



Rice Sector Development In East Africa

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Acronyms

AAA	Agro Action Allemande
AAMP	Area-Based Agricultural Modernization Programme
AD2M	Project to Support Development in the Menabe and Melaky Regions
ADLI	Agricultural Development Led Industrialization
AFD	Agence Française de Développement
AfDB	African Development Bank
AFSR	Appui à la Filière Semencière du Rwanda
AGRA	Alliance for a Green Revolution in Africa
AKF	Aga Khan Foundation
ASA	Agricultural Seed Agency
ASDS	Agricultural Sector Development Strategy
ARI	Africa Rice Initiative
ASDP	Agricultural Sector Development Programme
ATAAS	Agricultural Technology and Agribusiness Advisory Services Project
BADEA	Arab Bank for Economic Development in Africa
BSF	Belgian Survival Fund
BUF	Better U Foundation
CAADP	Comprehensive Africa Agriculture Development Program
CAAQ	Conseil des Appellations Agroalimentaires du Quebec
CAAS	Chinese Academy for Agricultural Sciences
CARD	Coalition for African Rice Development
CFC	Common Fund for Commodities
CIRAD	Centre de Coopération Internationale en Recherche Agronomique Pour le Développement
CRS	Catholic Relief Services
COSOP	Country Strategic Opportunities Paper
CTB	Coopération Technique Belge
DADP	District Agricultural Development Plan of Tanzania
DED	Deutscher Entwicklungsdienst
DFID	Department For International Development of the UK
DP	Development Project
DSIP	Development Strategy and Investment Plan
EAAPP	Eastern Africa Agricultural Productivity Programme
EAC	East African Countries
EC	European Commission
ECHO	European Community Humanitarian Aid Office
EIAR	Ethiopian Institute of Agricultural Research
ERS	Economic Recovery Strategy
ESE	The Ethiopian Seed Enterprise
ESIRU	Establishing System of Integrated Resources Utilisation
EU	European Union
FAD	Fiscal Affairs Department of the IMF
FARA	Forum for Agricultural Research in Africa
FAO	United Nations' Food and Agriculture Organization

FAUR	Fédération des. Associations d'Usagers de Réseaux of the Agence Française de Développement
FFS	Farmer Field Schools
FIEFOC	Farm Income Enhancement and Forest Conservation Project
GDP	Gross Domestic Product
GoChina	Government of China
GOE	Government of Ethiopia
GoItaly	Government of Italy
GoIndia	Government of India
GOK	Government of Kenya
GOM	Government of Madagascar
GoR	Government of Rwanda
GOT	Government of Tanzania
GOU	Government of Uganda
GTZ	Gesellschaft für Technische Zusammenarbeit of Germany
Ha	Hectare(s)
IAEA	International Atomic Energy Agency
IDA	International Development Association of the World Bank
IDB	Islamic Development Bank
IDEA	Investment in Developing Export Agriculture
IRRI	International Rice Research Institute
IFAD	International Food and Agricultural Development
IFPRI	International Food Policy Research Institute
INIA	Instituto Nacional de Investigación Agronómica
IPM	Integrated Pest Management
ISAR	Institut des Sciences Agronomiques du Rwanda
JICA	Japan International Cooperation Agency
KAPP	Kenya Agricultural Productivity Project
KARI	Kenya Agricultural Research Institute
KATC	Kasisi Agricultural Training Centre
KATRIN	Kilombero Agricultural Training and Research Institute
KFW	Kreditanstalt für Wiederaufbau (German Development Bank)
KOICA	Korea International Cooperation Agency
KWAMP	Kirehe Community-based Watershed Management Project
LEAD	Livelihood and Enterprises for Agricultural Development
LBDA	Lake Basin Development Authority
MCC	Millennium Challenge Corporation
MDGs	Millennium Development Goals
MIAD	Mwea Irrigation Agricultural Development Centre
MSME	Micro, Small and Medium Enterprises
MT	Metric Ton
NAC	Nutrition Assise Communautaire
NAFCO	National Agricultural and Food Corporation
NAP	National Agricultural Policy
NARIC	National Recognition Information Centres
NCPB	National Cereals and Produce Board
NDF	Nordic Development Fund
NDP	National Development Plan
NEPAD	New Partnership for Africa's Development
NERICA	New Rice for Africa

NFNS	National Food and Nutrition Security Policy
NIB	National Irrigation Board
NMC	National Milling Corporation
NRDS	National Rice Development Strategy
NRRDS	National Rice Research and Development Strategy
NRSF	National Rice Stakeholders Forum
NSGRP	National Strategy for Growth and Reduction of Poverty
ODA	Official Development Assistance
OFDA	Office for Foreign Disasters Agency of the US Government
OFID	OPEC Fund for International Development
OPEC	Organization of the Petroleum Exporting Countries
OXFAM	Oxfam International
PADAB	Bugesera Agricultural Development Support Project
PADANE	North-east Agricultural Improvement and Development Project
PADR COMIPADR	Plan d'Action de Développement Rural/Contribution Mise en Oeuvre
	Plan d'Action de Développement Rural
PAIR	Projet d'appui aux Infrastructures Rurales
PAM	Pan African Mining
PAPSTA	Support Project for the Strategic Plan for the Transformation of Agriculture
PARECAM	Programme d'appui à la résilience aux crises alimentaires à Madagascar
PARPA	Action Plan for the Reduction of Absolute Poverty
PARRUR	Partenariat et Recherche dans le secteur Rural
PASAM	Programme d'Appui au Secteur Agricole au Mali
PASNVA	Le Projet d'Appui au Système National de Vulgarisation Agricole
PEAP	Poverty Eradication Action Plan
PHBM	Upper Mandraré Basin Development Project
PLAE	Programme de Lutte Anti Erosive
PMA	Plan for the Modernization of Agriculture
PP2	Program Phase 2
PPRR	Rural Income Promotion Programme
PRA	Participatory Rural Appraisal
PRICON	Private Sector Development and Consultancy Centre
PROJER	Projet Jeunes entrepreneurs ruraux
PRSP	Poverty Reduction Strategy Paper
PRPIM	Projet de Réhabilitation du Périmètre Irrigué de Manombo
PSDR	Projet de Soutien au Développement Rural
QDS	Quality Declared Seeds
RARI	Regional Agricultural Research Institute
RIS	Rice Industry Secretariat
ROR	Réseau des Observatoires Ruraux
SADC	Southern African Development Community
SALOHI	Strengthening and Accessing Livelihoods Opportunities for Household Impact
SCAMPIS	Scaling Up Micro Irrigation Systems
SG2000	Sasakawa Global 2000
SIDA	Swedish International Development Agency
SIRSA	Système d'Information Rurale et de Sécurité alimentaire
SMAD	Service Militaire d'Action au Développement
SSA	Sub-Saharan Africa

SSC	South-South Cooperation
SSIP	Small-Scale Irrigation Project
SRI	System of Rice Intensification
TICAD IV	Tokyo International Conference on African Development
TOSCI	Tanzania Official Seed Certifying Institute
TUL	Tilda Uganda Limited
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
URoT	United Republic of Tanzania
USAID	United States Agency for International Development
USD	United States Dollars
WARDA	West Africa Rice Development Association
WB	World Bank
WFP	World Food Program
WTO	World Trade Organization
WUR	Wageningen University & Research Centre

1. Introduction

The Common Fund for Commodities invited the European Cooperative for Rural development (EUCORD) to submit a proposal to conduct an appraisal and elaboration of a full project proposal: “Rice Sector Development in East Africa”. As a result, EUCORD undertook a desk study in order to conduct a general overview of the East African regional rice sector, and to conduct a preliminary assessment of priority countries.

This report presents the findings of the desk study. It is a synthesis of country papers, National Rice Development Strategies and studies and reports prepared in the context of the Coalition for African Rice Development (CARD) initiative. In addition, it includes material from documents, minutes and reports generated during stakeholders’ visits and visits made in Uganda and Tanzania in 2011 while discussing program development opportunities. The methodology focused on collecting, collating and reviewing existing and new initiatives and programs focused on rice development in East Africa. Data and information used in this study were collected through a review of various government documents and studies. These are listed under the References.

Based on United Nations Country Grouping, 19 territories constitute East Africa and include: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Mauritius, Mayotte, Reunion, Rwanda, Seychelles, Somalia, United Republic of Tanzania, Uganda, Zambia, Zimbabwe.

The present study however takes a narrower focus, and is based on rice-related developments in seven East African countries: Ethiopia, Kenya, Madagascar, Mozambique, Rwanda, Tanzania and Uganda.

2. The Rice Sector

2.1 A World Perspective

Rice has been gathered, consumed, and cultivated by women and men worldwide for more than 10,000 years - longer than any other crop. It is the most important food crop for about half of the human race. Global production of rice has risen steadily from around 200 million metric tons (MT) of unmilled rice in 1960, to over 678 million MT in 2009. Today, rice represents 29% of the total output of grain crops worldwide.

Over 90% of the world’s total rice crop is produced in South and East Asia. In area and production, China is the leading country in the world. Africa accounts for 3% of global production. The major limiting factor for the growth of rice is not climate, but water supply. Rice is the only major crop that can be grown in the standing water in vast areas of flat, low-lying tropical soils and is uniquely adapted for growth in submerged conditions. Rice is grown in the tropical and subtropical regions of most continents. It is cultivated under widely differing conditions because of the great cultivar diversity.

Global rice cultivation is estimated at 150 million ha. Rice yields recorded worldwide include 5.8 MT/ha in Japan, 5.6 MT/ha in China and 4.3 MT/ha Indonesia¹. Comparing these yields with the world average of about 3.5 MT/ha, it is evident that there is great potential to improve rice yields elsewhere. The development of rice therefore presents an opportunity to reduce the number of food-insecure people that presently stand at 860 million², by half by 2015, and to achieve MDG 1 (i.e., to eradicate poverty and hunger).

Despite continuously increasing production, world market rice prices remain high and do not show signs of abating. Only about 5-6% of the rice produced reaches international markets. In 2010, the three largest rice exporters, in decreasing order of quantity exported, were: Thailand, Vietnam and India. Together, they accounted for nearly 70% of world rice exports. Global rice stocks fell from 147.3 MT in 2000 to 74.1 MT in 2008. Current rice exporters may however turn into importers at some stage. For instance, China, a traditional exporter of rice, has since 2010 turned into a net importer. Major importers include Nigeria, Indonesia, Bangladesh, Saudi Arabia, Iran, Iraq, Malaysia, the Philippines, Brazil and some African countries (Ivory Coast and Senegal). Although China and India are the two largest producers of rice in the world, both countries consume the majority of the rice produced domestically (with China becoming an importer), leaving little to be traded internationally.

2.2 Africa's Rice Sector

Rice is becoming an increasingly popular food in Africa because it is easy to store and cook, it is tasty and can be used for a large variety of dishes. It is grown in more than 75% of African countries, with a combined population of close to 800 million people. While it is already the main staple food crop in ten African countries, per capita consumption in others is rising at such a rapid pace that this figure will more than double in the coming years.

In 2008, Africa produced an estimated quantity of 23 million MT of unmilled rice on 9.5 million hectares³. The western, northern and eastern regions of Africa had the largest shares, with 10.2 million MT, 7.3 million MT, and 5 million MT, respectively. These quantities of unmilled rice were harvested on 5.8 million hectares, 0.8 million hectares and 2.4 million hectares in West, North and East Africa, respectively.

Between 1961 and 2006, rice consumption in West Africa increased at a rate of 4.5% per year, while rice production grew at 3.2% per year. The high increase in rice consumption is not limited to West Africa as a high rice consumption growth rate has also been recorded in East and Southern Africa. Africa's rice production has not been able to match the growth in demand. Rapidly rising imports have been filling the widening gap between regional supply and demand. This rapid growth in imports was estimated at 3.77% per year between 2001 and 2006⁴.

According to the Africa Rice Center, Africa produces only a share of 3% of global rice production (or 14 million MT of milled rice). In 2009, Africa imported 9.8 million MT of milled rice with a market value of around USD 5 billion (at 500 USD/MT). This quantity represents one-third of the world market, and 40% of Africa's total rice consumption. With such high dependence on imports, Africa is highly exposed to international market shocks.

¹ FAO, 2007 : <http://www.fao.org/DOCREP/003/T0751F/To751f02.htm>

² CARD: www.riceforafrica.org

³ FAOSTAT, 2010

⁴ CARD, 2010: www.riceforafrica.org.

This has grave consequences for its food security and political stability, as was demonstrated by events during the 2008 food crisis.

The African situation may get worse before it gets better. For instance, there was an alarming statistic of African rice imports reaching 9.8 MT in 2009 - which represents one-third of the world market and 40% of its own needs. This indicates that rice demand in Africa is growing the fastest in the world (6% per year) calling for concerted efforts to address this situation.

So far, African rice fails to compete with imports because large-scale commercial rice processing is poorly developed or limited, and urban consumers have become used to the look and feel of imported rice. Locally milled rice is generally of poor quality and mainly consumed in rural areas. It often tends to be contaminated with stones and dust. Even when it is of acceptable quality, it does not sell well in cities, where consumers are acquainted with imported rice. For some people, eating imported rice has even become a status symbol. One of the major challenges for Africa is therefore to produce sufficient and affordable rice that meets the preferences of its fast-growing and increasingly urbanized population; and which can compete with imported rice both in terms of price and quality.

Taking a value chain approach can help to improve market prospects for producers and scale up their profit margins. A value chain relates to a specific product (such as rice) and entails the whole series of operations, from production of inputs to cultivation, post-processing, distribution and marketing, until the product reaches the consumer. Value is added at each stage, and the different stages are undertaken by different operators - including the farmer and the rice miller - by various technologies, and possibly in different countries.

Value chains offer a strategy for income generation which has important repercussions for extending the reach of agriculture, but also for attracting young people to the rural sector – or dissuading them from leaving it. This approach can play a role in improving working and social conditions, addressing unemployment, low salaries and food security. The fact that value chains are market-driven means that the end use dictates all the other phases.

In the case of rice, the end use is the growing market for graded quality rice, especially among domestic urban populations. This rising market provides an opportunity for medium to large-scale processors to invest in the development of outgrower schemes to improve the supply of premium quality rice for processing. By sourcing premium quality unmilled rice from smallholder farmers, processors provide an incentive to producers to gain more income derived from producing a premium quality product. The introduction of good agricultural practices helps to increase productivity, improves the quality of the crop produced, improves food security and ultimately helps to make the agricultural sector more competitive.

The potential for growth in the African rice sector is enormous. A rapid increase in the area under rice, irrigated as well as rainfed, is necessary. In particular, it is vital to develop new irrigated rice schemes. Only 17%⁵ of the rice-growing areas in Africa is irrigated. If proper interventions are in place, the existing potentials of Africa can enable it to produce more than the level of consumption, allowing it to also export rice.

The system of rice cultivation in Africa is generally classified into five growing ecosystems, as follows:

⁵ Somado *et al.*, 2008: The bitter harvest of Gambian rice policies. Volume 5, Issue 2- June 2008, pp 129-142, University of California, Los Angeles, CA, USA

- Rainfed upland rice is grown on naturally-drained soils where the water table always remains below the rice roots. The moisture supply depends entirely on rainfall;
- Rainfed lowland (hydromorphic) rice is grown on soils where the roots are periodically saturated by the fluctuating water table in addition to rainfall;
- Mangrove swamp rice (tidal swamp rice) is grown in swamps along coastal areas with tidal intrusion;
- Deepwater or floating rice is grown on flat or V-shaped valley bottoms and floodplains, which sometimes lead to floating conditions;
- Irrigated rice (or paddy rice) is grown on banded “paddies” (flooded parcel of arable land), either under rainfed or irrigated conditions.

2.3 East Africa’s Rice Sector

The average annual milled rice production was 2.6 million MT in the period 2001-2005. In 2006, the milled rice production estimate for East Africa was 3.1 million MT, with Madagascar and Tanzania accounting for 2.3 million MT and 525,300 MT, respectively; a strong upward trend in production grew at a rate of 7.21% during the same period. All countries increased annual rice production, resulting in a higher rice production growth rate in East Africa than those of Central Africa and West Africa. The region’s performance was due to increases in rice production in Kenya, Tanzania, Uganda and Madagascar.

In 2006, milled rice consumption was estimated to reach 3.1 million MT in East Africa. During the five-year period of 2001-2005, the average annual consumption of milled rice in East Africa was 2.8 million MT. Overall, sub-regional rice consumption grew at a relatively high rate of 2.7% per year. On a per capita basis, Madagascar, Mozambique and Tanzania stand out as major rice-consuming nations in Africa. With per capita food supply of more than 100 kg/year, rice is by far the main staple in Madagascar (see Table 1).

Table 1: Domestic rice supply in East Africa (FAO, 2007)

Countries	Domestic supply (MT) ⁶	Food supply kg/capita/year
Ethiopia	1,050,806	0.67
Kenya	295,423	7.55
Madagascar	2,338,488	102.05
Mozambique	465,191	20.27
Rwanda	60,802	5.88
Tanzania	874,579	18.91
Uganda	158,227	4.71

Between 2001 and 2005, East Africa became nearly self-sufficient in rice, with rice imports representing 7% of the total quantity consumed. Unlike other sub-regions of Africa, the eastern part of Africa traditionally produced most of the rice it consumed. Madagascar, for example, is apparently self-sufficient in its most important staple food crop. However, with increasing rice demand in almost every country, reliance on the world market to supply rice to African consumers, even in relatively small amounts, is becoming a *very risky, expensive and unsustainable strategy* -- and may lead to severe food insecurity and civil unrest. In terms of

⁶ Production + imports - exports + changes in stocks (decrease or increase) = supply for domestic utilization.

statistics, the total area brought under rice cultivation in East Africa was slightly greater than 1.7 million hectares over the period 2001-2005 and increased at an annual rate of 0.45%. In relative terms, Uganda had the highest increase in cultivated land area, with an area growth rate of 7.67% per year. East Africa recorded a remarkably high rate of increase in yield between 2001 and 2005, at 6.73% per year. Aggregate rice yield averaged 2.2 MT/ha during this period.

3. Review of the Rice Sector in Seven East African Countries

This section provides reviews of the current situation of the rice sector in seven countries in East Africa. For each, it describes the rice value chain, and assesses the potential, strengths, weaknesses and constraints for further expansion and opportunities for a donor-supported (e.g. CFC) regional rice program.

3.1 Ethiopia

3.1.1 Background

Since 2006, Ethiopian rice production trends show increases in both area and productivity. With about 17 million hectares of land suitable to rice production, Ethiopia has tremendous potential to increase its rice-growing area and is seeking partnerships to make use of this land. During the Third General Meeting run by the Coalition for African Rice Development (CARD), the Ethiopian government recognized that rice can significantly contribute to improving food security and poverty reduction.

Three rice ecosystems exist in the country, including: upland rice, rainfed lowland rice, and irrigated lowland rice. The introduction and expansion of rice production in suitable agro-ecologies could be an option to achieve food security and self-sufficiency. Even though rice is not a traditional staple food in Ethiopia, it is considered a high potential emergency and food security crop. According to FAO figures shown in Table 2, rice production more than doubled between 1997 and 2010 while imports increased more than six fold during the same period.

Table 2: Rice production, trade and food supply, Ethiopia, 1997-2010 (FAOSTAT, 2011)

Year	Area (Ha)	Yield (Hg/ha)	Seed (MT)	Production unmilled rice (MT)	Imported milled rice (MT)	Imported milled rice 1000\$	Exported milled rice (MT)	Exported milled rice 1000\$	Food supply milled rice (MT)	Food supply quantity milled rice (kg/capita/yr)
1997	6500	18462	NA	12000	3600	1300	0	0	11698	0.19
1998	7000	18571	NA	13000	2869	985	0	0	14076	0.23
1999	7500	18667	NA	14000	3637	1700	0	0	18021	0.28
2000	8200	18293	NA	15000	2105	937	0	0	12879	0.20
2001	8364	18427	NA	15412	1700	400	0	0	14830	0.22
2002	7700	18182	NA	14000	6890	1975	0	0	18326	0.27
2003	7200	18056	NA	13000	14256	3657	0	0	29224	0.41
2004	6500	18462	NA	12000	13548	4359	0	0	25878	0.36
2005	6241	18016	NA	11244	15222	5808	0	0	26296	0.35
2006	6421	18689	NA	12000	23256	8185	0	0	39735	0.52
2007	6100	18433	NA	11244	31645	8501	0	0	52709	0.67
2008	13000	18795	NA	24434	18992	9602	0	0		
2009	13131	19039	NA	25000	24498	13000	20	1		
2010	13300	18947	NA	25200						

3.1.2 National Rice Policy

Agriculture is the mainstay of the Ethiopian economy, contributing 43% of GDP and engaging 83.3% of the population. About 70% of Ethiopia's industry is involved in the processing of farm products⁷. Two-thirds (or 67%) of the country's total landbase is estimated to be suitable for agriculture. The bulk of agricultural output comes from 13.3 million smallholder households, each owning an average landholding size of 0.93 ha to produce different food and cash crops in addition to herding livestock (NRRDSE, 2009). Farming is predominantly rainfed, has limited market linkages, and is based on rudimentary technologies. Consequently, the country's agricultural products are often characterized by low volumes, poor quality and expensive to get to the marketplace, affecting sustainability of market supply and profitability of farmer's enterprises. Recognizing the above-mentioned structural problems of the country's agricultural sector, the GOE has put in place agricultural development policies in line with its overall strategy framework of Agricultural Development Led Industrialization (ADLI), formulated in 1991. ADLI places very high priority on accelerating agricultural growth and achieving food security.

3.1.3 The Rice Value Chain

Producers: Producers are the first link in the marketing chain. Farmers produce and sell their rice through different channels. The main channels are wholesalers and millers, rural assemblers, urban assemblers and consumers. Rural assemblers are traders who collect rice from farmers at local markets during market days and sell to wholesalers or millers. The markets are placed in remote areas which are usually held once a week. Urban assemblers are few in number and purchase rice from producers during market days. They sell to wholesalers only to get a better price. Farmers transport rice to the nearest markets using pack animals, animal carts and vehicles. Large amounts of grain are sold and purchased immediately after harvest between December and March. Supplies of rice decrease between May through October.

Wholesalers: These are licensed grain wholesalers who bulk and store large amounts of grain. Wholesalers don't move from one market to another as the petty grain traders do. They permanently reside in town with their permanent store and collect rice grains brought by farmers, assemblers (rural and urban) and processors. They are few in numbers and most of the time they sell rice to Addis Ababa.

Millers: Millers are licensed for both milling and the retail trade. Millers, as owner of milling machines, have dual roles in rice trading. Firstly, they are involved in milling the rice; secondly, they purchase milled rice for themselves, storing it to sell later. They sell the rice to locally available urban distributors and consumers. Most of the time, the rice is sold regionally to distribution centers in Addis Ababa, Wollo, Bahir Bar, Gondar and Woldia. These collect rice from farmers, and rural assemblers.

Brokers: These are unlicensed traders who are often involved in wholesale trade. Brokers don't have a warehouse, but facilitate buying and selling of other traders and sometimes make their own purchases.

⁷ MoFED, 2007, 2009.

Assemblers: These include unlicensed rural and urban assemblers of rice. They collect rice during the main market days at specific local market points.

Retailers: These are shop owners who are licensed to sell a variety of different products. They are not specialized rice sellers, but have it as part of their assortment of grain products for their customers. Retailers usually purchase from distributors in the cases of Bahir Dar, Gondar and Woldia but in Woreta they purchase either from millers, wholesalers, farmers or assemblers.

3.1.4 Opportunities, Constraints and Priority Subsectors

Opportunities and Constraints

Since 2006, Ethiopian rice production has been increasing steadily both in terms of area and productivity. With about 17 million hectares of land suitable to rice production, Ethiopia has tremendous potential to increase the area under rice and is looking for partnerships to make use of this land.

The first major constraint is poor access to improved rice varieties, caused by a limited number of high-yielding varieties, especially for irrigated rice, and limited participation of seed growers in the production and marketing of rice seed. The Ethiopian Seed Enterprise (ESE), which is the major seed producer in the country, but has only one farm (at Chagni in the Amhara region) that is suitable for rice seed multiplication.

The second major constraint is poor access and use of modern postharvest techniques and equipment. The traditional techniques currently employed lead to considerable postharvest losses and low product quality. Grass weeds and insect pests constitute the third major constraint, which can be tackled if appropriate pesticides are available. In areas where the use of chemical inputs such as fertilizer is common (e.g. in the Chewaka area), greater access to credit is needed, to improve the use of these inputs. Shortage of labor has also been identified as a constraint, specifically during periods of intensive weeding.

There is considerable interest in the large-scale commercial production of rice in all potential areas of the country; in some of these areas, large-scale producers have already started commercial enterprises. Rice marketing is constrained by poor knowledge of producers and other market actors about rice product quality, limited access to rice market information, and limited group marketing options. Other constraints are the limited use of storage as a marketing strategy, excessive numbers of intermediaries, and price seasonality.

Priority Subsectors

Ethiopia joined the CARD initiative as a member of the second group countries in 2009, and has since developed its National Rice Research and Development Strategies of Ethiopia (NRRDSE) and plans for its implementation under the auspices of the Ministry of Agriculture. The NRRDSE aspires to increase national rice production eightfold by 2019.

Priority actions have been identified as follows: promoting agroecology-based rice research and development; promoting small-scale and commercial rice production; incorporating gender issues; promoting the value chain approach; and fostering environmental sustainability. The Ethiopian government has already formulated its national rice

development strategy and has made partnership arrangements with local and international stakeholders. It has also started developing an implementation plan, which includes a role for the private sector to help achieve the goals laid out in the NRRDSE.

Table 3: Priority subsectors in Ethiopia

	Policy/ institutional	Infra- structure	Human resource capacity	Provision/ support	Information/ knowledge
Seed					
Fertilizer					
Irrigation/water management					
On-farm technology dissemination					
Mechanization					
Quality improvement					
Access to market					
Access to credit					
Overall policy tools					

3.2. Kenya

3.2.1 Background

While rice is the third most important staple cereal in Kenya after maize and wheat, the country is only able to produce 20% of its national needs. Recent years have seen rice grow in importance in Kenya as per capita consumption, particularly in urban areas, has increased far more rapidly than that for other cereal crops. For example, national rice production, most of which comes from irrigation schemes established by the government, stood at 47,256 MT in 2007 against a consumption of 293,722 MT. Approximately 84% of the rice consumed in Kenya is produced on irrigated land with the remaining 16% being produced under rainfed conditions. The irrigated areas cover approximately 13,000 ha and include irrigation schemes in Nyanza West Kano and Ahero (at 3,520 ha), Western Bunyala scheme (at 516 ha) and Mwea irrigation scheme (at 9,000 ha).

Per capita rice consumption in Kenya was estimated to be between 10-18 kg per capita per year in figures from 2005⁸. Annual rice consumption increased in the years after that at a rate of 12% compared to wheat (4%) and maize (1%)⁹. It is expected that the demand for rice in the country will continue to rise in the future. Furthermore, the promotion of rice production and consumption in Kenya is hoped to help remove the over-reliance on maize as a staple food and therefore to improve rural and urban households' incomes and food security. According to Table 4, the area under rice production increased by 111% in the period from 1997 through 2010, while production increased by 54% with an average yield of 3.6 MT/ha.

⁸ WARDA, 2005

⁹ NRDS, 2009

Table 4: Rice production, trade and food supply, Kenya, 1997-2010 (FAOSTAT, 2011)

Year	Area (Ha)	Yield (Hg/ha)	Seed (MT)	Production unmilled rice (MT)	Imported milled rice (MT)	Imported milled rice 1000\$	Exported milled rice (MT)	Exported milled rice 1000\$	Food supply milled rice (MT)	Food supply quantity milled rice (kg/capita/yr)
1997	10340	39724	605	41075	34869	9252	2375	574	85846	2.95
1998	8639	48419	926	41829	32277	10215	126	77	85207	2.86
1999	13229	39845	972	52711	41513	11748	41	33	83915	2.74
2000	13882	37710	924	52349	87082	27755	29	23	139491	4.44
2001	13200	34091	910	45000	112793	28885	133	107	167442	5.19
2002	13000	34615	580	45000	111848	20575	139	201	167813	5.07
2003	10781	37568	580	40502	143508	26608	264	361	218347	6.42
2004	13223	37280	1116	49295	97960	20058	50	37	268411	7.69
2005	15940	39321	1617	62677	122809	28063	75	77	260550	7.27
2006	23106	28062	1152	64840	142218	35363	454	217	298041	8.11
2007	16457	28715	1171	47256	131404	36244	362	462	285090	7.55
2008	16734	13076	1528	21881	139277	44803	694	618		
2009	21829	19333	1413	42202	136877	46535	742	867		
2010	20181	39662	1413	80042						

3.2.2 National Rice Policy

Rice development is considered to be a high priority in Kenya; this is especially in view of the potential for increased production through the expansion of cultivated area and the application of more efficient production methods. Kenya has set for itself a target of increasing rice production from the current 75,000 MT/year to 178,580 MT/year by 2018, the period set for implementing the National Rice Development Strategy (NRDS). The NRDS was prepared in line with overarching strategy documents, i.e. Vision 2030, the draft National Food and Nutrition Security Policy, and the current Strategic Plan of the Ministry of Agriculture.

About 80% of the required increase will be derived from the expansion and rehabilitation of irrigated rice production. The main thrust of the planned rice development addresses: technical issues; farm inputs and equipment; credit support; infrastructure; and market structure improvement. The National Rice Stakeholders Forum (NRSF) will be established to set priorities and to implement interventions identified in the NRDS.

3.2.3 The Rice Value Chain

The main actors in the rice value chain in Kenya consist of input and service providers, primary producers, logistics centers and industries, traders and final consumers. Specific service providers consist of input merchants (agrovets and agro-chemical companies), extension workers (government and private) and credit providers. Primary producers consist of tenant farmers/leaseholders, owner cultivators and farm workers. Logistics centers and industries consist of multi-purpose cooperatives, international and non-governmental organizations (JICA, FAO), the National Irrigation Board (NIB) and rice millers.

Producers: Rice is mainly produced by small-scale farmers through four major irrigation schemes. This includes Mwea in Central province, Bunyala in Western, and Ahero and West Kano in Nyanza province. Upland rice is also grown in other parts of the country and this includes; Migori and Kuria in Nyanza province, and Tana Delta and Msabweni in Coast province. Rice is grown by about 300,000 rice farmers, who provide labor and also earn their livelihood from the crop's production.

Millers: There are four major rice mills spread across the country with varying capacities. Lake Basin Development Authority has a milling capacity of 3.5 MT, Mwea National Irrigation Board (NIB) 24 MT, Western Kenya Rice mills 3 MT and Tana Delta with 3 MT per hour. Additionally, there are several small, privately-owned one-pass mills, especially in Mwea.

Traders/Retailers/Wholesalers: There are several rice traders in the country. The major traders include the government-owned National Cereals and Produce Board (NCPB), National Irrigation Board (NIB) and Lake Basin Development Authority (LBDA) –through their rice mills in Ahero, Mwea and Kibos– which process and supply milled rice to supermarkets and local retailers; Mwea Farmers’ Multipurpose Cooperative Society; supermarkets in major urban centers; Dominion Farms and Capwell Industries; among others. In addition, there are numerous small traders, mostly women, who sell rice in the local markets.

3.2.4 Opportunities, Constraints and Priority Subsectors

Opportunities and Constraints

In general, rice production systems are profitable, despite low yields obtained by farmers. Techniques need to be examined to increase rice output on farms and hence improve income and nutrition in rice-producing households. Capital is a constraint for most farms despite the availability of credit which most farmers are not using - mainly because of lack of knowledge about credit facilities and fear of loans. Low availability of water for irrigation is found to be a constraint to farmers in irrigation schemes, especially in the Mwea region.

Irrigated rice production is more profitable than rainfed rice production as it has a higher gross margin. Kenya’s irrigation potential is estimated at 540,000 ha of which only about 105,000 ha is exploited. The irrigated area could be expanded by 1 million ha by developing the Tana and Athi river basins.

Within irrigation schemes such as Mwea, average land area per household is 1.6 ha. Land allocation has remained static over the years, whereas population growth has increased at a faster rate. As a result, there has been an informal subdivision of land units within the irrigation schemes; land is increasingly rented out to other people by the official NIB tenant farmers, reducing some of these farmers to casual laborers on their own farms.

Various banks and microfinance institutions are accessible in these regions, and provide credit to rice growers. Farmers however are afraid to take loans out as they think that their land could be auctioned off if they default in paying the loan as land is used as collateral. Access to credit is seen as a great enabler for primary producers, especially small-scale farmers, in enhancing their adoption of technologies and better production methods to improve output on farms. To enhance borrowing and the use of credit by rice growers, credit schemes and credit institutions in partnership with the government need to formulate trainings to educate farmers on the management and use of finances and especially how to acquire and use credit.

In a survey¹⁰ of rice producers conducted in 2009, it was found that extension services are mainly provided to rice producers by the Ministry of Agriculture (as reported by 43% of the

¹⁰ KARI, 2009: www.kari.org.

respondents); MIAD (Mwea Irrigation Agricultural Development Centre), KARI (Kenya Agricultural Research Institute) and NIB accounted for 4% each. However, approximately 43% of farmers had no access to extension services. The inability of farmers to access extension services could be a result of changes in institutions providing extension to rice farmers. Before restructuring in early 2000, NIB used to offer extension services to rice farmers, especially in the irrigation schemes. In 2000, NIB withdrew these services as they were supposed to be taken over by the Ministry of Agriculture; however, this did not occur in some regions. There is a need for adequate extension services by trained extension staff in rice production and rice-related issues to be deployed in irrigation schemes and other regions where rice is grown.

According to key informants, rice research was moved from NIB to KARI in early 2000, but KARI did not successfully take up the role of providing research services to rice farmers. There is an increased incidence of rice diseases which is attributed to the lack of new varieties being released. According to MIAD, no new rice varieties have been released for irrigated rice ecosystems in the last 15 years. An urgent need exists for the role of the various institutions to be spelt out clearly and to support plant breeding research for new rice varieties.

Priority Subsectors

According to the Kenya NRDS, which was launched in October 2009, priority areas for future interventions (see Table 5) are: irrigation, seed production, capacity building for farmers and front-line staff, access to credit, on-farm interventions, and disease control. The NRDS is aligned with the national agriculture sector strategies, the MDGs and Kenya's development master plan entitled Vision 2030. The constraints to implementing the NRDS are the lack of adapted rice production technologies, inadequate seed supplies, lack of production and processing equipment, expensive fertilizer, disease and insect pest infestations, sustainable access to affordable producer credit and quality inputs, and inadequate funding. Irrigated rice is expensive, mainly because of the high-cost production process that depends on electric pumps.

Local Kenyan rice has difficulties competing for consumer preference, with imported Asian rice. The Kenyan government is therefore working to improve the quality of its local rice. It can be commended for its subsector analysis and for its short, medium and long-term interventions, but more attention should be paid to capacity strengthening and reducing postharvest losses. In the interim, the authorities need to address the country's poor infrastructure, the improvement of which would help alleviate most of the problems faced by the agriculture sector. The plan is to bring down the costs of production, which will in turn reduce the cost of rice for the consumer. By 2030, the country hopes to be self-sufficient in rice production and to produce a surplus for export.

Table 5: Priority subsectors in Kenya

	Policy/ institutional	Infra- structure	Human resource capacity	Provision/ Support	Information/ knowledge
Seed					
Fertilizer					
Irrigation/water management					
On-farm technology dissemination					
Mechanization					
Quality improvement					
Access to market					
Access to credit					
Overall policy tools					

3.3. Madagascar

3.3.1 Background

Rice is the staple food for a large majority of people in Madagascar. The average consumption of rice is estimated at 138 kg/capita/year in rural areas and at 118 kg/capita/year in urban areas. Although it stagnated for a long time, as is shown in Table 6, annual rice production has increased significantly since 2003 and was estimated at 4,737,970 MT in 2010 – an increase of 1,937,970 MT (1,162,782 milled rice equivalent). .

Table 6: Rice production, trade and food supply, Madagascar, 1997-2010 (FAOSTAT, 2011)

Year	Area (Ha)	Yield (Hg/ha)	Seed (MT)	Production unmilled rice (MT)	Imported milled rice (MT)	Imported milled rice 1000\$	Exported milled rice (MT)	Exported milled rice 1000\$	Food supply milled rice (MT)	Food supply quantity milled rice (kg/capita/yr)
1997	1176800	21737	96240	2558000	44150	12206	1363	92	1337128	95.83
1998	1203000	20341	96600	2447000	52165	14787	769	665	1390738	96.67
1999	1207500	21284	96744	2570000	83076	20677	906	398	1434491	96.75
2000	1209300	20512	97012	2480470	190530	37904	330	599	1507553	98.69
2001	1212650	21956	97282	2662470	160788	32030	368	185	1602717	101.89
2002	1216020	21414	97552	2603970	53237	8978	422	155	1683536	103.99
2003	1219400	22962	99040	2800000	240011	45850	350	201	1712736	102.82
2004	1238000	24475	100000	3030000	126127	15574	363	201	1776328	103.69
2005	1250000	27144	103280	3393000	299109	92925	203	112	1799855	102.18
2006	1291000	26995	97600	3485000	146900	43500	126	148	1845920	101.96
2007	1220000	29473	102400	3595760	186150	56600	1941	85	1898616	102.05
2008	1280000	30579	107200	3914170	167572	79300	51	782		
2009	1340000	33884	108000	4540440	106798	45804	6	45		
2010	1350000	35096	108000	4737970				5		

The entire rice supply chain came to represent the most important economic activity in Madagascar in 1999. Rice farmers generate over 85% of the total added value of the rice value chain. Traders and processors generate about 10% and 4% of added value respectively.

Domestic rice production almost doubled between 1997 and 2010. This increase is driven by both area expansion and productivity growth. Domestic production, (average of 4.1% per year from 1997 to 2007), has kept up with demand for rice (about 4.2% per year) during the same

period. Rice cultivation in Madagascar is concentrated in six distinct regions, covering approximately 1.4 million hectares.

3.3.2 The Rice Value Chain

According to the 2004-2005 agricultural census conducted by the Ministry of Agriculture, Livestock and Fisheries, rice growing is practiced by 2,075,000 farmers and another 30,000 operators, many of whom are involved in collection, husking, and wholesale and retail selling. The rice value chain actors in Madagascar are as follows:

Collecting agents: These agents act as middlemen between producers and wholesalers. They are in direct contact with producers and are often transporters. Each collecting agent employs on average five people, accounting for around 22,000 jobs.

Processing agents: Processors are mainly involved in husking rice, and on certain occasions, in steam or parboiling treatment. Husking machines are normally small units for processing rice. There were about 2,300 small-scale rice processing units in Madagascar in 1999. These process from about 200 to 1,100 MT of unmilled rice per year and employ about 10,000 laborers in total. Small processing units have increased in number after the liberalization of output markets in the 1990s and particularly since the mid-1990s. These units represent tough competition for the traditional, large-scale rice processors.

Wholesalers: These are usually located in urban areas and have an important role in linking regional supply and demand; facilitating interregional transfers of domestically produced rice; and supplying the domestic market with imported rice. It is estimated that there are about 100 wholesalers involved in rice trading, with an average of 5,000-10,000 MT of rice sales per wholesaler.

Retailers: In 1999, retailers were estimated at 24,000¹¹. Retailers in Madagascar sell 710,000 MT of rice per year. With average rice sales per retailer varying from 8 to 58 MT per year, it is estimated that there are about 23,800 operators in the whole country. The aggregate storage capacity at the retail level is estimated at around 56,000 MT.

3.3.3 Opportunities, Constraints and Priority Subsectors

Opportunities and Constraints

Madagascar is the largest African producer and largest per capita consumer of rice. The country produces close to 5 million MT of rice, but it does not have a cohesive marketing strategy even though there are separate domestic and external marketing strategies. The major challenge for the agricultural sector (including rice) remains the building of its capacity to supply the market with a sufficient quantity of quality products; this in order to ensure food security for the growing population, to supply industries down the chain, and to export. There are a number of obstacles that need to be considered, particularly:

- Lack of investment: the precariousness of land titles hindering investment, the lack of clear directions in the management of agricultural investment areas and the scarcity of incentives to enable agribusiness actors to set up shop;
- Availability and limited access to quality agricultural inputs (improved seed, fertilizers, etc.);

¹¹ UPDR/FAO, 1999-2000.

- Difficulties for producers in accessing credit: lack of collateral, high interest rates, the productivity and viability of farm holdings, lack of stable and developed funding policies;
- Weakness of the dissemination systems: missing knowledge about innovative techniques that might enable productivity growth, underdeveloped integration, and failure to capitalize on the results of applied research;
- Poor product quality: the agricultural products being too variable, fragmented, heterogeneous and in short supply to attract business people and industrialists; the run-down state of the road infrastructure; and the lack of support for export initiatives for raw or processed agricultural products;
- Growers' lack of technical capacity and management skills: gaps in the agricultural extension system, weak development of rural professions, and lack of training opportunities in certain areas; and
- Significant losses: reducing the losses associated with rice production and handling would go a long way to reducing import requirements. In 1999, for example, losses stood at 107,000 MT or 57% of the amount of imported rice.¹²

Priority Subsectors

Priority subsectors emphasized by the country NRDS, launched in December 2009, are shown in Table 7. Currently, subsector interventions include seed, fertilizer, irrigation, water management, transfer of technology, mechanization and improved access to markets. The country's priorities in the short term are to provide inputs (fertilizers and pesticides), mechanization, extension, training and knowledge management, and information systems for various purposes (marketing, monitoring, etc.). Their implementation has been constrained by the political crisis and the resultant suspension of international cooperation and funding. There are also systemic constraints, such as an inefficient marketing system and isolation of production areas from the major markets. For the NRDS to secure sustainable investment, the following actions are necessary: integration with other initiatives, access to different systems of financing, development of partnerships, expansion of technical cooperation, improved land management, and adaptation to the changing ecology.

Table 7: Priority subsectors in Madagascar

	Policy/ institutional	Infra- structure	Human resource capacity	Provision/ support	Information/ knowledge
Seed					
Fertilizer					
Irrigation/water management					
On-farm technology dissemination					
Mechanization					
Quality improvement					
Access to market					
Access to credit					
Overall policy tools					

¹² National Strategy for the Development of Rice Growing (NSDR) For Madagascar.

3.4. Mozambique

3.4.1 Background

Rice is not an indigenous crop of Mozambique. During the 1930s and 1940s, the Portuguese colonial government attempted to develop a viable commercial sector by investing in irrigation schemes. Rice became an important crop after a series of support measures that turned the country into a net exporter of rice. During the 1980s and 1990s, agricultural production reached its lowest level because of a combination of adverse factors, including civil war and droughts, which contributed to these trends. It is estimated that during these years the production of food crops, particularly rice and maize, declined by 70%, while cash crops (such as cotton, cashew nuts, tea and coconuts) declined by 25%. Between 1998 and 2009, the area under rice production decreased by 14%, the production decreased by 42%, and yield decreased by 32%, while the importation of milled rice increased by 488%.

In summary, the consumption of rice is presently increasing in Mozambique, mainly in the urban areas, with an estimated total rice market of about 550,000 MT, of which 350,000 MT are imports from Asian countries (NRDS, 2009). According to the FAO data presented in Table 8, annual rice production amounts to about 180,000 MT (or 108,000 MT milled rice equivalent), while annual milled rice imports vary between 31,500 to 425,000 MT.

Most of Mozambique's agricultural potential lies in the central and northern provinces of the country, which have more favorable climatic conditions and rainfall patterns. Rice production is concentrated in specific agro-ecological zones.

Table 8: Rice production, trade and food supply, Mozambique, 1997-2010 (FAOSTAT, 2011)

Year	Area (Ha)	Yield (Hg/ha)	Seed (MT)	Production unmilled rice (MT)	Imported milled rice (MT)	Imported milled rice 1000\$	Exported milled rice (MT)	Exported milled rice 1000\$	Food supply milled rice (MT)	Food supply quantity milled rice (kg/capita/yr)
1997	165274	10904	14480	180218	44800	13200	0	0	139667	8.27
1998	181000	10552	14887	191000	48700	16500	0	0	160414	9.26
1999	186086	10000	14736	186087	34000	10300	0	0	132489	7.45
2000	184196	9816	13939	180806	70000	21200	0	0	165482	9.07
2001	174233	9582	8000	166945	31500	9500	0	0	162351	8.66
2002	100000	9336	9600	93362	75980	13619	35	10	178556	9.27
2003	120000	9790	7600	117483	159350	30244	185	26	228295	11.54
2004	95000	9604	5360	91242	262586	49396	308	121	264212	13.01
2005	67000	9701	8400	65000	259348	67500	34	13	293758	14.10
2006	105000	9445	8400	99173	382275	96300	0	0	376097	17.61
2007	105000	9967	8320	104655	425600	127500	300	73	443198	20.27
2008	104000	9799	14560	101914	263650	100000	95	75		
2009	182000	9835	14800	179000	280346	136741	95	75		
2010	185000	9730	14800	180000						

3.4.2 National Rice Policy

Food security is a priority for the Government of Mozambique. A Strategy for the Green Revolution was established in 2007 as a measure to stimulate and increase agricultural productivity, and most importantly, basic food crops. The government identified measures that could be put in place to stimulate the production of food, and in particular, cereals. A

Government Strategy was adopted in regard to the world food situation and an Inter-ministerial Commission was created for the elaboration, implementation and monitoring of a Plan of Action for Food Crop Production between 2008 and 2011. According to this action plan, rice is the second priority crop after maize.

The NRDS of Mozambique is based on the existing rice development paper included in the Plan of Action for Food Crops Production, 2008–2011. The Plan, which was adopted to face the global food crisis in early 2008, places rice as the second priority crop after maize. Mozambique's NRDS is geared to reversing the country's increasing dependence on rice imports through harnessing its rich natural endowments, thereby contributing to the development of the commercial agricultural sector as well as to poverty reduction. Rice production in 2018 is expected to reach about 1.36 million MT; most of the increase will be derived from the expansion of rainfed lowland production, coupled to some increase in yield. Three priority areas have been identified: strengthening competitiveness of local produce; increased production and productivity; and capacity building and coordination.

3.4.3 Opportunities, Constraints and Priority Subsectors

Opportunities and Constraints

Mozambique has great potential and suitable environmental conditions for rice development. The country has around 900,000 ha suitable for rice production, of which only 200,000 ha are being cultivated. The number of families (630,000) involved in rice production could easily increase if inputs and irrigation infrastructure are put in place. An increase in domestic production could also reduce the need for rice imports and save much needed foreign currency.

Most of the rice produced in Mozambique is used for home consumption at the farm level, while about 10% of production is marketed. The increasing gap between domestic production and consumption is filled by imports. The reasons for low production of domestic rice are related to four interrelated factors including labor, land property rights, technology, water and climatic risk.

In traditional systems, which constitute the majority of the farming systems in Mozambique, land preparation, transplanting, weeding, harvesting, and even bird-scaring absorb a quantity of labor varying between 200 and 300 man days per ha. The high labor requirements are often mentioned as an explanation for the “labor scarcity” constraint in expanding rice production. Given the high labor requirements, the typical household has difficulty in cultivating more than 1 ha. Mechanization and other new technologies could be promoted in order to alleviate this constraint and contribute to higher production.

Land availability does not seem to be a major constraint to the expansion of rice production. However, the lack of land titles, the coexistence of customary and individual property rights, and other issues related to the implementation of the land law create difficult conditions for using available land effectively.

The difficulty of accessing input markets and credit to purchase inputs are indicated as a constraint to the adoption of improved technologies to increase productivity.

Less than 3% of total area under rice cultivation is irrigated and rice production systems are mostly rainfed. The problem of limited irrigated area is aggravated by inefficient water use, lack of proper drainage resulting in soil salinity, and low capacity in managing and maintenance of existing systems. A support system to improve water management, including extension services and irrigation equipment maintenance services, is largely missing. The irrigation and water control system in the south of Mozambique and particularly in the Chokwe district is a notable exception.

A common complaint perceived from the milling industry in Mozambique is the difficulty to procure sufficient raw materials. Most of the existing mills, particularly the medium and large-scale ones, are either closed or operating below capacity.

Input traders, collectors of unmilled rice, wholesalers, and retailers, also often fail to coordinate with each other and with farmers. In the case of input traders, given the low demand for fertilizers, chemicals, and seed among farmers, there is little scope for them to do the necessary investment in the input distribution system.

A platform linking farmers, millers, credit providers, and input traders would help to establish a cycle that encourages farmers to use more inputs, produce more outputs, mill more rice, and repay working capital during the rice cycle. The cycle requires a concerted action of several actors - between traders, farmers, millers and financial intermediaries. Losses in the postharvest and processing system result in a lower supply of marketable surplus, estimated at around 15-20% of production. Considerable losses also occur during production, harvesting and threshing operations.

The absence of collection centers for paddy and market infrastructure for the commercialization of rice reduces the incentives of traders and farmers to meet to ensure that a greater amount of unmilled rice/milled rice goes into marketing channels. High transport costs limit the incentives to commercialize. Lack of marketing initiatives such as brand building of Mozambican rice, and promotion and awareness campaigns, contributes to a lower awareness of the characteristics of Mozambican rice. This in turn reduces the effort of marketing intermediaries to procure domestically produced rice.

Limited commercialization of domestically produced rice is also due to the absence of a focused policy framework and a weak institutional structure. The key underlying causes include:

- Lack of a focused strategic and policy framework: to guide policies, programs, projects, and investments in the rice sector.
- Lack of an effective research and extension system: that is capable of generating and disseminating technologies because of low funding and absence of a clear commitment to establish long-term programs.
- Absence of a rural financial system: both farmers and entrepreneurs lack access to working and investment capital. Credit to agriculture is only 8% of total credit and is mainly focused on the tobacco, cotton, sugar, and cashew sectors. There is no agricultural bank with the mandate of establishing a network in rural areas and meeting the specific needs of the agricultural sector. Given the low level of agricultural commercialization, commercial banks do not have either the mandate or the incentive to finance agriculture.
- Weak capacity of farmers' and trade associations: Rice requires well-developed organizations capable of working together to manage water control and irrigation

systems through Water Use Associations. The resolution of supply bottlenecks between production and marketing requires better organization of rice collection, transportation, and processing, through the establishment of collection centers, joint planning of logistics, and stable and affordable access to production inputs and information.

Priority Subsectors

Mozambique has had a rice development strategy since 2005. A wide range of on-going rice interventions, divided into policy/institutional, infrastructure and human resource capacity projects is ongoing. Seed, fertilizers and irrigation are the subject of interventions in all projects. The future steps are designed to deal with the identified constraints. Mozambique launched the NRDS in 2010. Several constraints to implementing the NRDS were identified in research, seed production, infrastructure, technology transfer and access to credit (see Table 9). Specifically, Mozambique has a lot of poor quality seed imported from many countries and one of the main interventions will be to clean up the seed in the country. The voucher system for the distribution of fertilizers is not new in the country, having been introduced as a response to the 2007/8 food price crisis, and the system now forms part of a European Union project in three provinces to produce seeds and provide access to fertilizers for maize and rice.

Table 9: Priority subsectors in Mozambique

	Policy/ institutional	Infra- structure	Human resource capacity	Provision/ support	Information/ knowledge
Seed					
Fertilizer					
Irrigation/water management					
On-farm technology dissemination					
Mechanization					
Quality improvement					
Access to market					
Access to credit					
Overall policy tools					

3.5. Rwanda

3.5.1 Background

Rice has been grown in Rwanda since the late 1950s. By 2008, the crop was being cultivated on 12,000 ha, producing 66,000 MT of unmilled rice. Since the 1980s, the country has been unable to meet its domestic demand for rice from national production. This has resulted in an increase in rice imports to satisfy the growing demand.

Rice is a priority food crop in Rwanda. With an average productivity over 5 MT/ha/yr (FAO: 2005-2010), two seasons of rice are grown on over 12,400 ha of marshlands. Although there has been a rapid rise in rice production in the past decade, the country has not yet achieved self-sufficiency. Rwanda annually imports an average of 26,736 MT of milled rice. Furthermore, the quality of locally produced rice lags behind that of imported rice. Thus, Rwanda's rice sector is confronted with the challenge of how to sustainably raise both the production and quality of locally grown rice to meet consumer demand.

Although rice is not a traditional crop, it has emerged as the most suitable crop for marshlands and inland valleys in recent years. Several reasons justify this recent shift in cultivation. Intensive cultivation of traditional crops such as banana, cassava, beans and potato on hillside slopes has caused soil erosion and has therefore diminished the sustainability of farming in the uplands. Rice is the only crop that thrives well on these soils and produces better yields than any other traditional crop, especially during the rainy season. The newly introduced varieties can yield up to 7 MT/ha. Thus rice provides a viable alternative for millions of resource-poor rural farm families in Rwanda.

The marshland ecosystem is comparable to lowland irrigated ecosystems in Asia except this land is prone to occasional flooding, particularly during the wet season. The inconsistent rains during the dry season can expose the rice crop to short periods of drought stress. The government spends large amounts on reclaiming swamps and developing the marshlands for rice cultivation.

According to the FAO figures shown in Table 10, between 1997 and 2009, the area under rice production increased by 346%, production increased by 1,032%, yield increased by 60% while the food supply increased by 845%.

Table 10: Rice production, trade and food supply, Rwanda, 1997-2010 (FAOSTAT, 2011)

Year	Area (Ha)	Yield (Hg/ha)	Seed (MT)	Production unmilled rice (MT)	Imported milled rice (MT)	Imported milled rice 1000\$	Exported milled rice (MT)	Exported milled rice 1000\$	Food supply milled rice (MT)	Food supply quantity milled rice (kg/capita/yr)
1997	3233	30328	269	9805	3962	1314	0	0	5881	0.96
1998	4144	19148	320	7935	17021	8292	0	0	16439	2.42
1999	4919	18132	277	8919	10527	4577	0	0	28482	3.83
2000	4266	27318	331	11654	1700	450	0	0	8516	1.07
2001	5090	30668	418	15610	19383	6595	0	0	34247	4.12
2002	6423	32658	494	20976	11929	3704	0	0	25439	2.98
2003	7607	36665	791	27891	12118	3160	0	0	28522	3.28
2004	12167	37964	905	46191	1257	289	0	0	30197	3.42
2005	13922	44673	912	62194	11527	3584	143	40	51277	5.70
2006	14034	44843	975	62932	16639	6147	76	19	54022	5.87
2007	15005	41320	1200	62000	18605	7448	50	10	55581	5.88
2008	18455	44432	938	82000	12675	5000	63	25		
2009	14433	76960	843	111076	25690	9155	31	13		
2010	12975	51833	843	67253						

3.5.2 National Rice Policy

The government has set rice production as a priority, especially in the valley bottom marshlands, which have a potential yield of 7 MT/ha. Furthermore, with the recent increase in international rice prices, the crop has become a valuable cash crop for most farmers. The government aims to increase productivity to a projected national average of 7 MT/ha of unmilled rice; extend the area cultivated to about 67,000 ha of marshlands; construct and maintain water supply systems to allow for two growing seasons per year; and improve handling and processing infrastructure to minimize postharvest losses and maximize the quality and quantity of the harvest.

The National Agricultural Policy (NAP) identifies rice as one of the priority agricultural commodities. It proposes developing appropriate technological packages for the sector to improve its commodity chain. The NAP recognizes that rice offers a potential market in the country and in the EAC region. The NAP also envisages the development of improved postharvest technologies to enhance the quality and value of rice. The Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II) identified rice as one of the high value crops in the country and one of the cereal commodity chains that will serve as a major source of internal agricultural markets in Rwanda. Under program 1, the strategic plan intends to intensify the production of rice in Rwanda. Through various subprograms, it aims to improve the efficiency of using inputs such as seeds, fertilizers, soil and water. Under subprogram 1.3, it intends to develop marshlands and raise the total area under rice cultivation. It furthermore intends to reduce the importation of rice into the country.

3.5.3 The Rice Value Chain

The rice value chain is perhaps the best organized amongst all staple crop value chains in Rwanda, being vertically integrated from the lowest level. However, several major technical or structural constraints exist at the level of harvesting, drying, trading and milling, as discussed below.

Producers: Rice in Rwanda is cultivated by low-input and low-risk smallholder farmers. In 2009, people engaged in rice cultivation were 44,907 (NRDS, 2011). In Rwanda, rice farmers belong to a total of 60 cooperatives, distributed within 29 rice schemes country-wide (Western (2), Southern (12), Eastern (13), and Kigali City (2)). Each cooperative covers rice farmers in a watershed. Rice produced in Rwanda is largely sold in unorganized rural markets, whereas the mainstream urban markets largely sell imported rice. This is mainly because the locally produced rice grains suffer higher breakages upon milling. The farmers who have obtained inputs from the cooperatives on loan sell their harvest to the cooperatives. Unfortunately, however, the time taken by the cooperatives to pay cash and the low prices often force farmers to sell the unmilled grains to the unorganized rural traders and/or millers.

Rural traders: Rice farmers in Rwanda sell a significant portion of their harvest to traders and/or rice mills located in the vicinity. The traders often purchase the grains from the farmers at lower prices. Some traders also buy unmilled rice directly from farmers at the doorsteps of cooperatives at a slightly higher rate. Farmers tend to prefer the latter route because they get immediate cash and a higher price.

Millers: Rice milling remains largely an informal industry in Rwanda. The total milling machine capacity in Rwanda is 17,355 MT/year. The capacity of each milling machine varies from 0.2 to 3.6 MT/hour. In 2009, only 10,321 MT rice was processed by modern mills, while others were either milled illegally in small-scale hullers or hand pounded. Most of the cooperatives do not have accurate figures of their production, but it is estimated that over 50% of rice production is not marketed through the cooperatives. This is either consumed at household level or sold directly to traders as unmilled or milled rice. Most of the small private mills (200 kg/hour), which have recently been banned by the government, are largely incompetent. The rice mills owned by most of the cooperatives on the other hand are not well-managed, and are heterogeneous, ill-equipped and obsolete. The privately-owned and cooperative mills generally produce Grade 2 or 3 rice. Most of the milled rice from rural mills is used for subsistence ends and/or sold to consumers in rural markets. Farmers hand pound the remaining portion of the harvest themselves, producing Grade 3 rice by breaking most of

the grains (25-50%). Farmers use the hand-pounded rice for subsistence needs and/or direct sales to retailers in the rural markets. When proper care is taken, all the locally-produced rice cultivars can be milled to Grade 1. This quality gap is mainly due to absence of a linkage along the continuum of production, processing and marketing.

3.5.4 Opportunities, Constraints and Priority Subsectors

Opportunities and Constraints

Rwanda's climatic conditions provide an ideal environment for rice production. Annual rice production is currently around 65,000 MT; however, this does not meet the market demand, and more than 30% of rice consumed in Rwanda is imported from Asia and Tanzania.

Despite Rwanda's impressive rice production, access to finance for investments in the rice sector is very limited. The large investments needed to improve swamplands and renovate mills remain inaccessible due to a lack of guarantees, as the swamplands are still government property.

Mechanized postharvest equipment (for harvesting, threshing, or winnowing) is very scarce in Rwanda. With the expansion of rice production and higher yields, it is increasingly evident that human labor alone will not be capable of handling all the work, and/or will produce rice of inferior quality. The drying and storage facilities at the cooperative level are similarly insufficient in terms of quantity and quality; yet the means of accessing credit to address these constraints are not available to cooperatives.

Rice plants require proper drainage of fields to allow for uniform maturity. Due to prolonged maturation of the varieties, non-synchronized planting, lack of awareness, and labor availability, farmers in marshlands often harvest the rice under wet conditions and/or during rainy days. Since threshing is done manually by beating against drums/wood, the high moisture content of grains and straw at harvesting stage reduces the output (yield). Rwandan farmers generally sun-dry the grains, but these are not turned properly while drying. Since the harvest is carried out under wet conditions and often before grains reach physiological maturity, the uneven moisture content of grains poses an additional challenge at this stage. As a result, the grains are not dried to the prescribed moisture content of <14%. The higher moisture content affects storage life and how millable the rice grains are.

With only five milling factories possessing a total capacity of only 10 MT unmilled rice/hour, the need for increased milling capacity is significant, especially for the zones of Nyagatare and Bugarama. Plans are underway to establish a new factory in Bugarama with a capacity of 2 MT unmilled rice/hour.

Development initiatives are being undertaken in different areas to facilitate access to credit by various actors in Rwanda's rice value chain; for example:

- The District of Gisagara has promised UCORIBU, a rice union working in conjunction with ICM Ginkonko rice mill, to cede the management of the swamplands to the cooperatives, which will allow them access to credit from banks;
- The World Bank's RSSP Program continues to serve large projects with a source of financing; however, the administrative process required to tap into this source takes time; and

- Microfinance institutions such as CAF Isonga and RIM have become interested in the rice value chain and are implementing innovative activities, such as the “warrantage” system, providing finance to producers for production activities, providing finance to cooperatives to purchase unmilled rice at harvest time, etc.

Due to the accelerated reclamation of marshland, the area under rice cultivation has risen significantly in the country, increasing demand for rice seed. To overcome seed shortages, farmers are growing low-yielding rice varieties which have little culinary quality and fetch low prices. The untimely access to good-quality seeds also limits the farmers’ ability to start the season on time and to obtain optimal yields.

Poor water distribution is a major constraint among rice growers, particularly during the dry season; and for farmers whose fields are located at the lower end of a marshland. In new marshland areas, water is sufficient but often not equitably distributed, or its availability is marred by technical difficulties which cut farmers off. Furthermore, the deterioration of the drainage and irrigation infrastructure often results in the silting of canals, and the destruction of leveled plots.

Intensive monocropping of rice has gradually built up the pressure of pests and diseases to alarming levels in several marshlands. Lack of knowledge among farmers on appropriate control measures against pests and diseases is a major impediment in raising rice productivity. The limited choice of rice varieties and poor access to pesticides affects farmers’ ability to deal effectively with diseases and pests, notably blast and stemborers. In addition, the pesticides used by farmers are not properly regulated, leading to water pollution and increased health risks of farmers and farm families in the marshlands.

Use of fertilizer is one of the major factors that catalyzed the rice green revolution in Asia. The lack of suitable fertilizer recommendations and the high cost of fertilizer are the two major reasons for poor nutrient management in rice fields.

Farmers generally burn crop residues instead of recycling the nutrients stored in the residues through decomposition. The resulting lack of organic residues and the slow rate of decomposition lead to a low use of organic manure in marshlands. Soil fertility is highly variable between marshlands, and in some cases within a given marshland. Soil fertility thus remains a constant threat to the sustainability of rice cultivation in marshlands.

In general, farmers in Rwanda learn about rice cultivation from each other and from across other marshlands. The lack of human capacity has weakened the extension system in the country. The system is currently struggling to raise its technical capacity on effective and timely dissemination of improved soil, water and crop management practices that have been shown elsewhere to increase rice production.

Priority Subsectors

The priority subsectors in Rwanda are seed, marshland development and water management. Marshland development is carried out mainly by the government while water management falls under the responsibility of farmer cooperatives.

Rwanda joined the second group of countries under the CARD initiative in May 2010, and has since developed its National Rice Development Strategy (NRDS). The government aims

to increase productivity to the projected national average of 7 MT/ha of paddy rice; extend the area cultivated to about 67,000 ha of marshlands; construct and maintain water supply systems to allow two growing seasons per year; and improve handling and processing infrastructure to minimize post-harvest losses and maximize higher quality and quantity of harvest. The priority sub-sectors are seed, marshland development and water management.

Table 11: Priority subsectors in Rwanda

	Policy/ institutional	Infrastruc ture	Human resource capacity	Provision/ support	Information/ knowledge
Seed					
Fertilizer					
Irrigation/water management					
On-farm technology dissemination					
Mechanization					
Quality improvement					
Access to market					
Access to credit					
Overall policy tools					

3.6. Tanzania

3.6.1 Background

Rice farming was introduced in Tanzania during the period of German colonization starting from 1884. In Tanzania, rice is now the second most important food and commercial crop after maize. An estimated 18% of farming households grow rice, and the economic activity in the rice sector contributes to 2.66% of the national GDP. The rice sector is among the major sources of employment, income and food security for Tanzanian farming households; and it ensures a staple food supply for the urban population. Tanzania is the second largest producer of rice in East Africa, after Madagascar. With steadily growing demand due to increases in per capita consumption and population growth, the total area under rice cultivation has also increased substantially.

According to the FAO data summarized in Table 12, the rice-growing area rose from 439,300 hectares in 1997 to 720,000 hectares in 2010 of which 90% is managed by small-scale farmers with holdings of 0.5 to 3.0 ha of land each. At the same time, rice production increased from 550,000 MT of unmilled rice (equivalent to 330,000 MT of milled rice) in 1997 to 1,104,890 MT (equivalent to 662,934 MT of milled rice) in 2010, representing a growth of 13.1% per year. Tanzania's productivity did not change much and varied from 1.2 to 2.4 MT/ha. The low yield is mainly caused by the use of low-yielding varieties, drought, low soil fertility, weed infestations, and the prevalence of insect pests and diseases and birds.

Table 11: Rice production, trade and food supply, Tanzania, 1997-2010, FAOSTAT, 2011

Year	Area (Ha)	Yield (Hg/ha)	Seed (MT)	Production unmilled rice (MT)	Imported milled rice (MT)	Imported milled rice 1000\$	Exported milled rice (MT)	Exported milled rice 1000\$	Food supply milled rice (MT)	Food supply quantity milled rice (kg/capita/yr)
1997	439300	12513	30810	549700	53489	14073	804	272	493973	15.61
1998	654500	12973	31625	849100	164426	67753	11552	4500	534777	16.48
1999	379100	19219	32461	728600	58749	25259	15350	5462	537716	16.16
2000	415600	18805	33320	781538	109267	33209	4454	1304	616084	18.05
2001	405860	21379	50904	867692	55629	12910	5791	2270	647276	18.48
2002	565600	17408	55872	984615	19523	3097	3155	479	618470	17.20
2003	620800	17669	55182	1096920	60273	8608	3501	483	727300	19.69
2004	613130	17263	63179	1058460	77950	21900	165	25	753583	19.86
2005	701990	16634	57039	1167690	26550	7050	3717	697	775092	19.87
2006	633770	19543	50218	1238560	31200	8350	48	11	820398	20.45
2007	557981	24048	59820	1341850	6874	2310	15131	2305	780496	18.91
2008	664667	20256	81406	1346340	16180	9857	4410	1357		
2009	904508	14748	64800	1334000	13046	7750	214	144		
2010	720000	15346	64800	1104890						

According to a Rice Sector Strategy prepared by the Rural Livelihood Development Company (2009), consumption of rice has steadily increased over the years. The same study indicates that rice demand in Tanzania cannot be met by domestic production.

According to Table 13, per capita consumption of rice in Tanzania, by a total population of 40 million people in 2008 and an annual growth rate of 2.8%, has gradually increased from 20.5 kg in 1998 to 25.8 kg in 2008. Annual consumption of milled rice was about 1,000,000 MT in 2008 with a self-sufficiency ratio of 84.5%. The annual production of milled rice in the last decade ranged between 530,000 and 851,000 MT. In order to fill the shortfall, 50,000 to 100,000 MT of milled rice (representing about 8% of domestic consumption) was imported in 2001–2005 at a cost of about USD 130 million (it is noteworthy that at the same time, small exports worth around USD 8 million, mostly to Kenya, Zambia and other neighbors, were also recorded in these years).

Although substantial volumes of rice are produced in Tanzania, the domestic crop is not even very price competitive in the local market vis-a-vis rigidly taxed imports because of relatively high production and transaction costs. The market is dominated by products (blended rices) of a quality that delivers the most adequate nutrition at the cheapest price.

Table 13: Production and sufficiency ratios

Year	Production of milled rice (1000 MT)	Self-sufficiency ratio	Total consumption	Per capita consumption
1998	530	82.3	644	20.5
1999	511	67.1		23.6
2000	511	67.1		23
2001	569	76.5		22
2002	645	76.3	845	24.4
2003	720	78.3		26
2004	556	69		22.3
2005	573	76.6		20.3
2006	785	81.8		25.6
2007	818	84.5	968	25.5

Source: USDA 2009 World Rice Statistics and Graphics

3.6.2 National Rice Policy

The Tanzanian government's commitment to address food security issues is reflected in the implementation of the National Strategy for Growth and Reduction of Poverty (NSGRP) goals and objectives. The NSGRP envisaged growth in the agricultural sector from 5% per year in 2002/03 to 10% per year by 2010. National policies and strategies on agriculture address the need to increase food production to meet the food security objective of achieving self-sufficiency in staple food production, including rice. The rice development strategy is therefore in line with both national policies and international commitments that Tanzania has ratified aimed at improving the livelihood of rural communities through enhancing household food security and incomes.

Rice is the second most important food crop in the country after maize and as such has input support from the government. Tanzania launched its NRDS in March 2010 at a workshop attended by development partners and representatives of lead ministries in the agricultural sector. Constraints to implementing the NRDS were grouped under technical, and management and coordination headings. The technical constraints comprise: low-yielding varieties, dependence on rainfall, inadequate infrastructure (irrigation, storage, electricity, transport and processing), and low productivity. The management and coordination constraints included shortage of funds and limited human resources.

3.6.3 The Rice Value Chain

The rice value chain in Tanzania begins with farmers buying inputs and producing grain that is sold to either assemblers or consolidators (local traders) or agents of larger traders. These actors operate in rural areas and will in turn sell to traders who transport rice to urban centers for sales to millers and eventually to retailers. The larger trading companies are vertically integrated and transport, store, and mill rice to be sold in both urban and rural retail outlets. At the same time, rural millers buy rice from assemblers or from producers directly to sell to retail outlets.

Brokers, wholesalers, retailers: In Dar es Salaam, an intricate network of brokers, wholesalers, middlemen, and retailers ensure that the product gets to the final consumer. Overall, there are considerable cash transactions involved in this entire process, making rice an extremely suitable crop for stimulating economic activity.

Millers: Over the past two decades, the functioning of the rice subsector has undergone substantial evolution. Formerly, rice was milled and marketed by government-owned businesses (parastatals). Today the rice milling sector has been completely privatized, following the privatization of National Agricultural and Food Corporation (NAFCO) and National Milling Corporation (NMC); except for government operations in support services like research, input supply and extension. The impact of this transition has created more opportunities for private sector, farmers and micro, small and medium enterprises (MSMEs) at all levels of the rice value chain.

Producers: The production of rice is undertaken mainly by small-scale farmers. Less than one percent of the rice crop is produced from large scale production, although some small-scale production takes place within larger-scale communal irrigation schemes. The majority of rice farmers are thus smallholders who produce rice for home consumption and sell surplus

directly to customers or through a cooperative society. Very few are organized into producer associations.

There are two key characteristics of rice producers in Tanzania: First, they are cash poor, lacking either savings or access to credit. As a result, “distress” sales made immediately after harvest are common. Informal loans made within the village infrastructure must be paid back and the early sale of rice or other crops is one of the most common mechanisms to achieve this. Secondly, they have very limited infrastructure for the storage of rice.

3.6.4 Opportunities, Constraints and Priority Subsectors

Opportunities and Constraints

The Tanzanian government has embarked on a program to increase cereal production in the country, including the six major rice-producing regions of Mbeya, Iringa, Ruvuma, Rukwa, Morogoro and Kigoma. Other important regions for rice production are: Mwanza, Shinyanga and Tabora. Tanzania is endowed with considerable water resources comprising rivers, lakes, and underground water sources for irrigation and other uses. From 2007 to 2009, the area under irrigation increased from 289,245 to 306,745 ha through the rehabilitation and development of new irrigation schemes. The total area under irrigation is targeted to increase by 854,300 ha by 2017.

Liberalization of the seed subsector has enabled the emergence of private seed companies, which are taking up production and sale of improved rice varieties such as SARO 5 (TXD 306), being multiplied and marketed by the Agricultural Seed Agency (ASA). In 2008, ASA produced and marketed about 120,000 MT of improved rice seed. Breeder (pre-basic) seed is multiplied at Kilombero Agricultural Training and Research Institute (KATRIN) at Ifakara; and at Dakawa quality declared seeds (QDS) are produced by farmers in groups or individually for sale to ASA, agro-dealers or directly to farmers in the same locality. Tanzania has set up procedures and regulations to ensure that seed reaching the farmer is of prescribed quality through the Tanzania Official Seed Certifying Institute (TOSCI) of the Ministry of Agriculture, Food Security and Cooperatives (MAFSC).

Nevertheless, improved seeds are used by only 10 percent of farmers. The use of self-saved seeds is common among small-scale rice farmers and these seeds are generally of low quality. The lack of availability of rice varieties with tolerance to drought, cold weather, major insect pests and diseases is a major challenge facing the rice sub-sector in Tanzania.

Most rice production in the country is rainfed and annual rainfall variation makes rainfed rice production susceptible to flooding or drought. The risk of drought impedes investment, causing production to stagnate at a subsistence level. The deterioration of drainage and irrigation facilities is posing a considerable constraint to increasing production of rice.

Rice producers and processors have restricted access to credit due to the reluctance and inability of commercial banks to provide financial support to the rural sector. The usual reason for the lack of credit is the insistence of commercial banks to have land as collateral. Farmers and processors lack collateral to be able to borrow from commercial banks. Also, loans from the banks have very high interest rates.

Private sector participation in the rice value chain is limited due to inadequate financial capabilities and lack of market information. However, the private sector is active in rice milling, supply of agro-inputs and trade. The participation of the private sector in production only occurs in large-scale rice production farms at Mbarali and Kapunga in Mbeya Region.

Priority Subsectors

Tanzania launched its NRDS in March 2010 and priority sectors identified are show in Table 14. The country has eleven ongoing rice-related development projects to: improve technical training centers; increase productivity; rehabilitate irrigation infrastructure; support the service delivery systems of irrigated agriculture; improve rice varieties through breeding and biotechnology; breed seed for disease resistance; improve input support from the government for food crop production (including rice); and improve how the private sector and other stakeholders should collaborate on agriculture in the Kilimo Kwanza.

The short-term priorities in this subsector are: introducing small-scale labor-saving technologies; strengthening research and extension services; and strengthening collaboration and links between national, regional and international institutions. In the medium term, Tanzania aims to strengthen its rice seed systems and to develop and rehabilitate irrigation systems. The long-term priorities are to develop infrastructure for rice production and value addition. The NRDS is linked with national strategies, and the support sought from development partners for implementing the NRDS has been mainstreamed through the government budget system. In the future, the government hopes to further improve the links between the NRDS and the national development and funding frameworks, and to improve implementation efficiency.

Table 14: Priority subsectors in Tanzania

	Policy/ institutional	Infrastruc ture	Human resource capacity	Provision/ support	Information/ knowledge
Seed					
Fertilizer					
Irrigation/water management					
On-farm technology dissemination					
Mechanization					
Quality improvement					
Access to market					
Access to credit					
Overall policy tools					

3.7. Uganda

3.7.1 Background

Although rice production was introduced in Uganda back in 1904, it only became economically relevant in the late 1940s as part of government efforts to incorporate rice-based food rations for the army. With the establishment of rice schemes in Kibimba in 1966 and Doho in 1976, smallholder lowland rice production took off in the eastern and northern parts of the country. However, it was only in the late 1980s that the production area rapidly increased to reach the current figure of 140,000 ha (see Table 15). Today, Uganda's total

annual rice production stands at 140,000 MT of milled rice representing about 70% of the national rice demand estimated to be 200,000 MT. Average unmilled rice yield in the country stands at a low 1.5-2.0 MT/ha (Final survey report on the status of rice production, processing and marketing in Uganda, 2006).

Demand for rice in Uganda has increased dramatically since 1997 and with a population growth rate of 3.2%, it is expected to continue to rise. According to FAO data shown in Table 15 below, annual unmilled rice production has increased from 80,000 MT in 1997 to over 210,000 MT in 2010, representing an annual growth rate of 12%. This strong increase in domestic rice production is mainly attributed to the release of improved rice varieties in 2002 (particularly upland NERICA varieties), conducive government policies, and increased demand and consumption of rice, particularly among urban and peri-urban populations. However, despite this production growth, annual milled rice imports remained at an average 22,500 MT (37,500 MT unmilled rice equivalent) over the five years between 2005-2010.

The per capita consumption of rice is estimated at 8 kg, producing a total consumption of 224,000 MT by the population of 28–30 million, which is growing at 3.2% per annum. Imports total 60,000 MT. Between 2003 and 2007, rice production increased from 123,000 to 160,000 MT. About 80% of rice farmers are small-scale farmers with less than 2 ha, and women play a major role in rice production. The goal of Uganda's NRDS is to increase household food security and reduce household poverty through increased production of high-quality rice, coupled to specific targets of achieving self-sufficiency in 2013 with 335,400 MT of production, and generating a surplus by 2018 at 540,150 MT¹³.

Table 15: Rice production, trade and food supply, Uganda, 1997-2010 (FAOSTAT, 2011)

Year	Area (Ha)	Yield (Hg/ha)	Seed (MT)	Production unmilled rice (MT)	Imported milled rice (MT)	Imported milled rice 1000\$	Exported milled rice (MT)	Exported milled rice 1000\$	Food supply milled rice (MT)	Food supply quantity milled rice (kg/capita/yr)
1997	60000	13333	6400	80000	15795	5583	276	119	77318	3.47
1998	64000	14063	6800	90000	34195	8077	256	113	84707	3.69
1999	68000	13971	7200	95000	18876	6778	197	68	115436	4.87
2000	72000	15139	7600	109000	31415	10270	682	256	114104	4.67
2001	76000	15000	8000	114000	16077	4500	380	103	88437	3.51
2002	80000	15000	8600	120000	20513	5601	720	198	112509	4.32
2003	86000	15349	9300	132000	9872	2977	34	16	124866	4.64
2004	93000	13011	10200	121000	16300	4950	2407	703	124346	4.48
2005	102000	15000	11300	153000	19100	5400	5610	1446	142227	4.96
2006	113000	13628	11900	154000	9750	3250	881	302	125124	4.22
2007	119000	13613	12800	162000	24576	6050	1193	314	144235	4.71
2008	128000	13895	13800	177857	30195	11200	3153	2303		
2009	138000	14911	14000	205765	29764	11236	9280	3965		
2010	140000	15579	14000	218111						

Beginning in 2005, the East Africa Community (EAC) member states Kenya, Uganda and Tanzania (Rwanda and Burundi followed) agreed to an EAC common external rice import tariff at 75% *ad valorem*. In line with a regionally-held notion that “food security” can be achieved by ensuring that domestic food production can fully meet domestic demand, EAC negotiators opted to protect the farming sector rather than consumers by agreeing to this

¹³ Uganda Ministry of Agriculture, Animal Industry and Fisheries, 2009.

relatively high import tariff. This makes the price of locally milled rice (currently at around USD 1,000 per MT) competitive.

Today, rice is grown mainly by smallholder farmers throughout the country. It is estimated that 59% of the area cultivated with rice is under lowland rainfed conditions, 36% is upland rainfed rice, and 5% is irrigated rice. Rainfed lowland (or hydromorphic) rice is grown on soils where the roots are periodically saturated by a fluctuating water table in addition to rainfall. Upland (or dryland) rice is grown on naturally drained soils where the water table always remains below the rice roots. The moisture supply is entirely from rainfall. Irrigated (or paddy) rice is grown on banded paddies, either under rainfed or irrigated conditions.

According to a survey conducted in 2006 by JICA and Sasakawa Global 2000 (SG2000), average household landholding size ranges between 2 and 6 hectares. Lira and Iganga districts have grown rice the longest compared to the other districts surveyed, and both grow lowland and upland rice varieties.

3.7.2 National Rice Policy

Agriculture is the mainstay of Uganda's economy, contributing 42% of GDP, over 85% of export earnings; and provides employment for over 80% of the population, 90% of whom lives in rural areas. The majority of agricultural output comes from about 4.5 million small-scale subsistence households, 80% of whom owns about 2 ha of land and produces a number of different food and cash crops besides herding some livestock.

Since the agricultural sector embraces such a large proportion of the country's population, the Government of Uganda (GoU) recognized the role of the sector in poverty eradication and is therefore implementing a Poverty Eradication Action Plan (PEAP). The poverty focus foresees modern farming as the lead strategy to enable the poor to raise their incomes and improve livelihoods. In order to meet this challenge, the government has developed the Plan for the Modernization of Agriculture (PMA) as a strategic framework within the PEAP that provides for the transformation of what is currently predominantly subsistence agriculture, into a market-oriented sector of the national economy; in order to create an environment for promoting investments in profitable arable agriculture, livestock farming, and utilization of fisheries, forestry and other natural resources; while generating gainful employment in all sectors of the economy.

The Ministry of Agriculture, Animal Industry and Fisheries recently demarcated the country into Agricultural Zones. Each zone has specific and unique production features that indicate comparative advantages for particular agricultural enterprises. In this way, rapid economic growth can be stimulated and household poverty reduced.

3.7.3 The Rice Value Chain

Producers: About 80% of rice farmers have farms of less than 2 ha. They use simple tools, little or no fertilizer, poor-quality seed, with little or no irrigation and poor water management practices, among others. Medium-scale farmers with landholdings of 2-6 ha represent about 15% of rice farmers in Uganda; this group produces rice using practices similar to small-scale farmers and a few use tools such as line markers. The major difference between medium and small-scale is the landholding size. About 5% of rice farmers are considered to be large-scale,

with over 6 ha of land under cultivation. The category of large-scale farmers includes rice schemes with production units of over 1,000 hectares.

Rural farmers: Rural farmers, and some farmers' groups with large holdings, transport the rice to millers to be milled prior to sale. Selling at the farm-gate is attributed to urgent family needs and relatively high costs of transport to the milling centers. Most farmers plant between one and two hectares of rice and sell their unhulled rice to rural traders or agents who collect it from their farms.

Rural agents: Rural agents handle most rice that is traded. Their functions are similar to those of the maize agents except that they also normally supply gunny bags, free of charge, to the farmers; and advise the rice millers when rice quantities are sufficient to merit sending transport for them. Variation in price is attributable to the availability of and demand for rice in the market.

Millers: Currently, there are close to 600 operational rice mills in Uganda. Most of these are small Engelberg type mills¹⁴ (77.5%) and Milltop mills¹⁵ (20.8%), with only few medium to large-scale mills (1.7%). The small rice-milling industries using Engelberg and Milltop machines mill 95% of the domestic unmilled rice production with an average maximum capacity of one ton per hour. These small mills contribute to the persistently low quality and market value of the rice. Mills are typically located in general trading centers of the main rice-growing districts where they also act as marketing centers for farmers/rural traders, millers and urban traders to conclude deals. Hulled rice is assembled and sold by large-scale farmers, farmers' groups and millers, to the urban traders and wholesalers. In order to attract business, millers normally supply gunny bags and provide transport to farmers to bring rice to their facilities. Some millers also assist the farmers to open up and clear their land. A few of the large-scale farmers pay the transport costs to milling centers themselves.

With the exception of a few mills that can de-stone and grade (into polished, unpolished and broken), the majority of mills produce a single grade type of rice which yields polished whole grains mixed with broken rice and stones. One of the largest mills in the country is Tilda Uganda Limited¹⁶ (TUL), which took over the Kibimba rice scheme in 1996 in the extreme east of Bugiri District. The ultra-modern TUL milling machinery has a processing capacity of 40,000 MT rice per year. At the Kibimba irrigated rice scheme, TUL has set up a large outgrowers' scheme in partnership with USAID/IDEA; this has introduced more tasty and lucrative upland rice varieties to the western plains of Bunyoro in order to meet increasingly differentiated domestic consumer preferences.

Urban traders: Urban traders are primarily wholesalers and importers who either purchase hulled rice from the millers and farmers or import it from other countries. Urban traders are mainly based in Kampala with a few living in Gulu and Lira towns. Traders usually clean,

¹⁴ With the Engelberg mill, hulling and polishing (removal of different layers below the husk) can be done in several stages during the same passage. Engelberg mills are widely used in small mills for milling rice for local markets. The essential principle of the Engelberg mill is that of a roller revolving inside a casing.

¹⁵ The Milltop mill is a one-pass machine which performs the husking, separation of husks and brown rice, the whitening and bran removal. The machine is a sturdy and simple construction allowing for low running costs and easy operation. The quality of rice milled by Engelberg tends to be lower than that by the Milltop type.

¹⁶ Tilda Uganda Limited (TUL) is a commercial agricultural company belonging to the Madhvani Group. TUL grows rice on a 4,000 ha plantation and processes it for domestic consumption and export to Kenya. Private outgrowers also sell their produce to TUL.

consolidate and bulk the rice. Much of the rice is sold to traders from southern Sudan, and the rest is taken to Kampala.

3.7.4 Opportunities, Constraints and Priority Subsectors

Opportunities and Constraints

Rice in Uganda is increasingly becoming a popular staple food as well as a cash crop. Previously, rice production technologies required wet ecological conditions, which meant that rice growing in Uganda remained unpopular for over 60 years, until NERICA upland rice was introduced in 2002. It is now possible to grow rice in almost every part of Uganda. Rice production in Uganda increased from 120,000MT in 2002 to 200,000MT in 2010, saving Uganda over USD 50 million annually on rice importation. Net import however is still estimated at about 60,000 MT.

Key constraints to rice production in Uganda include among others:

- Changing rainfall patterns against the backdrop of inadequate irrigation facilities;
- Declining soil fertility amidst a low fertilizer use regime;
- Pests and diseases and unaffordable agrochemicals;
- Poor postharvest handling and processing and thus low grain quality;
- Inefficient marketing infrastructure; and
- Inadequate advisory and extension services.

Priority Subsectors

The Uganda NRDS was launched in May 2009. The NRDS has links with the Comprehensive Africa Agriculture Development Program (CAADP), the National Development Plan (NDP) and the Development Strategy and Investment Plan (DSIP) of the Agriculture Sector, which identifies investment priorities. Its priority subsector strategies include (see Table 16): improving seed system facilities; training researchers, farmers and private sector personnel in seed production; improving research and technology generation; increasing access to and adoption of knowledge and technologies; developing a policy on fertilizer usage (currently not taxed) and soil management; improving irrigation infrastructure and water management; subsidizing acquisition costs for machinery and equipment; developing policy on agricultural finance; advocating land tenure and property rights reform to facilitate security for loans; strengthening the postharvest rice technology development center and training personnel; disseminating market information on rice quality and standards; and promoting packaging and branding.

Table 16: Priority subsectors in Uganda

	Policy/ institutional	Infra- structure	Human resource capacity	Provision/ support	Information/ knowledge
Seed					
Fertilizer					
Irrigation/water management					
On-farm technology dissemination					
Mechanization					
Quality improvement					
Access to market					
Access to credit					
Overall policy tools					

4. Conclusions and Recommendations

4.1 Summary and Conclusions

4.1.1 Summary of observations: Africa and the seven East African Countries

Africa

Africa's rice production has not been able to match the growth in demand. With a high dependence on imports, Africa, as a whole, is highly exposed to international market shocks. This may have grave consequences for its food security and political stability. In many countries, African rice fails to compete with imports because large-scale commercial rice processing is poorly developed or limited, and urban consumers have become used to the look and feel of imported rice. The potential for growth in the overall African rice sector is enormous, but a rapid increase in the area under rice, irrigated as well as rainfed, is necessary.

East Africa

In East Africa, a strong upward trend in production grew at a rate of 7.21% during the 2001-2005 period. All countries increased annual rice production, resulting in a higher rice production growth rate in East Africa than in both Central and West Africa. The region's performance was primarily due to increases in rice production in Kenya, Tanzania, Uganda and Madagascar.

On a per capita basis, Madagascar, Mozambique and Tanzania stand out as major rice-consuming nations in Africa. With per capita food supply of more than 100 kg/year, rice is by far the main staple in Madagascar.

Between 2001 and 2005, East Africa became nearly self-sufficient in rice, with rice imports representing only 7% of the total quantity consumed. However, with increasing rice demand in almost every country, reliance on the world market to supply rice to African consumers, even in relatively small amounts, is becoming a *very risky, expensive and unsustainable strategy* -- and may lead to severe food insecurity and civil unrest. In terms of statistics, the total area brought under rice cultivation in East Africa increased at an annual rate of 0.45%. East Africa recorded a remarkably high rate of increase in yield between 2001 and 2005, at 6.73% per year. Aggregate rice yield averaged 2.2 MT/ha during this period.

Ethiopia

With about 17 million hectares of land suitable to rice production, Ethiopia has tremendous potential to increase the area under rice and is looking for partnerships to make use of this land.

Constraints for sustainable increased production and productivity abound, however: poor access to improved rice varieties, especially for irrigated rice, and limited participation of seed growers in the production and marketing of rice seed; poor access and use of modern postharvest techniques and equipment; grassy weeds and insect pests; limited access to credit; shortage of labor, specifically during periods of intensive weeding; poor knowledge of producers and other market actors about rice product quality; excessive numbers of intermediaries, and price seasonality; and finally, inadequate storage.

On the plus side, there is considerable interest in the large-scale commercial production of rice in all potential areas of the country; Ethiopia joined the CARD initiative as a member of the second group countries in 2009, and has since developed its National Rice Research and Development Strategies of Ethiopia. The Ethiopian government has made partnership arrangements with local and international stakeholders. Priority actions have been identified.

Kenya

While rice is the third most important staple cereal in Kenya after maize and wheat, the country is only able to produce 20% of its national needs.

Local Kenyan rice has difficulties competing for consumer preference, with imported Asian rice. The Kenyan government is therefore working to improve the quality of its local rice. Kenya (NDRS) has set for itself a target of increasing rice production from the current 75,000 MT/year to 178,580 MT/year by 2018. About 80% of the required increase will be derived from the expansion and rehabilitation of irrigated rice production. The main thrust of the planned rice development addresses technical issues; farm inputs and equipment; credit support; infrastructure; and market structure improvement. As a result, by 2030, the country hopes to be self-sufficient in rice production and to produce a surplus for export.

In general, rice production systems are profitable, despite low yields obtained by farmers. Techniques need to be examined to increase rice output on farms and hence improve income and nutrition in rice-producing households. Capital is a constraint for most farms despite the availability of credit which most farmers are not using - mainly because of lack of knowledge about credit facilities and fear of loans. Low availability of water for irrigation is found to be a constraint to farmers in irrigation schemes, especially in the Mwea region.

Irrigated rice production is more profitable than rainfed rice production as it has a higher gross margin. Kenya's irrigation potential is estimated at 540,000 ha of which only about 105,000 ha is exploited.

According to the Kenya NRDS, which was launched in October 2009, priority areas for future interventions are: irrigation, seed production, capacity building for farmers and front-line staff, access to credit, on-farm interventions, and disease control.

Madagascar

Madagascar is the largest African producer and largest per capita consumer of rice. The country produces close to 5 million MT of rice, but it does not have a cohesive marketing strategy even though there are separate domestic and external marketing strategies. The major challenge for the agricultural sector (including rice) remains the building of its capacity to supply the market with a sufficient quantity of quality products; this in order to ensure food security for the growing population, to supply industries down the chain, and to export.

Domestic rice production has almost doubled between 1997 and 2010. This increase is driven by both area expansion and productivity growth. Domestic production, (average of 4.1% per year from 1997 to 2007), has kept up with demand for rice (about 4.2% per year) during the same period. The entire rice supply chain represents the most important economic activity in

Madagascar since 1999. Rice farmers generate over 85% of the total added value of the rice value chain.

Priority subsectors emphasized by the country NRDS, launched in December 2009, are: seed, fertilizer, irrigation, water management, transfer of technology, mechanization and improved access to markets. The sector must also address systemic constraints, such as an inefficient marketing system and isolation of production areas from the major markets.

Mozambique

Mozambique has great potential and suitable environmental conditions for rice development. The country has around 900,000 ha suitable for rice production, of which only 200,000 ha are being cultivated. The number of families (630,000) involved in rice production could easily increase if inputs and irrigation infrastructure were put in place.

Most of the rice produced in Mozambique is used for home consumption at the farm level, while about 10% of production is marketed. The increasing gap between domestic production and consumption is filled by imports. The reasons for low production of domestic rice are due to four interrelated factors: labor, land property rights, technology, water and climatic risk.

Less than 3% of total area under rice cultivation is irrigated and rice production systems are mostly rainfed. The problem of limited irrigated area is aggravated by inefficient water use. Limited commercialization of domestically produced rice is also due to the absence of a focused policy framework and a weak institutional structure.

Mozambique has had a rice development strategy since 2005. A wide range of rice interventions, divided into policy/institutional, infrastructure and human resource capacity projects is ongoing. Seed, fertilizers and irrigation are the subject of interventions in all projects. The future steps are designed to deal with the identified constraints. Mozambique launched the NRDS in 2010.

Rwanda

Although rice is not a traditional crop in Rwanda, it has emerged in recent years, as the most suitable crop for marshlands and inland valleys. Since the 1980s, the country has been unable to meet its domestic demand for rice from national production. This has resulted in an increase in rice imports to satisfy the growing demand. Furthermore, the quality of locally produced rice lags behind that of imported rice. Thus, Rwanda's rice sector is confronted with the challenge of how to sustainably raise both the production and quality of locally grown rice to meet consumer demand.

The government has set rice production as a priority, especially in the valley bottom marshlands, which have a potential yield of 7 MT/ha. Furthermore, with the recent increase in international rice prices, rice has become a valuable cash crop for most farmers. The priority subsectors in the country are seed, marshland development and water management.

The government proposes developing appropriate technological packages for the sector to improve its commodity chain. The Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II), through various subprograms, aims to improve the efficiency of using inputs such as seeds, fertilizers, soil and water; to develop marshlands;

and to raise the total area under rice cultivation. It furthermore intends to reduce the importation of rice into the country.

Tanzania

The rice sector is among the major sources of employment, income and food security for Tanzanian farming households; and it ensures a staple food supply for the urban population. Tanzania is the second largest producer of rice in East Africa, after Madagascar. With steadily growing demand due to increases in per capita consumption and population growth, the total area under rice cultivation has also increased substantially.

Most rice production in the country is rainfed and annual rainfall variation makes rainfed rice production susceptible to flooding or drought.

Tanzania's productivity is low and varies from 1.2 to 2.4 MT/ha. The low yield is mainly caused by the use of low-yielding varieties, drought, low soil fertility, weed infestations, and the prevalence of insect pests and diseases and birds.

Although substantial volumes of rice are produced in Tanzania, the domestic crop is not even very price competitive in the local market vis-a-vis rigidly taxed imports because of relatively high production and transaction costs. The market is dominated by products (blended rices) of a quality that delivers the most adequate nutrition at the cheapest price.

Rice is the second most important food crop in the country after maize and as such has input support from the government. Tanzania launched its NRDS in March 2010. Liberalization of the seed subsector has enabled the emergence of private seed companies, which are taking up production and sale of improved rice varieties.

The country has eleven ongoing rice-related development projects that aim to: improve technical training centers; increase productivity; rehabilitate irrigation infrastructure; support the service delivery systems of irrigated agriculture; improve rice varieties through breeding and biotechnology; breed seed for disease resistance; improve input support from the government for food crop production; and improve how the private sector and other stakeholders should collaborate on agriculture in the Kilimo Kwanza.

Uganda

Today, rice is grown mainly by smallholder farmers throughout the country. It is estimated that 59% of the area cultivated with rice is under lowland rainfed conditions, 36% is upland rainfed rice, and 5% is irrigated rice.

Uganda's production area is presently 140,000 ha. Today, Uganda's total annual rice production stands at 140,000 MT of milled rice representing about 70% of the national rice demand estimated to be 200,000 MT. Average unmilled rice yield in the country stands at a low 1.5-2.0 MT/ha.

Despite recent production growth, annual milled rice imports remained at an average 22,500 MT (37,500 MT unmilled rice equivalent) over the five years between 2005 and 2010.

However, despite this production growth, annual milled rice imports remained at an average 22,500 MT (37,500 MT unmilled rice equivalent). Imports total 60,000 MT. Uganda's NRDS

is ambitious: increase household food security and reduce household poverty through increased production of high-quality rice, coupled with specific targets of achieving self-sufficiency in 2013 with 335,400 MT of production, and generating a surplus by 2018.

Rice in Uganda is increasingly becoming a popular staple food as well as a cash crop. Key constraints to rice production in Uganda include among others, changing rainfall patterns against the backdrop of inadequate irrigation facilities; declining soil fertility amidst a low fertilizer use regime; pests and diseases and unaffordable agrochemicals; poor postharvest handling and processing and thus low grain quality; inefficient marketing infrastructure; and inadequate advisory and extension services.

The Uganda NRDS was launched in May 2009. Its priority subsector strategies include: improving seed system facilities; training researchers, farmers and private sector personnel in seed production; improving research; increasing access to and adoption of technologies; developing a policy on fertilizer usage and soil management; improving irrigation infrastructure and water management; subsidizing machinery and equipment costs; developing policy on agricultural finance; facilitate loans; strengthening postharvest rice technology; disseminating market information; and promoting packaging and branding.

4.1.2 Conclusions

All seven countries reviewed see a rise in domestic demand for rice, and seek to improve rice production and postharvest processes in order to replace imports. The countries have a lot more in common than not, in terms of their rice production potential, constraints and national rice development strategies. They all appear to have significant potential to increase areas under rice cultivation, and to improve productivity. Yet, there are key constraints for small-scale rice farmers in East Africa, many of which are held in common with farmers growing any food crop in the region. For example:

- Poor access of farmers to improved seed varieties to enhance productivity at the farmer level;
- Lack of sustainable mechanisms for providing improved agronomic skills and enhanced farmers' organization;
- Infrequent marketing and business linkages with the private-sector actors such as agro-processors and the input industry (seeds and fertilizers); and
- Lack of synergies and cooperation with other actors performing a facilitating role in the subsector.

The rice sub-sector is characterized by the following general patterns:

Agro-ecology: Irrigated systems present the preferred agro-ecological conditions for rice development in Kenya, Madagascar, Mozambique, Rwanda and Tanzania; rainfed lowland systems are favored in Uganda and Mozambique. Proposals for expanding land area under rice cultivation in some countries are however overly optimistic, especially for irrigated areas. The targeted yields are in principle attainable, but it is necessary to articulate and prioritize the strategies and conditions needed to achieve them.

Access to credit: The various National Rice Development Strategies (NRDS) indicate that lack of access to credit and inappropriate land tenure institutions are serious socioeconomic constraints. For example, even if credit facilities are available, how can farmers find out about

them, and how can they overcome their fear of taking out loans? Offering options other than land as collateral needs attention. In addition, the important role of women in rice production was acknowledged, but the strategies do not elaborate how to cater to their needs; i.e., to enable them to be more productive, while being able to fulfill their other roles and also improve their own and their children's wellbeing.

Seed production: The NRDS commonly overestimated the amount of certified seeds that would be produced. Although most countries have seed production systems in place, with varying degrees of public-private sector involvement, they need support to get them up to the desired level of production both in terms of quality and quantity.

Fertilizer: Most countries estimate fertilizer needs by assuming fixed and very high application rates. This gives an incomplete picture of the nutrient requirements. Using rice nutrient needs to achieve the set production targets and taking into account the most cost-effective application is a more efficient approach. Overall, there is no doubt that an integrated crop management approach is necessary to improve fertilizer efficiency while raising rice production.

Infrastructure: Without exception, the countries recognized the need for appropriate mechanization all along the rice value chain, to attain the targets for increased areas in rice production and to improve the timeliness of field and postharvest operations. This will require building local machinery production and maintenance capacity. Access to reliable and cheap sources of energy and an adequate transportation network are also important preconditions to ensuring that rice processors can be competitive.

Water: All the NRDS emphasized the need to invest in water control infrastructure, including rehabilitating run-down irrigation systems. However, the ownership and modalities for operating and maintaining the schemes have to be clarified and more work is needed to harmonize policies between different ministries, with respect to water use at the national level and between countries at the regional level. This must be coupled with identifying the most promising strategic locations for rice production and processing with respect to markets for rice. Improved water policies will also have to be underpinned by investments in improved transport infrastructure between production areas and markets. This is both a national and regional issue that has not been given sufficient attention.

Pre and postharvest losses: The importance of producing good-quality grain was recognized, but the extent of pre and postharvest losses have not been countered into strategies for rice value chain development. This resulted in an underestimation of the attention needed to reducing losses as a means of increasing the amount of grain that would be available for sale. Attention must be paid to improving knowledge regarding harvesting, threshing, drying and storage processes, and the capacity to handle the anticipated increased quantities of rice harvested.

Market-directed rice value chain: There is little detailed elucidation of the roles of the different national and regional actors in the rice value chains, as well as the connections between steps. Marketing was highlighted as an important national and regional issue. To facilitate marketing of locally-produced rice, more attention should be given to collecting data to get a better understanding of consumer preferences. There is furthermore little formulation of enabling national and regional trade policies.

Human resources: Every country realizes the need to strengthen human resources in rice research and extension, but the ways and means for achieving this have not yet been adequately addressed. There is also a need for improved access to rice-related information, research and extension services, and to improve the infrastructure for supporting the production and delivery of research products to the end users. These were among the regional issues that do not yet seem to have been adequately thought through in all countries in the study.

4.2. Recommendations

One of the prime objectives of this study is to identify and propose two countries of East Africa that could serve as the geographic basis for a project proposal in the East African rice sector and where the implementation of a project is feasible.

Assessing the study results and overall assessment of the seven countries, an argument could be developed in support of a project in any of the seven countries. However, in light of the overall similarities in their NRDS, challenges and constraints, as well as their geographic proximity, this study recommends Uganda and Tanzania as the two countries most suited to developing a rice value chain project.

Uganda and Tanzania are both net importers of rice. Both countries seek to double rice production by 2018 (Tanzania from 900,000 MT (2008) to 2 million MT (2018), and Uganda from 180,000 MT to 500,000 MT). The Government of Uganda intends to increase rice production to cater to the ever-increasing demand. About 80% of rice farmers in Uganda are small-scale farmers with landholding sizes of less than 2 ha using simple technologies and rudimentary hand tools. This reflects the technology improvements to be made, but also the tremendous production increase potential after those improvements are made.

In Tanzania, rice is the second most important food and commercial crop after maize; it is among the major sources of employment, income and food security for Tanzanian farming households.

Both countries share several common constraints which include: lack of access to production technologies including quality seed, fertilizer and agrochemicals; poor access to agricultural credit; lack of appropriate mechanization (both production and postharvest); limited investment in irrigation; lack of grading standards; and limited private sector investment in large-scale rice processing.

Some preliminary recommendations that would apply to both Uganda and Tanzania:

- Support seed multiplication and marketing of improved rice varieties;
- Capacity building of farmers on rice intensification and postharvest handling;
- Diffusion of improved rice technologies using a private sector-led approach (stockists and use of rice box);
- Rice is a labor-intensive crop and appropriate labor-saving technologies need to be accessed by the farmers especially as they tend to commercial production. Promotion of equipment hiring schemes;
- Scaling up of proven supply chain models, e.g. nucleus estate outgrower schemes in collaboration with large-scale agro-processors.

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Annex: Overview of Rice Interventions in East Africa by Donors

ETHIOPIA

	Policy / institutional	Infrastructure	Human resource capacity	Provision / support	Information / knowledge
Seed			Africa Rice Center- Developing stress-tolerant rice for poor farmers in Africa and South Asia Africa Rice center- Emergency Rice Project Africa Rice center- Developing the next generation of new rice varieties for sub-Saharan Africa and Southeast Asia Africa Rice center- Interspecific Hybridization Project		
Fertilizer					
Irrigation / water management					
On-farm technology dissemination					
Mechanization					
Quality improvement			JICA, EIAR, RARI, Universities- Organizing of women farmers for better production , postharvest handling and marketing		JICA, EIAR, RARI, Universities- Training of researchers and farmers in PRA , and improvement of extension materials
Access to market					
Access to credit					
Overall policy tools					

KENYA

	Policy / institutional	Infrastructure	Human resource capacity	Provision / support	Information / knowledge
Seed	JICA/African Institute for Capacity Development- Registration of suitable NERICA varieties with Kenya Plant Health Inspectorate Services		Rockefeller- Evaluating the adaptability and seed production potential of the New Rice for Africa varieties in different agroecologies and socio-economic settings in western Kenya Africa Rice- Emergency Rice Project Africa Rice- Developing the next generation of new rice varieties for sub-Saharan Africa and Southeast Asia Africa Rice - Interspecific Hybridization Project	Rockefeller- Evaluating the adaptability and seed production potential of the New Rice for Africa varieties in different agroecologies and socio-economic settings in western Kenya FAO- Initiative on Soaring Food Prices	Rockefeller- Evaluating the adaptability and seed production potential of the New Rice for Africa varieties in different agroecologies and socio-economic settings in western Kenya
Fertilizer				FAO- Initiative on Soaring Food Prices	
Irrigation / water management	WB- Natural Resources Management Project	WB- Natural Resources Management Project BADEA- The Rehabilitation and Development of Holla Irrigation project – (Phase 1&2) OPEC / Saudi Fund / BADEA / GoK- Bura Irrigation & Resettlement Project JICA/National Irrigation Board- Rehabilitation of Mwea Irrigation Scheme JICA/Ministry of	WB- Natural Resources Management Project		

		Agriculture- Irrigation, drainage and water storage development and management			
On-farm technology dissemination	WB- Kenya Agricultural Productivity Project (KAPP)		OPEC/Saudi Fund/BADEA/GoK- Bura Irrigation & Resettlement Project Rockefeller- Evaluating the adaptability and seed production potential of the New Rice for Africa varieties in different agroecologies and socio-economic settings in western Kenya IFAD- Southern Nyanza Community Development Project IFAD- Mount Kenya East Pilot Project for Natural Resource Management JICA/Ministry of Agriculture- Rice technology and production development and promotion		
Mechanization					
Quality improvement			Rockefeller- Evaluating the adaptability and seed production potential of the New Rice for Africa varieties in different agroecologies and socio-economic settings in western Kenya JICA/Ministry of Agriculture- Increasing		

			agricultural production through participatory planning, pluralistic extension and community agricultural development		
Access to market		OPEC/Saudi Fund / BADEA /GoK- Bura Irrigation & Resettlement Project	Rockefeller- Evaluating the adaptability and seed production potential of the New Rice for Africa varieties in different agroecologies and socio-economic settings in western Kenya		
Access to credit				OPEC/Saudi Fund / BADEA /GoK- Bura Irrigation & Resettlement Project FAO- Initiative on Soaring Food Prices	
Overall policy tools	WB- Kenya Agricultural Productivity Project (KAPP)				FAO- Initiative on Soaring Food Prices

MADAGASCAR

	Policy / institutional	Infrastructure	Human resource capacity	Provision / support	Information / knowledge
Seed	<p>AKF- Programme de Soutien dans la Région de la Sofia pour le Développement Rural Intégré</p> <p>FAO- Appui pour la redynamisation du sous-secteur semencier malgache en vue de la production et de l'utilisation de semences de qualité</p> <p>ctb</p> <p>- Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers</p> <p>CRS- Seed Voucher and Fairs Project to Face Global Food Crisis</p> <p>FAO- Project to alleviate the impact of the Global Food Crisis to the vulnerable households of the South East Region of Madagascar</p>	<p>FAO- Fourniture d'intrants aux populations vulnérables dans le cadre de l'initiative aux flambées des prix des denrées alimentaires</p> <p>GoChina- Riz hybride</p> <p>WB- Recherche agricole et diffusion des résultats de recherche</p>	<p>FAO- Appui pour la redynamisation du sous-secteur semencier malgache en vue de la production et de l'utilisation de semences de qualité</p> <p>CRS- Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers</p> <p>CRS- Seed Voucher and Fairs Project to Face Global Food Crisis</p> <p>OFDA- Post Cyclone Ivan and Jokwe Agricultural Recovery Project on the East Coast of Madagascar</p> <p>CRS- Emergency Project to respond to Cyclone Clovis in the South East Region of Madagascar</p> <p>GoChina- Riz hybride</p> <p>WB- Recherche agricole et diffusion des résultats de recherche</p> <p>EU- Réduction des risques de catastrophe pour améliorer la sécurité alimentaire</p> <p>GoItalia- Production and distribution of rice and beans seeds to rural</p>	<p>FAO- Appui pour la redynamisation du sous-secteur semencier malgache en vue de la production et de l'utilisation de semences de qualité</p> <p>CRS- Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers</p> <p>CRS- Seed Voucher and Fairs Project to Face Global Food Crisis</p> <p>OFDA- Post Cyclone Ivan and Jokwe Agricultural Recovery Project in the East Coast of Madagascar</p> <p>CRS- Emergency Project to respond to Cyclone Clovis in the South East Region of Madagascar</p> <p>OFDA Southeast Emergency Livelihoods Recovery Project</p> <p>FAO- Project to alleviate the impact of the Global Food Crisis to the vulnerable household of the South East Region of Madagascar</p> <p>USAID SALOHI</p>	<p>GoChina- Riz hybride</p> <p>EU- Système d'Information Rurale et de Sécurité alimentaire SIRSA</p> <p>WB- Recherche agricole et diffusion des résultats de recherche</p> <p>EU PASAM II</p> <p>EU, AFD, Inter coopération suisse- Réseau des Observatoires Ruraux ROR</p> <p>JICA- Research, demonstrations, workshops, technical materials on improved rice production packages and techniques in five regions in Central Highlands</p>

			families affected by seasonal floods in the South-East coast, regions of Vatovavy Fitovinany and Atsimo Atsinanana IRRI - Stress-tolerant rice for poor farmers in Africa and South Asia	IFAD/EU - Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP ECHO Emergency - Coordination and technical support to local production of improved rice seed in disaster-prone areas affected by cyclone Ivan	
Fertilizer	AfDB - Projet de Réhabilitation du Périmètre Irrigué de Manombo (PRPIM) CRS - Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers	GoIndia - Accord de ligne de crédit relatif à la production de riz et à la production d'engrais	CRS - Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers IFAD, EU - Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP	CRS - Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers USAID - SALOHI IFAD, EU - Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP GoIndia - Accord de ligne de crédit relatif à la production de riz et à la production d'engrais AfDB - Projet Jeunes entrepreneurs ruraux PROJER II	USAID - SALOHI EU - Système d'Information Rurale et de Sécurité alimentaire SIRSA EU - PASAM II EU/AfDB /Inter coopération suisse - Réseau des Observatoires Ruraux ROR
Irrigation / water management	KfW/GoM - Programme de Lutte Anti Erosive (PLAE) AfDB - Projet de Réhabilitation du Périmètre Irrigué de Manombo (PRPIM) USAID - SALOHI IFAD/EU - Programme d'appui à la Résilience aux	IFAD/WB - Upper Mandraré Basin Development Project - Phase II (PHBM) IFAD - Northeast Agricultural Improvement and Development Project (PADANE) KfW/GoM - Programme	WB - Upper Mandraré Basin Development Project - Phase II (PHBM) KfW/GoM - Programme de Lutte Anti Erosive (PLAE) AfDB - Projet de Réhabilitation du Périmètre Irrigué de	USAID - SALOHI IFAD/EU - Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP IFAD - SCAMPIS	AKF - Programme de Soutien dans la Région de la Sofia pour le Développement Rural Intégré IFAD - SCAMPIS BADEA/GoM - Etude d'aménagement de la plaine d'Ankaizina EU/GoM - Système

	<p>Crises alimentaires PARECAM DP AfDB - Appui à la FAUR</p>	<p>de Lutte Anti Erosive (PLAE) AfDB- Projet de Réhabilitation du Périmètre Irrigué de Manombo (PRPIM) AfDB/OPEC/GoM- Lower Mangoky Irrigation Area Development Project WB- Emergency Food Security and Reconstruction Project USAID- Food Security to Enhance Livelihood through Agriculture and Nutrition Activities AFD/GoM- Mise en Valeur et Protection des Bassins Versants du Lac Alaotra USAID- SALOHI IFAD/EU- Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP IFAD- SCAMPIS WB- Projet d'urgence reconstruction et sécurité alimentaire PAM- Réponse aux catastrophes naturelles récurrentes et à l'insécurité alimentaire à Madagascar EU/GoM- SMAD volet agricole AfDB /GoM- Projet Jeunes</p>	<p>Manombo AfDB/OPEC/GoM- Lower Mangoky Irrigation Area Development Project WB/AFD/GoM- Bassin Versant Périmètre Irrigué AFD/GoM- Mise en Valeur et Protection des Bassins Versants du Lac Alaotra USAID- SALOHI IFAD/EU- Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP AfDB - Appui à la FAUR PAM/GoM- Projet Jeunes entrepreneurs ruraux PROJER II EU- Réduction des risques de catastrophe pour améliorer la sécurité alimentaire</p>		<p>d'Information Rurale et de Sécurité alimentaire SIRSA EU/ AFD/InterCoopération Suisse- Réseau des Observatoires Ruraux ROR EU-PASAM II</p>
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		<p>entrepreneurs ruraux PROJER II UNICEF/GoM- Nutrition Assise communautaire NAC Volet agricole JICA- Rehabilitation of irrigation system in SW of Lake Alaotra</p> <p>JICA- Irrigation Development and Watershed Management in the SW of Lake Alaotra</p>			
On-farm technology dissemination	<p>AfDB/OPEC- Project to Support Development in the Menabe and Melaky Regions AKF- Programme de Soutien dans la Région de la Sofia pour le Développement Rural Intégré KFW/GoM- Programme de Lutte Anti Erosive (PLAE) EU- Observatoire du Riz WB/GoM- Projet de Soutien au Développement Rural (PSDR) AFD/GoM- Appui à Diffusion de Techniques Agro écologique AFD- Partenariat et Recherche dans le secteur Rural – PARRUR BUF- Groupement SRI</p>	<p>AFD/GoM- Appui à Diffusion de Techniques Agro écologique WB- Emergency Food Security and Reconstruction Project AFD/GoM- Mise en Valeur et Protection des Bassins Versants du Lac Alaotra AfDB - Partenariat et Recherche dans le secteur Rural – PARRUR</p> <p>BUF- Groupement SRI WB/GoM- Recherche agricole et diffusion des résultats de recherche EU- Réduction des risques de catastrophe pour améliorer la sécurité alimentaire</p>	<p>AfDB/OPEC- Project to Support Development in the Menabe and Melaky Regions IFAD/OPEC- Rural Income Promotion Programme WB/IFAD- Upper Mandraré Basin Development Project - Phase II IFAD- North-east Agricultural Improvement and Development Project AKF- Programme de Soutien dans la Région de la Sofia pour le Développement Rural Intégré KFW/GoM- Programme de Lutte Anti Erosive (PLAE)</p>	<p>AfDB/OPEC/GoM- Lower Mangoky Irrigation Area Development Project WB/GoM- Projet de Soutien au Développement Rural (PSDR) WB/GoM- Appui à Diffusion de Techniques Agro-écologique USAID- SALOHI BADEA/GoM- Riz hybride WB/GoM- Recherche agricole et diffusion des résultats de recherche</p>	<p>AKF- Programme de Soutien dans la Région de la Sofia pour le Développement Rural Intégré AfDB/OPEC/GoM- Lower Mangoky Irrigation Area Development Project USAID- SALOHI EU- PASAM 1 FAO- Fourniture d'intrants aux populations vulnérables dans le cadre de l'initiative aux flambées des prix des denrées alimentaires AFD- Partenariat et Recherche dans le secteur Rural - PARRUR Gvt of China- Riz hybride EU/GoM- SMAD volet</p>

			<p>USA/MCC- Millennium Challenge Account Grant</p> <p>EU- Observatoire du Riz</p> <p>AFD/GoM- Appui à Diffusion de Techniques Agro écologique</p> <p>WB- Emergency Food Security and Reconstruction Project</p> <p>CRS- Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers</p> <p>USAID- Food Security to Enhance Livelihood through Agriculture and Nutrition Activities</p> <p>OFDA- Post Cyclone Ivan and Jokwe Agricultural Recovery Project on the East Coast of Madagascar</p> <p>USA/MCC/CRS- Emergency Project to respond to Cyclone Clovis in the SouthEast Region of Madagascar</p> <p>AFD/GoM- Mise en Valeur et Protection des Bassins Versants du Lac Alaotra</p> <p>USAID- SALOHI</p> <p>FAO- Fourniture d'intrants aux populations vulnérables dans le cadre de l'initiative aux flambées des prix des</p>		<p>agricole</p> <p>WB/GoM- Recherche agricole et diffusion des résultats de recherche</p> <p>EU/AFD/Intercoopérati on Suisse- Réseau des Observatoires Ruraux ROR</p>
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			denrées alimentaires AFD - Partenariat et Recherche dans le secteur Rural BUF - Groupement SRI EU/GoM - SMAD volet agricole WB/GoM - Recherche agricole et diffusion des résultats de recherche AfDB /GoM - Projet Jeunes entrepreneurs ruraux PROJER II UNICEF/GoM - Nutrition Assise communautaire NAC Volet agricole Africa Rice - Developing crop adaptation strategies for climate change		
Mechanization	CRS - Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers	IFAD/EU - Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP JICA - Improvement of Antsirabe Agricultural Mechanization Training Centre	IFAD/OPEC - Rural Income Promotion Programme (PPRR) CRS - Global Food Crisis Response in Madagascar: Provision of Improved Rice Seeds and Fertilizer to Rural Agricultural Producers IFAD/EU - Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP Republic of India - Accord de ligne de crédit relatif à la production de riz et à la production d'engrais	Republic of India - Accord de ligne de crédit relatif à la production de riz et à la production d'engrais BADEA - Projet de décorticage de riz et de provenderie	BUF - Groupement SRI EU/GoM - Système d'Information Rurale et de Sécurité alimentaire SIRSA EU - PASAM II EU/AFD/Intercoopération Suisse - Réseau des Observatoires Ruraux ROR

Quality improvement	FAO- Appui pour la redynamisation du sous-secteur semencier malgache en vue de la production et de l'utilisation de semences de qualité Republic Of India- Accord de ligne de crédit relatif à la production de riz et à la production d'engrais	Republic Of India- Accord de ligne de crédit relatif à la production de riz et à la production d'engrais	BADEA- Etude de Faisabilité Techno-Economique du Projet de Décorticage de Riz et de Provenderie Republic Of India- Accord de ligne de crédit relatif à la production de riz et à la production d'engrais	Republic Of India- Accord de ligne de crédit relatif à la production de riz et à la production d'engrais	BADEA- Etude de Faisabilité Techno-Economique du Projet de Décorticage de Riz et de Provenderie Republic Of India- Accord de ligne de crédit relatif à la production de riz et à la production d'engrais JICA- Study on Rural Dwevelopment and Watershed Management in SW Region of Alaotra
Access to market	IFAD/OPEC- Rural Income Promotion Programme (PPRR) AKF- Programme de Soutien dans la Région de la Sofia pour le Développement Rural Intégré WB/AFD- Support to the platform of the dialogue for the management of the rice sector EU- Observatoire du Riz Word Bank/AFD/GoM- Bassin Versant Périmètre Irrigué	IFAD- North-east Agricultural Improvement and Development Project USAID- SALOHI AfDB /GoM- Projet Jeunes entrepreneurs ruraux PROJER II IFAD/EU- Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP	IFAD/OPEC- Rural Income Promotion Programme (PPRR) USA/MCC- Millennium Challenge Account Grant EU- Observatoire du Riz USAID- SALOHI AfDB /GoM- Projet Jeunes entrepreneurs ruraux PROJER II IFAD/EU- Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP	USAID- SALOHI	USAID- SALOHI EU- Observatoire du Riz EU/GoM- Système d'Information Rurale et de Sécurité alimentaire SIRSA EU- PASAM II EU/AFD/Intercoopérati on suisse- Réseau des Observatoires Ruraux ROR
Access to credit	IFAD/OPEC- Rural Income Promotion Programme (PPRR) IFAD/WB- Upper Mandraré Basin Development Project - Phase II (PHBM) IFAD- North-east Agricultural Improvement		USA/MCC- Millennium Challenge Account Grant AfDB /GoM- Projet Jeunes entrepreneurs ruraux PROJER II	IFAD/OPEC- Rural Income Promotion Programme (PPRR) IFAD/WB- Upper Mandraré Basin Development Project - Phase II (PHBM) IFAD- North-east Agricultural	EU/GoM- Système d'Information Rurale et de Sécurité alimentaire SIRSA EU- PASAM II EU/AFD/InterCoopérat ion suisse- Réseau des Observatoires Ruraux ROR

	and Development Project (PADANE) USA/MCC - Millennium Challenge Account Grant EU - PASAM II			Improvement and Development Project (PADANE) AfDB/OPEC/GoM - Lower Mangoky Irrigation Area Development Project CRS - Seed Voucher and Fairs Project to Face Global Food Crisis USAID - SALOHI	
Overall policy tools	AfDB/OPEC - Project to Support Development in the Menabe and Melaky Regions (AD2M) IFAD/OPEC - Rural Income Promotion Programme (PPRR) KFW/GoM - Programme de Lutte Anti Erosive (PLAE) WB/AFD - Support to the platform of the dialogue for the management of the rice sector WB - Emergency Food Security and Reconstruction Project USA/MCC - Millennium Challenge Account Grant WB/GoM - Projet de Soutien au Développement Rural (PSDR) WB - Emergency Food Security and Reconstruction Project AFD/GoM - Mise en Valeur et Protection des Bassins Versants du Lac	WB - Emergency Food Security and Reconstruction Project WB - Emergency Food Security and Reconstruction Project EU - PASAM 1	IFAD/OPEC - Rural Income Promotion Programme (PPRR) IFAD/WB - Upper Mandraré Basin Development Project - Phase II (PHBM) IFAD - North-east Agricultural Improvement and Development Project (PADANE) AKF - Programme de Soutien dans la Région de la Sofia pour le Développement Rural Intégré KFW/GoM - Programme de Lutte Anti Erosive (PLAE) USA/MCC -Millennium Challenge Account Grant WB - Emergency Food Security and Reconstruction Project EU - PASAM 1 AFD/GoM - Contribution à la mise en œuvre du	WB - Emergency Food Security and Reconstruction Project EU - PASAM 1 Republic Of India - Accord de ligne de crédit relatif à la production de riz et à la production d'engrais	EU - Observatoire du Riz EU/GoM - Système d'Information Rurale et de Sécurité alimentaire SIRSA EU -PASAM II EU/AFD/Intercoopération suisse - Réseau des Observatoires Ruraux ROR

	Alaotra IFAD/EU - Programme d'appui à la Résilience aux Crises alimentaires PARECAM DP EU - PASAM 1 EU/GoM - SMAD volet agricole AFD/GoM - Contribution à la mise en œuvre du PADR COMIPADR EU - PASAM II		PADR COMIPADR		
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MOZAMBIQUE

	Policy / institutional	Infrastructure	Human resource capacity	Provision / support	Information / knowledge
Seed	EU and GoM- Purchasing Power Support to Farmers through Inputs Vouchers	EU- Increasing Agricultural Production, Enhancing Food Security and Improving Livelihoods to mitigate the impacts of hiked food price	IRRI- Stress-tolerant rice for poor farmers in Africa and South Asia CAAQ-IRRI- Green Super Rice for Resource- Poor of Africa and Asia European Union and GoM- Purchasing Power Support to Farmers through Inputs Vouchers EU- Increasing Agricultural Production, Enhancing Food Security and Improving Livelihoods to mitigate the impacts of hiked food price	EUU and GoM- Purchasing Power Support to Farmers through Inputs Vouchers EU- Increasing Agricultural Production, Enhancing Food Security and Improving Livelihoods to mitigate the impacts of hiked food price	EU and GoM- Purchasing Power Support to Farmers through Inputs Vouchers EU- Increasing Agricultural Production, Enhancing Food Security and Improving Livelihoods to mitigate the impacts of hiked food price Mozambican company LAP Ubuntu SA - Libyan Investment Fund- Bela Vista Rice Project
Fertilizer	EU and GoM- Purchasing Power Support to Farmers through Inputs Vouchers		EU and GoM- Purchasing Power Support to Farmers through Inputs Vouchers	EU and GoM- Purchasing Power Support to Farmers through Inputs Vouchers Mozambican company LAP Ubuntu SA - Libyan Investment Fund- Bela Vista Rice Project	EU and GoM- Purchasing Power Support to Farmers through Inputs Vouchers
Irrigation / water management	EC- Strategic planning for irrigation in Mozambique SIDA- Pungué Basin Integrated Water Resources Management and Development Program (PP) SIDA- Pungué Basin Integrated Water	WB- Sustainable Irrigation Development Project EC- Strategic planning for irrigation in Mozambique AfDB- Small-Scale Irrigation Project (SSIP) AfDB- Massingir Dam and Smallholder	AfDB- Small-Scale Irrigation Project (SSIP) BID- Rehabilitation of secondary and tertiary canals of the Chokwe Irrigation Scheme EC- Drought Mitigation Plan for Gaza and Inhambane GoM and the	EC- Increasing Agricultural Production, Enhancing Food Security and Improving Livelihoods to mitigate the impacts of hiked food price (t.b.c.)	

	<p>Resources Management and Development Program - Phase 2 (PP2)</p> <p>GoM and the Netherlands- Project of construction of 3,000 ha of irrigation infrastructure and drainage and flood control in Munda Munda and Navicote</p>	<p>Agricultural Rehabilitation Project</p> <p>IDB- Rehabilitation of secondary and tertiary canals of the Chokwe Irrigation Scheme</p> <p>BADEA-OPEC Fund- Save Valley Irrigation Development Project</p> <p>EC- Drought Mitigation Plan for Gaza and Inhambane</p> <p>Mozambican company LAP Ubuntu SA - Libyan Investment Fund- Bela Vista Rice Project</p> <p>GoM and the Netherlands- Project of construction of 3,000 ha of irrigation infrastructure and drainage and flood control in Munda Munda and Navicote</p>	<p>Netherlands- Project of construction of 3,000 ha of irrigation infrastructure and drainage and flood control in Munda Munda and Navicote</p>		
On-farm technology dissemination	<p>Common basket (IFAD EC, Ireland, Denmark, Sweden, Canada, Austria, Finland)- Agricultural Support Programme</p> <p>GoM and the Netherlands- Project of construction of 3,000 ha of irrigation infrastructure and drainage and flood control in Munda Munda and Navicote</p>		<p>WB- Sustainable Irrigation Development Project</p> <p>Common basket (IFAD EC, Ireland, Denmark, Sweden, Canada, Austria, Finland)- Agricultural Support Programme</p> <p>AfDB- Small-Scale Irrigation Project (SSIP)</p> <p>EC- Drought Mitigation Plan for Gaza and Inhambane</p>		

			EU-GoM- Purchasing Power Support to Farmers through Inputs Vouchers EU-Increasing Agricultural Production, Enhancing Food Security and Improving Livelihoods to mitigate the impacts of hiked food price (t.b.c.) Mozambican company LAP Ubuntu SA - Libyan Investment Fund- Bela Vista Rice Project		
Mechanization					
Quality improvement		Mozambican company LAP Ubuntu SA - Libyan Investment Fund- Bela Vista Rice Project GoM and the Netherlands- Project of construction of 3,000 ha of irrigation infrastructure and drainage and flood control in Munda Munda and Navicote			
Access to market		AfDB- Massingir Dam and Smallholder Agricultural Rehabilitation Project BADEA-OPEC Fund- Save Valley Irrigation Development Project GoM and the Netherlands- Project of		JICA- Improve production and marketing linkages for food and high-value crops	

		construction of 3,000 ha of irrigation infrastructure and drainage and flood control in Munda Munda and Navicote			
Access to credit	BADEA-OPEC Fund- Save Valley Irrigation Development Project EU- Purchasing Power Support to Farmers through Inputs Vouchers		BADEA-OPEC Fund- Save Valley Irrigation Development Project EU- Purchasing Power Support to Farmers through Inputs Vouchers	EU- Purchasing Power Support to Farmers through Inputs Vouchers	EU- Purchasing Power Support to Farmers through Inputs Vouchers
Overall policy tools	WB- Sustainable Irrigation Development Project Italian Government- Development Strategy for the Rice Sector in Mozambique				

RWANDA

	Policy / institutional	Infrastructure	Human resource capacity	Provision / support	Information / knowledge
Seed	IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II) CTB- Support to the seed bearing sector in Rwanda (AFSR)	CTB- Support to the seed bearing sector in Rwanda (AFSR)	WB- Rural Sector Support Project Phase Two AFBD- The Bugesera Agricultural Development Support Project (PADAB) IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two IRRI- Stress-tolerant rice for poor farmers in Africa and South Asia IIRI-CAAS- Green Super Rice for Resource-Poor of Africa and Asia	WB- Rural Sector Support Project Phase Two IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture(PAPSTAI)	ADB-BAD/(FAD)- projet d'appui aux infrastructures rurales de la région naturelle du Bugesera (PAIR) AFBD- The Bugesera Agricultural Development Support Project (PADAB) CTB- Support to the seed bearing sector in Rwanda (AFSR)
Fertilizer	IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)			JICA- Supply and use of mineral fertilizer	
Irrigation / water management	IFAD-DFID-Netherland-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)	WB- Rural Sector Support Project Phase Two AFBD- The Bugesera Agricultural Development Support Project (PADAB) IFAD,DED,WFP,GoR - Kirehe Community-based Watershed Management Project (KWAMP) ADB/BAD (FAD)- projet d'appui aux infrastructures rurales de la région naturelle du Bugesera (PAIR) AAA- Establishing System of Integrated Resources Utilisation (ESIRU II)	WB- Rural Sector Support Project Phase Two IFAD,DED,WFP,GoR - Kirehe Community-based Watershed Management Project (KWAMP) AFBD- The Bugesera Agricultural Development Support Project (PADAB) IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)	IFAD,DED,WFP,GoR - Kirehe Community-based Watershed Management Project (KWAMP) IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)	WB- Rural Sector Support Project Phase Two AFBD- The Bugesera Agricultural Development Support Project (PADAB)

On-farm technology dissemination			AFBD- The Bugesera Agricultural Development Support Project (PADAB) FAO- Integrated Pest Management- Farmer Field Schools (IPM/FFS) GTZ- Mitigating impact of climate change on rice disease resistance	WB- Rural Sector Support Project Phase Two AFBD- The Bugesera Agricultural Development Support Project (PADAB) IFAD,DED,WFP,GoR - Kirehe Community-based Watershed Management Project (KWAMP)	ADB/BAD (FAD)- projet d'appui aux infrastructures rurales de la région naturelle du Bugesera (PAIR) AFBD- The Bugesera Agricultural Development Support Project (PADAB) FAO- Integrated Pest Management- Farmer Field Schools (IPM/FFS)
Mechanization	IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)				
Quality improvement		AFBD- The Bugesera Agricultural Development Support Project (PADAB)	AFBD- The Bugesera Agricultural Development Support Project (PADAB) JICA- Increasing crop production with quality extension services in Eastern province	AFBD- The Bugesera Agricultural Development Support Project (PADAB) IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)	AFBD- The Bugesera Agricultural Development Support Project (PADAB)
Access to market			IFAD,DED,WFP,GoR - Kirehe Community-based Watershed Management Project (KWAMP)	ADB/BAD (FAD)- projet d'appui aux infrastructures rurales de la région naturelle du Bugesera (PAIR) IFAD,DED,WFP,GoR - Kirehe Community-based Watershed Management Project (KWAMP) IFAD-DFID-Netherlands-GoR- Rural Sector Support Project Phase Two-	WB- Rural Sector Support Project Phase Two

				Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II) AAA - Establishing System of Integrated Resources Utilisation (ESIRU II) AFBD - The Bugesera Agricultural Development Support Project (PADAB)	
Access to credit	IFAD-DFID-Netherlands-GoR - Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)		IFAD-DFID-Netherlands-GoR - Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)	IFAD-DFID-Netherlands-GoR - Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II)	IFAD,DED,WFP,GoR - Kirehe Community-based Watershed Management Project (KWAMP)
Overall policy tools	AFBD - The Bugesera Agricultural Development Support Project (PADAB) IFAD-DFID-Netherlands-GoR - Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II) AAA - Establishing System of Integrated Resources Utilisation (ESIRU II)		ADB/BAD (FAD) - projet d'appui aux infrastructures rurales de la région naturelle du Bugesera (PAIR) AFBD - The Bugesera Agricultural Development Support Project (PADAB) CTB - Support to the development of a national Agricultural extension System (PASNVA) IFAD-DFID-Netherlands-GoR - Rural Sector Support Project Phase Two- Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA II) AAA - Establishing System of Integrated Resources Utilisation (ESIRU II)	ADB/BAD (FAD) - projet d'appui aux infrastructures rurales de la région naturelle du Bugesera (PAIR) WB - Rural Sector Support Project Phase Two AFBD - The Bugesera Agricultural Development Support Project (PADAB) CTB - Support to the development of a national Agricultural extension System (PASNVA) FAO - Integrated Pest Management- Farmer Field Schools (IPM/FFS)	

TANZANIA

	Policy / institutional	Infrastructure	Human resource capacity	Provision / support	Information / knowledge
Seed	WB&URoT Accelerated Food Security Project under the Global Food Crises Response Program		IRRI Stress-tolerant rice for poor farmers in Africa and South Asia OXFAM Improving the lives of 36,000 rice producers in Shinyanga Tanzania	IAEA/FAO Improving Rice Varieties through Mutation Breeding and Biotechnology in Zanzibar	IDA/WB- Rice Regional Centre of Excellence Project under Eastern Africa Agricultural Productivity Programme (EAAPP)
Fertilizer				WB & URoT Accelerated Food Security Project under the Global Food Crises Response Program	
Irrigation / water management		Japan Grass Roots Fund- Kibokana Irrigation Rehabilitation Project KOICA- Rehabilitation of Irrigation Infrastructure in Zanzibar WB- Agriculture Sector Development Project WB- Additional Financing to ASDP OXFAM- Improving the lives of 36,000 rice producers in Shinyanga Tanzania	WB- Additional Financing to ASDP JICA- Formulating and training of DADP Guidelines on Irrigation Scheme Development		WB- Additional Financing to ASDP IDA/WB- Rice Regional Centre of Excellence Project under Eastern Africa Agricultural Productivity Programme (EAAPP) OXFAM- Improving the lives of 36,000 rice producers in Shinyanga Tanzania
On-farm technology dissemination			EU/CIRAD- African weeds of rice GTZ/ Georg Univ /IRRI- Mitigating impact of climate change on rice disease resistance	WB- Agriculture Sector Development Project	IDA/WB- Rice Regional Centre of Excellence Project under Eastern Africa Agricultural Productivity Programme (EAAPP)

			WUR- Preparing African rice farmers against parasitic weeds		USAID- Increased Agricultural Growth and Expand the Staple Food Supply
Mechanization					
Quality improvement	JICA- Strengthening planning through District Agricultural Development Plan	OXFAM- Improving the lives of 36,000 rice producers in Shinyanga Tanzania	OXFAM- Improving the lives of 36,000 rice producers in Shinyanga Tanzania JICA- Training on basic farming techniques to all 40 irrigation zones		WB- Agriculture Sector Development Project Rice Regional Centre of Excellence Project under Eastern Africa IDA/WB- Agricultural Productivity Programme (EAAPP)
Access to market	OXFAM- Improving the lives of 36,000 rice producers in Shinyanga Tanzania		USAID- Increased Agricultural Growth and Expand the Staple Food Supply		IDA/WB- Rice Regional Centre of Excellence Project under Eastern Africa Agricultural Productivity Programme (EAAPP) OXFAM Improving the lives of 36,000 rice producers in Shinyanga Tanzania
Access to credit				USAID- Increased Agricultural Growth and Expand the Staple Food Supply	
Overall policy tools	WB- Agriculture Sector Development Project USAID- Increased Agricultural Growth and Expand the Staple Food Supply		JICA- Capacity development for ASDP monitoring and evaluation systems		

UGANDA

	Policy / institutional	Infrastructure	Human resource capacity	Provision / support	Information / knowledge
Seed	UNDP - Promotion of NARIC 3 Upland Rice in Uganda for Sustainable Household Food Security and Incomes project AfDB-NDF - Farm Income Enhancement and Forest Conservation Project (FIEFOC) USAID - Investment in Developing Export Agriculture (IDEA)		IIRI - Stress-tolerant rice for poor farmers in Africa and South Asia IRRI - Developing the next generation of new rice varieties for sub-Saharan Africa and Southeast Asia CAAS-IRRI - Green Super Rice for Resource-Poor of Africa and Asia	Rockefeller Foundation - Participatory evaluation of upland rice varieties and determination of suitable crop management practices in Uganda Common basket - agricultural technology and agribusiness advisory services project (ATAAS Project)	JICA - to improve research and extension for the NERICA Rice Promotion Project
Fertilizer	USAID - Investment in Developing Export Agriculture (IDEA)				
Irrigation / water management	AfDB-NDF - Farm Income Enhancement and Forest Conservation Project (FIEFOC)	USAID - Investment in Developing Export Agriculture (IDEA)			
On-farm technology dissemination	Common Basket - ¹⁷ The National Agricultural Advisory Services Programme UNDP - Promotion of NARIC 3 Upland Rice in Uganda for Sustainable Household Food Security and Incomes project		FAO - Project for Agriculture and Rural Development through Innovative Rice-based Farming Systems for Food Security and Poverty Reduction in Republic of Uganda Rockefeller Foundation -	FAO - Project for Agriculture and Rural Development through Innovative Rice-based Farming Systems for Food Security and Poverty Reduction in Republic of Uganda Common Basket - The National Agricultural	Rockefeller Foundation - Participatory evaluation of upland rice varieties and determination of suitable crop management practices in Uganda Common Basket - The National Agricultural Advisory Services Programme

¹⁷ Common Basket is composed of International Development Association (IDA)/The WB, International Fund for Agricultural Development (IFAD), European Commission (EC), Ireland Aid, Netherlands Development Assistance, Danish International Development Assistance (DANIDA) and Department for International Development (DFID) (United Kingdom), Central Government, District Governments, Sub-County Governments, Beneficiaries

			<p>Participatory evaluation of upland rice varieties and determination of suitable crop management practices in Uganda</p> <p>Common Basket- The National Agricultural Advisory Services Programme</p> <p>UNDP- Private Sector Development & Consultancy Center (PRICON)</p> <p>AfDB-NDF- Farm Income Enhancement and Forest Conservation Project (FIEFOC)</p> <p>USAID- Livelihood and Enterprises for Agricultural Development (LEAD) Project</p> <p>GTZ- IRRI- Mitigating impact of climate change on rice disease resistance</p>	<p>Advisory Services Programme</p> <p>Common basket- Agricultural technology and agribusiness advisory services project (ATAAS Project)</p>	<p>AfDB-NDF- Farm Income Enhancement and Forest Conservation Project (FIEFOC)</p> <p>USAID- Investment in Developing Export Agriculture (IDEA)</p> <p>IFAD-AfDB- Area-Based Agricultural Modernization Programme (AAMP)</p>
Mechanization					
Quality improvement	<p>UNDP- Promotion of NARIC 3 Upland Rice in Uganda for Sustainable Household Food Security and Incomes project</p> <p>African Development Bank&Nordic Development Fund- Farm Income Enhancement and</p>		<p>FAO- Project for Agriculture and Rural Development through Innovative Rice-based Farming Systems for Food Security and Poverty Reduction in Republic of Uganda</p>		

	Forest Conservation Project (FIEFOC)				
Access to market	<p>UNDP- Promotion of NARIC 3 Upland Rice in Uganda for Sustainable Household Food Security and Incomes project</p> <p>AfDB&NDF- Farm Income Enhancement and Forest Conservation Project (FIEFOC)</p> <p>USAID- Livelihood and Enterprises for Agricultural Development (LEAD) Project</p> <p>USAID- Investment in Developing Export Agriculture (IDEA)</p>	<p>USAID- Investment in Developing Export Agriculture (IDEA)</p> <p>IFAD&BSF- for the Third World District Livelihoods Support Programme</p> <p>AfDB&IFAD- Community Agricultural Infrastructure Improvement Programme</p>	<p>UNDP- Promotion of NARIC 3 Upland Rice in Uganda for Sustainable Household Food Security and Incomes project</p> <p>UNDP- Private Sector Development & Consultancy Center (PRICON)</p> <p>USAID- Investment in Developing Export Agriculture (IDEA)</p> <p>IFAD, AfDB, GoU- Area-Based Agricultural Modernization Programme (AAMP)</p> <p>IFAD&AfDB- Community Agricultural Infrastructure Improvement Programme</p>	AfDB&NDF- Farm Income Enhancement and Forest Conservation Project (FIEFOC)	
Access to credit	<p>IFAD& AfDB, GoU- Area-Based Agricultural Modernization Programme (AAMP)</p> <p>IFAD- Rural Financial Services Programme</p>		<p>UNDP- Promotion of NARIC 3 Upland Rice in Uganda for Sustainable Household Food Security and Incomes project</p> <p>IFAD& AfDB, GoU- Area-Based Agricultural Modernization Programme (AAMP)</p> <p>IFAD & BSF- District Livelihoods Support Programme</p> <p>AfDB&IFAD- Community</p>		IFAD- Rural Financial Services Programme

			Agricultural Infrastructure Improvement Programme IFAD- Rural Financial Services Programme		
Overall policy tools	FAO- Project for Agriculture and Rural Development through Innovative Rice-based Farming Systems for Food Security and Poverty Reduction in Republic of Uganda AfDB&NDF- Farm Income Enhancement and Forest Conservation Project (FIEFOC) AfDB & IFAD, GoU- Area-Based Agricultural Modernization Programme (AAMP) BSF&IFAD- District Livelihoods Support Programme		BSF&IFAD- District Livelihoods Support Programme		