Substantial factors influencing the performance of rice farmers in Mbeya Region, Tanzania

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Crops production subsector depends on various factors including natural factors as well as non-natural factors. Meanwhile, in vast areas of Tanzania including the Mbeya Region, rice farmers struggle to make their living through rice farming regardless of various challenges with which the subsector is crumbled. This study aimed at assessing the factors influencing the performance of rice farming in the Mbeya Region of Tanzania. Multi-stage sampling technique was applied to obtain representative samples. Data was collected from a field survey of 240 small-scale farmers by the use of questionnaires from January to March 2018. Descriptive statistics method was used to analyze the data and the Ordinary Least Square regression model was used to estimate parameters. The results indicate excess rainfall and droughts events significantly influenced rice production negatively by reducing 3 and 5% for each occurrence, respectively. Marital status and gender significantly influenced positively rice production in the study area. Other influential production factors including market price lag, pest and diseases, and farm size were statistically significant in rice production. The study recommends possible interventions such as increased accessibility to extension services, agricultural financial services, improved seeds, fertilizers, and pesticides to mention a few by government and other responsible institutions which hamper the growth of the rice industry to increase food security to the farming populace.

Key words: Rice, performance, factors, regression, Tanzania.

INTRODUCTION

Agricultural crop production remains the mainstay for the majority population in the rural areas of Tanzania (Reincke et al., 2018). Among other crops, rice production is the dominant cereal crop in the country ranked second after maize production (Alam and Effendy, 2017). According to the Tanzania Ministry of Agriculture, approximately total rice harvested area is 1,109,814 ha (MOA, 2019). Currently, rice is been cultivated in more than 64 districts from different regions of Tanzania (RCT, 2015). The leading regions are Mbeya, Morogoro, and Shinyanga regions which are characterized by various ecosystems. It is mainly produced under a rainfed ecosystem (95%) and the remaining amount is under small-scale irrigation schemes (USDA, 2019). Rice is
grown by small-scale farmers for both households’ consumption and commercial purposes. The production has been varying from time to time due to various challenges including the climate and weather variability especially with seasonal and insufficient rainfall (Boniphace et al., 2014).

Realizing the importance of the rice industry the Tanzania government has been supporting rice production by initiating various programs and addressing the prominent challenges. The programs aimed at reducing the obstacles to increasing production and productivity. Therefore, the government and private organizations are working together to investigate and provide amicable solutions for the challenges which hold back rice productivity. Some of the solutions include an introduction and recommendation of the adoption of new technologies such as improved seed varieties, fertilizers, and irrigation services (Mligo and Msuya, 2015) to boost rice production. Nonetheless, weather variability remains the dominant challenge to crop production in the country (Kaliba et al., 2018). The situation has led to a decrease in food and income for most rural families relying on agriculture production (Global Information Network, 2019). At the household level, most challenges include poor access to education, poor technology adoption, lack of extension services, and poor prices (Urassa, 2015; Haji et al., 2018). Therefore, this study aimed at investigating the main challenges for increasing rice yield in the study region.

MATERIALS AND METHODS

Description of the study area

Mbeya region is among the oldest regions located in the Southwest of the Southern Highlands of Tanzania. It lies between latitude 7° and 9°31’ South of the Equator and between longitude 32° and 35° east of Greenwich. The region receives reliable rainfall annually varying from 650 mm in the great Usangu plains and Chunya district to 2600 mm in the Northern areas of Lake Nyasa. Normally the rains occur from October through May and experience a temperature average ranging from 16 to 25°C. The total population is 2.707,410 with 52.1% females and 47.9% men according to the Tanzania National Bureau of Statistics (NBS, 2012).

The paper is based on data collected from a survey conducted in Mbarali and Kyela districts of the Mbeya Region of Tanzania. The targeted population is the small scale rice farmers in the region. Cross-section research designs were used whereby data was collected from the respondents once at a time. The survey was conducted from January to March 2018 which was the period of active farming. The study was conducted on time as it was during the active agricultural season in which most farmers were working in the fields doing weeding and applying fertilizers. Mbarali and Kyela (Figure 1) are the two leading districts in rice production in the region and from each district, two wards were purposively selected. Four villages were again purposively selected where a total of 240 respondents were obtained by a random sampling technique. Thereafter, face-to-face interviews were used to solicit responses from the farmers based on socio-economic and demographic factors, general rice production practices, factors affecting rice production practices, agricultural information, and technology services. The interviews were guided with a set of written questions. Also, focus group discussions were conducted by involving the selected key personnel’s; the villages’ leaders, agricultural extension officers, and other important social leaders in the respective villages (Table 1).

Analytical techniques

OLS regression equation was used to estimate the parameters used in the model. The regression equation relates the rice production in kilogram as a dependent variable with a set of independent variables. OLS regression was used because it is simple and useful to estimate the linear regression model. The equation could be demonstrated as follows:

\[ Y_i = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \ldots + \alpha_n X_n + \mu_i \]  

(1)

where Y is the rice production in kilogram per unit area, \( \alpha \) is the constant of the regression equation, \( \alpha_1,...,\alpha_n \) are the respective parameters to be estimated by the regression model, \( X_1,\ldots,X_n \) are the respective explanatory variables and \( \mu_i \) is the error term.
Table 1. Distribution of respondent by sex, age, marital status, education, and off-farm income.

| Variable name    | Characteristics | Frequency | %  |
|------------------|-----------------|-----------|----|
| Sex              | Male            | 186       | 77.5 |
|                  | Female          | 54        | 22.5 |
| Age              | ≤ 45 years      | 134       | 56   |
|                  | > 45 years      | 106       | 44   |
| Marital status   | Single          | 10        | 4.2  |
|                  | Married         | 230       | 95.8 |
| Education        | Illiterate      | 6         | 2.5  |
|                  | Literate        | 41        | 17.1 |
|                  | Primary         | 169       | 70.4 |
|                  | Secondary       | 22        | 9.2  |
| Income off-farm  | Yes             | 116       | 48   |
|                  | No              | 124       | 52   |

Source: Field Data (2018).

RESULTS AND DISCUSSION

Descriptive statistics of the respondents

Distribution by sex, age, and marital status

A total of 240 rice farming households are involved in this survey. Among them 75.5% were males and 25.5% were females. The findings imply that rice farming activities are dominated by males in the Mbeya region. This result agrees with Diiro (2015) in Uganda. However, it went contrarily with (Chidi et al., 2015) who documented that in Ebony State female farmers dominated males by 58.3%. The study revealed that 56% of the respondents were having from 45 years and below while 44% were above 45 years. The study further revealed that the majority 96% of respondents were married while a few 4% were single. This indicates that almost all the rice farmers are married (Ajah and Chukwumah, 2014), and the situation could be an added advantage for family labor. About 70.4% of the entire population had attained primary education, 17.1% had read and write knowledge (Literate), 9.2% had secondary school education, and 2.5% were illiterate. Similar statistics are reported by Afolami et al. (2012) that the majority of farmers had primary education which is low and hampered them from technological adoption and attending agricultural extension services.

In terms of family size, the majority of households 83.3% have between 2 and 4 members, 9.2% have less than 2 members, 7.5% have from 5 to 7 members and none of the households were having a family size greater than 7 members. This trend shows that family labor size was inadequate in the study as compared to Kim et al. (2017) who reported that households with up to ten members were self-sufficient in terms of house labor. Additionally, 48% of the respondents were having off-farm jobs while 52% were only doing farming activities. This is an indication that farmers in Mbeya Region do not depend on rice farming only and this could be an advantage for adding income in the household apart from the income reaped in agriculture. These findings agree with Diiro (2015) who found that in Uganda farmers with off-farm income were better off in terms of income. Diiro also claimed further that because of extra earns from the off-farm jobs farmer could practice diversification at the same time adopting new technologies.

Land size, farm-size, crops type, reasons for cropping, and outputs

The results in Table 2 show that the majority of respondents (89%) own land. Land is regarded as an important asset to any household in rural areas. Owning to land ownership helps farmers to plan holistic allocation of resources including crops, livestock, and settlements. Our findings agree with the statistics provided by the Tanzania Bureau of Statistics (NBS, 2014) that almost 85% of the rural people own land. The further description shows that the majority of 73% of farmers in rural areas own less or equal to 2 ha of land, while only 27% own above 2 ha of land. This implies that although the majority of farmers own land the sizes are too small, thus, proper allocation of land is required as the number of people is increasingly more land will be in demand (Diiro, 2015). Additionally, about 80.8% have farm size less than 2 ha, while 16.75 and 2.5% of the respondents were having from 1-3, 4-6, and above 6 ha, respectively. This implies that the majority of farmers own a smaller amount...
of land. The present situation reflects the real traits of rural farmers as they tend to own small land and also cultivate small-sized farms in Tanzania (NBS, 2014). In terms of crops production, all 240 farmers attested to grow rice as a major crop. This agrees with the findings of Ngailo et al. (2016) who documented that almost all the households in Kyela district produce rice. However, some farmers (59%) revealed that depending on the season, weather variability, and market challenges they opt to produce maize as an alternative crop. Additionally, about 41% of the households in the same research area grow maize as their main crop.

**Factors affecting rice production**

Figure 2 shows the perceived factors influencing rice production in the Mbeya region. Among the factors, the

| Variable name             | Response | Frequency | %  |
|---------------------------|----------|-----------|----|
| Land ownership            | Yes      | 214       | 89 |
|                           | No       | 26        | 11 |
| Land size (ha)            | ≤2       | 176       | 73 |
|                           | >2       | 64        | 27 |
|                           | 1-3      | 194       | 80.8 |
| Farm size (ha)            | 4-6      | 40        | 16.7 |
|                           | >6       | 6         | 2.5 |
| Major crops types         | Rice     | Yes       | 240 | 100 |
|                           | Maize    | Yes       | 141 | 59  |
|                           |          | No        | 99  | 41  |
| Crop uses                 | Food     |           | 26  | 3   |
|                           | Cash     |           | 2   | 0.8 |
|                           | Food and cash | 211 | 88 |
| Rice outputs(Kg/ha)       | ≤15000   | 163       | 68 |
|                           | >15000   | 77        | 32 |

Source: Field Data (2018).
The fifth challenge affecting rice production is the accessibility and availability of quality seeds (Figure 2). Farmers have acknowledged that it has been difficult to access both quality and certified seeds and have therefore continued using local seeds. Meanwhile, the local seeds have a reputation for producing low yields and are also prone to diseases. This fact goes in line with Elias (2018) who suggested proper accessibility to quality seed for better farmers’ yields. Another factor identified by farmers was the poor availability of labor to work in their fields. Most farmers depended on insufficient family labor. Poor access to extension service is also an important factor for reduced crop production. Most farmers confirmed that they have never received extension services. Extension services are essential for farmers because it is through the services farmers receive important information and knowledge concerning better agricultural practices. This includes services such as time for field preparation, planting time with regards to rainfall availability, availability of important inputs like seed, fertilizers and also pesticides, market, and market prices (Boniphace et al., 2014). The last factors observed by farmers were the availability of fertilizer. Most farmers attested to not using fertilizer because it is not accessible.

Through focus discussions, it was revealed that although fertilizer is sold by government agents the prices are higher than the one set by the central government.

### Empirical estimate from OLS results

Table 3 presents the results of the estimated parameters for the factors influencing rice production in the study.
Farmers have perceived different challenges that affect their rice performance including environmental factors such as variations in rainfall, temperature, and sunshine. Other variables are limited access to extension and technological services such as improved seeds, farmers' extension training, chemical fertilizers, and labor. Through empirical estimates, it revealed the extent to which key specific variables including households gender, marital status, labor size, and farm size influence rice production. Others include variation in rainfall and droughts, pest and diseases, and previous market price. Therefore, the study recommends possible interventions by the government and other responsible institutions on the identified factors which hamper the growth of the rice industry. The collaboration of the central government as policymakers and other partners should target on establishing irrigation schemes so that farmers would be able to produce rice continuously and other crops to increase their income. It also should go in hand with increasing access to improved seeds, extension services, fertilizer, and pesticides. Finally, a special eye looks on farm size since it was found that an increase in farm size increases rice outputs. Thus, there is a risk of diminishing outputs as a result of the population increase not in line with the land size.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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