowledge support systems. It is also envisaged that the CAADP compact will provide a basis for the formulation of a supporting regional compact.

As shown in table 2, the NRDS of Rwanda firmly align with all the four pillars of CAADP, developed by the African Union's New Economic Partnership for Africa's Development (NEPAD). The NRDS envisages doubling of the local rice production in Rwanda through (a) expansion of area under rice cultivation through development of new marshlands and (b) diversification of rice production in rain fed lowland ecosystems. These strategies are consistent with pillar 1 of CAADP (land and water management) which emphasizes on extending the area under sustainable land management and reliable water control systems.

NRDS intends to improve infrastructures in marshland and enhance quality and competitiveness of Rwandan rice through improved post harvest handling, milling, value addition, branding and market access. This strategy is in accordance with pillar 2 of CAADP (market access) that intends to increase market access through improved rural infrastructure and other trade related interventions.

NRDS addresses improvement in rice productivity through efficient delivery and distribution of key inputs such as seeds, fertilizers, water, machineries and transportation infrastructure. This strategy is consistent with pillar 3 of CAADP (food supply and hunger) which seeks to increase food supply and reduce hunger across the region by raising small holder productivity and improving food security responses.

The pillar 4 of CAADP (agricultural research) aims to improve research systems to disseminate appropriate new technologies. This is in consistence with the NRDS that emphasizes on facilitating research and extension of rice production in the country through capacity building and delivery of improved varieties, soil fertility-, pest- and disease management technologies.

Table.2. Matrix showing alignments between NRDS and the four pillars of CAADP

CAADP pillars	PSTA II	Approaches of NRDS	Expected Outcomes
Pillar 1 (Land and Water Management)	Program 1	<ul style="list-style-type: none"> Expand area under rice cultivation Diversification of Ecosystems 	The area under sustainable land management and reliable water control systems is extended
Pillar 2 (Market Access)	Program 3	<ul style="list-style-type: none"> Improve marshland infrastructure Enhance quality and competitiveness Create favourable policy and regulatory environments 	Improved market access through improved rural infrastructure and other trade related interventions
Pillar 3 (Food supply and Hunger)	Program 1	<ul style="list-style-type: none"> Improve productivity through efficient delivery and distribution of inputs 	Small holder productivity and improving food security responses are enhanced
Pillar 4 (Agricultural Research)	Program 2	<ul style="list-style-type: none"> Facilitate research and extension of rice technologies 	Research systems to disseminate new technologies are improved

2.2. Guiding Policies

2.2.1. National Agricultural Policy (NAP)

The purpose of the NAP is to put in place a framework for effective implementation of the development strategies of government in order to achieve the goals of Vision 2020 and the EDPRS in the agricultural sector. The NAP takes into consideration all the other relevant national, regional and international development frameworks and policies. The NAP addresses decentralization, liberalization, privatization, environmental protection and market- and export oriented production. At regional level, the policy takes into account the national policy for regional integration and economic cooperation within existing and planned Regional Economic Communities (REC) such as Common Market for East and Southern Africa (COMESA) and East African Community (EAC).

In consistence with the CAADP under NEPAD initiative, the NAP intends to achieve increased agricultural production and improved food security and soil- and water resource management. The NAP implies that the farmers must produce for the market and not simply generate incomes required to meet their food security. It aims to integrate rice production into the national economy and contribute to macro-economic stability and growth. It insists that research and extension have to play a major role and must get oriented to the needs of market. NAP proposes that rice production must have a high degree of elasticity and adequately respond to market dynamics. It emphasizes on institutional framework to ensure favorable

environments for administration, investments, legal framework, and relationships between the stakeholders of rice sector. These stakeholders include individual farmers, cooperatives, local administration, governmental and non-governmental organizations and private sector entities. Thus the NAP framework is conducive for the implementation of strategies proposed under NRDS.

2.2.2. Rice Sector Policies

The policies developed in 2010 addresses two key challenges facing rice sector – insufficiency (volume) and inappropriateness (value). The policy emphasizes that self sufficiency in rice production shall be achieved by (a) rising the productivity of existing lands and (b) by further expanding the area under rice cultivation. The quality of locally produced grains on the other hand, needs to be improved through (i) handling and (ii) efficient processing of the harvest.

To boost productivity, the government policies call for invigoration of research and delivery of new and improved seeds, site-specific fertilizer recommendations, pest and disease management practices, water use efficiency and post harvest technologies. To improve quality of locally produced grains, the government seeks to enable transparency in rice trading practices. In order to organize trading in rural areas, the policy proposes establishment of ‘paddy collection centres’ in marshlands and mandatory registration of traders. It recommends the government to propose minimal support prices for paddy. It also recommends setting Grade 2 as the minimum quality of all operating paddy mills in the country, and lists guidelines on operation and maintenance of machineries. The policies recommend that government declare rice as a sensitive good and make amendments in response to any changes in local policy environments, macroeconomic conditions, regional policies and global rice trade to tap further dividends from the initial investments of government in marshlands and rice schemes.

The implementation of these policies had begun in July 2010. The government conducted inspection of procedures of milling and standards of machineries in several private mills. Based on this evaluation, the government has ordered closure of those private mills that do not produce the minimum acceptable quality of white rice upon milling. The government is currently amalgamating the operational structures of large public mills. The government has planned to step up its focus on marginal lands and on procurement and distribution of inputs (seeds and fertilizers) for the 2011 seasons to raise the productivity.

2.3. Process of Implementation

2.3.1. Strategic Plan for Agriculture Transformation II (PSTA II)

PSTA II for the period 2009-2012 follows on from the first Strategic Plan for Agricultural Transformation in Rwanda (PSTA I, 2005-2008). The objectives of the PSTA II are to bring agricultural strategies fully into consonance with national strategies such as the EDPRS, Vision 2020 and the national investment strategy (section 4.5.1). PSTA II adopts decentralization policy, which seeks to involve local administrations more directly in the development process. The PSTA II serves to elaborate and develop the programmes, sub-programmes and activities

that will lead agricultural development, and thus sets a basis for a Sector-Wide Approach (SWAp) in agriculture.

The overall objective of the PSTA II is to increase agricultural output and incomes under sustainable production systems, and to ensure food security. The specific objective is to increase output of all types of agricultural products with emphasis on export products, which have high potential and create large amounts of rural employment under sustainable modes of production. PSTAII recognizes rice as a priority crop and aims to export locally produced rice grains to regional markets. The PSTA II is implemented through four main programs in the country viz., Intensification and development of sustainable production systems (Program 1), Support to the professionalization of the producers (Program 2), Promotion of commodity chains and agribusiness development (Program 3), and Institutional development (Program 4). These 4 programs contain 20 Sub-Programmes and a total of 122 activities.

2.3.2. Support Project to the Strategic Plan for the Transformation of Agriculture (PAPSTA)

PAPSTA (table 7) is one of the largest projects in the agricultural sector. Started in 2006, the project is planned for a period of 6 years with a total budget of 22.6 million USD. The goal of the project is to contribute to increased agricultural incomes and improved nutritional status of the rural poor population through implementation of the priority programs of the Strategic Plan for the Transformation of Agriculture (PSTA) described below. The activities under PAPSTA are fall under two components: (i) institutional development and capacity building for all key stakeholders involved in the implementation of the PSTA, and at all levels, i.e. central, provincial and district levels and (ii) introduction of new integrated production approaches in consistency with different PSTA programs. It emphasizes on watershed management approach, integration of animal and crop production techniques and soil protection techniques.

In the context of NRDS, the PAPSTA's inputs into PSTA sub programs namely sustainable management of natural resources, land and water management (SP 1.1), marshland development (SP 1.3), irrigation development (SP 1.4), promotion of farmers' organizations and capacity building of producer organizations (SP 2.1) have larger roles in rice sector.

2.3.3. National Rice Program

MINAGRI set a 10-year national rice development program² in motion in 2006. It aims to achieve the following targets by 2016:

- enhance productivity to 7t/Ha
- expand the area under rice cultivation to 66,904 Ha
- meet the domestic demand and generate surplus for export
- develop irrigation schemes to meet the water requirements of two rice seasons per year

² National Rice Development Programme (2005) Rwanda Agricultural Development Authority, MINAGRI

- minimize quantitative and qualitative post harvest losses by providing adequate handling and processing infrastructure

Since the program was designed prior to the design of EDPRS framework, the program has not been effectively linked with the investment plan. Nevertheless, the strategies proposed in NRDS align with the ambitions of national rice program. When implemented, NRDS shall help attain these targets. The national rice program is estimated to cost about 590 Million USD. While 90% of the budget is allocated for rehabilitation and development of the necessary production infrastructure, the remaining resources will be invested in infrastructure maintenance, capacity building and research.

2.3.4. Master Plan for Marshland Development

Master Plan for the Marshland development in Rwanda proposes reclamation of about 66,000 Ha for rice production by 2016. It aims to provide protection of water catchments and soil conservation. It seeks to develop marshlands after conducting thorough studies on hydrology, pedology, environment agro economic and sociology in order to ensure sustainable rice cultivation in the marshlands. Currently about 13,000 Ha of marshlands have been developed for rice cultivation in Rwanda. Thus the current cultivated area can be increased by over four-fold. This potential can be significantly raised, if adequate investments are made in marshland reclamation.

2.3.5. Rural Sector Support Project (RSSP)

RSSP aims to revitalize the rural economy and improve the quality of life of the rural poor through increased transfer of technical financial resources for the sustainable rural development. RSSP facilitates efficient application of resources to marshland development. During phase 1 (RSSP I; 2001-2008), the marshland development was focused on building institutional and technical capacities for efficient cropping and post-harvest technologies. In phase 2 (RSSP II; 2008-2012), it aims to accelerate rice intensification and promote the emergence of a vibrant, commercially-oriented rural economy by scaling up successful activities of phase I and broadening the scope and range of interventions to support small scale commercial enterprises.

RSSP conducts prefeasibility studies on various marshlands, and assesses environmental, geotechnical and economic feasibilities. Upon satisfactory compliance, RSSP undertakes reclamation activities. As of 2009, RSSP has recovered about 4500 Ha (3,018 Ha in Phase I) of marshlands in Rwanda. It intends to expand area under rice cultivation and productivity through increased transfer of financial and technical resource.

2.4. Expenditure Frameworks

2.4.1. National Investment Strategy (NIS)

NIS was developed and adopted in 2002 by the government of Rwanda. It formulated projections of the public investments in all sectors that are necessary to achieve the PRSP objectives. The NIS considers the availability of natural resources and the absorptive capacity

for efficient utilization of the resources in the different sectors. It also identifies the funding gaps for various sectors. The NIS assumes two phases of investments in the national development strategy namely, Primary growth phase (Phase I, 2002-2006) and Consolidation phase (Phase II, 2006 onwards). The NIS further presumes the intensive public investments made during the phase I will be sustained by the involvement of private sector during the consolidation phase.

To assist in implementation, a number of measures and programs were undertaken for promotion of the private sector by the government. The Gross Domestic Investments (GDI), from both the public and private sector, need to be gradually raised from 18% GDP in 2001 to 22% gross domestic product (GDP) by 2010. NIS estimates that the total required public investments have to increase from 51.5 billion RWF in 2002 to 127.5 billion RWF in 2010. NIS envisages that the corresponding public investments in the agricultural sector have increased from 8.3 billion RWF in 2002 to 15.7 billion RWF in 2010³. It is expected that the proportion of agricultural investments in the total public investments will gradually fall to 8.2% in 2010 due to expected investments from private sector. In consistence with CAADP, the government of Rwanda is committed to invest at least 10% of annual GDP in agriculture over the next 7 years.

2.4.2. Agriculture Sector Investment Plan (ASIP)

ASIP lays out the investment requirements of the MINAGRI's medium-term strategic plan (2009-2012). It focuses on investing in the infrastructure required for agricultural intensification, promotion of professionalism, agricultural technological innovations and public – private sector partnerships. The investments are structured under the four strategic programs defined under PSTA II (described above). The investment plan details the total cost of each program and sub-program and is based on the PSTA II's underlying assumptions regarding unit costs, targets and phasing of activities. It calculates the gap by comparing the capital investments by the government of Rwanda committed under the medium-term expenditure framework (MTEF) and country's development partners' planned investments with the investment needs.

While the private sector is emphasized as the real driver of growth in agriculture, the investment plan only outlines private sector capital investments that contribute directly to the Government of Rwanda's investment targets. Hence the public sector is the major source of agricultural financing. The ASIP shows a gap of 324,332,997 USD against an estimated total requirement of 815,434,941 USD for the period. Program 1 shows a deficit of 273,062,818 USD against a budget of 624,821,658 USD. Program 2 has a shortage of 35% in the estimated 41,960,150 USD. The shortfall in program 3 is 18% of 127,822,126 USD. A largest deficit of 13,568,838 USD against an estimated 20,831,000 USD is experienced in program 4. The government of Rwanda's annual budget allocation to agriculture sector is however lower than the Maputo declaration of allocating at least 10%. Nevertheless, in order to supplement the short fall in PSTA II, the government has declared allocation of 800 million USD between 2009 and 2012.

³ Budget Execution Report for the fiscal year 2009/10, Ministry of Commerce, September 2010

2.5. Role of key Stakeholders

A broad spectrum of stakeholders is involved at various levels in the rice sector, both at the central and decentralized levels, necessitating effective coordination, monitoring and evaluation system. The major stakeholders include different ministries, government institutions, development partners, local government authorities, the private sector and non-governmental organizations (NGOs). The horizontal and vertical linkages that are relevant to implementation of NRDS are shown in fig. 2.

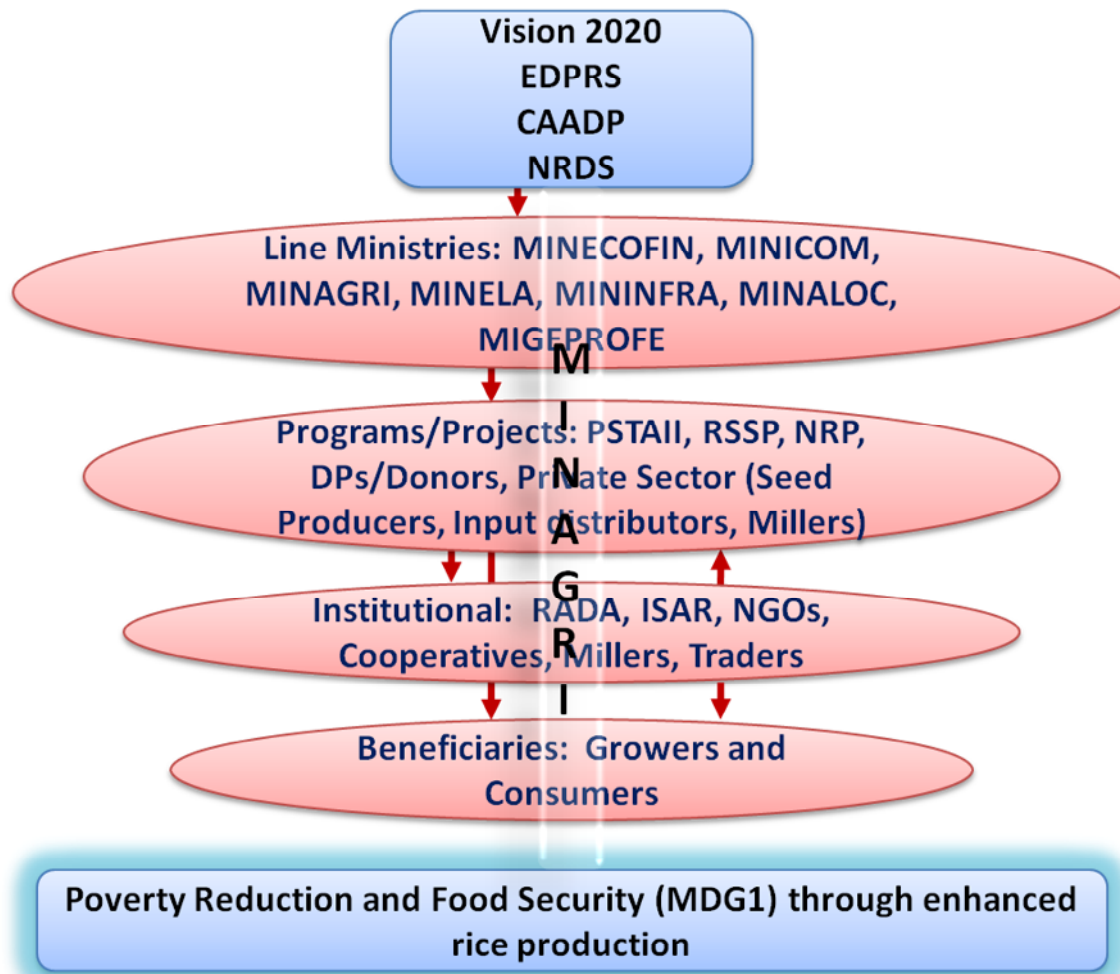


Fig.2. Schematic diagram showing the horizontal (elliptical circles) and vertical (arrows) linkages between overarching strategic visions and the goal. Ministry of Agriculture and Animal Resources (MINAGRI) provides the vertical linkage across the various institutions, programs and the beneficiaries.

2.5.1. Line Ministries

The overall responsibility of drawing policies, strategies, coordination, and implementation of programs lies with MINAGRI. It is also responsible for the mobilization of financial resources for the various national programs. Thus MINAGRI provides the vertical linkage (coordination between different functional actors (shown in fig. 2)) across the value chain of rice in Rwanda. At the central level, MINAGRI is a champion in establishing vertical linkages among the players involved in implementing NRDS.

2.5.1.1. Ministry of Economic planning and Finance (MINECOFIN)

MINECOFIN is responsible for planning of all national public investment programs, mobilization and allocation of financial resources. It plays a key role in ensuring that investment programs are consistent with the national development frameworks, such as the EDPRS, and sets the budget ceilings for the annual and medium term expenditure framework (MTEF) sector budgets, in accordance with the national priorities. MINECOFIN is also responsible for monitoring of the performance of the utilization of invested financial resources and the impact on the general economic growth and poverty reduction.

2.5.1.2. Ministry of Lands, Water, Forestry and Environment (MINELA)

MINELA deals with several important aspects that are directly related to rice cultivation in Rwanda. The Ministry is responsible for 'administrative issues' regarding land and water utilization for agriculture, whereas MINAGRI is in charge of the actual 'usage' of land and water for rice production. Since NRDS proposes expansion of area under rice cultivation as one of the strategies to double rice production in Rwanda, MINELA shall play an important role in enabling the implementation of administrative processes on marshland reclamation.

2.5.1.3. Ministry of Infrastructure (MINIFRA)

MINIFRA is in charge of development of major infrastructures such as roads and energy. It has a key role to play in rice sector by developing rural roads, feeder roads and rural energy supply in rice production areas. The road network in rural areas is very important in facilitating transportation of inputs and trading of paddy grains in marshlands. The power supply is critical in promoting land productivity through facilitation of mechanization of farm activities such as ploughing, puddling, harvesting, thrashing and other post production processes (milling, storage) and entrepreneurship in rural areas.

2.5.1.4. Ministry of Local administration (MINALOC)

MINALOC represents the most important horizontal linkage (relationships between actors involved in the same function). It is responsible for coordination of all developmental activities carried out at sector and district levels. MINALOC is also directly involved in the coordination of planning and implementation of agricultural activities. The coordination is achieved through local district offices. Each district office directly coordinates with rice cooperatives in the respective district. The execution of schemes and funds are organized the district management authorities. The Ministry has direct linkages with these decentralized entities and receives reports directly from the district authorities on a regular basis.

2.5.1.5. Ministry of Commerce and Trade (MINICOM)

MINICOM plays an important role in the promotion of post harvest processing activities and trade of rice grains, in marketing and import and export of milled rice grains. It is also in charge of promotion of cooperatives, which is a key strategy under the NRDS for improving the productivity in small holder farms.

2.5.1.6. Ministry of Gender and Women in Development (MIGEPROFE)

MIGEPROFE plays key roles in gender promotion and in women empowerment in all agricultural activities. About 54% of farmers in Rwanda are women⁴. Amongst the work force from within farm families, women perform 77% of the farm chores². Women can play more proactive roles than men in areas such as entrepreneurship, post harvest handling and storage influencing grain quality, and trade activities. Hence MIGEPROFE provides an important linkage in achieving the objectives of NRDS.

2.5.2. Other Public Institutions

Rice sector can benefit from a number of public parastatal institutions and semi-autonomous agencies in Rwanda. The following sections brief the role of major public institutions and organizations that can influence the successful implementation of NRDS.

2.5.2.1. Rwanda Environmental Management Authority (REMA)

REMA is mandated to facilitate coordination and oversight of the implementation of national environmental policy and the subsequent legislation. It is responsible for sustainable management of environment as set out under EDPRS and Vision 2020. In rice sector, REMA has a key role in marshland reclamation processes and land management practices. Prior to reclamation of any marshland in Rwanda, a feasibility study must be conducted by the reclamation agent providing the environmental impact assessment in compliance with REMA.

2.5.2.2. Rwanda Bureau of Standards (RBS)

RBS intends to improve the quality of Rwandan people through the effective application of Standardization, Quality Assurance, Metrology and Testing (SQMT). The Bureau seeks to make Rwandan milled rice grains competitive in both regional and international trade. RBS is responsible for setting and scrutinizing milling regulations in Rwanda. Rwanda Bureau of Standards (RBS), in alignment with that of EAC standards, classifies milled rice grains into three grades: Grade 1 with a presence of up to 10% broken grains, Grade 2 with up to 25% broken grains and Grade 3 with up to 50% broken grains.

2.5.2.3. Financial Institutions

National Bank of Rwanda (BNR) and other micro finance institutions in rural areas are important for the sustainable development of rice sector in the country. BNR disburses soft loans (1% below the market rate) to individual farmers for effectively utilizing national policies

⁴ National Agricultural Survey (2008), National Institute of Statistics of Rwanda

on long-term inputs such as machineries and implements. BNR manages special funds and lines of credit, agricultural guarantee facility (AGF) and rural investment facility (RIF), on behalf of the government, for farmers. Within the framework of economic policy development and poverty reduction strategies, these facilities serve as financial instruments to stimulate investments in priority sectors. Through AGF, BNR attempts to stimulate bank loans for development activities in Agriculture sub-sectors, by reducing bank risks related to agricultural loans. The RIF is a grant facility from RSSP to support partially long-term loans granted by participating financial institutions in favor of agriculture development projects and activities such as mechanization.

Two non-commercial Banks, The Rwanda Development Bank (BRD) plays a significant role in agricultural financing. BRD intends to promote development investments and is increasingly paying special attention to the rice sector. Banque Populaire du Rwanda (BPR) offers a full range of financial services in the urban and rural areas. The bank intends to finance market driven processes in a sustainable way. To ensure loan recovery, the BPR financing is based on cooperative characteristics. Special attention is given to farmers, agribusiness enterprises, private individuals, micro-, small- and medium enterprises.

Micro Finance Institutions (MFI) is increasingly playing a major role in financing the agricultural sector in Rwanda. Studies show that most of the MFIs have a small base of operation (less than 500 members) with an average loan amount of only 53 USD. MFIs also experience very low average repayment rates. BRD is involved in micro finance promotion in order to increase credit access to small holder farmers. The BRD's microfinance arm referred to as Fund for the Strengthening and Development of Micro finance (FOREDEM) promotes micro finance in Rwanda. FOREDEM is a semiautonomous unit of BRD. It seeks to improve the financing of farmer cooperatives and refinancing of MFIs. In addition to formal MFIs, several organizations and rural credit institutions, including some faith based organizations, provide lending and rural financing in Rwanda.

2.5.2.4. Rwanda Agricultural Development Authority (RADA)

RADA was established in 2005 to oversee the implementation of agricultural development priority actions as defined in the National Agricultural policy. It is one of the key players in development of rice sector and therefore the implementation of NRDS. It has taken over the activities of the former National Seed Services (SNS) and is in charge of implementation, coordination and oversight of all activities related to rice development, including: soil and water management, irrigation, crop production and postharvest activities such as storage and post-harvest processing. At the grass root level, RADA provides the linkage for the administrators (MINAGRI), researchers and policy makers with all the rice cooperatives, farming communities and consumers. This vertical linkage is imperative for the successful implementation of NRDS, and therefore RADA represents the champion at the decentralized level.

2.5.2.5. The Agricultural Research Institute of Rwanda (ISAR)

Institut des Sciences Agronomiques du Rwanda (ISAR) is mandated to promote the research for development of rice by providing scientifically proven technologies in rice production. While it is not mandated to aggressively disseminate technologies to farmers, it is responsible for

making sustainable technologies available for dissemination. Through collaborations with Africa Rice Center, ISAR was able to produce modest outputs such as the release of high yielding varieties in 2002 and seed multiplication. ISAR's activities of research and technology development will become increasingly important for the sustenance of rice sector in the country, and therefore provides a vital linkage in successful implementation of NRDS.

3. Matching of the Strategies, Policies, Programs, Plans and the Expenditure Frameworks with the NRDS's Sub-sectors

3.1. Matching of the various Strategies, Policies, Programs, Plans with the NRDS' sub-sectors

Rice was introduced into Rwanda in 1960s but the sector did not pick its pace until late 1990s. Since rice is not a traditional crop in Rwanda, the government's strategies, policies and programs were not in place until early 2000s. Thus the planning activities suffered a short lag period. Yet the value chain of rice grew at its own pace and directions without proper guidance until recently. Nevertheless the recently developed strategies and policies reflect Rwanda's renewed spirit in competing for economic growth in the region. These strategies cover the continuum of production, processing and marketing of rice. Rice intensification appears to depend largely on government's initiative on reclaiming marshland areas for rice cultivation. NRDS emphasises multi-pronged strategies covering the entire value chain in order to double rice production in Rwanda. The government's policies and regulatory framework for distribution of improved seeds, fertilizers, machineries and other inputs are in consistent with approaches described under NRDS. A matrix showing the on-going policy frameworks that are relevant to the implementation of NRDS is shown in table 3.

The implementation of EDPRS which intends to transform agriculture from subsistence farming to market-oriented agriculture is implemented through PSTA II. The four programs of PSTA II are carried out through 20 different sub-programs and a total of 122 activities. Table 4 shows the details of alignment of NRDS sub-sectors with PSTA II programs.

Table.3. Matrix showing frameworks of on-going policies that are relevant to NRDS

Name of the framework of policies dialogue	Stakeholders (champion(s) or leaders	Status and period	Agenda	Matching with NDRS sub-sectors	Remarks
1. Agriculture policy	MINAGRI	Effective 2004-	Sustainable intensification of crop production in marshlands	<ul style="list-style-type: none"> • Expansion of area • Productivity 	Encourages optimal use of inputs and marshlands to maximize rice production
2. Master plan for marshland development	MINAGRI	Effective, 2003-	<ul style="list-style-type: none"> • Marshlands • Protection of water catchments and soil conservation 	Expansion of area under rice cultivation	Of the 66,094 Ha ear marked, 13,500 have been developed so far
3. Rice policy	MINAGRI	Effective, 2010-	<ul style="list-style-type: none"> • Diversification of rice ecosystems and area • Post-harvest handling • Milling and grading standards • Trading regulations 	<ul style="list-style-type: none"> • Value chain • Expansion of area and ecosystems • Quality and competitiveness 	Addresses the need for creation of favorable environment for the rice sector
4. Natural water resources management policy	MINELA	2002-2030	<ul style="list-style-type: none"> • Equitable and sustainable access to water • Improved management of water resources 	Irrigation	Policy needs to address decision making processes at grass root level
5. Land policy	MINELA	Effective 2008-	<ul style="list-style-type: none"> • Stipulates planning and environmental impact assessment of land development • Land Consolidation 	Productivity	Discourages land fragmentation that reduces the productivity and profitability
6. Environmental policy	MINELA	Effective 2005-	Management of environmental resources in marshlands	Cross-cutting issues (environment, health)	Calls for rational use of fertilizers and pesticides

Table.4. Strategic linkages between NRDS and the national PSTA II and EDPRS objectives

Strategic Components of NRDS	PSTA II sub-program
1. Facilitate Research and Extension	EDPRS (strengthening of institutional frameworks)
1.1. Improved Varieties (HYV, hybrids)	PSTA II SP 2.3
1.2. Maintenance Breeding	
1.3. Ecosystems	
1.4. Pests and Diseases	PSTA II SP 2.2
1.5. Capacity Building	EDPRS (building of technical capacities) PSTA II SP 4.1,
2. Expand Area under Cultivation	EDPRS (intensification of sustainable production systems; marshlands)
2.1. Marshland Reclamation	PSTA II SP 1.3
2.2. Rain fed Lowlands, uplands	
2.3. Land Consolidation	PSTA II SP 4.2
3. Improve productivity through efficient delivery and distribution of inputs	
3.1. Water Equity	PSTA II SP 1.1
3.2. Seed Multiplication	PSTA II SP 1.5
3.3. Fertilizers, Pesticides	PSTA II SP 1.5
3.4. Mechanization (tools, machineries)	
3.5. Farmers' cooperatives	EDPRS (building of organizational capacities); PSTA II SP 2.1
3.6. Infrastructure (irrigation, post harvest, storage)	PSTA II SP 1.4
4. Enhance quality and competitiveness	EDPRS (commodity chain and agribusiness)
4.1. Flavour, Aroma	
4.2. Post harvest handling	
4.3. Storage	PSTA II SP 3.6
4.4. Trading	
4.5. Milling	
4.6. Value Addition	PSTAI SP 3.4,
4.7. Branding	
5. Create favourable environments through policy and regulatory frameworks	
5.1. Supply-demand trends	
5.2. Statistics, Market survey	PSTAI SP 4.3,
5.3. Policy Impact Analyses	PSTAI SP 4.2,
5.4. Value Chain Development	
5.5. Trading regulations	
5.6. Monitoring & Evaluation	PSTAI SP 4.4,

3.2. Matching of the expenditures frameworks with the NRDS' sub-sectors

Table.5. Matrix showing the current frameworks of funding in rice development

Name of Project/ Program	Stakeholder (s) /Champion(s) or leaders	Coverage	Category and type	Status and Period	Total Budget	Matching with NDRS sub-sectors & related budget	Remarks
1. Support project for the strategic plan for transformation of agriculture (PAPSTA II)	IFAD, Netherland, DFID, GoR (Government of Rwanda)	Intensification of sustainable production systems	Grant, Loan	2006-2013	22.67 m US\$	Marshland development	Budget includes contributions from the government
3. The Bugesera Agricultural Development Support Project (PADAB)	African Development Bank	Irrigation and catchment basin development	Grant	2007-2012	18.7 m US\$	Irrigation, Extension	Not exclusive for rice
4. Kirehe Community-based watershed management project (KWAMP)	IFAD, WFP, DED, GoR	Commercial agriculture in Kirehe district	Grant	2009-2016	43 m US\$	Value chain development	Rice is one of the 5 mandate crops and 7 commodities
5. Support to the development of a national agricultural extension system	Belgium	Agricultural extension service	Technical cooperation	2007-2010	4.67 m €	Extension	Covers all crops
6. Integrated Pest Management – Farmer field school (IPM/FFS)	FAO	Pest and disease control	Grant	2009-2010	300,000	Research and Extension (300,000)	Covers mainly rice
7. Rural Sector Support Project	World Bank, GoR	Marshland Development,	Loan	Phase II (2008-	53 m US\$	Marshland Development (24 m	

Name of Project/Program	Stakeholder (s) /Champion(s) or leaders	Coverage	Category and type	Status and Period	Total Budget	Matching with NDRS sub-sectors & related budget	Remarks
		Strengthening commodity chain		2012)		USD) Capacity Building (35,000 SD)	
8. Project for increasing crop production with quality extension services in the eastern province (JICA extension)	Japan	Rice production in Bugesera and Ngoma districts	Technical Cooperation	2010-2013	5.5 m US\$	Production techniques, machineries/tools	
9. Grant assistance for the food security project for underprivileged farmers	Japan	Fertilizer, Productivity	Grant	2008-2010	3000 m ¥	Soil fertility management	Covers 4 crops (including rice)
10. Support to the seed bearing sector in Rwanda (AFSR)	Belgium	Seed production	Technical Cooperation	2004-2010	7.73 m €	Seed multiplication	Covers all food crops
10. Project D' Appui aux infrastructures rurales de la region naturelle du Bugesera (PAIR)	ADB	Infrastructure, productivity, watershed management	Grant	2009-2015	30 m US\$	Soil water management	Not exclusive for rice crop
11. Establishing System of Integrated Resources Utilization (ESIRU II)	GTZ – Agro Action Allemande (Germany)	Marshland development, agro forestry	Technical Cooperation	2007-2011	2.5 m €	Marshland development, Rural roads	Focuses on Southern province

4. Determination of Unsatisfied Needs (Gaps)

The successful implementation of NRDS in Rwanda requires several needs to be met. These needs are analyzed below in terms of institutional, policy and investment measures/actions that are required within the existing and planned framework of rice sector. A matrix showing the required interventions in various sub-sectors of NRDS is shown in table 6.

4.1. Needs in the Operational Domains

4.1.1. Marshland reclamation

Although there are 66,094 Ha of marshlands available in Rwanda, only 13,000 Ha of marshlands have been reclaimed for rice cultivation. Development of marshlands requires tremendous financial and administrative resources. Institutional capacities in developing marshlands are currently being built mainly within the framework of RSSP and non-government organizations (NGOs). Experience from the old marshlands in Rwanda suggests that after the initial years of marshland development, water becomes scarce for raising two rice crops in a year, particularly during the dry season. Hence Rwanda requires assistance in appropriate planning and budgeting of water resources prior to establishment of new marshlands that are designed for rice cultivation. Conducting feasibility studies on hitherto unexplored marshlands through appropriate geotechnical-, environmental-, social- and economic evaluations are imperative for sustainable expansion of area under rice cultivation. Due to the limitations on financing the marshland reclamation activities however, Rwanda largely depends on external assistance, both in technical- and financial terms, for developing its marshlands.

Currently rice is produced almost exclusively in marshlands (irrigated ecosystem) in Rwanda. Rwanda can explore growing rice in other ecosystems rain fed lowland and upland ecosystems. Growing rice in such marginal ecosystems has been shown to be successful in Asia and elsewhere in Africa. Although some of the initial efforts by JICA (NERICA lines) and China (Upland lines) gave only limited success, rigorous selection of NERICA lines and upland rice accessions should open up new vistas in Rwanda's efforts in doubling rice production stated under NRDS. By growing rice in such marginal lands, Rwanda can also reduce the pressure of marshland reclamation. These efforts however need international collaboration at research and extension levels.

4.1.2. Seeds

The rice growers in Rwanda currently have only a few varietal options. While the farmers in established old marshlands grow long and slender type (indica) varieties, farmers in new marshlands cultivate traditional varieties that are short and bold type (japonica) due to shortage of seed supply. Trends in local markets suggest that consumers prefer indica rice. However the narrow choices of long grain varieties (released in 2002) increases the vulnerability of rice cultivation in old marshlands to biotic and abiotic pressures in an ecosystem which is already under pressure. Thus there is an urgent need for development of new rice varieties in Rwanda. The current research activities engaged in such activities in Rwanda largely depend on a strategy of introducing and testing of rice varieties that have been developed

elsewhere. However, the microclimatic variations in Rwandan marshlands require breeding and selection of varieties that are suited to the local ecosystem.

4.1.3. Soil Fertility Management

Rice farmers adopt a blanket recommendation of fertilizers that are used for growing rice under irrigated conditions in Asia. However the limited soil surveys conducted in marshlands show large variations in the balance of macro- and micro nutrients. Hence the efficiency of fertilizers used in rice fields is often suboptimal. There is a need to assess marshland/site-specific nutrient requirements which can lead to a shift from blanket recommendations in order to improve the sustainability of yields and profitability of rice cultivation. The supply and hence the use of organic manures in marshlands are limited. Awareness on negative impacts of certain traditional soil management practices such as burning of rice straws and shallow ploughing that contribute to lower productivity levels need to be raised. Soil management practices that prevent the detrimental effects of eroded top soils from the hills and slopes in marshlands require to be introduced.

4.1.4. Water Management

The structural organization of sharing water resources in marshlands in Rwanda is not clearly defined. As a result, the equitable distribution of water in marshlands is often felt as a challenge for rice farmers. Rwanda needs to learn from the experience of other countries in Asia such as Cambodia and India where water sharing between the administrative districts/states is a long debated issue. In addition, Rwanda needs to be provided with appropriate technological options that can help save and use water more efficiently. In this context, the Asian experience such as, the alternate wetting and drying of rice fields and aerobic rice, will help.

Table.6. Matrix showing various elements of intervention that are required under various sub-sectors of NRDS

Sub-sector	Policy/ Institutional	Infrastructure	Human resource/ Capacity	Provision/ Support	Information/ Knowledge
Seed	<ul style="list-style-type: none"> • Seed Certification • Timely supply of seeds • Private Sector Involvement 	<ul style="list-style-type: none"> • Breeding facilities • Seed quality testing laboratory 	<ul style="list-style-type: none"> • Researchers (breeder, agronomist) • Technicians (production) 	<ul style="list-style-type: none"> • Incentives for quality 	<ul style="list-style-type: none"> • Regional/International research collaborations
Fertilizer	<ul style="list-style-type: none"> • Fertilizer recommendations • Emphasis on micronutrients • Soil reclamation 	<ul style="list-style-type: none"> • Blending facilities • Road network 	<ul style="list-style-type: none"> • Implementation of quality standard (public) 	<ul style="list-style-type: none"> • Overhead cost • Timely delivery 	<ul style="list-style-type: none"> • Site-specific recommendations
Irrigation/ Water Management	<ul style="list-style-type: none"> • Role of local government authorities in WUA • Policy on water use 	<ul style="list-style-type: none"> • Maintenance of old marshlands • Supplementary irrigation sources (bore wells, pumps) during dry season 	<ul style="list-style-type: none"> • Agronomists in Water management committee of marshlands 	<ul style="list-style-type: none"> • Budget for maintenance and clearance of soil, weed from canals in marshlands 	<ul style="list-style-type: none"> • Alternate wetting and drying systems • Water management technologies
On farm technology dissemination (R&E)	<ul style="list-style-type: none"> • National Extension Strategies • Institutional identity on research and extension 	<ul style="list-style-type: none"> • Farmers Training Centre 	<ul style="list-style-type: none"> • Extension staff • Progressive Farmer groups 	<ul style="list-style-type: none"> • Budget for recruitment and training 	<ul style="list-style-type: none"> • Dissemination (packaging) techniques

Sub-sector	Policy/ Institutional	Infrastructure	Human resource/ Capacity	Provision/ Support	Information/ Knowledge
Mechanization	<ul style="list-style-type: none"> • Credit policy • Catalysis of private sector 	<ul style="list-style-type: none"> • Electricity in rural areas • Workshops in rural areas 	<ul style="list-style-type: none"> • Rural artisans • Service providers • Agricultural Engineers 	<ul style="list-style-type: none"> • Incentives for service providers, private sector • Initial wave of investments in machineries 	<ul style="list-style-type: none"> • Mechanization options for rice farming systems • Ergonomic designs • Socioeconomic impacts
Quality Improvement	<ul style="list-style-type: none"> • Adherence of grading and milling standards • Trading regulations 	<ul style="list-style-type: none"> • Paddy Collection Centres in marshlands • Feeder roads 	<ul style="list-style-type: none"> • Training on quality testing • Supervisors for milling standards 	<ul style="list-style-type: none"> • Minimum support prices for premium rice 	<ul style="list-style-type: none"> • Market studies (survey, statistics) • Awareness on post harvest handling
Access to Market	<ul style="list-style-type: none"> • Predetermined contracts between growers and mills/traders • Transparent and organized rural trading regulations 	<ul style="list-style-type: none"> • Feeder roads • Communication network and hygiene at paddy collection centres 	<ul style="list-style-type: none"> • Regulators of rice trading • Post harvest technologist • Biochemist (flavour, aroma) 	<ul style="list-style-type: none"> • Registration of millers, traders • Mechanization in post harvest handling 	<ul style="list-style-type: none"> • Market information on prices and traders • Awareness on the linkages between handling and quality
Access to Credit	<ul style="list-style-type: none"> • Short-term Loans on inputs, machineries • Crop Insurance schemes • Soft Loans 	<ul style="list-style-type: none"> • Rural banks • Microfinance institutions in rural areas 	<ul style="list-style-type: none"> • Women self groups (lending) • Bank field officers 	<ul style="list-style-type: none"> • Business models/ Financial plans for cooperatives • Guarantee for performing cooperatives 	<ul style="list-style-type: none"> • Inventory of assets of cooperatives • Credit rating • Awareness on special schemes
Policy Tools	<ul style="list-style-type: none"> • Regional/international initiatives • Regional policies • Changing trends in trading 	<ul style="list-style-type: none"> • Rice sector planning, coordination and implementation unit 	<ul style="list-style-type: none"> • Sector coordinator • Policy Analyst 	<ul style="list-style-type: none"> • Declaration of rice as 'sensitive good' • Continued priority for rice crop in agriculture 	<ul style="list-style-type: none"> • Policy impact analyses • Profitability studies in rice sector

4.2. Needs in the Structuring Domain

4.2.1. Policy and Regulatory Gaps

Government regulations and policies on water sharing are not clearly made available to rice growers. Rice farmers in most parts of the country have formed water users' association, a co-operative association of individual water users who wish to undertake irrigation for rice and other crops on a mutual basis. However, there is a need for intervention from local government authorities on setting priorities and avoiding controversies. The government can promote supplementary irrigation in marshlands through financial incentives to private entrepreneurs and farmers. The government shall encourage investments in rigging of bore wells. The government shall also facilitate equitable water distribution by encouraging motorized (2-5 HP) pumping of water to areas that are topographically not inclined to receive water from the common irrigation channels in the marshlands.

The recent documentation on national rice policies deals with various issues across the value chain. However, lack of data on consumption and market statistics might limit the validity of these policies the impact of the recent policies. Evidence-based policy options in critical issues such as rice consumption pattern, consumer preferences, price elasticity, and quality of milling in small and private mills will have greater reinforcement of the rice sector.

4.2.2. Institutional Issues

MINAGRI which provides the vertical linkage through the rice sector in Rwanda shows a great degree of commitment and will in attaining quantum jumps in rice production. The rice sector however seems to depend largely on the success of a single strategy of expanding area under cultivation. The yield trends in some of the old marshlands have already begun to show a steady decline in rice yields due to over exploitation of resources such as soil nutrients and water⁵, and pressure from pests and diseases, and lack of renewal of resources such as varieties and technologies. Therefore MINAGRI requires integration of multi-pronged strategies proposed under NRDS. The implementation of NRDS however needs building of additional human and institutional capacities that can coordinate and execute the various strategies in Rwanda.

Capacity building in rice sector deserves the much needed attention in order to sustain the initial success made from the government's efforts in reclaiming marshlands and total rice production in the past decade. Special emphasis should be laid on disciplines such as breeding, pest and disease control, water management and post harvest technologies. Given the importance of technology dissemination in NRDS, Rwanda needs support in efficient expansion of extension network. Although the EDPRS targets to narrow the ratio of extension worker to

⁵ Kayiranga, D (2006) The effects of land factors and management practices on rice yields.
http://www.itc.nl/library/papers_2006/msc/nrm/kayiranga.pdf

farm households to 1:2,250, the government has not yet set out a clear strategy on agricultural extension activities that will promote productivity of small holder rice farms.

4.3. Investment measures

To accomplish the goal of doubling rice production in Rwanda, significant amounts of investment along the value chain is required. The suggested estimates are shown in table 7. It is assumed that the investments shown below will enable implementation of the multipronged strategies articulated under NRDS. The estimates cover only the costs required to double the rice production (as envisioned under NRDS) and do not cover the overall needs of rice sector in the country. The figures are only indicative and are therefore subject to further evaluation. The total cost of investment is estimated at 139 million USD (17.375 m USD/year). Wherever possible, the empirical costs were used. For instance, to calculate the cost of marshland reclamation, the RSSP's current estimate of 7540 USD/Ha was used.

Table.7. Estimated requirement of Capital Investments ('000 USD) for rice sector

Components	Expansion Of Area (10000 Ha)/ Ecosystem	Seeds	Soil Fertility	Water Management	Others (infrastructure, pest control)	Market Information, Access, Policy regulations
Research	500	1,000	1,000	1,000	500	250
Dissemination		1,000	1,500	1,000	500	250
Institutional (Procurement, Coordination, Overheads)	100,000	5,000	10,000	5,000	10,000	500
Total Requirement	100,500	7,000	12,500	7,000	11,000	1,000
% Share of Total	72.3%	5%	9%	5%	8%	0.7%

A major share of the total investment is allocated for the development of marshlands. In 2008, rice was grown in a cumulative total area of 12,000 Ha (2 seasons per year) from the available 13,000 Ha of marshlands in Rwanda. Assuming that the productivity factors will remain constant, Rwanda will need to grow rice in 24,000 Ha by 2018 in order to double its rice production. To attain this target, Rwanda will have to develop an additional 13,000 Ha of marshlands. However since multiple strategies are attempted under NRDS, it is assumed that in order to achieve the NRDS' goal of doubling the rice production, the area under rice production does not have to be doubled. Given the thrust to improve the productivity of existing lands, it is assumed that a total of 10,000 Ha would sufficiently supplement the contribution from other strategies to doubling the rice production by 2018.

Therefore besides the need for funding marshland reclamation activities, capital investments are required for research and dissemination of technologies, inputs, soil fertility assessments,

and building infrastructures such as feeder roads, thrashing and drying yards in marshlands require support from DPs.

5. Opportunities

The rice sector in Rwanda is the fastest among EAC countries – the total rice production increased by 32-fold in the past decade⁶. This is mainly due to the several high profile initiatives from the government in marshland development. Furthermore, the sub-tropical climate, organic peat soils, natural water resources and the organizational capacity of farmers in marshlands also favour rice production. Despite the low levels of inputs and crop management practices adopted by rice growers in the country, recent reports show that the national average rice yield for 2009 is 4.5 t /Ha⁷, much higher than that obtained in several of the irrigated ecosystems in Asia. Rwandan rice farmers in some marshlands report yields of up to 11 t /Ha. Marshlands such as Cyili, Rwamagana and Umutara have already become the ‘rice bowls’ of Rwanda. Thus Rwanda has ample scopes in expanding their potential for rice production in Rwanda.

Having recognized the importance of rice sector, the government has declared rice as a priority crop and thereby is constantly attracting investments. The governance and accountability of Rwanda’s public expenditures are widely recognized as one of the best in Africa. Appreciating the efficiency in taking the benefits to the targeted recipients, the DPs engaged in agriculture sector of Rwanda show greater degree of confidence in committing strategic investments on long term developmental issues. These characteristics should broaden the scopes for tapping funds for implementing the rice development strategies of Rwanda. In the short and medium term however, the country needs to prioritize on enhancing its human resources in technical and organizational capacities.

The recent engagements of private entrepreneurship in rice sector are encouraging signs for Rwanda’s rice sector. The country seeks to expand private investments in building its infrastructure such as thrashing- and drying yards in marshlands and milling industry. Privatization of seed production in Rwanda stands to bring in more quality seeds to the market on a self-financing basis. It is also possible that a commercially oriented seed industry might bring in new high yielding rice varieties (including hybrid rice varieties) and establish stronger links with rice farmers. The government’s strategy to privatize distribution of seeds and other inputs shall therefore effectively meet the real needs of farmers on a timely basis. Further advances in varietal improvement, soil fertility management and water saving technologies will also become vital to the long-term viability of the rice sector in Rwanda.

Access to finance is often a critical constraint for rice production and comes into play at each step of the value chain. The supporting financial services that are necessary to facilitate upgrading of the farmers and the small millers are still very weak and in need of significant capacity building. The private sector nevertheless finds it profitable along the entire value

⁶ EAC Rice import tariffs and food security (2010) USDA Foreign Agricultural Service

⁷ Draft of National Rice Development Strategies – Version I. Rwanda Agriculture Development Authority, Kigali

chain of rice sector (from inputs through trading of milled rice grains) in Rwanda. Given the proper regulatory framework, a more conducive environment shall be facilitated between the small farm holders and private sector. Thus the private sector needs more support from the NRDS through appropriate policy environments and interventions.

Rwanda has recently adopted new strategies in agricultural mechanization in order to increase land productivity. These strategies emphasize on private entrepreneurship in machinery contracts and agro-processing in marshlands. New financial schemes that encourage private entrepreneurs to own and lease farm machineries and implements should reduce constraints such as availability of labour during peak seasons in marshlands. The rural electrification programs of Rwanda shall also encourage private investments in increasing the profitability of rice production by improving the post harvest handling and storage of paddy grains.

The climatic conditions in Bugarama marshlands in Rwanda favour growing slender long grain rice varieties such as Basmati. Given the demand for Basmati rice in global market, Rwanda stands to tap global markets through exports. Creating special niches for growing such premium rice in Bugarama will be advantageous to Rwanda in branding the locally produced rice and in reaping the associated socioeconomic benefits through rice exports.

6. Conclusions and Recommendations

The growth potential for rice sector in Rwanda is immense. The rice production in the country increased by 6-fold in the last 10 years. Most of this increment is due to a parallel increase in area under rice cultivation although the average annual increase in productivity is 151 Kg/Ha during this period. NRDS of Rwanda proposes multi-pronged strategies for Rwanda to attain self sufficiency. The strategies are consistent with the country's long-term goal (Vision 2020) of shifting from subsistence farming to market-oriented agriculture. The medium term framework described under EDPRS (2008-2012) aims to intensify rice production through further expansion of marshlands and value chain.

In alignment with this overarching strategy of poverty reduction and the pillar 1 visualised under CAADP, the NRDS envisages expansion of area under rice cultivation as one of the major drives in doubling rice production in Rwanda. NRDS also seeks to improve competitiveness of rice sector through enhanced post harvest handling, milling, branding, access to market and credit-, policy- and regulatory frameworks. This is in consistence with pillar 2 of CAADP. Productivity improvement through efficient delivery and distribution of inputs such as seeds, fertilizers and water distribution in small holder rice farms align well with the pillar 3 of CAADP. The promotion on research systems to disseminate appropriate new technologies under NRDS also reflects the strategies of CAADP (pillar 4).

Rwanda implements the EDPRS goals of agriculture sector through four main programs under Project for Sustainable Transformation of Agriculture (PSTA II). The sub-sectors that are relevant to the implementation of NRDS are thoroughly reflected in these programs. For instance, the various sub programs of PSTA II focus on NRDS' sub-sectors such as delivery of

improved varieties (SP 2.3), building of technical capacities (SP 4.10), intensification of sustainable production systems (marshlands, SP 1.3), water resources (SP 1.1), soil fertility management (SP 1.5), building of organizational capacities (SP 2.1), post harvest- and storage technologies (1.4), commodity chain, competitive agribusiness (SP 3.4), market statistics and survey (SP 4.3), policy regulations (SP 4.2), and monitoring and evaluation of projects and programs (SP 4.4).

The horizontal and vertical linkages amongst beneficiaries and programs/projects are delivered by the institutions that are involved in the implementation. MINECOFIN provides the vertical linkage between the country government/DPs and programs/projects. Other line of ministries such as MINECOFIN, MINELA, MINICOM, MINIFRA and MINALOC provide the vital linkages between regulatory frameworks of the government with the designs and implementation of programs/projects. However, it is the MINAGRI that provides the vital vertical linkage through the entire profile of other horizontal- and vertical linkages between institutions and the outcomes (impacts) of the projects/programs. Thus at the central level, MINAGRI is identified as the champion in providing the leadership in coordination and implementation of NRDS. At the decentralized level, Rwanda Agricultural Development Authority provides the much needed direct linkages between the beneficiaries (rice growers and consumers) and the various institutions involved in the articulation and implementation of NRDS. Hence RADA is identified as the champion at the decentralized level.

Agriculture sector investment plan (ASIP) which provides the financial profile of projects and programs for the medium term frame work that are currently being implemented shows an overall gap (funding requirement) of 41% or approximately 325 million USD of its planned 800 million USD investment for the period of 2009-2012. Most of the budget lines are shown against broader agendas of agricultural sector, and hence are not rice-specific. Nevertheless, it is estimated that for the rice sector, a total of 139 million USD will be required over the period of next 10 years to accomplish the NRDS goal of doubling rice production by 2018 (17.375 million USD per year). While ASIP's budget meets some of the requirements of NRDS, tapping of further resources from the government and donors is required for tackling some of the strategic issues stated under the NRDS.

Rice sector has largely been governed by public elements. This was mainly due to a lack of policies encouraging private entrepreneurship in the value chain of rice, and the relatively low returns (profitability). In the recent past, the private sector has evinced interest in different areas of rice sector in Rwanda. The government is currently encouraging the participation of private entrepreneurship mainly in distributing inputs in different districts of the country. Recently, the government has also engaged in shared ownership of marshlands with private millers. ICM (Inter City Mills), an Australian corporate, is involved in rice production and milling in Rwanda. ICM uses a mix of global technology and manual labour for crop establishment and management in various marshlands, followed by mechanical harvesting, handling and processing to maximize yield and quality of rice grains.

The lack of human resources in coordination and execution, and research capabilities represent major challenges for the implementation of NRDS. Yet, given the consumer demand, the agronomic suitability of rice production in marshlands, the organizational capabilities of farmers, the strong institutional linkages, and local governance, Rwanda is well positioned in tapping the potential of becoming a competitive rice producer in Sub-Saharan Africa.

Annex

List of people contacted during the consultancy period

Sl. No	Name and Designation	Institution/Organization
1.	Dr. Agnes KALIBATTA Honourable Minister	Ministry of Agriculture and Animal Resources, Kigali
2.	Mr. Ernest RUZINDAZA Permanent Secretary	
3.	Mr. Norbert Director (Chairman, NRDS task force)	Rwanda Agriculture Development Authority
4.	Mr. Eduard Cyubahiroe (NRDS taskforce member)	Rwanda Agriculture Development Authority
5.	Mr. Fumihiko Suzuki	Program Manager (Agriculture), JICA
6.	Ms. Emmy	Ministry of East African Community
7.	Mr. Francois Nsengiyumwa	Co-ordinator, Crop Intensification Program
8.	Emmanuel Nzeyimana	Economist, Rural Sector Support Project
9.	Ms. Joly Dusabe	Co-ordinator, Crop Intensification Program
10.	Mr. Edouard Munyamaliza	Development Officer, Office of Canadian High Commission
11.	Ms. Evode Ngombwa	Public Relations Specialist, National Land Center
12.	Mr. James Tayebwa	Ministry of Commerce
13.	Mr. Aime Uwase	Ministry of East African Community
14.	Mr. Jean Calvin Kayiranga	Inter City Mills (ICM) Rwanda Agribusiness
15.	Mr. KURADUSENGE	Ministry of Commerce