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Production of Upland Rice and Constraints Faced by the Farmers in Tselemti District, Northern Ethiopia

Hadush Hagos
Socioeconomics and Research Extension, Mekelle Agricultural Research Center, Mekelle, Ethiopia

Abstract
Rice is an important crop introduced recently in Tselemti district. This study identified the production and associated constraints of upland rice in Tselemti district of Northern Ethiopia. Data were collected from primary and secondary sources. A total of 150 randomly selected respondents from the potential rice producing kebles were included in the study. There was an increasing trend of rice production and the area in the past seven years. On the other hand, there were technological, biological, physical, socioeconomic and institutional constraints specified by farmers in rice production and utilization. Therefore, solving the prioritized constraints in rice production and utilization is important to adopt rice technology in a sustainable manner.
Keywords: constraints, upland rice, Tselemti district

1. Introduction

Rice has become a commodity of strategic significance across many African countries (Hegde and Hegde, 2013). It is also the most rapidly growing food sources across the continent due to the great urbanization in Africa than any other region in the world. Total milled rice production in Sub-Saharan Africa (SSA) increased from 2 million tons in 1961 to 16 million tons in 2009. At the same time, milled rice imports into SSA increased from 0.5 million tons in 1961 to 10 million tons in 2009 due to insufficient domestic production to meet the growing demand (Otsuka and Kijima 2010; Seck et al., 2010). To import 10 Mt of milled rice it costs US dollar 5 billion. With the high food and fuel prices predicted to last well into the coming decade, relying on imports is no longer a sustainable strategy (AfricaRice 2011). Mostly, the increase in rice production is mainly due to the expansion of cultivated areas, while the paddy yield in African countries has grown slowly from around 1.5 to 2.5 tons per hectare over 50 years (FAO, 2012).

Rice has become a commodity of strategic significance in Ethiopia for domestic consumption as well as export market for economic development (Hegde and Hegde, 2013). Besides, rice is among the target commodities that have received due emphasis in the promotion of agricultural production, and as such it is considered as the “millennium crop” expected to contribute to ensuring food security in Ethiopia. Although rice is introduced to the country very recently, it has proven to be a crop that can assure food security in Ethiopia, the second most populous nation in SSA (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.

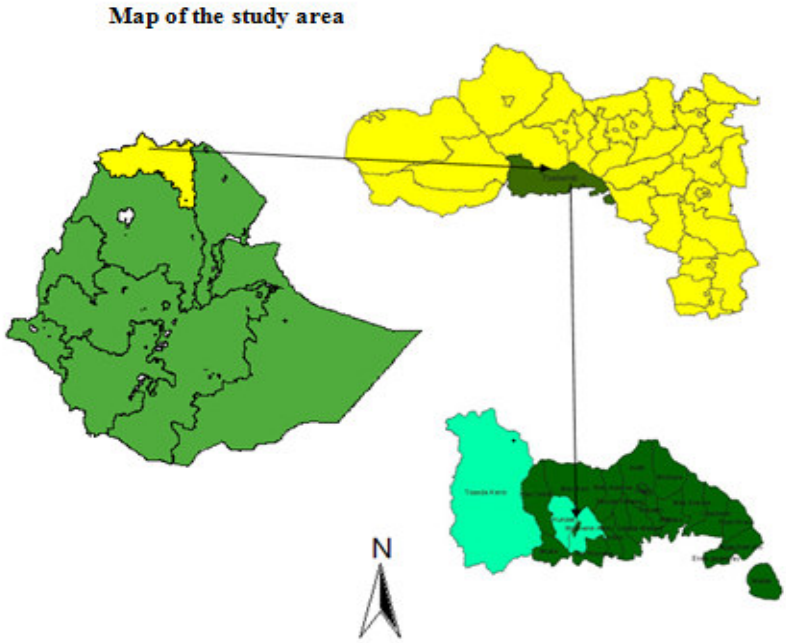
The study area, Tselemti district is one of the potential rice crop growing areas identified nationally in North Western Zone of Tigray. Maitsebri Agricultural Research Center (MyARC), which is a center of excellence in rice crop research in Tigray Region, on top of releasing one variety to the area, it has been making efforts to introduce the nationally released rice varieties. Besides, encouraging extension intervention programs had been made by the Bureau of Agriculture and Rural Development and Non-governmental organizations (NGOs) in collaboration with district office of agriculture and rural development for the last seven years. As a result of such interventions, farmers in the study area cultivated improved rice varieties as an alternative food and cash earning crop.

The recent trends in the area and production of rice along with its high compatibility in the traditional consumption habits show that rice is becoming one of the staple foods and important for ensuring household food security in the district. On the other hand, the district food security and nutrition of the people depends on the amount and stability of their farm output and income. Poor choice of crops to be grown and its management system and other related problems account for the low productivity of the area. Consequently, the potential area for rice production would remain unproductive due to little motivation of farmers to grow rice.

Moreover, there were no any social studies, particularly on the wide range and diversified problems associated with the sector to achieve the desired change in rice technology of the area. A study on rice production and associated constraints that affect the rice technology is useful for technology development and design of strategies that foster adoption of rice technologies to cope up with the current food insecurity problem of the area. Therefore, this study was aimed to assess the production and the constraints associated with upland rice technology packages to fill the existing knowledge gap.

2. Materials and Methods

Tselemti district, located in the Northern part of Ethiopia, is found at 38º15' E and 13º48' N. The district is classified into three agro climatic zones: high altitude covers about 2.65%, mid altitude covers 19% and low altitude covers 78.35% of the total area of the district. The district covers an altitude ranging from 800 to 2870 meters above sea level. The mean annual temperature of the area is 16 ºC (November-January) and 38 ºC (February-May) minimum and maximum, respectively. The annual rainfall ranges between 758 and 1100mm and has a mono-modal pattern. Generally, rain fall starts in June and ends in September.



Three kebeles of the district was selected for the study based on the rice production potential. The selected kebeles were Tsaedakerni, Wuhidet and Medhanialem. A total 150 respondents were considered for the study. The number of respondents from each kebele was selected by following proportionate random sampling procedure. The constraints were listed based on the researchers' experience, discussing with key informants and extension experts. Finally, the frequency of the respondents indicating each of the constraints was found out and ranked based on the highest percentage. Secondary data was collected from Tselemti district office of agriculture and rural development annual reports especially from 2008 to 2014 production season to see the temporal dimension and trend of adoption of rice technology in the study area.

3. Result and Discussion

3.1. Rice Production in the Study Area

In the study area, rice technology was introduced in 2007 by the MyARC, which was first conducted as an observation trail of two varieties. After evaluation of the good performance of the two varieties the research center was focused on the adaptation of improved rice varieties and recommends NERICA-3 and NERICA-4 to the area. Besides, the research center was engaged in nationally released rice varieties, seed multiplication and introduced to beneficiaries in collaboration with the Office of Agriculture and Rural Development (OoARD). Furthermore, the variety development and agronomic practice have been found promising to enhance production and productivity so as to improve the livelihood of small scale farmers in the region.

In addition to the introduction of different varieties to farmers MyARC had been released one variety following the three year variety adaptation and participatory rice variety selection trials. The released variety NERICA-13(Maitsebri-1) was best performed and selected by farmers and continued in catching the interest of the beneficiaries. The variety N-13 has been selected based on its crucial merits like earliness, high yield, resistance to lodging, high straw yield, seed size, white seed colour and quality of cooking for *injera* making. The trend of rice production and the area in the past seven years was increasing as indicated in the figure below.

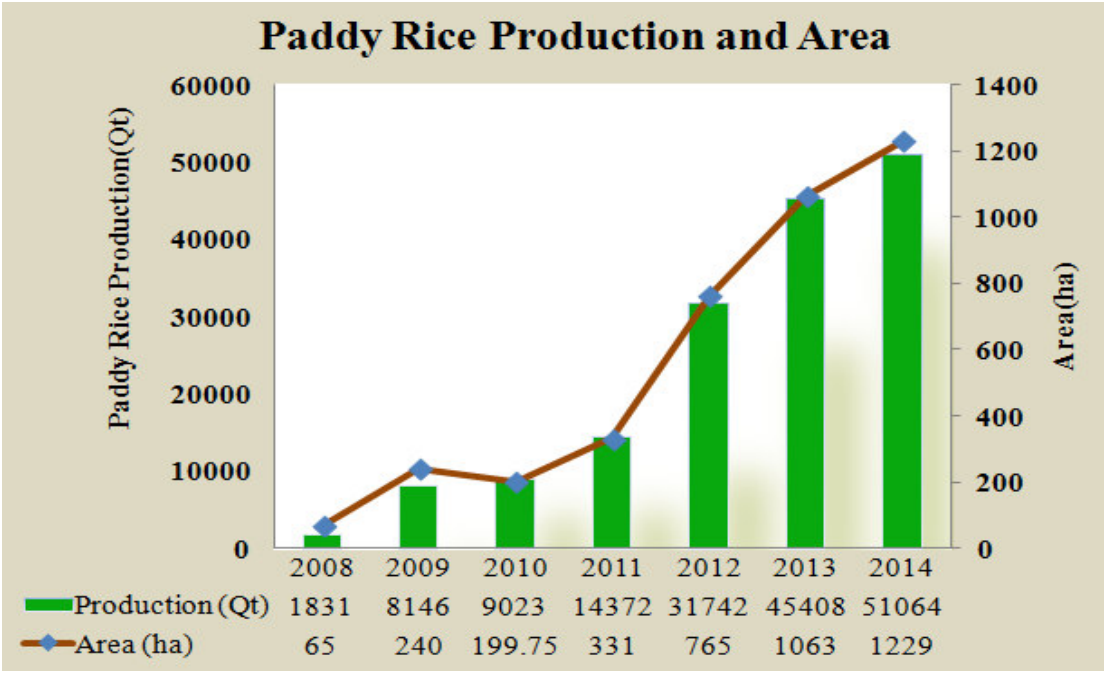


Figure 1. Paddy rice production and area in Tselemti district (2008-2014)
Source: OoARD, 2014

The potential for upland rice production in the district is huge, which was estimated about 7000 hectares (OoARD, 2014). It is simply a matter for the farmers to switch over to its cultivation when they senses that the price of rice will be good in that cropping season, provided there is good precipitation and availability of an appropriate polishing machine. Under such conditions the farmer will easily convert from growing conventional crops like sorghum to growing upland rice. Sorghum, Finger millet and Noug were the first choice of crops that substituted with rice. Since it is becoming a staple crop, farmers seem to be willing to grow at least for their food all the time no matter the constraints they are facing.

It is helpful to know what types of rice the farmer is growing. A preference of one type over the other determines the focus or direction for both formal research and extension. More than 95% of the rice area was covered with upland NERICA varieties. The distribution of respondents by variety they planted at least once were 41.9% NERICA-13, 35.5% NERICA-3, 29% NERICA-4, 3.2% X-jigna and the rest 38.7% did not know about the variety they had been grown in the past three years.

In the study area, food security at household level is important for ensuring a good livelihood and freedom from hunger. Currently, rice consumption is becoming increasingly popular and plays a very important part in the food security of the area. Rice is rich in carbohydrates and proteins and is used mainly for human food consumption in different forms. It is an important component of household food intake and income in the surveyed rice grower households. A very high proportion of households use it for their own consumption. Currently, almost all of the rice growers are food sufficient and some of them have an excess rice grain available all the year.

As a food crop, rice has some inherent characteristics which make it attractive, in particular for small-scale farmers as well as for the urban poor and rich. Rice fits easily into the lifestyles of the people specially to prepare different dishes like *injera* which is the common food of Ethiopians. In most cases, rice is eaten in the form of *injera* lonely or in combination with other food crops like sorghum and *teff*. Rice was also cooked by boiling in water, steaming or frying and is eaten. It is also eaten in the form of *kita*, Porridge (*gonfo*) and bread (*dabo*). It was also used for local drinks like *tella*, even though; most of the farmers talk about its strong for drinks that could bring headache. Furthermore, rice has some inherent characteristics which make it attractive that can available all year round because of its long shelf-life, making it preferable to other crops for food security.

Moreover, it also provides job opportunities for youth and the landless poor who are engaged in daily laborer activities. Rice field requires careful management starting from land preparation up to harvesting, particularly on weeding activities. Most of the families could not accomplish these activities using only their family labour. This situation requests the additional manpower whatsoever the cost of labour in the market. Many landless poor and young generate income the whole summer, especially during peak periods of agronomic practices to solve their immediate financial constraints.

3.2. Constraints Associated with Rice Production in the Study Area

There are several constraints faced by the farmers during the adoption of improved rice technologies. This section deals with the various constraints experienced by the respondents in rice production. The constraints associated with rice production and post harvest were studied under the five sub-sections, namely;

1. Technological constrains
2. Biological constraints
3. Physical constraints
4. Socioeconomic constraints
5. Institutional constraints

The distribution of respondents with regards to the constraints militating against rice production and post harvest in the study area is presented in table 1.

1. Technological constraints

The results revealed that the first and critical technological constraint experienced by the respondents was lack of "polishing machine" reported by majority (63.3%) of the respondents. Farmers were suffering due unavailability of the machine in their nearest area. The absence of polishing machine also hinders from participating in the market. This totally affects the rice production in a given production season.

"Scarcity of improved seeds" reported by 43.3% of the respondents was a serious problem encountered by farmers in the study area. The respondents reported that they did not have enough quantity and quality rice seed for the next cropping season. The seed they received from the district cooperative and even from the research center was sometimes adulterated. Even the price of the seed was much higher than the price they sold at the market. Similar findings by Oinam and Sudhakar (2014) reported that "Non availability of suitable high yielding varieties" was the constraint for rice adoption in Bishnupur district of Manipur state.

Improper "storage facilities" and lack of "threshing machine" were also the problems encountered by the respondents in the study area, with 32.6% and 38.7% respectively. This was not that much mandatory for most of the rice producers. Alternatively, farmers could use the conventional way of storing and threshing rice.

2. Biological constraints

Among the biological constraints "Rodents" and "Termite" were the problems encountered by some of the respondents in the study area, with 31.3% and 21.3% respectively. Rodents particularly rats and squirrels were reported as important constraint that had an indispensable contribution in yield losses of field and storage facilities. Similarly, there were termite problems in some farmer's field, especially during moisture stress period. On the other hand, "disease incidence" was the constraint expressed by a small number of respondents (15.3%). The occurrence of disease was a recent assessment of the farmers that need the attention of researchers and experts in the future undertakings.

3. Physical Constraints

The physical constraint reported by almost half of the respondents (48%) was "shortage of suitable land" for rice. To obtain a successful crop, adequate and assured soil moisture reserves and fertility during key periods of plant growth were essential that most of the non-adopters lacking. The other physical constraint which reported by 42% of the respondents were "Plowing difficulty". It requires more than two plowing for planting rice crop in a fertile and weed free field. The clay soil type by itself made it difficult to plough the soil without moisture and with more moisture.

4. Socioeconomic constraints

The first and foremost socioeconomic constraint raised by the respondents was "requirement of heavy weed management" reported by 82.7% of the respondents. The weeding habit for the common crops of the area was very poor. When they started to grow rice they found it difficult to manage the weeding to realize the desired production. It requires spending two or three weeding frequencies to escape the crop from weed competition. This situation was tedious and demanding more labor and financial provision which was not common on other crops.

The results indicated that the other most serious constraint in the categories of socioeconomic attributes were "high cost of fertilizer" (81.3%), "Inadequate finance" (75.3%) and "High cost/scarcity of labor" (69.3%). These constraints were almost interrelated with one another. Obviously, if there were no rice marketing, there would not be adequate finance for purchasing the required fertilizer and paying the daily laborers. The demand for fertilizer was very limited in the study area. There was little tendency to took the required chemical fertilizer as per the recommendation to the land size they owned. Most of the respondents expressed that daily laborers were demanding higher wages for every agricultural work. There were also migrations of agricultural laborers to other places for employment, to earn higher wages when compared to the wages in their own place, which created scarcity of labor in the area. The findings by Oinam and Sudhakar (2014) reported that high cost of labor was the first constraint that affects adoption of rice in Bishnupur district of Manipur state.

"Low level of knowledge and awareness" was revealed as the constraint by more than half (62%) of the

respondents. Rice crop was a recently introduced crop in the study area. Most of the cultivation practices in rice farming right from land preparation to post harvest handling and utilization require skill for doing these operations. This is consistence with findings of Oinam and Sudhakar (2014) that shows "lack of awareness or knowledge about certain technologies" was a constraint for rice adoption.

5. Institutional constraints

The first most important institutional constraint reported by 64% of the respondents was "poor marketing of products". Improvement in production alone was not sufficient to achieve better income unless the marketing aspect as well improved. This might be the reason for the financial constraints in rice production. The marketing gap enforces them not produce rice as much as the potential beyond fulfilling their daily consumption. Farmers should be assisted and knowledgeable of the need to organize themselves into cooperative groups to create market linkages. Creating the market would enable them mobilize the required financial resources for the acquisition of increased farm land for rice production. Similarly, the result indicated that "lack of transportation facilities" was reported by more than half (57.3%) of the respondents. This made difficult for paddy rice moving to market, polishing machine and milling activities. This is consistence to the findings of Alarima *et al*. (2011) that reported "poor road network from their farms to city centre" was a constraint in rice production.

Furthermore, the result revealed that half the proportion of the respondents (52.1%) was suffering due to lack of electricity. The absence of electricity in the area made it impossible to establish polishing machine. Moreover, there was high power interruption at the already installed polishing machine after walking several kilometers to the town. "Poor governmental support" was also the constraint expressed by 46% of the respondents. The crop needs special attention on post harvest machinery and market linkages. The administrations at different levels were not taking the required efforts on creating awareness among various sections to boost rice production as required.

The other important institutional constraint identified by 44.7% of the respondents was "inefficient extension service delivery" on rice. The focus given by the extension was too low comparing to the time invested at chemical fertilizer awareness creation. Adequate efforts to create awareness of farmers all over the potential rice field were not properly addressed. There were not sufficient method demonstration and result demonstration in farmer's holdings to start over the new crop. Similar findings by Oinam and Sudhakar (2014) and Alarima *et al*. (2011) reported that "lack or weak access to extension services" was a constraint to rice adoption.

In general, regardless of the constraints registered above, the potential of rice and farmers interest on the crop were promising to be continued in the study area. The consideration of the crop as their food security, higher yield potential, livestock feed, better shelf life and other simplicity of with their socioeconomic circumstances would contribute for its sustainable use. The focus given nationally and by other supporting stockholders would also contribute to minimize the constraints for the successful development of the sector.

6. Conclusion

Rice fits easily into the lifestyles of the people specially to prepare different dishes like *injera* which is the common food of Ethiopians. Constraints associated with the production and utilization of rice farmers were classified based on five categories, this was the technological, biological, physical, socioeconomic and institutional aspects. Polishing machine and the requirement of heavy weed management were among the serious problems under the categories of technological and socioeconomic constraints, respectively. Poor marketing of products was the first prioritized problem under the institutional constraints. However, the biological constraints were specified by some of the respondents.

The rice promotion and development was highly dominated by the public and supporting NGOs. Encouraging the involvement of private sector in the area is important in the development of rice sector. There was less efficient service provision in the area of rice polisher and marketing of products. For sustainable and efficient rice polisher service provision, the private sector has to be encouraged to enter into the business. In doing so, the public sector, especially OoARD should play facilitation role in providing long term credit access, information on the sources, specification, operation and maintenance of rice machines.

Table 1. Constraints of rice production and post harvest in the study area

No.	Constraints	No of respondents	Percent (%)	Rank
1	**Technology constraints**			
1.1	Polishing machine	95	63.3	I
1.2	Storage facilities	49	32.6	IV
1.3	Threshing machine	58	38.7	III
1.4	Scarcity of improved seeds	65	43.3	II
2	**Biological constraints**			
2.1	Disease incidence	23	15.3	III
2.2	Termite	32	21.3	II
2.3	Rodents	47	31.3	I
3	**Physical constraints**			
3.1	Plowing difficulty	63	42	II
3.2	Shortage of land	72	48	I
4	**Socioeconomic constraint**			
4.1	Low level of knowledge and awareness	93	62	V
4.2	High cost/scarcity of labor	104	69.3	IV
4.3	Inadequate finance	113	75.3	III
4.4	Requirement of heavy weed management	124	82.7	I
4.5	High cost of fertilizer	122	81.3	II
5	**Institutional constraints**			
5.1	Transportation facilities	86	57.3	II
5.2	Poor marketing of products	96	64.0	I
5.3	Poor governmental support	70	46.7	IV
5.4	Inefficient extension service delivery	67	44.7	V
5.5	Electricity problem	78	52.1	III

Source: Computed from own survey, 2015

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