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Challenges and Opportunities of Rice in Ethiopian Agricultural Development

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Ethiopian Institute of Agricultural Research

Challenges and Opportunities of Rice in Ethiopian Agricultural Development

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Contents

Preface

The importance of rice crop in the Ethiopian Agriculture is increasing from time to time and different actors from public and private sectors and donors are showing interest in promoting it. The public rice related programs are well articulated in the National Rice Research and Development Strategy developed in early 2010 along with the national implementation plan developed both at national and regional level for the years 2011 to 2015. Different rice specific research and development projects are also under implementation.

This proceeding is the output of a workshop titled "The Role of Rice in Ethiopian Agricultural Development: challenges and opportunities" held on February 21, 2011. The objectives of the workshop include assessing the status of rice research and development, identifying opportunities and constraints, and facilitating linkages among stakeholders in the rice sector..

We believe that the information contained in this publication will inspire all actors in promoting the rice sector thereby contributing to the achievement of the targets in the Nation Rice R&D strategy in particular and in the Growth and Transformation Plan of the country in general.

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An Overview of the National Rice Research and Development Strategy and its Implementation

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Introduction

Background

Ethiopia is situated in the tropical zone, but because of its wide range of altitude (from below sea level to over 3000 m above sea level); it is endowed with a broad diversity of climates ranging from humid tropics to alpine climates suitable for successful growth of most types of both temperate and tropical crops. The total mean annual flow from all the river basins is estimated to be 122 billion cubic meters and the ground water potential is estimated at 2.6 billion cubic meters (MoARD, 2010). These water resources can potentially be used for irrigation. Ethiopia has also one of the largest livestock inventories in Africa (CSA, 2008; MoARD, 2010).

In spite of its enormous agricultural potential, Ethiopia's history, however, is punctuated by food insecurity and famine due to climatic variability and the poor performance of the agricultural sector. Cognizant of this problem, the government has been implementing Agricultural Development Led Industrialization (ADLI) strategy, which has been reflected in the Plan for Accelerated and Sustainable Development for Eradication of Poverty (PASDEP) (MoFED, 2006) and in the recent the current Growth and Transformation Plan (GTP) (MoFED, 2010. The GTP of the government gives recognition to and focus on commercialization as the next step of agricultural development. It envisages diversification and specialization of crop and livestock production by farmers to improve allocative efficiency, and intensification of resource use to improve technical efficiency.

Amongst of the target commodities that have received due emphasis in promotion of agricultural production, rice is is considered as the "Millennium crop" expected to contribute to ensuring food security in the country. Even though, it is a recent introduction to the country, rice has shown promise as to be among the major crops that can immensely contribute towards ensuring food security in Ethiopia. The country has vast suitable ecologies for rice production along with the possibility of growing it where other food crops do not do well.

Based on GIS techniques and agro-ecological requirements of rice, the potential rain-fed rice production area in Ethiopia is estimated to be about thirty million hectares. Rice is compatible with various traditional food recipes like bread, soup, "*enjera*", and local beverages (like "*tela*" and "*areki*"). The country has also a comparative advantage of producing rice due to the availability of huge and cheap rural labor as the crop is labor intensive.

The importance of rice as a food security crop, source of income and employment opportunity due to its relative high productivity as compared to other cereals is recognized by farmers as well as private investors who frequently request for improved varieties for different ecosystems.

Cognizant of the aforestated importance of rice and the existing potential for its production, a national steering committee was established to promote research and development (R&D) activities on rice in the country. The technical committee composed of experts from different institutions has been given the responsibility to develop the National Rice Research and Development Strategy of Ethiopia (NRRDSE) to make sure that the country will benefit from the crop. Accordingly, the the NRDDSE was developed by the technical committee and was approved by the steering in early February 2010.

Scope

The NRRDSE envisages seeing the existing limited area and subsistence-dominated rice sub-sector progressively transformed into commercially profitable and viable production system.

The strategy follows

- agro-ecology based promotion;
- small- and large-scale rice production;
- gender;
- value chain; and
- ensuring environmental sustainability.

The major strategic interventions are

- strengthening the institutional framework and policy development;
- research, technology delivery and capacity building;
- production, multiplication and dissemination of certified seeds;
- fertilizer marketing and distribution;
- irrigation and investment in water control technologies;
- pre-harvest mechanization technologies;
- post-harvest management and marketing;
- supporting maintenance of agricultural equipment; and
- access to credit/ agricultural finance.

Purpose

The main purpose of the strategy and its implementation plan (SIP) is to guide the implementation of the NRRDSE. It documents the specific activities that will be undertaken in the coming five years by the respective stakeholder organizations along with the project-based activities that require external funding.

The other purpose of the SIP is to create awareness among the different implementing organs of the NRRDSE on what is expected in terms of each activity. It also helps them timely plan the respective activities along with the human and financial requirement each year. The plan is also expected to link effectively the strategy of the rice R&D with donor support.

Targets

The projected increase in area and production of rice from what is existing in 2009 in ten years up to 2019 have been summarized on Table 1. For the whole country, the area is projected to increase from 155, 886 ha in 2009 by over 197% and 396% in 2014 and 2019, respectively. In the second five-year phase (2014-2019), the area is projected to increase by about 67% as opposed to the first five-year (2009-2014) phase for which the projected area increase is about 197%. Likewise, the total rice production is expected to increase from 498,332 t by about 279% in 2014 and 635% in 2019 with the projected increase from 2014 to 2019 amounting to about 110%.

Region-wise, the productionareas is expected to increase by about 264%, 289%, 301%, 753%, 902%, 964% and 328% between 2009 and 2019 in Amhara, Oromiya, SNNPR, Tigray, Gambella, Benshangul Gumz and Somali, respectively (Table 1). Similarly, the total rice production in the same period as compared to that of the base year of 2009 is projected to increase by about 458% in Amhara, 583% in Oromiaya, 540% in SNNPR, 1075% in Tigray, 1376% in Gambella 1594% in Benshangul Gumz and 649% in Somali regions. In Afar region, there has not been any rice production in 2009, but irrigated rice will be grown on 120 ha in 2014 with an estimated production of 660 t, the area and production in 2019 are projected to increase by about 108% and 165% compared to the expected targets in 2014, respectively.

In terms of rice ecology or rice types, the country's total cultivated area is expected to increase from that in the 2009 base year by about 272%, 420% and 520% for upland rain-fed, lowland rain-fed and irrigated rice, respectively (Table 1). Likewise, the gross production in 2019 is expected to increase from what existed in 2009 by about 382% for upland rain-fed rice, 712% for lowland rain-fed, and 996% for irriaged rice. In comparison, the greater increase in both area and production of all the three types of rice in Ethiopia is expected during the first (2009-2014) than during the second (2014-2019) five-year period.

Generally, both under the existing situation in 2009 and in the projection up to 2019, upland rain-fed rice is restricted only three regions i.e. to Amhara, SNNPR, and Tigray, while lowland rain-fed rice occurs in all regions except in Somali and Afar (Table 2). Until 2009, irrigated rice is grown only in Gambella Region; however, by 2014 it will be produced in all the regions except in Tigray.

The projected increase in total rice production is expected to come not only from an increase in area but also in productivity. To that end, the average productivity will increase from 3.2 t/ha in 2009 to 4.1 t/ha in 2014 and to about 5.12 t/ha in 2019 (Table 2). This indicates that the research component of the strategy has to contribute not only in looking for technologies that enhance adapatability but also productivity of the crop per unit area.

With regard to rice ecology class, total grain production in 2019 as compared to that in the 2009 base-year is projected to increase by about 30%, 56% and 75% for upland rain-fed, lowland rain-fed and irrigated rice, respectively (Table 2). Likewise, raw seed production (t/ha) is projected to increase from that in 2009 by about 33% for upland rain-fed rice, 55% for lowland rain-fed rice and 75% for irrigated rice. Furthermore, as compared to the 2009 corresponding values of 25.9 for upland rain-fed rice, 30.7 for lowland rain-fed rice and 38.4 for irrigated rice, the seed multiplication factors for the same three classes of rice in that order are in 2019 projected to increase by about 30%, 56%, and 75%.

In general, for all the three rice ecology classes except for lowland rain-fed rice, the projected increments in all the three parameters, i.e. grain yield, raw seed and seed multiplication factor are higher during the first (2009-2014) than in the second (2014-2019) five-year phase of the ten-year strategy (Table 2).

Table 1. Projected rice area and production in Ethiopia by region and rice ecology from 2009-2019

Region	Year	Area (hectares)				Production (tons)			
		Upland rain-fed	Lowland rain-fed	Irrigation	Total	Upland rain-fed	Lowland rain-fed	Irrigation	Total
Amhara	2009	38,430	30,000		68,430	103,761	96,000	-	199,761
	2014	81,769	63,833	13,624	159,226	261,662	255,330	74,932	591,924
	2019	124,662	97,316	27,248	249,226	436,317	486,580	190,736	1,113,633
Oromiya	2009		12,940		12,940		41,408	-	41,408
	2014		30,805		30,805		123,220	-	123,220
	2019		34,743	15,570	50,313		173,715	108,990	282,705
SNNPR	2009	1,475	27,681		29,156	3,983	88,578	-	92,562
	2014	3,680	69,044		72,724	11,775	276,177	-	287,952
	2019	5,526	103,687	7,785	116,998	19,342	518,434	54,495	592,271
Tigray	2009	3,950	1,200		5,150	10,665	3,840	-	14,505
	2014	18,580	5,965		24,545	59,457	23,859	-	83,316
	2019	32,823	11,117		43,940	114,880	55,586	-	170,466
Gambella	2009		3,350	10,000	13,350		10,720	40,000	50,720
	2014		53,530	20,000	73,530		214,120	110,000	324,120
	2019		93,710	40,000	133,710		468,550	280,000	748,550
Benshangul Gumz	2009		10,080		10,080		32,256	-	32,256
	2014		58,670		58,670		234,680	-	234,680
	2019		102,260	5,000	107,260		511,300	35,000	546,300
Somali	2009			16,780	16,780			67,120	67,120
	2014			43,984	43,984			241,912	241,912
	2019			71,807	71,807			502,649	502,649
Afar	2009			-	-			-	-
	2014			120	120			660	660
	2019			250	250			1,750	1,750
Total	2009	43,855	85,251	26,780	155,886	118,409	272,802	107,120	498,332
	2014	104,030	281,846	77,728	463,604	332,895	1,127,385	427,504	1,887,784
	2019	163,011	442,833	167,660	773,504	570,538	2,214,165	1,173,620	3,958,323

Source: MoARD, 2010

Table 2. Projected productivity of paddy grain and seed production of rice in Ethiopia from 2009 up to 2019

Description	Rice Ecology	Productivity in 2009		Projected Increase in Ethiopia	
		Africa	Ethiopia	2014	2019
Grain yield (t/ha)	Upland Rain-fed	3.2	2.7	3.2	3.5
	Lowland Rain-fed	2.2	3.2	4.0	5.0
	Irrigated	4.1	4.0	5.5	7.0
	Total	3.1	3.2	4.1	5.1
Raw seed yield (t/ha)	Upland Rain-fed	-	2.4	2.9	3.2
	Lowland Rain-fed	-	2.9	3.6	4.5
	Irrigated	-	3.6	5.0	6.3
Seed multiplication factor	Upland Rain-fed	-	25.9	30.7	33.6
	Lowland Rain-fed	-	30.7	38.4	48.0
	Irrigated	-	38.4	52.8	67.2

Source: MoARD, 2010

Components and sub-Components

Component 1: Rice Research, Source Seed and Capacity Building

Breeding and genetics

This activity has two major components. The first part will focus on enhancing germplasm variability and the second will focus on variety development for the different agro-ecologies.

Germplasm enhancement: The success of plant breeding research depends on the availability of genetic variation. Since rice is not indigenous to Ethiopia, the source of germplasm is introductions.

The specific activities are:

- Introduction and evaluation of rice nurseries (germplasm) for upland, lowland rain-fed, and for irrigated ecosystems;
- Introduction and evaluation of rice nurseries (germplasm) for biotic (diseases, insect pests, weeds) and abiotic (cold, drought, salinity, heat) stresses;
- Introduction and evaluation of fine grain aromatic rice nurseries;
- Introduction and evaluation of hybrid rice for different rice ecosystems and biotic and abiotic stresses; and
- Hybridization rice for different traits

Variety development: Improved variety is one of the major inputs required for increasing production and productivity of crops. However, a given improved variety has limited life span with its potential because of the dynamic nature of the environment. On the other hand, the producers as well as the consumers' demand is also changing from time to time, thereby requiring redesigning of the breeding objectives accordingly. These situations make variety development a continuous and dynamic activity.

Varieties are developed by advancing promising materials from nursery stage to variety trial following different breeding stages either at regional and/or national level. Varieties can also be developed through introducing commercial varieties that are released and found under production in other countries and conducting adaptation trial at different target locations.

The specific activities in the variety development are:

- Preliminary Variety Trial (PVT) of different sets for different rice ecosystems;
- Regional Variety Trial (RVT) of different sets for different rice ecosystems;
- National Variety Trial (NVT) of different sets for different rice ecosystems;
- Adaptation of introduced commercial varieties for upland, lowland and irrigated rice ecosystems and release at regional and national level;
- Abiotic stress tolerance (cold, heat , drought, saline soils, acidic soils) evaluation trials
- Variety verification trial (VVT) for different rice ecosystems and biotic and abiotic stresses

Both regional (Sirinka, Gonder, Bako, Bonga, Jinka, Axum, Humera, May Tsemri, Gode, Gambella) and national (Adet, Pawe, Werer, Assosa, Jimma) research centers will be involved in conducting variety trials.

Breeder and pre-basic seed maintenance and multiplication

Maintaining true to type seed of released cultivars is one of the major routine activities in crop breeding program. It helps to keep the purity of the breeding materials.

The main objectives of this activity are maintaining and multiplying released rice varieties; and facilitating and disseminating the released varieties. The specific demand (the required amount) of breeder and pre-basic seed from 2011 to 2015 is presented on Table 3.

Introduction and adaptation of pre- and post- harvest technologies

As rice is one of the recently introduced crops in the country, the implementation plan will give priority to adoption of imported technologies. The specific activities include

- Introduction and adaptation of different tillage implements like ploughs, rotary tillers, tines ridgers, rice planters and weeders in relation to the main aspects of tillage such as increased crop yield, moisture management and weed control;
- introduction of post-harvest equipments like mechanical reapers, threshers, cleaners, graders and rice mill, and directly extending to users after field evaluation; and
- Introduction and adaptation of appropriate mechanical power sources, i.e., small horsepower tractors and attachments

Rice production management

Rice production management involves: a) cropping system; b) agronomy; and c) crop protection. These have been outlined below.

Cropping systems: In order to increase and sustain rice production and productivity in the country, it would be important to do crop rotation, sequential cropping, and intercropping experiments in the rice growing areas of the country.

The specific research activities for cropping system research are:

- evaluation of crop rotation for rice production under different rice ecosystems, which will be undertaken at Woreta, Metema, Werer, Pawe and Gode;
- evaluation of double cropping on rain-fed low land and irrigated rice ecosystems, which will be undertaken at Woreta, Pawe, Assosa, Werer, and Gode; and
- assessment of rice-other crops relay intercropping for irrigated rice ecosystem, which will be conducted at Werer, Woreta and Gode.

Agronomy: Soil nutrient application rates, schedule of nitrogen fertilizer application, seed rate, and planting methods are among the major agronomic practices that limit rice productivity and production.

The specific activities in rice agronomic research are:

- the effect of fertilizer on rice yield in different rice ecosystems (upland, lowland and irrigated);
- the effect of N fertilizer application time on rice yield for different rice ecosystems;
- determination of rice seed rate for broadcasting on different rice ecosystems;
- comparative study of drill raw planting Vs broadcast planting on rice for different rice ecosystems;
- comparative study of dibbling raw planting Vs broadcast planting on rice for different rice ecosystems;

- evaluation of rice transplanting practices for rain fed lowland and irrigated rice ecosystems;
- study on tillage practices; and
- study on required water amount and irrigation interval for irrigated rice production.

Crop protection: Rice production is affected by a wide range of insects, diseases, weeds, birds and other vertebrate pests. With Rice being a recently introduced crop in Ethiopia, little is known about the types and prevalence of pests damaging the crop. It would be imperative to make first surveys for assessing the status of pests in the country. For some of the pests well recognized in significantly affecting the crop, for example, pests like termites and weeds), the research would focus on integrated control approaches.

The specific research activities under rice crop protection include:

- survey on rice insect pests and diseases in different rice ecosystems (upland, lowland and irrigated);
- survey of weeds of different rice ecosystems;
- study on integrated termite management practices in different rice ecosystems; and
- study on integrated weed management practices in different rice ecosystems.

Suggested project-based activities in rice research, source seed and capacity building

Building National Rice Research and Training Center

For effective and integrated interventions in rice research and training, there is a need to have a center, where the rice research and trainings can be conducted in a specialized and integrated manner. The Ethiopian Agricultural Research System has designated Adet Agricultural Research Center of Amhara Region Agricultural Research Institute (ARARI) to serve as the national coordination center for rice research. Currently, the center has meager capacity both in terms of human and physical facility resources. Thus, it is mandatory to build the center's capacity both in terms of human resources and physical facilities so that it can serve as nation center for rice research and training.

Physical capacity building: It is proposed that the center will have the civil works that include

- residence blocks;
- fully operational meeting halls;
- social center;
- library;
- laboratory;
- greenhouses;

- information and communication technology (ICT) installations to support the development of an information system;
- cold rooms. Equipment would also include laboratory equipment; machinery and vehicles, which will enable the center, discharge its mandates and responsibilities.

Human resource capacity building: Post-graduate trainings at PhD and MSc levels are needed to fill the knowledge gaps in technical and social aspects related to priorities in rice research, training, and dissemination. Since local universities do not have specialized training in rice, all the long-term trainings will be arranged in a sandwich-model between a local university and universities elsewhere.

Introduction of pre and post-harvest technologies

Increases in agricultural productivity come from the development and transfer of inputs of high yielding varieties, fertilizers and pest control chemicals, and appropriate mechanization technologies. By introducing integrated mechanization system that will best suit the needs of rice farmers; the whole farming operation can be placed in a better position to meet the local food requirements with significant surplus for foreign exchange and agro-industries. The strategic means to meet the mechanization requirement is introduction and adaptation of potential technologies from countries of similar setting coupled with on-station back-up research.

Human capacity building for rice research

Cognizant of the critical shortage of skilled and experienced experts in all aspects of rice research, there is a need to have technical support through short- and long-term engagement of expatriates from countries with long tradition of rice research. Along with this, there is also a need to develop local capacity through short- and long-term trainings of local experts for sustaining the research and development efforts of the sector.

Component 2: Rice Development and Capacity Building

This component has the following five sub-components

- production and dissemination of rice seed;
- rice extension (agronomy, soil fertility and protection);
- irrigation and investment in water control technologies;
- pre- and post-harvest mechanization technologies including maintenance; and
- strengthening the institutional framework and policy support including institutional support, marketing, finance and credit.

These sub-components will be supported with different project-based activities in rice development and capacity building.

Subcomponent 2.1: Production and Dissemination of Rice Seeds

In the National Rice Research and Development Strategy of Ethiopia (NRRDSE, 2010), it is projected that 34,770.26 and 58,012.79 tons of certified class seed need to be produced for use in 2014 and 2019, respectively. Based on this general projection, the different class of seed (breeder, pre-basic, basic and certified) to be produced annually for the first 5 years is projected taking into consideration the fact that two-third of the farmers will re-use the seed (assumption of three-year replacement cycle). Accordingly, the projected demand for certified, basic, pre-basic and breeder rice seed are summarized on Table 3.

Table 3. Demand (t) for different classes of rice seed in Ethiopia from 2011-2015

Seed class	Projected seed demand (t) by year					Total
	2011	2012	2013	2014	2015	
Certified	7,193.9000	8,940.7300	10,933.5200	12,803.1900	14,724.1000	54,595.4400
Basic	243.0800	287.3900	329.0300	354.8400	393.8000	1,608.1400
Pre-basic	7.9994	8.8815	9.3498	9.7828	10.1579	46.1700
Breeder	0.2534	0.2586	0.2624	0.2564	0.2540	1.2800

Source: MoARD, 2010

The seed production of rice should be in line with the national seed multiplication class i.e. breeder, pre basic, basic and certified class seed (C1 – C4). In line with this:

- Breeder and pre-basic seed production is to be carried out by federal and regional agricultural research centers. To some extent, pre-basic seed will also be produced by public federal as well as regional seed enterprises until multiplication of sufficient breeder and pre- basic seeds could be handled by research centers.
- Basic seed production is to be carried out by:
  - Public federal (ESE) and regional (Oromiya, Amhara, SNNPR and others) seed enterprises;
  - Private seed producers and investors who have large-scale farms suitable for rice seed production and having the technical capacity either on contractual basis with public federal and regional seed enterprises or on their own; and
  - Federal and regional agricultural research centers until the production of sufficient basic seed can be taken over by the public and private seed producers.
- Certified class seed (C1-C4) production is to be handled by:
  - Public federal (ESE) and regional (Oromiya, Amhara, SNNPR and others) seed enterprises on their own farms or on large-scale and small-scale (farmers) farms on contractual bases;
  - Private seed producers and investors having large-scale farms suitable for rice seed production and the technical capacity either on contractual basis with public federal and regional seed enterprises and/or on their own; and
  - Farmers-based seed production on contractual basis with farmers' cooperative unions and with technical support of regional agriculture offices at all levels.

Subcomponent 2.2: Rice Extension (Agronomy, Soil fertility and Protection)

This subcomponent will focus on upgrading the existing rice production packages and training manuals to increase production and productivity; and provision of training for farmers, development agents (DAs) and subject matter specialists (SMS) on the practical, field-oriented skills and knowledge of rice seed production using FTCs as focal targets. In addition, large-scale demonstration and popularization activities will be organized through field days, field tours and field visits to improve the skills and capacity of SMSs within the regional agriculture offices. The SMSs are meant to backstop MoA-DAs working in their Woredas and facilitate their links to the agricultural research and development communities. The main extension activities will be

- demonstration and popularization of released varieties, agronomic practices and pre- and post-harvest technologies for both rain-fed and irrigated riceto DAs, SMS, and farmers;
- provision of associated training to DAs, SMS, and farmers; and
- creation of market linkages for the rice inputs and outputs.

Subcomponent 2.3: Irrigation and Investment in Water Control Technologies

Irrigated agriculture in Ethiopia is dominated by smallholder farmers, and it is largely categorized as either traditional or small-scale irrigation. The government of Ethiopia is currently increasing its support and involvement in improving traditional irrigation systems and in the expansion of the areas under modern irrigation to increase agricultural productivity and improve rural livelihood through producing market oriented economic crops that include rice as one of the priority crops.

To increase rice production under irrigation, the existing irrigation schemes will be rehabilitated while new irrigation schemes (gravity) will be developed. In the rain fed lowlands, communities will be encouraged to participate in the development of simple and low cost rainwater management structures for improved rice production. Research and development staffs at all levels and farmers will be trained in the operation and maintenance of schemes. Water measuring devices for improved water usage under irrigation will be provided. More efforts will be made on the establishment and strengthening of water users' associations (WUA).

Subcomponent 2.4: Pre- and Post- harvest Mechanization Technologies Including Maintenance

This component focuses on batch production and participatory evaluation of some recommended tools and implements for wider adaptation through field demonstration and training of farmers, development agents, and local manufacturers. Efficient tillage implements (animal drawn mouldboard plough, row planters, and weeders) and post-harvest equipments (threshing, cleaning, grading, and rice milling equipments) will be manufactured by national and regional agricultural mechanization research centers. Then, these technologies will

be supplied to trained farmers on a use and return basis. This would permit farmers to try them out without having to take the financial risk. In the consecutive years, the work will resume and based on the demands, the technologies will be multiplied by private workshops and distributed to interested farmers on a sales basis. Thus, the rice research and development strategy implementation plan as whole works on the technology multiplication and extension system to make sure that research outputs will be deliverable through commercialization.

Subcomponent 2.5: Strengthen the Institutional Framework and Policy support including Institutional support, marketing, finance and credit

Building implementation capacity of agricultural marketing needs strengthening the on-going Institutional framework, and financing and credit.

The Implementation plan rooted its activities on the significant market intervention areas related with:

- empowering cooperatives and union to improved marketing;
- improving knowledge of grading, market information and trade through ECX;
- enhancing storage use as a market strategy;
- promotion rice value addition and investment;
- promotion of the local consumption of domestic rice; and
- promotion of rice export.

Specifically, the interventions are:

- Effective coordination and regulation of the supply of required agricultural inputs
- Empowering cooperatives and unions to improve marketing
- Improving knowledge of grading, marketing information and trade through ECX
- Stabilizing rice market price
- Promotion of value addition and investment

Sub-component 2.6. Suggested Project-Based Activities in Rice Development and Capacity Building

These include

- construction of state-of-the art model rice milling and dehulling facility;
- capacitating public seed enterprises;
- strengthening federal and regional seed quality control laboratories;
- assessment of irrigated rice potential areas and possible investment options;
- capacitating selected FTCs to serve as a model for rice development; and
- human capacity building for rice development

Component 3: Coordination and Management of the Implementation Plan of NRRDSE at National Level

This component includes

- coordination and management at national level; and
- costs and finances; and
- monitoring, evaluation and knowledge management

Coordination and Management at National level

NRRDSE will be implemented and coordinated by the Ministry of Agriculture with close collaboration of the different directorates within the Ministry and the Ethiopian Institute of Agricultural Research (EIAR) at the federal level, and by the regional agriculture offices (AOs) together with the respective regional agricultural/ pastoral/agro-pastoral research institutes (Fig. 1).

The management of the strategy at national level will be streamlined within the normal operations of Ministry of Agriculture with the Planning and Programming Directorate as a rice secretariat taking the leading role.

Activities include

- compilation of NRRDSE budget for each financial year;
- developing NRRDSE implementation plan for the strategic action areas;
- monitoring and evaluation of physical and financial performance of the strategic action areas; and
- receiving all rice related project/programme proposals, in consultation with RTC, analyze and make it ready for approval by the national Rice Steering Committee (RSC).

Members of the National Rice Steering Committee are

- Ministry of Agriculture;
- Ethiopian Institute of Agricultural Research;
- Ethiopian Seed Enerprise;
- Farmers Research Group Project (FRG II);

- Sassaka Africa Association;
- Regional agriculture offices (AOs); and
- Regional agricultural research institutes.

The collaborators include

- JICA;
- Japan International Research Center for Agricultural Sciences (JIRCAS);
- Sasakwa Africa Association;
- African Rice Centre; and
- Coalition of African Rice Development (CARD)

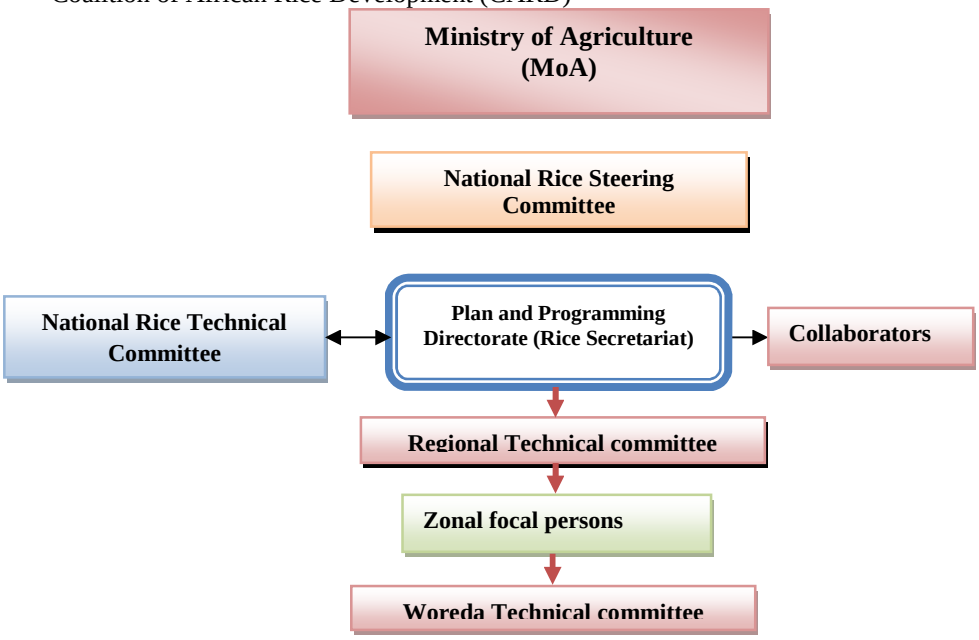

Fig. 1. Coordination and management of the Implementation plan of NRRDSE at National level

At regional level, a technical committee will be established to overlook the implementation of the regional rice activities along with communication of rice issues in the region with the rice secretariat at the federal level. It also prepares quarterly rice data/information and report to the secretariat. The secretariat also receives quarterly reports from institutions working in the areas of rice like EIAR, ESE, etc, compiles, analyzes, and makes it ready for the RSC and needy organizations.

At zonal level, there will be only a focal person to link the rice Woreda activities with regional technical committee. At Woreda level, there will be a technical committee composed of relevant actors (Fig.1).

Costs and Finances

Public funding

All the identified activities under each component will be implemented through the respective public agencies and their funding will be as per the public finance request and approval process. Thus, it is expected that each implementation public agency will plan the finance each year to implement its respective activities.

Project-based funding

The identified project based activities will be implemented through projects that will be externally funded. Thus, it is expected that the National Rice R&D Steering Committee will devise a mechanism for external funding. Among the potential sources of funding are JICA, Bill, and Melinda Gates Foundation (BMGF), USAID and others.

Monitoring, Evaluation and Knowledge Management

The different activities in the rice R&D presented above will be monitored and evaluated against the targets indicated in the NRRDSE. The National Rice R&D Steering Committee with the support of the Rice Secretariat will take the responsibility of the overall MandE of this implementation plan.

The tools for the MandE are the bi-annual review meeting of the National Rice R&D Steering Committee, the quarter and annual reports from the respective implementation institutions, specialized MandE of respective expected externally funded projects, and field visits by members of the National Rice R&D Steering Committee and the technical committee.

At regional level, the focal person based at respective regional agriculture offices (AOs) will take the responsibility of undertaking the MandE in collaboration with the national Rice Secretariat and through supervision of timely reporting.

References

CSA. 2008Summary and Statistical Report of the 2007 Population and Housing Census, Addis Ababa, Ethiopia

MoARD. 2010. National Rice Research and Development Strategy of Ethiopia. Ministry of Agriculture. Addis Ababa, Ethiopia. 61pp

MoFED. 2006. Ethiopia: Building on Progress: A Plan for Accelerated and Sustained Development to End Poverty (PASDEP), 2005/06-2009/10, Vol. I: Main Text, Addis Ababa.

MoFED. 2010. Growth and Transformation Plan: 2010/11 - 2014/15. Volume I: Main Text. Addis Ababa, Ethiopia. 135p.

Trends and Challenges in Rice Investment in Ethiopia

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Introduction

Agriculture plays a leading role in Ethiopia's overall economic development. The government's policy considers agriculture as the pillar of the economy that provides the population with employment, foreign exchange earning, source of raw materials for industry, and source of food for the population (EFDR, 2001). In particular, agriculture is believed to determine the pace and direction of the industrial development through financing the industrial sector and generating effective demand for industrial outputs. In the industry development sector itself, export-oriented principle plays a leading role (FDRE Policy, 2002).

Since 1992, the Ethiopian government has successfully implemented a series of reform programs in order to transform the economy from command to market economy, speed up the integration of the economy into the world economy and encourage the wider participation of the private sector in the development of the national economy. The government's development policies and strategies particularly recognize the need for transforming the agriculture sector from its low-productivity status and subsistence production orientation to a high productivity and market-oriented production.

Ethiopia, with a total landmass of about 111.5 million ha of which 74.3 million ha is suitable for agriculture, has increasingly become one of the preferred investment destinations in East Africa. There are 18 major agro-ecological zones in Ethiopia; the country is divided into 32 agro-ecological zones based on seven-moisture regime or length of growing period classes and six thermal regimes (MoARD, 2005). As a result, Ethiopia is suitable for production a large variety of crops, including cereals, pulses, oilseeds, stimulants, fiber crops, fruits, vegetables, root and tuber crops, and sugarcane.

It is estimated that 11.5 million hectares of land in the country is under cultivation and grains are the most important field crops occupying 86% of the cultivated area and constituting the chief constituent in the diet of most

Ethiopians. Of the gross annual grain production, the contribution of rice is around 0.1 million ton in 2009 production season (CSA, 2010).

The paper presents the trends in rice investment along with the existing constraints and opportunities based on (i) the review of agricultural and investment policies, strategies and programs; and (ii)assessment of existing investment institutions and reviewing the existing conditions through analyzing their reports and by reviewing other secondary data along withg the experiences of the author.

Investment in Rice Development and its Challenges

Existing Policies Related to Agricultural Investment

The government of Ethiopia has developed and just entered into the implementation of the five year Growth and Transformation Plan (GTP). This plan has given due emphasis to agricultural investment with two areas of focus areas. The first one is the highland agricultural investment, which has limited land resource, and sufficient human labor and infrastructure. Therefore, the investors in this area concentrate on producing horticultural crops such as vegetables, flowers, and herbs. The second focus area is the lowland area, which has ample amount of arable investment land, but insufficient labor force and infrastructure. It is suitable for production of cereals including rice, pulses, oil crops, and other industrial crops.

The policy also recognizes the decisive role of private capital in the development of large-scale modern farming. To realize this, the government has created enabling conditions to encourage both domestic and foreign private investments. The government's policy focuses on expanding medium and large commercial farms in the lowlands without displacing settled farmers. It also affirms that unutilized land in the vicinity of smallholders (even in the highlands) can be rented and used for modern farming as long as it does not displace farmers (MoA,, 2010). To lead the policy and strategy to success, the Ethiopian government has been heavily investing on infrastructure, rural finance, research, access to improved technology and information, market development, agricultural extension services, promotion of cooperatives, education, and resettlement programs. In addition, and more importantly, the main objective of the former PASDEP and the new GTP has been to accelerate the transformation from subsistence to commercialization of smallholder agriculture through attaining increased productivity and increased share of marketed production, and continued support to pro-poor basic agriculture within the framework of the national food security program (MoFED, 2010).

In terms of the institutional reforms in supporting agricultural investment, the government has established Agricultural Investment Support Directorate (AISD) under the Ministry of Agriculture, with mandates primarily to administer agricultural investment land and provide necessary support to investors. Ethiopian Meat and Dairy Technology Institute (EMDTI) is another institution established to support the investors who are working on meat and dairy sub-sector. The Ethiopian Horticulture Development Agency (EHDA) is similarly responsible for the development of horticultural crops (e, vegetables, floriculture, fruits, and herbs) development. In addition to these institutions, the National Export Commodity Committee (NECC), which is led by the prime minister, evaluates and gives directions for the export-oriented commodity that are produced through agricultural and industrial investment. Among others, AISD is responsible for supporting rice investment in the country.

Trends of investment on rice

Rice is the new crop for the country. Before three years, there has not been any large-scale commercial rice farm. However, currently the development in commercial rice farming is encouraging. The Federal government administers 3.6 million hectares of land in Gambella, Benishangul Gumuz, Oromiya, and SNNP regions. Out of these, around 398,000 hectare of land has been transferred to local and foreign investors. From the total land transferred to investors, the share of rice farms is around 83,000 hectares, which about 21% of the commercial investment land (Table 1).

Table 1 Commercial agriculture investment in Ethiopia as of 2010

Investment Type	Area (ha)
Oil seeds and pulses	60,000
Cotton	116,656
Sugar Cane	65,000
Horticultural & Crops	431
Rice	83,000
Bio-fuel	50,000
Palm oil	20,000
Tea	3,012
Total	398,099

Source: MoA, 2011

Role of investment on rice in Ethiopia

Introduction and expansion of commercial rice farms provide the country with a number of opportunities and benefits. Development of large rice farms supports efforts geared at attaining food security, and it will help diversify cash and food crops of the country. It increases and/or diversifies sources of foreign currency earnings. On the other hand, the investors participating on rice

commercial farms introduce and transfer modern farming technologies, equipment, and skills. It also increases and enhances wage and self-employment opportunities for the community. Moreover, the investors play important role in local infrastructures and social services development. Electric power can also be generated for the local community from rice husk, thus, contributing to the main electric energy. Development of modern commercial farms increase capital accumulations and contribute to the country's overall economic growth.

Rice starch has both domestic and industrial uses. Industrially, its applications are numerous and it is used in various modern industries including the manufacturing of textile, paper, adhesives, insecticides, paints, soaps, explosives and such derivatives as dextrin and nitro starch. Industries use the product mainly as binding, diluting adhesive and water absorber agent in their production process. The source of supply of starch is local as well as import. However, starch production in the country is insignificant. Currently, there is only one privately owned starch production plant that produces starch from enset.

Challenges of Rice Development

Being a new investment area, rice development cannot be without some challenges. Development of large-scale commercial rice farm is at infant stage and lacks expertise and awareness on proper commercial farmland designing. Lack of developer parties or companies is another challenge. The investor needs an expert or contracting companies who have experience to develop large-scale commercial farms. Large-scale commercial farms require different types and quality of managerial, professional, technical knowledge and skills such as large-scale commercial farm managers, machinery operators, and skilled personnel in rice processing and polishing. Nevertheless, as of now most of the farms could not easily get these personnel. Moreover, large-scale rice farms require a large number of customers, but investors could not get sufficient global market need based improved rice seed.

Conclusion

Ethiopia has conducive and clear investment policies to attract local and foreign investors in the agricultural sector in general and in favour of the development of rice investment. All governmental, non-governmental organizations and private sector actors need to join forces if meaningful development has to be realized in this regard. Higher education and

research institutions need to give adequate emphasis to the research on development of large-scale commercial farms in general and for rice in particular.

The country shall pay adequate attention to obtaining best practice and experience from successful countries on comprehensive development of large-scale commercial farms.

The government and investors need to assure and give emphasis to local community participation and benefit, and environmental protection while commercialization is undertaken on large-scale commercial farm level.

References

CSA. 2010. Agricultural sample survey 2009/2010, Addis Ababa, Ethiopia

ECA. 1997-2006. Ethiopian Customs Authority. External Trade Statistics 1997-2006, Addis Ababa, Ethiopia

EFDR. 2001. Agricultural and rural development policy and strategy. Federal Democratic Republic of Ethiopia

EFDR. 2002. Ethiopian Federal Democratic Republic. Industry Development Strategy. Addis Ababa, Ethiopia. Federal Democratic Republic of Ethiopia. Addis Ababa

EIA. 2009. Ethiopian Investment Agency. Annual Report (2009). Addis Ababa, Ethiopia

Esayas Kebede. 2009. Agricultural commercialization in Ethiopia. A paper presented on SGA, workshop. 24 Nov 2009, ECA,Addis Ababa, Ethiopia

MoA. 2010. Ministry of Agriculture. Five Year Development Plan. Federal Democratic Republic of Ethiopia. Addis Ababa, Ethiopia

MoARD. 2005. Ministry of Agriculture and Rural Development. Major Agro-ecologies of Ethiopia. Forest, Land Use and Soil Conservation Department, MoARD, Addis Ababa, Ethiopia

MoFED. 2010. Ministry of Finance and Economic Development. Growth and Transformation Plan of Ethiopia. Addis Ababa, Ethiopia

Ramswamy C. 2008. Redefine concept of commercial agriculture Tamil Nadu Agricultural University, India.

Stakeholder Analysis in Rice Research and Development

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Introduction

In Ethiopia, rice is among the target commodities that have received due emphasis in promotion of agricultural production, and as such it is considered as the "millennium crop" expected to contribute to ensuring food security in the country. Although rice is introduced to the country very recently, rice has proven to be a crop that can assure food security in Ethiopia, the second most populous nation in sub-Sahara Africa (SSA) with about 74 million people in 2007 (MoARD, 2010)

Currently, mainly small-scale farmers grow rice in different parts of the country, but it is also produced by large-scale farms in few places mainly in lowlands of the country. The country's total milled rice production in 2009 was estimated at 323,916 metric tons. Total current rice consumption is about 353,998 tons with estimated annual average import of 21,724 tons over the last ten years. Ethiopia adopted NERICA varieties such as NERICA-1, 2, 3, 4 and Suparica-1 varieties in addition to the local varieties such as X-Jigna and others. Due to the introduction of upland and irrigated rice varieties in the country, rice farming has increased from by 53,302 farmers in 2006 to over 284,268 in 2009. There have been twelve upland/lowland NERICAs and Sativa-type, and three irrigated rice varieties released in Ethiopia from 1999 up to 2007 (MoARD, 2010).

Different actors are involved in the promotion of rice production and marketing in the country. This paper presents the stakeholder analysis in rice research and development in the country with the objective of generating knowledge about the relevant actors to understand their behaviour, intentions, interrelations, agendas, interests, and the influence or resources they have brought - or could bring-to the development of the sector. This information can, then, be used to develop strategies for managing these stakeholders, to facilitate the implementation of rice development plans, and to understand the policy context and assess the feasibility of future policy directions.

Any stakeholder analysis starts from defining who the stakeholders are. Stakeholders are all those who need to be considered in achieving project goals and whose participation and support are crucial to its success. Stakeholder

analysis identifies all primary and secondary stakeholders who have a stake in the issues with which the project or policy is concerned (Golder and Gawler, 2005). In general, the goal of stakeholder analysis is to develop a strategic view of the human and institutional landscape, and the relationships between the different stakeholders, and the issues they care about most. The popularity of stakeholder analysis reflects an increasing recognition of how the characteristics of stakeholders (individuals, groups and/or organizations) influence decision-making process (Brugha and Varvasovszky, 2000).

Different studies document that stakeholder analysis can help a project or program to identify:

- the interests of all stakeholders who may affect or be affected by the program/project;
- potential conflicts or risks that could jeopardise the initiative;
- opportunities and relationships that can be built-on during implementation;
- groups that should be encouraged to participate in different stages of the project;
- appropriate strategies and approaches for stakeholder engagement; and
- ways to reduce negative impacts on vulnerable and disadvantaged groups (Golder and Gawler, 2005; Brugha and Varvasovszky, 2000, Schmeer, 1999).

Stakeholders and their Linkages

Technology generation linkages

Adet Research Center of Amhara Region Agricultural Research Institute (ARARI) nationally coordinates the rice research in Ethiopia. The major stakeholders involved in rice research and development are shown on Fig. 1. In general, the variety development program is linked with adaption trails in collaboration with AfricaRice and the International Rice Research Institute (IRRI).

Ethiopia is expected to be member of AfricaRice soon, which creates the opportunity for improved access to germplasm, human capacity building and sharing of experiences in rice R&D. Nationally, in addition to Adet Agricultural Research Center, Werer and Jimma Agricultural Research Centers of the Ethiopian Institute of Agricultural Research (EIAR), all regional agricultural research institutes (RARIs), Jimma and Sodo Universities, and Woreta Agricultural and Vocational Training (ATVT) College are involved in the research. Even though, the research is underway, the capacity seems to be weak in all research institutes mainly because of very few numbers of

researchers and the majority of whom are not trained for rice research and specialization in limited area of rice research.

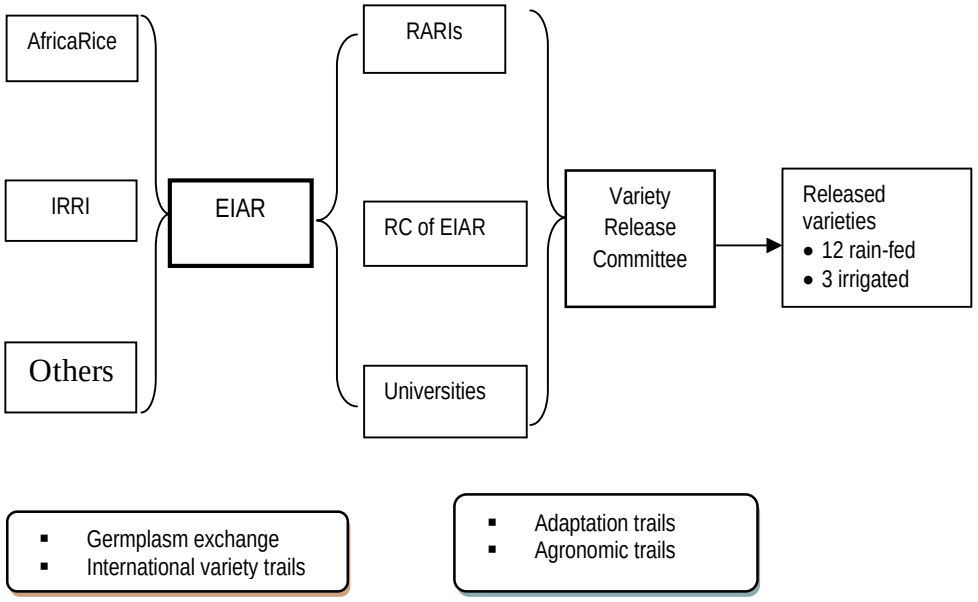

Fig. 1. Actors in rice research

Linkages in rice technology transfer

Fig. presents the linkage of the different actors in the rice technology transfer. Members of the national agricultural research system (NARS) involved in rice research promote pre-extension demonstration and in recent years, they are involved pre-scaling up of available technologies especially in variety demonstration. The transfer of rice technology has been promoted by SG 2000 in the major production areas of the country in collaboration with regional bureaus of agriculture. The current extension package was developed by the Extension Directorate of the Ministry of Agriculture.

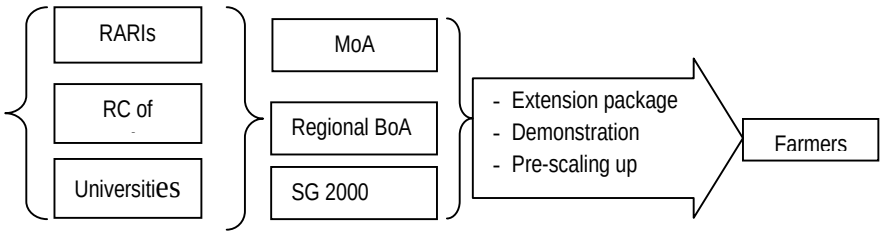

Fig. 2. Linkages in rice technology transfer

Linkages in rice seed supply

The seed supply is one of the major constraints in the rice development in the country. Most of the seed demand in the major rice producing areas seems to be met by farmers' own seed. For new rice growing areas, initial seed supply depends upon sources through public institutions and SG2000. It is only in recent years that the public seed enterprises have started production of rice seed. Most of the seeds distributed were produced under farmers-based seed multiplication (FBSM) with the support of SG 2000. In the last two years, the seeds produced through pre-scaling were collected by public seed enterprises and used as seed. As presented in Fig. 3, basic seed production and supply is the responsibility of Adet Agricultural Research Center for upland rice varieties and Werer Agricultural Research Center for lowland and irrigated rice varieties. In addition, other research centers of both EIAR and RARIs are involved in production of rice basic seed on case- by-case basis.

The Ethiopian Seed Enterprise (ESE) and regional seed enterprises (Amhara, Oromiya, and South Seed Enterprises) produce seed for the popular rice varieties partly on their own farm and partly under farmers-based seed production schemes; while SG 2000 has also been involved in promoting farmers-based seed multiplication. Even though, the trend in the volume of seed supply is increasing from time to time, there is considerable shortage of certified seed supply. To ensure equitable distribution of the available seed, each year the Seed Production and Distribution Committee of MoA allocates or appropriates the produced seeds for the different regions as per their apparent demand.

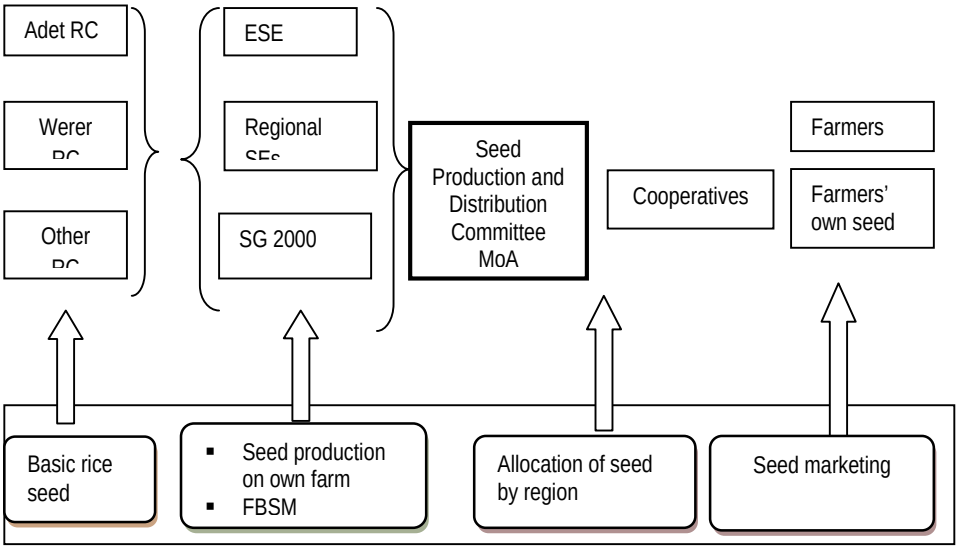

Fig. 1. Linkage in rice seed supply

Once seed is appropriated by region, cooperative unions are responsible to distribute to farmers through their member primary cooperatives. Price setting is done using the nationally set procedure, where regions discuss with suppliers along with the possible profit margins for the different actors in the chain.

Although in the large rice growing areas, currently, there is no private sector for rice seed production and supply, it is obvious that the informal seed production is common, and some kind of rice seed marketing systems are operating.

As it is the case for other cereals, the stakeholders in the rice seed system require further strengthening of their linkages and capacity development in seed production in order to ensure the availability of seed of the released varieties in the required time and place.

Promoting rice post-harvest

As indicated in the National R&D strategy, the issue of post-harvest management for rice is most critical factor in the country. Hence, it is not competitive with the imported rice, as a result it is not available in supermarkets.

Currently, rice processing is done using traditional mills that cause grain breakage of 40 to 50%. Some efforts were made by SG 2000 and rural technology centers to promote improved processing to ensure quality rice grains, although the use of these introduced machines is very limited. Recently, some importers are bringing rice-processing equipment (Fig. 4).

The need to strengthening the linkages in promoting rice post-harvest management sould consider the following aspects

- further strengthening the introduction of suitable post harvest tools;
- strengthening the local capacity of rice post-harvest management tool production, marketing and supply of spare parts; and
- capacity building in the use different post-harvest tools at farmers and millers levels.

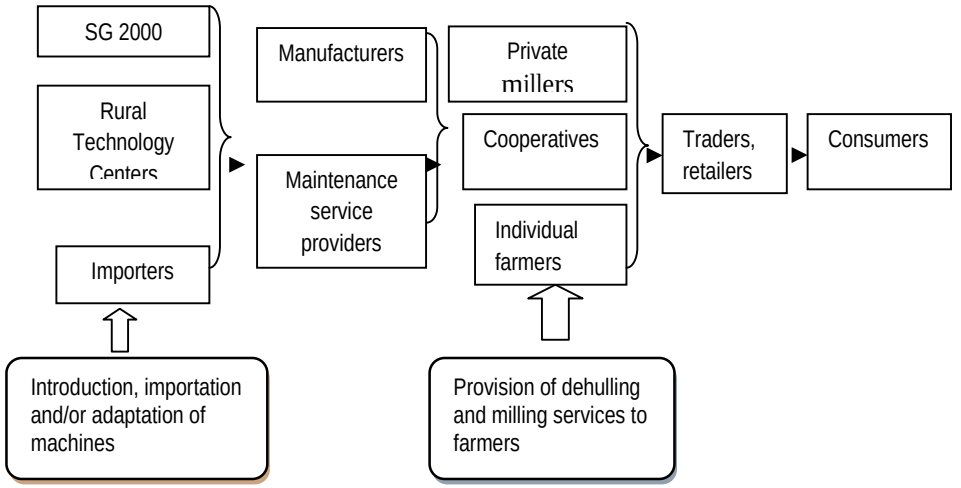

Fig. 2. Linkages in promotion of rice post-harvest management

Linkages in rice marketing

In general, the markets for domestically produced rice are limited to localities in the major production areas. The existing supermarkets in major urban areas market imported rice, as the domestic rice does not fulfill quality standards mainly due to breakages and lack of uniformity. The millers in the major production areas are involved with trading both wholesaling and retailing either to other nearby urban traders or directly to consumers.

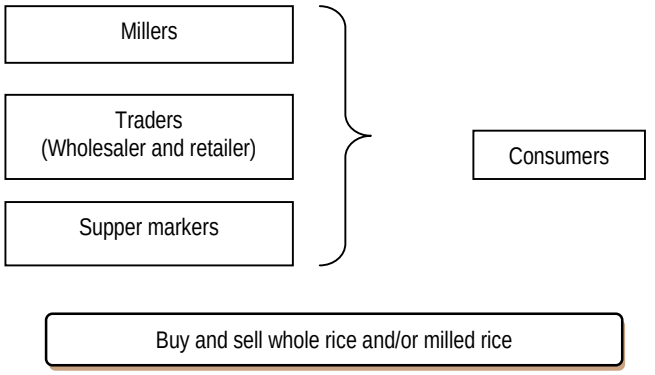

Fig. 5. Linkages in domestic rice marketing

The need to strengthen linkages in rice marketing is to link with ensuring the quality of domestically produced rice to make it competitive with the imported rice; and creation of efficient market linkages along with required market infrastructure within the country.

Coordination of Linkages among Rice Actors

Under the overall direction of the Federal Ministry of Agriculture (MoA), the National Rice R&D Steering Committee plays a central role to bring all the actors, public sectors, private sectors, rice producers, donors and NGOs on the same board (Fig 6). It is composed of different national actors including MoA, EIAR, ESE, JICA, SAA, regional BoA, and regional agricultural/pastoral/agro-pastoral research institutes. Research institutes coordinate the linkages among the different actors along with the promotion of the implementation of the National Rice R&D strategy. The National Rice R&D Technical Committee is accountable for technical issues. The day-to-day activities of the steering committee/technical committee are handled by the Rice R&D secretariat supported by Japanese Government through JICA, which is based within the MoA.

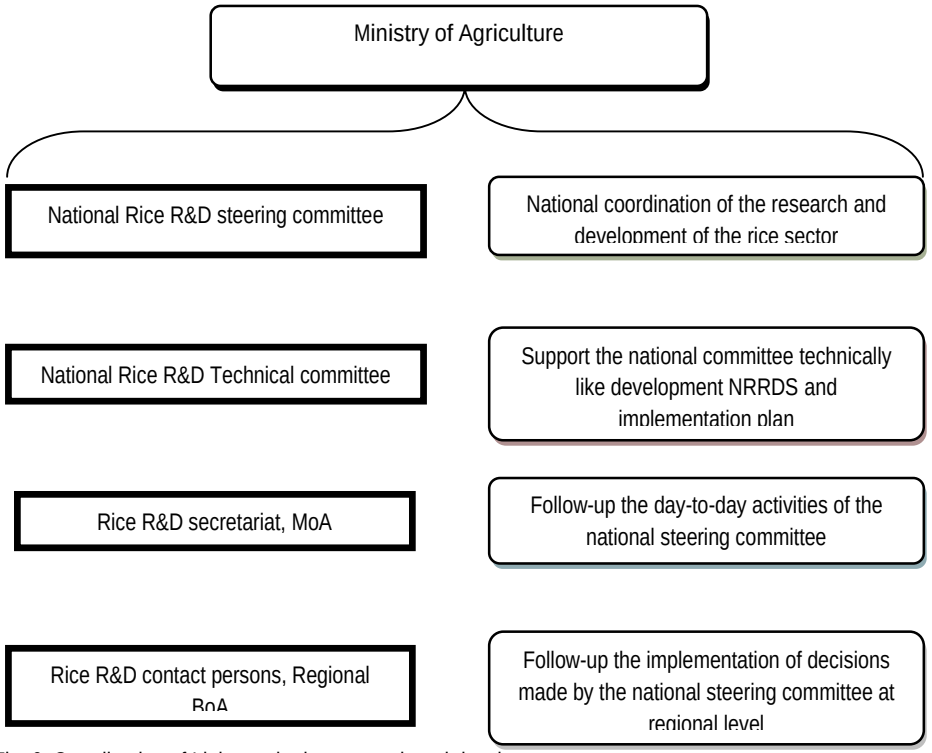

Fig. 6. Coordination of Linkages in rice research and development

Conclusions and Recommendations

The paper presented the stakeholder analysis with the main objective of identification of the important stakeholders along with their role within rice R&D; identification of the linkages among the different stakeholders; and assessing the existing opportunities and constraints for better linkage among the stakeholders and identification of the needs of interventions.

Upon having good linkages with International Research Institutes like AfricaRice and IRRI, the national research system consisting of EIAR, RARIs and universities has been involved with research in rice, and it has managed to release 12 rice varieties for rain-fed and three varieties for irrigated conditions. However, the research programs are weak mainly in terms of having very few numbers of researchers in all research institutes and specialization in limited area of rice research. Currently, there is no capacity for more advanced rice research (rice breeding), there are no comprehensive technology packages for different rice ecologies, and there are weak mechanisation technologies including post-harvest management. Cognizant of these capacity limitations, there is a move by EIAR in collaboration with JICA supported FRG II project to establish a national rice research and training center.

The supply of certified rice seed is very limited, and mostly there is a trend that the seed produced by farmers through some programs like the program of SG 2000 is used as seed for other areas. This shows the need to strengthen the linkage among actors involved in certified rice seed production.

For increased competitiveness of the domestic production even in the domestic market there is a need to strengthen the rice post-harvest management capacity at all levels through

- further strengthening the introduction of suitable post-harvest tools;
- strengthening the local capacity of rice post-harvest management tool production and marketing;
- capacity building in the use of different post-harvest tools at farmers and millers levels; and
- development of rice products market. This, in turn, is expected to ensure better marketing of domestically produced rice.

Moreover, creation of efficient market linkages along with required market infrastructure within the country is expected to boost the competitiveness of domestically produced rice.

Different efforts are underway to implement the approved National Rice Research and Development Strategy through developing implementation plan

at regional and federal levels; undertaking M&E in the form of regular meetings of the National Rice R&D Steering Committee; and overall support to the investment in rice sector development. This requires that the roles of different actors should be strengthened along with coordination and the value-chain. Specifically, it is recommended to strengthen the following:

- The research capacity through promoting advanced rice research and initiating and expanding research in other areas/disciplines like agronomic practices and post-harvest management along with physical and human capacity building. It is recognized that for effective promotion of the rice sector the establishment of National Rice Research and Training Center is very crucial;
- Stakeholders involved in certified rice seed production need to strengthen their linkages to make sure that breeder's seed of the released rice varieties will be available in the required quantity and quality at the required time and place at reasonable price;
- Stakeholders involved in post-harvest management need to make sure that the required post-harvest tools and equipment are available domestically. Thus, is important to strengthen the introduction of suitable post harvest tools; emphasize on strengthening the local capacity of rice post-harvest management tool production and marketing; and focus on capacity building in the use different post- harvest tools at farmers and millers levels; and
- The National Rice Secretariat, which is supported by JICA needs to be institutionalized within the MoA for promoting effective functioning of the National Steering Committee for better coordination of the rice R&D efforts involving the different stakeholders

References

Ministry of Agriculture and Rural Development. 2010. National Rice Research and Development Strategy of Ethiopia. The Federal Democratic Republic of Ethiopia, Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia. 48pp.

Ruairi Brugha, R. and Z. Varvasovszky. 2000. Stakeholder analysis: Review. Health Policy and Planning: 15 (3) 239 - 246.

Golder B and Gawler. 2005. Stakeholder Analysis: Cross-Cutting Tool. Resources for Implementing the WWF Standards. WWF. accessed at http://wwf.panda.org/ on Feb 10, 2011.

Schmeer K. 1999. Guidelines for Conducting a Stakeholder Analysis. November 1999. Regional Office of the World Health Organization Washington, D.C, United States of America

An Overview of Rice Research in Ethiopia

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Introduction

Rice is a recent introduction in Ethiopia; however, its importance is being well recognized in the country as the area coverage of 18,000 ha and total production of 42,000 tons in 2006 has increased in 2009 to 155,000 ha and 496,000 tons, respectively (MoARD, 2010). Rice production has brought a significant change in the livelihood of farmers and created job opportunities for a number of citizens in different areas of the country. The demand for improved rice technologies is increasing from time to time from different stakeholders. This, therefore, calls for the need to establish a strong research and development system to bring about productive, sustainable, stable, and profitable rice farming system in the country.

Research Components

Among the target commodities which have received due attention in promotion of agricultural production, rice is the one considered as the "millennium crop" expected to contribute to ensuring food security in the country. Accordingly, Ethiopian Institute of Agricultural Research (EIAR) has treated it as one of nationally coordinated research projects. As the crop is a recent introduction in the country, its research status is at infant stage. Almost all research activities are concentrated on variety development and there are only a few research activities on crop management, while the other research disciplines are yet hardly touched.

Both regional and federal research centers including Adet (national coordinator), Gonder, Bako, Bonga, Gambella, Gode, Maytsebri, Humera, Pawe, Assosa, and Werer Agricultural Research Centers are involved in rice research as collaborating centers mainly in the national variety and adaptation trials, which are organized and coordinated by the national coordinating center. So far, variety development has been focusing exclusively on pure lines and is targeted to address mainly upland and lowland rain-fed, and to some extent irrigated ecosystems. The sole source of rice germplasm is introductions. The coordinating center introduces rice germplasm from different sources mainly from IRRI and AfricaRice.

To date, the following approaches are followed for rice variety development

- introducing commercial varieties and evaluating their adaptability at different locations for possible registration release of the promising ones; and
- introducing different nurseries and promoting the promising ones for possible release following series of field screening and evaluation (variety testing) stages.

Achievements

Variety development

So far, 20 improved rice varieties have been officially released officially for large-scale production. Of these, seven are upland New Rice for Africa (NERICA) rice varieties including NERICA-4 and NERICA-3 released for rain-fed upland ecosystem and NERICA-1, NERICA-2, NERICA-6, NERICA-14 and NERICA-15 released for upland - irrigated ecosystem. NERICA rice varieties have been developed by AfricaRice (the ex-WARDA) scientists, and they are expanding and bringing the rice green revolution in different countries of Africa including Ethiopia. Out of the remaining 13 released varieties, four varieties are irrigated, two varieties are lowland rain-fed, and seven varieties are upland rain-fed types.

Farmers have also given due attention not only for rice production but also for variety development as they have developed two varieties (one upland and one lowland rain-fed types) through selection. The two farmer-selected varieties (Demwoze and Nechu Ruz) have been produced widely in Fogera area (rain-fed lowland) of the Amhara Region and in Guraferda area (upland) of the Southern Nations, Nationalities, and Peoples Region (Table-1).

Table 1. Some agronomic characteristics of rice varieties developed by farmers

Description	Farmers varieties (Local Name)	
	Demwoze	Nechu Ruz
Ecology	Rain-fed lowland	Rainfed upland
Breeder/maintainer	Farmer in Fogera area of Amhara Region	Farmer in Guraferda of Southern Nations, Nationalities and Peoples Region
Plant height (cm)	110-120	115-125
Days to maturity	140-150	140-150
Grain color	White	White
Threshability	Easy	Easy
Disease reaction	Moderately resistant	Moderately resistant
Reaction to termite damage	------	tolerant
Presence and/or absence of awn	Awned and not highly attacked by birds	Not awned
1000 seed weight (gm)	25-27	26-28
Productivity (t/ha)	35-45	30-40

Crop management

Fertilizer rates of only 80kg/ha of Nfor upland NERICA rice and 69 and23 kg/ha of N and P_2O_5 respectively for rain-fed lowland rice have been recommended for Fogera area of Amhara Region. Seed rate of 140 kg/ha for rain-fed lowland rice has also been recommended. Transplanting of rice seedlings at four leaf stage, two to three seedlings per hill, and spacing of 25 cm between rows and 20 cm between hills have been recommended for rain-fed lowland rice production because these practices give higher yield as compared to the use of dry and pre-germinated seeds.

Rice demonstration and popularization

The national rice research project in collaboration with JICA and AfricaRice (the ex-WARDA) has produced seeds of different classes of different rice varieties and distributed to different stakeholders. The Ethiopian Seed Enterprise (ESE) has also started multiplying rice seed in collaboration with the National Rice Research Project to meet the ever-increasing demand for seed of different rice varieties.

The national rice research project in collaboration with different governmental and non- governmental organizations has promoted improved rice varieties in order to create awareness on and promote the use of the improved varieties and on the diversified merits of the rice crop. Demonstration and promotion has also been undertaken on the use of different improved crop management technologies including fertilizer, seed, transplanting and irrigation, and these practices are being adopted by rice growers. In collaboration with different development partners six rice polishing machines were purchased and distributed to Gambella, Somali, Afar, Benshangule Gumuz and Amhara Regions; especially in the resettlement and agro pastoralist areas.

Partnerships

For a profitable and sustainable rice farming system in the country, working with different development partners (both governmental and non-governmental organizations) is of a paramount importance. Accordingly, the National Rice Research Project has been working with the following organizations and/or institutes:

- Ministry of Agriculture (MoA);
- Ethiopian Seed Enterprise (ESE);
- Japan International Cooperation Agency (JICA);
- Japan International Research Center for Agricultural Sciences (JIRCAS);
- International Livestock Research Institute (ILRI);
- Sasakawa Africa Association (SAA);

- International Rice Research Institute (IRRI);
- AfricaRice (the ex-WARDA);
- Menschen fur Menschen (MfM);
- World Bank through Eastern Africa Agricultural Productivity Project (EAAPP); and
- Mennonite Economic Development Association (MEDA).

Challenges and Opportunities

The rice research and development sector of the country has a lot of challenges that have been constraining the progress. Some of the challenges constraining rice research for development are:

- lack of improved varieties and recommended crop management practices for different rice ecosystems, and biotic and a biotic stresses;
- shortage of pre-harvest mechanization and post-harvest processing technologies;
- inadequate awareness on post-harvest management and utilization;
- lack of skilled manpower and research facilities;
- shortage of seed supply (i.e. wek seed systems);
- weak promotion efforts for the available technologies;
- inadequate financial resources;
- poor infrastructure for commercialization of rice production; and
- poor marketing channel.

On the other hand, there are enough opportunities in the country, which are believed to bring differences in rice research and development. Among these, the major opportunities are:

- The availability of tremendous potential to enhance rice production including about 5 million ha of highly suitable and about 24 million ha of suitable land, and the untapped water resources for irrigated rice production (MoARD, 2010);
- The potential of the crop in poverty reduction and economic growth being justified by the progressively increasing number of producers, processors and traders getting involved;
- Being one of the strategic crops selected by the Government as rice is believed to contribute immensely to bringing about food security in the country;
- Presence national rice research and development strategy already developed;
- Having a green light for the establishment of national rice research and training center coupled with Ethiopia going to be the member of AfricaRice in the near future;
- Increasing interest of both domestic and foreign private investors to invest in rice production and post-harvest processing business;
- Availability of improved rice technologies from different sources for adoption and technology development;

- Willingness of different development partners to support rice research and development efforts in the country; and
- Availability of different regional and international research and development projects supporting the rice sector in the country such as Stress Tolerant Rice in Africa and South East Asia (STRASA), and Eastern Africa Agricultural Productivity Project (EAAPP).

Overall, there is a dire need to bridge the gap through utilizing the opportunities against constraints so that the country can benefit from this globally important crop of rice.

Research Directions

Ethiopia can benefit from rice research for development endeavors if all relevant research and development interventions are addressed properly. Considering the situations existing in Ethiopia in view of the experiences in the major world rice producing countries, the following research and development directions are suggested as the major avenues of focus for the national rice research project to bring a difference in rice production, productivity quality, and promotion in the country:

- Ecosystem-, stress- and market- oriented variety development approach with the participation of farmers should be followed for developing both pure line and hybrid rice varieties;
- Adopting and strengthening ecosystem-oriented research approach in the development of crop management technologies related to agronomy, cropping systems and crop protection;
- Agricultural mechanization and food science research interventions should be strengthened so that farmers would be motivated to produce a lot of rice and at the same time benefit from selling their produce with fair price;
- As a short-cut strategy, available rice technologies elsewhere abroad should be introduced and tested;
- Research should also focus on rice value chain development;
- Seed multiplication and dissemination of improved varieties should be given due attention;
- The available rice technologies should be promoted extensively so that they can reach the users rapidly and timely;
- Due attention should be given to capacity building both in terms of human as well as physical resources; and
- The positive trends of strong linkages among the different development partners should be further strengthened and sustained

References

Chandler RF and JR Boulder. 1979. Rice in the tropics: A guide to the national programs. International Agricultural Development Services, Westview Press, Inc., USA. 256 pp.

Guimaraes EP. 2009. Rice breeding. ***In:*** MJ Carena (ed), Cereals: the Banks and the Italian Economy DOI: 10.1007/978-0-387-72297-9, # Springer Science + Business Media, Rome, Italy

Maclean JL, DC Dawe, B Hardy, and GP Hettel (eds).2002. Rice Almanac. Los Banos (Phillipines): International Rice Research Institute, Bouake (Cote d'lvoire): West Africa Rice Development Association, Cali (Colombia): International Center for Tropical Agriculture, Rome (Italy): Food and Agriculture Organization.253 pp

Ministry of Agriculture and Rural Development (MoARD).2010. National Rice Research and Development Strategy of Ethiopia. The Federal Democratic Republic of Ethiopia, Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia. 48pp.

Rice Research and Development Component of East Africa Agricultural Productivity Project

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Overview of EAAPP

The overall objective of East Africa Agricultural Productivity Project *(*EAAPP) is to contribute to increased agricultural productivity and growth in eastern African countries by strengthening the capacity of Regional Centers of Excellences (RCoEs) in wheat, rice, cassava, and dairy. Its contrubition revolves around technology generation, training, and dissemination, and facilitation of e increased sharing of agricultural information, knowledge, and technology, across the recipient countries.

The project has two phases of five years each. The first phase will concentrate on the establishment of RCoE in Ethiopia for wheat (WRCoE) with participation of other countries' Centers of Excellence for dairy (Kenya), cassava (Uganda) and rice (Tanzania). The second phase of the project would further strengthen the RCoEs and will accommodate entry of new RCoEs for other commodities, and deepen the integration of national research effort into a genuine regional system.

The project has a budget of US $30 Million for five years period. Out of this amount, US $800,000 is available to Rice Research and development by WRCoE.

The components of the project are capacity building in human resources and infrastructure development; technology generation; training and dissemination; and improved availability of seeds and genetic materials and project management unit.

The roles and responsibilities of the WRCoE are

- networking, facilitate exchange and sharing of knowledge, technology and information in the region;
- participate in harmonization of policy, project management and coordination;
- monitoring and evaluation;

- implement crosscutting issues, i.e., policy, gender, environment, climate change and HIV-AIDS;and
- Oother important roles like creating and maintaining databases, impact, and environmental assessment in the region.

The overall project outputs are

- improved technologies are made available to the users at the required quality and quantity;
- strong linkage is created along the value chain of the selected commodities;
- capacity of the support institutions enhanced and;
- national and regional partnership strengthened. Intermediate project outputs can be measured as:
  - increase in number of farmers, processors and other stakeholders who have adopted new technologies;
  - area under new technologies and/or increase in number of improved animals;
  - percent increase in land area under improved cultivars; and
  - increase in production and/or productivity at farm level.

Rice Component of EAAPP in Ethiopia

Ethiopia has a huge potential for rice production that is estimated to be about 30 million hectares. However, development and promotion of rice technologies have been constrained not only by shortage of skilled work force and research facilities but also due to lack of awareness and knowledge about the crop and its husbandry. Recently, the government of Ethiopia has given special emphasis to the crop as one of the potential crops identified to contribute to national food self-sufficiency in the Millennium Development Goal (MDG).

The production, productivity, and expansion of the crop have been also constrained by lack of improved varieties, crop management practices, pre-harvest, harvest and post-harvest technologies, biotic and abiotic stresses. Adet Agricultural Research Center as national coordinating center of the crop will work in close collaboration with Rice Regional Center of Excellence (RRCoE) at KATRIN, Tanzania especially through acquisition of germplasm, improved seeds, and post-harvest technologies.

The following activities are financed by EAAPP:

- agricultural research and training including training for service providers and lead farmers;
- greater availability of seeds; and
- coordination (national and regional), M&E, policy analysis, and advocacy as needed. The training sub-component will include provision of tailor-made training to researchers SMSs, DAs, farmers, and other value chain actors. The dissemination sub-component aims at promoting improved

technologies. Detailed description of each component and sub-components are presented below (MoA, 2010; EIAR, 2008).

Technology Generation

Technology generation will focus on the following harmonized regional priority areas that are consistent with those identified by ASARECA.

Development and validation of demand driven rice varieties with resistance to drought, blast, and Rice Yellow Mottle Virus (RYMV)

So far, few improved rice varieties were developed for some agro-ecologies of Ethiopia. However, the variety development system was not fully participatory and the grain quality of the varieties is not up to the standard. These situations necessitate strengthening the variety development activities in the country. The main objective of the variety development theme in the EAAPP Project would be to develop adaptive, biotic, and abiotic stress tolerant and high market quality varieties for lowland, upland and irrigated rice production systems.

Introduction and evaluation of rice germplasm for yield, biotic and abiotic stresses tolerance, and grain quality

Rice is not indigenous to Ethiopia; therefore, the source of germplasm is introduction. So far, limited numbers of rice germplasms have been introduced from International Rice Research Institute (IRRI) and AfricaRice Center. The introduced germplasms have been used to develop rice varieties for different agro-ecologies and/or rice ecosystems of the country. However, the need for rice varieties in the country is not satisfied and this calls for introduction and evaluation of diverse rice germplasm for rain fed lowland, irrigated, and upland systems.

Variety development

Advanced lines will be evaluated in yield trials with participation of farmers and other stakeholders.

Participatory variety adaptation

Previously released commercial varieties will be evaluated for their adaptation to target rice ecosystems of the country. Farmers, agricultural development workers, and other stakeholders will participate in the variety evaluation and selection.

Maintenance breeding

Released varieties and elite materials will be maintained on different plot sizes depending on the availability of seed and demand.

Development and validation of integrated crop management options in rice-based cropping systems

- ***Integrated soil and water management:*** This theme will cover soil fertility and water management in rice for different rice ecosystems. Under the current production system in the country, the use of inorganic fertilizer is minimal. However, it is anticipated that the scenario will change in the near future. For instance, in Chewaka area of Illubabor where chemical inputs like fertilizer use for rice is common, there is a need to develop recommendation of soil fertility management. Different irrigation intervals and amounts of irrigation water will be tested and appropriate practices will be recommended;
- ***Develop appropriate rice cropping systems:*** Cropping systems that encompass crop rotation, sequential cropping, and intercropping to help improve soil fertility and yield of rice will be developed;
- ***Iii. Develop integrated pest management:*** Rice production is affected by wide range of insects, diseases, and weeds. This needs to develop an integrated pest management options for sustainable rice production; and
- ***Introduction and adaptation of pre-harvest mechanization technologies****:* This is aimed at introducing and evaluating pre-harvest implements for their suitability and acceptability.

Promotion of value-added rice based products and by-products

Rice quality losses are attributed to a combination of factors affecting the way the crop is harvested, cleaned, handled, dried, stored, and milled. These losses either are direct physical losses, or manifested as deterioration of quality, which reduces the market value.

- *Evaluation of threshing and dehulling equipment*: Imported and locally made threshing and dehulling equipments (Rubber Roll, Jet rice mill, portable mills of friction type and abrasive type) will be tested with different machine adjustment conditions.
- *Study on methods of drying and storage:* Both sun drying and mechanical batch-drying methods will be evaluated. Regarding the storage study, raised bed storage unit, sealed storage unit, and other indoor storage structures constructed from locally available materials will be evaluated.

Increase quality and competitiveness of rice through value addition

- *Value chain analysis:*The whole value chain analysis study will be conducted to help identify stages at which value adding innervations could be applied in the chain. Different value addition methods of rice products and by-products will be evaluated and made available to users; and
- *Determine the effects of different grain storage methods on nutritional quality and safety*

Training and Dissemination

To promote improved technologies of rice by the CoE to smallholder farmers/Agro-pastoralists the training and dissemination sub component of the project will use different strategies and mechanisms. Best bet technologies that have been generated by these research centers will be identified based on different AEZs, and extension package will be formulated. The dissemination mechanism includes preparation of manuals, guidelines, leaflets, and posters, which will be translated into national and local languages, followed by intensive training for targeted communities. The approach is used to disseminate the technologies will be entirely based on participatory, client and market oriented with due emphasis to value chains. Demonstration plots on smallholder farmers' fields and farmers/agro-pastoral training Centers (FTCs /PTCs) will be used in order to achieve the strategy. In all targeted areas, different working groups will be organized which include men, women, and youth and linked with research, extension, and market.

Based on the results obtained from demonstrations, technologies proven for their economic, social, and environmental benefits will be up scaled to more number of farmers' collaborations with targeted regions and implementing agencies. In this process, the involvement of different service providers has paramount importance. Thus, the project will create partnerships with a range of institutions, both public and private to facilitate the dissemination, adoption, and up scaling.

Currently, strong actions have been taken by the government to strengthen the linkage among the different development partners working in the agricultural sector. As result of this, Agriculture Development Partners Linkage Councils have been established at various administrative levels of the country. These linkages have played and are playing significant role in enhancing rural development and in transforming small-scale farm to commercial level. The project will support both in strengthening the existing councils and in establishing new ones especially at Woreda level where the project is planned for implementation. To accomplish the above-mentioned activities the training and dissemination sub component of the project will implement the following three main activities and sub-activities.

Dissemination of proven technologies

The various technologies will be disseminated to the targeted farmers/agro-pastoralists through various dissemination mechanisms and strategies of which the following are the major ones.

Conduct participatory demonstrations

Demonstration of technologies will be carried out in different pilot areas to serve the various purposes of the technology verification, modification, and adaptability testing under different management

practices. Two demonstration plots (farmers' practices and improved management practices) will be prepared to compare and convince farmers about the economic advantages of using improved technologies, and consequently to accelerate adoption. Under this sub- activity, the following dissemination strategies are selected.

- ***Scaling-up/out of the best practices /technologies:*** Based on the outcome of the demonstrations conducted in different areas mentioned above, best-bet technologies and proven practices selected by farmers and farmers' groups will be scaled up to reach more number of farmers within the project area. Similarly, these technologies and best practices will be promoted and diffused to other woredas in collaboration with service providers and implementing agencies. In advance, clear up-scaling strategy and implementation plan will be developed and thereafter, capacity building program will be undertaken for all actors involved in the implementation of the program; and
- ***Experience / knowledge sharing visits:*** Experience and knowledge sharing visit is one of the strategies designed to build the capacity of actors involved in the EAAPP. This activity will be conducted through organizing experience-sharing programs for farmers, DAs, SMSs and for other actors actively involved in the implementation of the project, and stakeholders participating in the project will be selected for the visits. Likewise, farmers' field days, study tours, traveling workshops, and exhibitions will be organized in collaborations with project implementing regional states of the country and with EEAPP. This is to enable farmers to learn from each other and gain practical skills.

Strengthening value chains

The economies of many countries in sub-Saharan Africa in general and in Ethiopia in particular are entirely focused on crop and livestock production, with little or no emphasis to vale chains. The agricultural production system is based on subsistence mode of agricultural production and not market oriented, although recently some changes are being realized. In addition, the small-scale farmers' agricultural productions do not fulfill quality standards in the national, regional, and global markets.

Thus, this problem calls for joint collaboration among the various actors in the value chain. A typical value chain will include producers, assemblers/traders, processors, distributors, retailers, and final consumers. The focus is also to ensure significant value addition along the supply chain.

The project will aim at strengthening value chains by identifying constraints of main and support actors in the value chain process, and creating strong platform for sustainable production, processing, and distribution.

Enhancing local /farmers' innovations

The project will support local innovations by providing small amount of budget on competitive bases. The scenario is to build the capacity of farmers to innovate and spread farmers-led innovations with regard to the commodities selected for dissemination. Innovations that are not tested before but important for the generation and dissemination of rice are highly encouraged and supported by the project. Emphasis will be given to local innovation that are not introduced in the area before through the regular extension system but that could meet priority needs of farmers.

Capacity building

This sub-component of the project aims at building both human and physical capacities of regional states, zones, Woredas and especially for FTCs/PTCs. The capacity building components include the following

- Equipping agricultural extension offices at various levels;
- Human resource development including DAs and SMSs;
- Consultation workshops; and
- Production of training and extension materials

Strengthening development partners' linkage

Realizing the importance of linking development partners involved in the agricultural development activities in enhancing agricultural transformation, the government of Ethiopia has taken strong action to bring all development actors into one development platform. This has been clearly stated on the rural development polices and strategies of the country. To bring this into practice, the Ministry of Agriculture has established development partners linkage councils at all administrative levels of the country.

Improved Availability of SeedsZ

This Component will support to minimize the existing seed shortage through strengthening the capacities of the various organizations currently involved in the sector. The component has three sub-components

- multiplication and distribution of improved seeds;
- seed business development; and
- harmonization of seed polices and regulations.

Multiplication and Distribution of Improved Seeds

The sub component will be implemented in collaboration with the national and regional states seed enterprise/agencies for seed it will assist the sectors to capacitate for efficient and effective seeds production and distribution. Farmers based seed multiplication activity will be carried out in selected project weredas through organizing them into different working groups.

Support to Business Development

The project will assist private individuals, companies, and seed-producing farmers to prepare feasibility studies and business plans for bankable projects for seed production, processing, and marketing. Similar business training will be carried out on semen production, handling, and insemination. Assistance includes

- Mobilization of the private sector through workshops and seminars;
- Assistance to potential entrepreneurs in formulating and screening of business development proposals;
- Giving advices on appropriate technology (including equipment);
- Identification of domestic and international institutions (AGRA, Rockefeller) willing to support private sector; and
- Visits to regional and other countries to explore business partnerships

Support for harmonization of policies and regulations to allow regional seed market

The project will build on agreements that representatives from regional governments have reached through ASARECA and EASCOM to harmonize seed policies and regulations to promote seed and breeds trade across the 10 ASARECA countries. For more than a decade, through ASARECA, EASCOM, and other regional forums, representatives from governments and seed companies have discussed regulatory adjustments to allow a unified seed market. Despite regional agreements among technical experts, regulations remain an obstacle to regional seed markets because governments have not implemented agreements. Thus, the project will reinitiate reviewing and harmonization of existing policies and regulations to reinforce previous initiative of promoting regional seed and breeds trade. The project will also assist the development of framework and mechanisms for seed and breeds access and exchange among collaborating countries. ASARECA will arrange discussion forums in collaboration with CoEs for policy makers of the regional governments for the implementation of the policies and regulations.

References

The World Bank. 2009. Project Appraisal Document for Eastern Africa Agricultural Productivity Program APL1 in support of the first phase of East Africa Agricultural Productivity Program

Ministry of Agriculture (MoA). 2010. Project Implementation Plan, FA number 4567 ET, Addis Ababa, Ethiopia.

Ethiopian Institute of Agriculturall research (EIAR). 2008. Country Document for wheat regional center of excellence, East African Agricultural Productivity Program. Addis Ababa, Ethiopia.

Empowering Rice Farmers' Innovation in Ethiopia

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Introduction

In Ethiopia, although rice production started relatively in recent years, JICA has been supporting the sector particularly in seed production, capacity development in terms of personnel, and development of Ethiopian Rice Research and Development Strategy (MoARD, 2010). These were implemented in collaboration with Sasakawa Africa Association/SG2000 and Japan International Research Centre for Agricultural Science (JIRCAS).

Since 2010, the Project for Enhancing Development and Dissemination through Farmer Research Groups (FRG II), which is a collaborative project between JICA and EIAR, has been involved in rice research and development. The project promotes farmer participatory technology generation in the production and value chain improvement of rice and other commodities and research areas.

FRG Approach and JICA Projects

FRG approach is one of the research approaches, in which groups of farmers, development agents, and a multidisciplinary research team jointly participates in the generation and improvement, verification, and dissemination of agricultural technologies to meet farmers' needs and improve farmers' production and management practices.

FRG Project (Phase I)

In order for agricultural research to address farmers' biological and socio-economic constraints, the Project on Strengthening Technology Development, Verification, Transfer, and Adoption through Farmer Research Group (FRG Project) was implemented in the Central Rift Valley of Ethiopia from 2004 to 2009 through collaborations among JICA, EIAR, and Oromia Agricultural Research Institute (OARI). Encouraging results were obtained particularly through enhanced interaction among stakeholders in the FRG approach.

One of the major outputs of the first phase of the project was the development of "FRG Guideline to Participatory Agricultural Research through Farmer Research Group (FRG) for Agricultural Researchers" (EIAR/OARI/JICA,

2009). The guideline describes FRG approach, in which researchers facilitate farmers together with other stakeholders to involve in the process of technology development and improvement. The guideline and the approach were developed based on the experiences of researchers together with farmers and development agents who carried out FRG-based research projects in the Central Rift Valley of Ethiopia during the first phase of the project period.

FRG II Project

Successful results of the first phase of the FRG Project brought up a vision to scale up the participatory research approach to all the agricultural research institutions in the country. JICA and EIAR mutually agreed to implement the FRG II Project as the second phase of the JICA's technical cooperation to the sector. The FRG II Project commenced in April 2010, and it is intending to cover all the federal and regional research centers and universities that are under the Ethiopian national agricultural research system.

FRG II Project is aimed at scaling out the outcomes of the first phase of the FRG Project at all the agricultural research institutions through supporting implementation of:

- training on FRG approach;
- FRG-based research projects in selected priority areas;
- capacity development of researchers on delivering technology information to extension; and
- development and modification of FRG guidelines.

Although the FRG II Project covers diverse research areas, rice and seed have been selected as focal priority research areas. During the 2010 season, FRG II has provided technical and financial support to eleven FRG-based research projects of which six were in rice and five were in seed related issues.

Rice Research and Development in FRG II

FRG-Based Rice Research

With rice being one of the JICA's priority areas, FRG II selected the crop as one of its focal priority research areas. To this end, it started by making a call for FRG-based research on rice, and six proposals from agricultural centers of Adet in Amhara, Gode in Somali and Werer in Afar, and Jimma University in Oromia were selected (Table 1)

Table 1. FRG-based research on rice funded by FRG II for 2010-2012

Research titles	Principal researchers	Centers
Participatory variety selection with farmers for farmers in rice varieties for rain-fed condition	Sewagen Taklu	Adet
Participatory evaluation of different weeding time and frequency of lowland rice in Fogera	Agegnehu Shibabaw	Adet
Demonstrating rice transplanting and seed pre-germination technologies in Fogera	Alemayehu Assefa	Adet
Effect of nitrogen fertilizer rates and weed competition on yield and yield component of NERICA-1 in Gode	Abdurahman Osman Arale	Gode
Enhance rice production through improved seed production on agro-pastralists' fields in Afar	Getnet Belay	Werer
Popularization and seed multiplication of upland NERICA for livelihood improvement of small scale farmers in Jimma	Mulgeta Seyoum	Jimma University

For researchers of the selected research proposals, FRG II provided training on FRG approach along with technical knowledge and skills related with rice. The FRG approach training was given at Melkassa Agricultural Research Centre (MARC) to make sure that the selected research projects would be carried out in participatory manner. To find out gaps in available rice technologies and to strategize FRG-based researches in rice, the researchers are working on a cultivation standard grid, through which researchers are able to identify which topics were missing and/or need further investigation. This will also help the researchers to deliver technical information to development agents and farmers in a form of technology sets for each locality. Table 2 shows a simplified version of the rice cultivation standard grid.

Table 2. Rice cultivation standard grid

Technologies	Rice agro-ecologies								
	Low altitude			Mid-altitude			High altitude		
	RL	RU	I	RL	RU	I	RL	RU	I
Seed preparation									
Land preparation									
Planting									
Weeding									
Plant protection									
Water management									
Soil management									
Tools and machines									
Harvesting									
Post-harvest									
Marketing									

Note: RL = Rain-fed lowland, RU = Rain-fed upland, and I = Irrigated

The rice cultivation standard grid is open for modification to fit the respective research topics considered and according to the gaps and priorities identified from the grid.

All the selected rice research projects are following FRG approach and their research activities including planning and analysis are implemented together with development agents and groups of rice farmers. The approach makes sure that technical information generated from the research will meet farmers' needs; development agents and farmers gain knowledge and skills that will be the foundation for their problem solving capacity in the future: and the development agents and farmers will be a good resource for technology dissemination because of their better understanding of the generated technical information.

The Project is planning to add few more topics with additional research institutions to meet the need for location specific problems and situations.

Human Resource Development

The project promotes the human resource development in two ways. The first is provision of technical trainings locally using both local and international experts, and the second is through support of trainings to be given abroad in countries where there are long experiences in rice research and development.

To that end, technical trainings were provided to researchers of the selected research topics through series of seminars by inviting a rice expert from the NERICA Rice Promotion Project in Uganda. The seminars covered general rice production technologies, experimental design, analysis of yield and yield components along with a review of 2010 trials and planning of the 2011 trials (Table 3).

Table 3. Seminars on rice conducted by FRG II in the 2010 season

Seminar titles	Period	Participants
Seminar for rice development related personnel	April 21-22, 2010	60
Seminar for researchers on on-going FRG- based rice projects on basic data analysis	July 15, 2010	29
Seminar for researchers on on-going FRG- based rice projects on yield component	November 17, 2010	11
Seminar for researchers on on-going FRG- based rice researchers experimental design and review of 2010 trials	February 22-23, 2010	13

Anumber of researchers have attended rice related short-term trainings in Japan and Tanzania in the fields of seed production, production management, and post-harvest management. Besides, one researcher is on a long-term MSc studies on rice in Japan since the start of the project (Table 4).

Table 4. Rice rerated training abroad under FRG II Project

Course title	Period	Participants
Post-harvest rice processing (Japan)	Aug 25 - Sept 26, 2010	Laike Kebede, Melkassa ARC
Rice production research in Africa (MSc) (Japan)	Feb 6, 2010 - Mar 31, 2013	Abebaw Desse, Pawe ARC
Rice cultivation techniques development (Japan)	Feb 6 - Nov 12, 2011	Alemayehu Assefa, Adet ARC
Hands-on rice seed production (Tanzania)	Mar 7 - 11, 2011	Tesfaye Wossen, Adet ARC
Lowland rice cultivation techniques for small scale and extension in Africa (Japan)	Marc 27 – Oct 19, 2011	Woldegiogis Daniel, Adet ARC

Further training opportunities both in country and abroad will be provided for researchers and research assistants by JICA and in collaboration with JICA, SAA, JIRCAS, IRRI, and others. The JICA- assisted rice related institutions in Tanzania and Uganda will also be used for training of Ethiopian personnel.

Conclusions

FRG II Project promotes participatory research known as FRG approach through which researchers in close collaboration with development agents and farmers generate technologies that can cater for farmers' immediate needs while the participation empowers farmers' innovation capacity. FRG II Project covers all the research institutions in Ethiopia to institutionalize ultimately the FRG approach. Rice is a focal priority area of the FRG II Project among other research areas, and six research projects are currently supported financially and technically.

With adaptation of cultivation recommendation standard grid and focus on value chain, rice research under FRG II will generate technical and management information for farmers. Outputs from the FRG-based rice research are expected to contribute to rice farming, and prove the efficacy of the approach.

References

EIAR/OARI/JICA. 2009. FRG Guideline to Participatory Agricultural Research through Farmer Research Group for Agricultural Researchers.

JICA. 2009. Coalition for African Rice Development：CARD.http://www.jica.go.jp/activities/issues/agricul/pdf/02_gaiyo_en.pdf

MoARD. 2010. National Rice Research and Development Strategy of Ethiopia. Ministry of Agriculture. Addis Ababa, Ethiopia. 61pp

Ethiopians Driving Growth through Entrepreneurship and Trade Project: Overview of Its Rice Related Activities

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Introduction

On the 11 February 2011, Mennonite Economic Development Associates (MEDA) has launched a new project in Ethiopia entitled Ethiopians Driving Growth through Entrepreneurship and Trade (EDGET). With a commercially driven approach, the project activities concentrate on integrating smallholder rice farmers and small-scale artisans into higher value markets through increased market linkages (including input, services and final markets) and enhanced productivity. Over the life of the project, an estimated 10,000 households will be reached.

The proposed program will enhance the participation of target groups in the selected subsectors through increased access to market linkages, production techniques and technologies, and critical support services including finance. A major component of the project inception phase will be completion of value chain analyses to determine exact activities in each sector.

Preliminary research indicated that the project includes

- Production aspects involving improved input supplies, awareness on improved techniques, irrigation including efficient micro-irrigation technologies, and rural credit;
- Post-harvest handling aspects like storage, grading and market segmentation as well as improved technologies for value-added activities; and
- Market linkages including consolidation/bulking and other strategies to deal more effectively with traders and development of selling/marketing strategies to new markets. Activities to address these issues will incorporate interventions on both the demand and supply sides.

To achieve the anticipated results MEDA will collaborate with local organizations and it will work with key facilitating partners (KFPs) to build

their capacities of value chain development and financial services through a co-implementing strategy.

The project will span over five years including both inception mission and wrap-up, from approximately 10 January 2011 to March 2016.

Overview of the Project

To achieve the anticipated results, MEDA will collaborate with local organizations or key facilitating partners (KFPs) by providing training and technical assistance to develop partner capacity. It will work with these partners to integrate marginalized producers into profitable sub-sectors with enhanced access to sustainable markets for inputs, equipment, and finance and other services such as transportation and marketing. The project's target client group are smallholder rice farmers in the areas surrounding Lake Tana in the north and in the Bench Maji zone in SNNPR.

Project Purpose

The intermediate purposes is to enable Ethiopian individuals, organizations and public and private sector actors to sustainably support and promote a thriving and equitable subsector- in this case rice- with full participation of smallholders, both women and men.

The immediate purposes are

- increasing capacity of local institutions, including private businesses, to provide appropriate, affordable and inclusive services, input supplies, technologies, extension services, business development support, market access, and finance to farmers and other stakeholders in the rice value chain; and
- enhancing the capacity of local organizations and government to deliver market-driven programs that integrate vulnerable populations into the value chain.

Expected Results

The expected results of the program are as follows.

Impact (Post-Project):

- Rural and peri-urban households realize increased income and improved livelihoods through increased participation in thriving rice subsector and

enhanced production techniques, access to appropriate technologies, and improved input supplies and support services including finance.

Intermediate outcomes:

- Strong, equitable market systems are achieved for rice through active participation of farmers with sustainable support from private businesses and local institutions; and
- Enhanced capacity of selected Ethiopian organizations and government to scale up and implement market-driven value chain development projects through results-based methodologies

Immediate outcomes:

- Improved production capacity of rice farmers through sustainable access to modern techniques, appropriate technologies and quality support including finance services;
- Enhanced capacity of farmers to access new markets, local and export, with appropriate products;
- Commercial service providers, including extension providers, input suppliers, technology dealers, and financial service providers sustainably deliver profitable services and products to smallholder farmers and other value chain players;
- Market opportunities researched and analyzed;
- Value chain strategies developed for rice to address constraints through extension services, input suppliers, technology providers, financial service providers, market intermediaries, post-harvest facilities and other services as needed;
- Producer households and groups linked with wholesale and retail markets through consolidators, processors, post-harvest facilities, lead farmers, association leaders and other channels as appropriate
- Financial services that meet the needs of value chain players including farmers and SMEs are identified, strengthened, and positioned to overcome financial bottlenecks;
- Service providers including private sector value chain stakeholders such as input suppliers and technology dealers, public sector agencies and financial institutions, receive technical assistance, business training and financial support enabling them to more effectively meet the needs of target producers while improving their own efficiency and profitability; and
- Capacity of key facilitating partners (KFPs) assessed with technical assistance program designed and delivered to enhance expertise in value chain development programming

Project Description

MEDA uses a programming approach consisting of simple but effective techniques and tools for introducing, promoting and sustainably establishing

new services, technologies and techniques. Under this methodology, poverty reduction is achieved through highlighting appropriate incentives to encourage clients to try new methods in their businesses. These strategies are driven by the market, and the mutual benefits realized by actors throughout the value chain ensure that the new activities will be sustained. Adoption of new approaches is ensured by collaborating with enterprises that operate as engines of growth.

The following key requirements for target client groups were identified.

- Production aspects including improved input supplies, awareness on improved techniques, irrigation including efficient micro-irrigation technologies, and rural credit;
- Post-harvest handling including storage, grading and market segmentation as well as improved technologies for value added activities; and
- Market linkages involving consolidation/bulking and other strategies to deal more effectively with traders, and development of selling/marketing strategies to new markets

Main Activities

The following represents a brief systematic overview of the proposed program based on preliminary market research. The specific interventions and strategies will need to be based on in depth research into the particular constraints of each component of the value chain.

- Design and deliver training modules and technical assistance strategies based on analysis of requirements of key facilitating partners (KFPs);
- Training needs assessment to determine the specific training requirements of producers;
- Assess technology needs and requirements of producers and other value chain actors in both sectors;
- Engage producer groups to facilitate production and marketing;
- Design and deliver training modules and technical assistance strategies based on analysis of requirements of target clients;
- Identify and assess support service providers (including input suppliers, technology providers, and business and financial service providers as well as public sector agencies) with capacity to reach target groups;
- Facilitate capacity of providers through training and other strategies in delivering demand-driven services to producers on sustainable and commercial basis. Support new product/service development and improved payment and delivery mechanisms as appropriate;
- Identify and develop strategies (for example an innovation fund) to support access to technology of value chain actors;
- Develop producer groups' negotiating capacity and ability to respond to market demand;

- Identify, where applicable, lead firms and/or sales agents with capacity to provide stable market opportunities for producers and act as implementing agents to deliver training and services to producers;
- Work with local micro-finance institutions and other financial service providers to support the development of suitable loan products and delivery mechanisms for target clients throughout the value chain;
- Monitor and evaluate program on on-going basis with strategies developed to address any shortfalls;
- Develop strategies to stimulate market scale-up and demonstration effects to increase impact beyond direct clients and replicate the project model;
- Implement exit strategy to ensure MEDA's exit from program includes sustainable delivery of support services, market linkages and improved production and techniques; and
- Prepare evaluation report to analyze the project with development of lessons learned to share at industry events and fora.

Proposed Project Locations

Research, field visits and interviews with a range of stakeholders support an initial focus on the following two geographic areas: Lake Tana in the north, SNNPR in the south with Addis Ababa serving as a central hub for each of the selected sectors. These project locations are proposed based on the following preliminary assessments pending further investigation during the project inception mission.

Investing in Local Capacity

A key lesson learned from MEDA's many economic development projects is the vital importance of building the capacity of local partners to provide on-going market-focused programming. MEDA's investigation to date indicates that there is limited expertise in sustainable commercially driven value chain development amongst local NGOs in Ethiopia; MEDA will work with a select number of partners to help develop their capacity. These Key facilitating partners (KFPs) will operate as direct program implementers with the goal of becoming leading market development organizations in Ethiopia. Capacity building activities for KFPs will likely include training workshops, seminars, technical assistance, peer exchanges, and on-going mentoring. Collaborating partners are established organizations who have agreed to work with MEDA through information sharing and other forms of cooperation. Sasakawa Global 2000, Improving Productivity and Market Success (IPMS) project and SOS Sahel are among those described in more detail in the proponents section of this proposal.

Each of these organizations brings strengths to the proposed project including outreach to a broad client base in the targeted areas, expertise in assisting with production issues, new techniques and technologies, and qualified local staff.

Recognizing the importance of access to finance, the project will capitalize on the value chain approach to identify the financial services needs of the small-scale producers and other businesses in the value chain. MEDA has identified several potential financial service partners ranging from commercial banks to grass-roots focused micro-finance institutions. Legal restrictions prevent direct investment in such institutions; nonetheless, there is potential to provide financial and technical support to banks and micro-finance providers to support outreach to small-scale producers and enhance lending to Small and Medium Enterprises (SMEs). The project will work directly with two micro-finance institutions (one in each region) to assist them to better reach rural and urban small-scale producers with appropriate financial products, whether credit, savings, value chain financing, SME finance, or other identified financial service needs.

Details of Lead Proponents

In Africa, Asia and Latin America, we achieve effective long-term solutions through a commitment to local capacity building that incorporates equitable economic strategies, environmental responsibility, and inclusive programming. Our North American offices comprise approximately forty international staff that travels extensively; and in-country activities rely on approximately ten expatriate and 170 national staff; and we work with a network of partner institutions, local agencies and private sector players to achieve widespread sustainable results.

We work with 127 partners in 39 countries and reach over two million direct clients (affecting many more if we include family members and staff of clients). Our focused staff is complemented by the expertise and contributions of MEDA's three thousand North American business members. In 2008, MEDA received $2.9 million in financial contributions from these members. This enabled us to leverage a total development budget of $18,500,000.

We are recognized as a learning organization and leader in the establishment of best practices in our field: we sit on a number of boards of directors; conduct training, technical assistance and consulting for local and international NGOs, multilaterals and government organizations; and advance our communities of practice through industry participation.

Our achievements have also brought us the recognition of our peers in pro-poor economic development – both implementers and training institutions. MEDA staff members are active in a number of industry associations, where we were recently recognized for our outstanding contribution to the association is working groups. We were also requested by the Microenterprise Development Institute of the University of Southern New Hampshire to coordinate a new

track in pro-poor enterprise development for its summer school and international master's program.

Conclusion

MEDA expects to facilitate and build capacity of the private sector to expand the rice value chain including improved field productivity, improved quality, improved harvest and processing and improved markets, and stimulating private sector investments through innovative finance and new technologies.

Focusing on building the private sector can create sustainable provision of new services and provide inherent incentives to self regulate and adhere to quality standards. By focusing on the private sector's profitability, there can be a sustainable cycle of increased profitability and re-investment in the value chain. With demonstrated profit margins, farmers can begin to pay for inputs, become credit-worthy, and invest in new technologies. Further innovations can occur when private enterprises demonstrate and replicate new technologies. Finally, there can be high impact on the value chain through efficient investments when focusing on the activities that have the highest return on investments. MEDA will work with all partners in a collaborative means to promote uptake of R&D, and to support all work in the Rice sector by various institutions.

Experiences of SAA/SG 2000 in Rice Technology Transfer

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Introduction

In early 2000, SAA/SG 2000 received information that a large number of smallholder farmers in the Fogera plains are producing rice. Based on this information, a delegation from SAA/SG2000 visited Adet Agricultural Research Center (ARC), Amhara Bureau of Agriculture (ABoA), Woreta Woreda Development Agents, several rice producing farmers in the Fogera plain, and also Pawe ARC to learn more about the status of rice research and production in that part of the country.

SAA/SG 2000 delegates found out that the production of rice crop in the Woreta plains enabled farmers in the area to become self-sufficient in food crop production. The team also noted that a serious food shortage problem has existed in the Woreta plains due to mainly the seasonal inundation of the farmlands.

Following the visit, the SAA/SG2000 decided to assist the national research and extension systems in the re-introduction, field-testing, and transfer of improved rice production technologies. In the meantime, it also decided to popularize rice production among smallholder farmers in other localities that have similar ecologies. For this purpose, the Oromiya Zone of Amhara Region was identified as the first area for SAA/SG 2000 intervention. This paper presents the experiences of SAA/SG2000 in the promoting rice production in the country since the early 2000.

Activities and experiences

In 2002, SAA/SG 2000 assisted the bureau of agriculture (BoA) in Oromiya Zone of Amhara to establish on-farm demonstrations. In the meantime, SAA/SG 2000 contacted Dr. Tareke Berhe, Country Director of SAA/SG 2000 Guinea, who has extensive knowledge and experience in rice research and production, to help in pushing further the research and popularization of rice in the country. As a result, Dr. Tareke sent more rice varieties, including NERICA types, which the then Ethiopian Agricultural Research Organization (EARO) and now the Ethiopian Institute of Agricultural Research (EIAR) started testing. Subsequently, EARO also introduced quite a number of rice varieties

for testing. Dr. Tareke visited Ethiopia several times to provide further assistance and advice.

Results of the 2002 on-farm demonstration plots in Oromiya Zone were very encouraging. Close to 200 on-farm demonstration plots were established on a quarter of a hectare each. On the other hand, efforts to introduce Pawe 1 and X-Jigna varieties on the Vertisols of the Becho Plains in Western Shewa in 2001 failed because of poor adaptation.

Food preparation was a serious challenge and hence SAA/SG 2000 sponsored and organized a training program on food preparation from the rice crop. The extension Department of the MoA coordinated the training. Housewives in the Woreta Plains served as the SMSs and a lead trainer (W/ro Tenagne) from MoA. The trainees were women and men rice growers from the Oromiya Zone.

SAA/SG 2000 continued to popularize the rice crop in the north, central, southwestern, and southern Ethiopia in 2002. In the meantime, testing of the NERICA rice introduced from Guinea at research centers started in 2002 with the financial assistance of JICA, and technical leadership of EARO and SG 2000.

Furthermore, in 2002 SAA/SG 2000 and JICA jointly facilitated and financed experience-sharing trips for rice researchers and extension officers to SAA/SG 2000 country programs in Uganda and Guinea. In addition, testing, and seed multiplication of the NERICA varieties have been undertaken with the financial support of SAA and JICA.

SAA/SG 2000 has assisted some farmers establish on-farm demonstrations of X-Jigna, Pawe 1 and locally produced rice varieties with improved crop management practices in southern and south western Ethiopia. Moreover, different rice varieties such as NERICA 1-4, Superica 1 were also tested under different environments including testing under irrigated condition in Werer and Gode and under rain-fed condition in Woreta in 2004 & 2005. Moreover, SAA/SG2000 facilitated demonstration and popularization of rice varieties to different part of the country including the Ethiopian plateaus, settlement areas of Chewaka in Illubabor zone of Oromiya, Guraferda in SNNPR, and irrigated areas of Werer and Gode in Afar and Somali regions Because of demonstration, popularization, and subsequent activities, rice has become a cosmopolitan crop in Ethiopia.

SAA/SG 2000 in collaboration with the research and extension introduced rice germplasm to select appropriate varieties for different agro-c-ecologies of Ethiopia (Table 1). It also introduced post-harvest technologies such as rice threshers and polishers, agro-processing technologies including food

preparation and value addition, seed multiplication and dissemination (Table 2), and capacity building that included development agents, farmers, women agro-processing groups, private entrepreneurs and researchers.

Considering rice germplasm, SAA/SG2000 alone has introduced 327 genotypes/varieties of different types of rice for testing in different parts of Ethiopia (Table 1). Of the total introductions, about 44% were cold tolerant types meant for testing at Debre Zeit, Holetta, Addis Ababa, and Adet Agricultural Research Center. Likewise, SAA/SG2000 has also contributed immensely with respect to the multiplication and dissemination of seeds of different rice varieties (Table 2).

Table 1. Rice germplasm introduced by SG2000 and evaluated in different agro-ecologies of Ethiopia from 2002-2008

Character of germplasm	No. of varieties	Place of introduction	Remark
Elite lines of NERICAs	12	Werer, Chewakaa, Fogera, Assosa, Tigray	NERICA-7 to 18
Salt tolerant NERICAs	31	Werer and Gode	Irrigated
Cold tolerant elite lines of	20	Werer and Jimma	Upland rain-fed
IElite Inter- and Intra- specific Lines	69	Werer and Gode	irrigated
Different types of rice varieties	16	Bonga area	To private investors
Cold tolerant	143	Debre Zeit, Holetta, Addis Ababa, Adet ARC	Under evaluation
Low to mid altitude FOFIFAs	6	Chewaka, D/zeit, Hollota, A.A, Adet	Under evaluation
Stress tolerant NERICAs	30	Chewaka	Under evaluation
Total number of lines	327		

In addition to its aforementioned roles in addressing the challenges, SAA/SG 2000 in collaboration with partners, sponsored establishment of national rice steering committee to guide national rice research, development, and technical committee to advice the national steering committee on technical issues related to rice research and development in Ethiopia.

Table 2. Seeds of various rice varieties disseminated for the last six years by SG2000

Rice variety	Region	Remark	No.	Rice variety
NERICA-1 to NERICA-4 & Suparica-1	Gambella, Amhara, Oromiya, Tigrai, South, Somali, Afar	Released	1	NERICA-1 to NERICA-4 & Suparica-1
NERICA-6 to NERICA-18	Gambella, Amhara, Oromiya, Tigrai, South, Somalí, Afar	Under evaluation	2	NERICA-6 to NERICA-18
6 different lines of Fofifas from Madagascar	Amhara, Oromiya, Tigrai, South, Somali, Afar	Released	3	6 different lines of Fofifas from Madegascar
3 types of irrigated rice varieties	Somali, Afar	Released	4	3 types of irrigated rice varieties
X-jigna	Oromiya, Tigrai, South, Somali, Afar	Released	5	X-jigna

Challenges

Even though, rice has great potential to contribute to food security of Ethiopia, there are several challenges that need to be tackled in order to exploit this potential. The main challenges include:

- Centuries old pre- and post-harvest cultivation and handling technologies such as back- breaking cultivation and weeding, harvesting and threshing systems that led to soil degradation and hence low productivity;
- Poor seed quality: and
- Lack of access to input and output markets.

In order to address these problems, efforts were exerted by SAA/SG2000 and the national research and extension system to popularize post-harvest and agro-processing technologies of rice. In line with this, proto-types of rice polishers were introduced from Japan to be fabricated in Ethiopia. SAA also sponsored production of rice threshers and polishers at Selam Vocational Training College, and popularized it in different rice production areas. As a result, rice shellers and polishers have been erected at Woreta, Guraferda, Chewaka, and Gode.

In the areas of agro-processing and value addition, capacity building was given to women groups on how to utilize rice in national and international food preparations.

Conclusions

Since 2001, SAA/SG2000 has made significant contributions in introducing rice germplasm and popularizing improved NERICA and Superica-1 varieties in irrigated and rain-fed areas Ethiopia. These areas include central Ethiopian plateaus, settlement areas of Chewaka in Illubabor zone of Oromiya, Guraferda in SNNPR, and irrigated areas of Werer and Gode in Afar and Somali regions, respectively. In line with introduction of varieties, SAA/SG2000 has also given much emphasis to capacity building of researchers, extension workers (Subject Matter Specialists and Development Agents), farmers, private and community seed producers, and private entrepreneurs in post harvest and agro-processing.

Because of all these efforts, rice is recognized as a millennium crop for food security by Ethiopian Government in 2006, and later as a crop, that can contribute to agricultural transformation efforts of the country. Overall, SAA/SG2000 is more than happy to see different development partners coming onboard in rice development efforts in Ethiopia to realize the country's objectives of food security and agricultural transformation.

About FRG II

THE PROJECT FOR Enhancing Development and Dissemination of Agricultural Innovations through Farmer Research Groups (FRG II Project) is to enhance the capacity of researchers to take part in innovations through farmer research group approach (FRG approach). Implemented by a technical cooperation between Ethiopian Institute of Agricultural Research (EIAR) and Japan International Cooperation Agency (JICA), the FRG II covers all the agricultural research institutions in the country through training on the approach, financing FRG based research projects in selected priority research areas and filling gaps and enhance linkages between research and extension by delivery of technical information. For more information, visit

http://www.jica.go.jp/project/english/ethiopia/001/

http://www.eiar.gov.et/projects/110-japan-international-cooperatin-agency-jica