HISTORY, CURRENT STATUS AND FUTURE DIRECTIONS OF RICE RESEARCH IN ETHIOPIA

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Abstract

Rice cultivation is a recent phenomenon in Ethiopia. Though the crop is a recent introduction to the country; its importance is well recognized as the production area coverage of about 10,000 ha in 2006 has increased to over 50,000 ha in 2018 and number of farmers engaged in rice production has also grown year after year. The engagement in the rice production has transformed the living standard of many farmers. The potential rice production area in Ethiopia is estimated to be over 5,590,895 ha. The earlier rice research endeavors in Ethiopia was started in the late 1950's and early 1960's, though successful rice production was not started by then. Emphasis on rice research was given in 1985/6 with the establishment of Pawe and Abobo research centers during the then massive resettlement program. Japan Oversea Cooperation Volunteers has supported the Agriculture bureau and the research dealing with rice research in Gambella between 1984 and 1998. In Pawe area, the Italians have done a successful rice research and production activities through the Tana-Beles prioject. As a result, rice production was started in Pawe and Gambella areas. In the early 1980s through the technical support of North Korean experts', research on rice was initiated in Fogera Plain where the most successful and sustained rice production appeared. Later, many research centers become engaged in rice research and have developed many recommendations for rice production in the nation. Currently 35 improved rice varieties had been released for the three rice ecosystems (15 for rainfed upland, 11 for rainfed lowland and 9 for irrigated). Moreover, various location specific rice crop management technologies have been generated with respect to fertilizer rate and application time, seed rates, row spacings, planting methods across the major rice producing regions. A number of crop protection recommendations are also given to different rice growing locations. Some mechanical implements like row weeders, harvesters, threshers, etc were evaluated and introduced to rice producers. The Ethiopian Institute of Agricultural Research (EIAR) has recognized the importance of rice and had established Fogera National Rice Research and Training Center (Fogera NRRTC) in 2013. Fogera NRRTC is mandated to coordinate the rice research in the country. At present 12 federal and regional centers including: Fogera, Pawe, Gondar, Tepi, Bonga, Assosa, Maytsebri, Worer, Bako, Jima, Gode, and Gambella Research Centers, are involved in rice research activities across the country. There are also some agricultural universities (like Mizan-Tepi and Debretabor) engaged in the rice research.

Key words: Rice, production, potential, research.

1. HISTORICAL HIGHLIGHTS ON RICE RESEARCH IN ETHIOPIA

Rice cultivation is a recent phenomenon in Ethiopia. Perhaps the Portuguese might have brought it with them for the first time in to Ethiopia in the sixteenth century (Gashaw, 1989). The discovery of wild rice (Figure 1) in Fogera plain and Gambela areas has motivated different governmental and nongovernmental organizations to start adaptation trials on cultivated rice in different parts of the country (Gashaw, 1989; Zegeye et al., 2004; Mitiku 2011).

Figure 1. Wild rice collected from Fogera area

The earlier rice research endeavors in Ethiopia was started in the late 1950's and early 1960's (Assefa 2012; Gashaw, 1989; Sewnet, 2005 and personal communications). In 1957, a sugar cane plantation started rice growing at Metahara, along with the Awash River. Various authors documented that different governmental and nongovernmental organizations like the Americans, Japan Oversea Cooperation Volunteers (JOCV), Institute of Agricultural Research (IAR), Agricultural Development Department (ADD) of the Ministry of Agriculture, Tana Beles Project (led by Italians), Ethiopian Water Construction Authority (EWCA), Addis Ababa University Science Faculty and the North Korean agricultural experts (Ethio-Jigna project) were involved in rice research and development activity in Fogera plain, Chefa, Gambela, Melka Werer, Lante and Pawe areas up to 1980's and they came up with the encouraging results and recommendations (Getachew, 2000; Sewnet, 2005; Mitiku 2011).

Emphasis on rice research was given in 1985/6 with the establishment of Pawe and Abobo research centers during the then massive resettlement program. Japan Oversea Cooperation Volunteers (JOCV) has supported the Agriculture bureau and the research dealing with rice research in Gambella between 1984 and 1998. They have evaluated some varieties introduced from IITA (Personal communication). In Pawe area, the Italians have done a successful rice research and production activities through the Tana-Beles prioject. As a result some improved varieties had been released informally and disseminated into the resettlement areas in Gambella and Pawe for demonstration and large scale production (Zegeye et al., 2004). In the early 1980s through the technical support of North Korean experts', research on rice was initiated in Jigna (Dera *woreda*) and Shaga (Fogera *woreda*) cooperatives (Zegeye et al., 2004; Tilahun *et al*, 2018; Tilahun, 2018). Following past unsuccessful endeavors of introducing rice into the area by different organizations and the government, in July 1984, a team of North Koreans composed of nine experts come to Fogera with a project entitled "Ethio-Jigna Development Project" (Figure 2). The project came with the objective of starting and promoting rice and horticultural crops (Tilahun *et al*, 2018). The Koreans started their research on rice and horticultural crops. Concerning the rice, in addition to the rice genotypes they introduced from North Korea, they also evaluated rice genotypes from earlier endeavors by other researchers. After the evaluation of all the genotypes, one variety, which is latter named *x-Jigna* introduced from North Korea was found to be appropriate for the area. The Koreans helped the farmers in Fogera are to start large scale production of X-jigna, which is still under production for about thirty years in the area. However, due to the liquidation of farmer's producers' cooperatives and evacuation of rice producers from the resettlement areas in 1991, the rice research, extension and production activities were weakened for a while. In 1994, the development activity was reinitiated by South Gondar zone and Fogera woreda agricultural office with the strong personal commitment of the late Mr Getachew Afework (Tesfaye 2009; Tilahun *et al*, 2018; Tilahun, 2018). Mr. Getachew has obtained some seeds of the variety introduced by North Korean, from farmers in Jigna kebele, which later renamed as X-jigna due to lack of proper documentation. After multiplying the seeds of this variety Mr. Getachew introduced it to other farmers through demonstration plots. After Mr Getachew joined Adet

Agricultural Research Centre as researcher he developed more rice varieties (Gumara and Kokit) and rice management technologies (Zegeye et al., 2004; Mitiku 2011).

Figure 2. One of the North Korean experts (Mr Li) in the middle with the farmers in 1987.

Following the reestablishment of the rice research at Pawe and Adet, Pawe Research Center released M-55 as Pawe-1 in 1999 and the Adet/Amhara Regional Agricultural Institute released three improved rice varieties (IAC-164 as Gumara, IREM 194 as Tigabe, and IRAT 209 as Kokit) in 2000 (Mitiku, 2011). After the reinitiating the rice research program, Ethiopian Institute of agriculture gave due attention for the ctop and the research activities were revitalized at Pawe Research Center. Consequently, the National Rice Research program was initially coordinated by Pawe Research Center. However, in 2003 Adet Research Center took over the mandate of the national rice research coordination until the establishment of Fogera National Rice Research and Training center on August 7, 2013.

2. THE STATUS AND POTENTIAL OF RICE PRODUCTION IN ETHIOPIA

According to the report of MoARD (2010) the potential rice production area in Ethiopia is estimated to be about 39,354,190 hectares, of which 5,590,895 ha is highly suitable, 24,910,629 ha is suitable and 8,852,666 is moderately suitable. Most of Ethiopia's rice production potential area lies in the western part of the country (Figure 3). Despite the potential, the country is importing huge amount of rice which is increasing time to time. The country has imported 310,097 tons of rice in 2016. Though the crop is a recent introduction to the country; its importance is well recognized as the production area coverage of about 10,000 ha in 2006 has increased to over 50,000 ha in 2018 (Tilahun *et al*, 2018; and Tilahun 2018). The number of farmers engaged in rice production has also grown year after year. Currently, Amhara, Southern Nations, Nationalities and Peoples Region (SNNPR), Oromiya, Somali, Gambella, BeniShangul Gumuz, and Tigray regions are the major rice producing areas in Ethiopia (MoARD, 2010). The Amhara region takes the lion's share of producing the crop and accounted for 44% of the area coverage and 40% of the production in the year 2009, followed by the SNNPR which contributes 18.7% of the area coverage and 18.6% of the rice production in the same year. Tigray, Benishangul Gumuz, and Gambella are regions that have started rice production in recent years. However, the amount of area under rice cultivation in Ethiopia is low as compared to the potential. For instance, for the year 2009, only 1.3% of the total potential area was covered with rice (MoARD, 2010). Due to the increasing high demand for rice despite the increased level of production, there was high volume of rice importation. For instance, for the year 2008 and 2009, the government of Ethiopia imported 25,667 and 30,082 tons of rice respectively (Biruhalem, 2010). It is

assumed that if rice production continues to increase, the country will be able to substitute imports and will export it in the near future (MoARD, 2010).

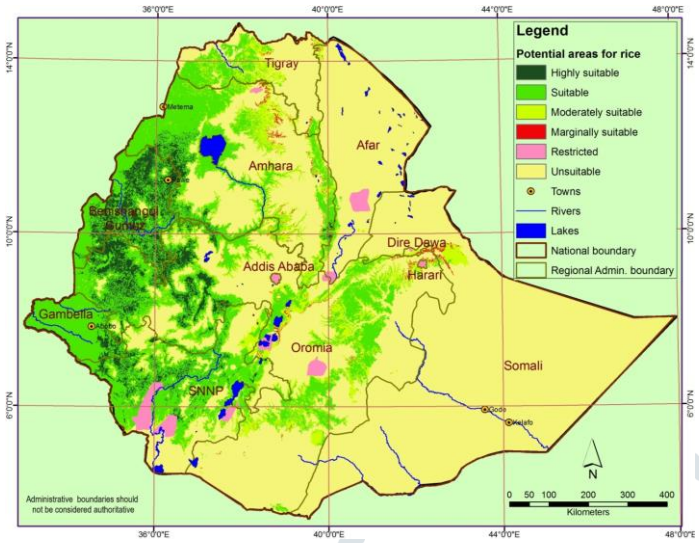

Figure 3. Suitability map of rain-fed rice production in Ethiopia. Source MoARD (2010).

3. THE CONTRIBUTION OF RICE RESEARCH IN TRANSFORMING FARMERS' LIFE

Beside its higher yield per unit area, rice has a higher market value which is equal or some times higher than that of nationally popular crop, teff (SG2000, 2002). Generally, rice has great potential and can play a critical role in contributing to food and nutritional security, income generation, poverty alleviation and socio economic growth in Ethiopia. Subsequently, rice is classified as the fourth "National Food Security Crop" after wheat, maize and teff in the country (Biruhalem, 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. At the Fogera plain, rice plays an important role in relaxing the problem of food-insecurity of the farming community (Astewl, 2010). Before the introduction of rice, farmers at the Fogera plain were mainly engaged in livestock production and smaller proportion of crops production (Figure 4). Since the area is waterlogged during the main rainy season, it was unsuitable for crops production as traditional crops cannot grow in such condition (Tilahun *et al*, 2018). They only grow some crops after the water recedes with residual moisture. Since the introduction of rice in the area, which grows wonderfully in the waterlogged condition the farmers lives has tremendously transformed from only livestock production focus to rice production focus. The engagement in the rice production has transformed the lives of the farmers from being the poorest in the region to richest farmers with surplus production on top of the household food security granted. Moreover, the rice production has created business opportunity for actors along the rice value chain such as rice processers and traders' private business-men (Dawit *et al.*, 2018).

Figure 4. Situation of Fogera before and after rice introduction

4. CURRENT STATUS OF THE RESEARCH

The Ethiopian Institute of Agricultural Research (EIAR) has recognized the importance of rice and had established Fogera National Rice Research and Training Center (Fogera NRRTC) in 2013. Fogera NRRTC is mandated to coordinate the rice research in the country. At present 12 federal and regional centers including: Fogera, Pawe, Gondar, Tepi, Bonga, Assosa, Maytsebri, Worer, Bako, Jima, Gode, and Gambella Research Centers, are involved in rice research activities across the country (Figure 5). There are also some agricultural universities (like Mizan-Tepi and Debretabor) engaged in the rice research.

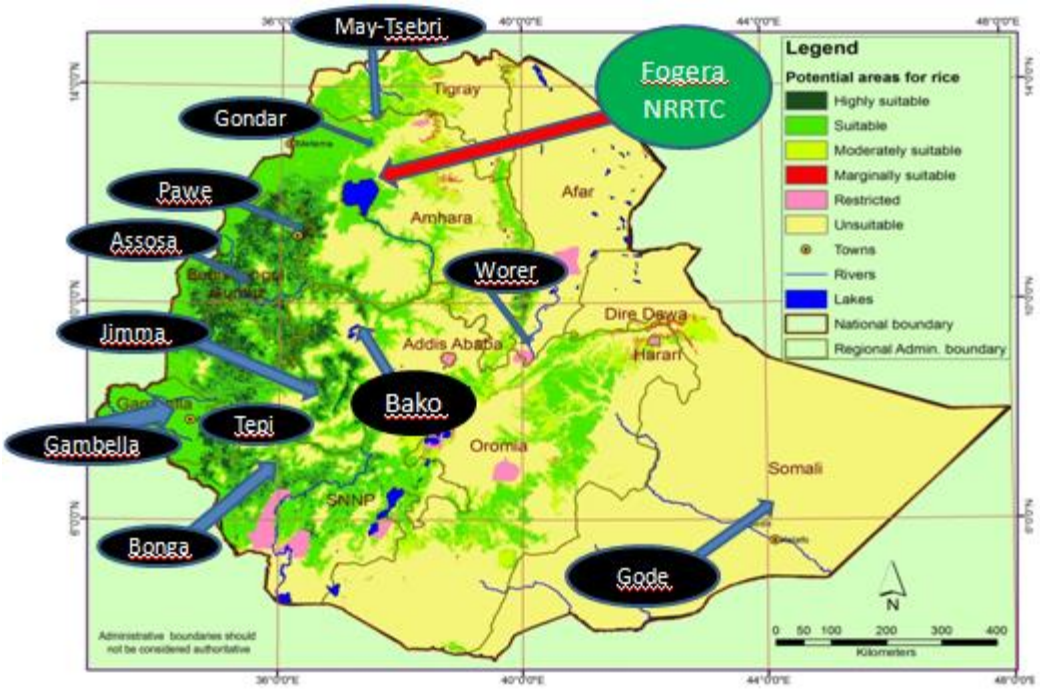

Figure 5. Distribution of research centers working on rice in Ethiopia

In 2010, the extension Directorate of Ministry of Agriculture and Rural Development (MOARD) developed the National Rice Research and Development Strategy of Ethiopia in collaboration with Japan International Cooperation Agency (JICA) and Sasakawa Global 2000 (SG 2000) (MoARD, 2010). The document has clearly elaborated the rice production potential, the importance of the crop and research directions. Moreover, to strengthen the rice research of the country, EIAR has developed a 15 years "Rice Research Strategy" which is under implementation starting 2017.

5. MAJOR ACHIEVEMENTS OF RICE RESEARCH IN ETHIOPIA

Long before the establishment of Fogera NRRTC, the national rice research project in collaboration with different governmental and non- governmental organizations has generated and promoted different rice production technologies. Currently 35 improved rice varieties had been released for the three rice ecosystems (15 for rainfed upland, 11 for rainfed lowland and 9 for irrigated). The released varieties are giving higher yields in the research and farmers' fields (Table 1).

Table 1. Yield potential of the recently released rice varieties in different rice ecologies

Name of the variety	Year of release	Appropriate ecology	Yield (t/ha) at	
			Farmers Field	Research Field
Shaga	2017	Lowland	5.0	6.8
Wanzaye	2017	Lowland	3.9	6.5
Erib	2017	Lowland	4.1	5.3
Abay	2017	Lowland	4.0	5.3
Fogera-1	2016	Upland	3.2	4.2
Maitsebri-2	2016	Upland	3.8	4.5
Fogera-2	2016	Lowland	4.9	6.1
Adet	2014	Upland	2.4	4.2
Nerica-13	2006	Upland	3.3	3.8
Nerica-12	2013	Upland	3.4	4.1
Hibir	2013	Lowland	3.6	4.7
Chewaka	2013	Upland	3.3	4.2
Ediget	2011	Lowland	3.2	5.2

Farmers are not only involved in rice production but also varietal development as they have developed two varieties (one lowland and one upland rain-fed types) through selection. The two farmer-selected varieties (Demwoze and Nechu Ruz) have been grown widely in Fogera area (rainfed lowland) of the Amhara Region and in Guraferda area (upland) of the Southern Nations, Nationalities, and Peoples Region (Sewagegn, 2011).

Various location specific rice crop management technologies have been generated with respect to fertilizer rate and application time, seed rates, row spacings, planting methods across the major rice producing regions. Consequently, a number of crop protection recommendations are given to different rice growing locations. Similarly, information related to crop protection has been generated on rice disease, insect pests and weeds distribution and prevalence. More over some mechanical implements like row weeders, harvesters, threshers, etc were evaluated and introduced to rice producers. In general, best fit rice technologies are frequently demonstrated, popularized, and pre-scaled in major rice growing regions.

6. CONSTRAINTS OF RICE RESEARCH IN ETHIOPIA

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

- inadequate financial resources;
- poor infrastructure (lab facilities, green houses, quarantine sites etc)

7. DIRECTION OF THE RICE RESEARCH

- ✓ So far, variety development has been conducted exclusively on selection from pure lines. Future varietal development using hybridization technique should be strengthened.
- ✓ The varieties developed were mainly for rain-fed upland and lowland, and to some extent irrigated ecosystems. The irrigated rice should be given due attention to address the growth of irrigated agriculture in the country.
- ✓ Market- oriented (esp the export) variety development approach should be followed
- ✓ 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.
- ✓ 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.

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