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The socio-economic and institutional factors affecting farmers' preferences for selection of rice varieties in Kilombero District, Morogoro region, Tanzania

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Abstract The farmers' selection of the best variety for rice production is the most important step to increase crop productivity. The results revealed that socio-economic factors such as age, education, farming experience, total land holdings and source of seeds had influenced on farmers' decisions to use high yield varieties (HYVs). On the other hand, the socio-economic factors such as household size, membership to farmers' associations, land for growing rice and income from selling rice were the key constraints for the farmers' preferences for using HYVs. Moreover, gender, marital status, membership to social networks, cost of production, yield harvested, access to credit, source of rice seeds, market prices, and transport were positively recorded but not significantly related to farmer's preference for using HYVs.

Keywords: Farmer preferences, High yielding varieties, Institutional factors, Rice varieties, Socio-economic factors

Introduction

About 80% of the people in developing countries such as Tanzania, Ethiopia, Djibouti, Myanmar and Afghanistan (World Bank, 2019) live in rural areas and depend directly on agriculture for their livelihood. In Africa, agriculture is the driving engine of economic development.The sector accounts for about 20% of African Gross Domestic Product (GDP), 60% of its labor force, and 20% of all commodity exports (Davis *et al.*, 2017). In Tanzania per se, the agricultural sector provides 85% of exports, employs 80% of the workforce and contributes to 75% of foreign exchange earnings and about 29% of the GDP (GoT-NRDS, 2009). According to FAO (2015), 69% of the total population lives in rural area and mostly represents smallholder farmers who have big responsibility to feed the population and ensure the country's food security. The United Republic of Tanzania (2013) reported that cereal crops such as maize, paddy rice, wheat, millet and sorghum grown in Tanzania

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contributed to approximately 65% of the agricultural GDP. Rice is the second staple food and commercial crop after corn which employs 40% of the population of farm families (National Bureau of Statistics, 2016). It is estimated that the crop occupies the most important place among cereals with an annual per capita consumption of 25 kilograms (United Republic of Tanzania, 2013). Tanzania is the second largest producer of rice in East Africa after Madagascar (Demont, 2013) with the production of 899,000 Mt (Wilson and Lewis, 2015). Being the second largest producer of rice, the largest production was due to its large production land area, not production per unit area. There is no doubt that Tanzania has larger rice production areas compared to Madagascar, but in Madagascar the production is higher than Tanzania (Demont, 2013)**.**

The research done by Nakano and Kajisa (2013) indicated clearly that the attempt of the country to increase production by expanding the cultivated area has less impact on increasing crop productivity. Therefore, production transformation to increase rice production in Tanzania is needed in order to assure food security as well as an income for the growing population. In today's world where land is limited, we cannot increase food production by increasing the area under cultivation, but rather it must be done by increasing farm productivity. To achieve this, serious and willing transformation from traditional methods of cultivation to modern technology is required. It has been proven that the productivity of land can be increased through the use of higher yielding crop varieties with maximized and intensified cultivation. The development and use of HYVs may increase crop sustainability and improve the livelihood of the majority of rural farmers (Asfaw *et al.,* 2012). However, about 71% of the rice grown in Tanzania is produced under rain-fed conditions and the yield is less than 1.8 t/ha. According to Benard *et al*. (2014), irrigated land represents 29% of the total farm areas with most of it consisting of traditional irrigation at the small village level and consequently, the average yield of rice was less than 3 t/ha (Nakano and Kajisa, 2013;Wilson and Lewis, 2015). Due to the contribution of the agricultural sector to the economy, the government aimed to support agricultural research which will have an impact on production and disseminate new technologies to improve the rice productivity of farmers. As a result, in 2009 the government developed the National Rice Development Strategy (NRDS) with the aim of doubling rice production by 2018 from 899,000 Mt of paddy rice to 1,963,000 Mt (GoT-NRDS, 2009). However, since the inauguration of the NRDS, the objectives have not been fully met and there is slow turnover on the use of high yield varieties (HYV) by the farmers.

According to Romanillos *et al*. (2012), HYVs have the ability to increase the yield by an average of 15 to 30 percent over the best local varieties. HYVs

are characterized by higher crop yield/ha. In Tanzania, there has been several released and recommended HYVs which have high yield potential compared to local varieties. These include the New Rice for Africa (NERICA), it is a high yield cross between *Oryza sativa* L. and *Oryza glaberrima*. It has a high ability to thrive in harsh environments (Somado *et al.*, 2008). The variety has a potential yield of 7.0 t/ha but can achieve 5.4 and 6.0 t/ha in Nigeria and Ethiopia, respectively (Seyoum *et al.*, 2011). TXD306 is another HYVs developed through a double cross between a local cultivar Supa and the Korean cultivars Pyongyang and Subarimati (Msomba *et al.*, 2004). The variety has early maturity, production of many tillers, resistance to water logging, a high yield potential (5.4 – 6.5 t/ha), semi aromatic characteristics and high milling recovery (Bucheyeki *et al.*, 2011). IR05N221 named Komboka, which means to be liberated, has a potential yield of 6.5 to 7.0 t/ha. This variety is light insensitive and can be grown twice a year. Apart from these approved HYVs which have been bred with regards to local area requirements, there is little use of HYVs. The current adoption rate according to the study conducted by Monela (2014) was less than 10% for HYVs. In order to assess the factors affecting farmers in using new technology, we need to clearly understand the internal (socio-economic) and external (institutional) factors concerning adoption of new technology. Therefore, this study aimed to investigate and identify the socio-economic and institutional factors affecting farmers' preferences regarding the selection of rice varieties in Kilombero district Morogoro region, Tanzania.

Materials and Methods

Morogoro region is the second largest rice producing area in Tanzania after the Shinyanga region. In Morogoro, rice is cultivated in eight districts, namely Kilombero, Mvomero, Kilosa, Malinyi, Ulanga, Morogoro urban, Gairo and Morogoro rural. Morogoro region produces nearly 12% of the rice grown in the country. The Kilombero district is leading in rice production in the region followed by Kilosa district. In order to obtain a general picture of rice cultivation in the whole region, we selected Kilombero district to represent the whole region. The district is made up of 19 wards, namely Kidatu, Sanje, Mkula, Mang'ula, Kisawasawa, Kiberege, Kibaoni, Ifakara, Lumemo, Idete, Mbingu, Mofu, Mchombe, Chita, Chisano, Mlimba, Utengule, Masagati, and Uchindile with a total population of 407,880 (National Bureau of Statistics, 2019). Purposive sampling technique was used to select three wards of Kibaoni, Lumemo, and Kiberege. The wards are the main rice producer and are well populated with both HYV and LYV farmers. In our sample area, most of the rice is grown under rain-fed lowland conditions. In each ward, we chose two

sample villages by purposive sampling based on the number of rice growers per village. In total, we selected six villages as our sample villages with a total sample size of 338 households. The survey was conducted from December 2018 to February 2019 and the data were collected at household level. The data were collected through face to face individual interviews. The sampling frame was 2,763 rice farmers and the population for each village are in brackets as: Kiberege (665), Lungongole (233), Mkasu (571), Kibaoni (576), Machipi (247), and Michenga (471) (National Bureau of Statistics, 2019). Then the formula for sample size determination adopted from Cochran (2007) was used to obtain the sample of 338 respondents,

$$n = \frac{n_o}{1+\frac{(n_o-1)}{N}} \qquad \text{equation 1}$$

And $n_o = \frac{Z^2pq}{e^2}$ equation 2

where N = population size (2,763), Z = Z score (1.96), P = estimated proportion of the population = 0.5, q = 1-P and e = margin of error = 0.05 Cochran (2007). From the equation 1

$$n_o = \frac{(1.96)^2(0.5)(1-0.5)}{(0.05)^2}$$

$$n_o = \quad = 384.16$$

Substitute the value of equation 2 to equation 1 then $n = \frac{384.16}{1+\frac{(384.16-1)}{2,763}}$

$$n = 338$$

Therefore, n from 6 villages was 338 and then the proportional stratified sampling method was employed to select farmers from each respective village. A cross-sectional research design was used in this study as this allows the researcher to collect data at once in a single point. According to Babbie (2015), the design is suitable for description purposes as well as for the determination of relationships between variables.

Data Collection

The study used a multi-stage sampling method. First, purposive sampling was used to select the districts; proportional stratified sampling was used to select wards and villages; simple random sampling was adopted to select the rice farmers. The districts were purposively selected based on the intensity of rice production, agro-ecology and accessibility. Out of 338 rice farmers, 147 were HYV farmers and 191 were LYV farmers. The respondents interviewed were the household head (either a male or a female), who directly makes decisions and manages the farm. There were 79 HYV male farmers and 68 female farmers while there were 104 male and 87 female LYV farmers.

Data Analysis

The data were coded and analyzed using statistical methods. Descriptive statistics such as frequency and percentage were calculated to determine distribution of the study variables. The binary logistic regression model was used to analyze the relationships between the dependent and independent variables. The rice varieties (LYV and HYV) are dependent variables which were coded as 0 and 1 respectively, while the independent variables included socio-economic characteristics of age, gender, education level, household size, marital status, experience, membership of social networks, membership of farmers association, area for growing rice, total land size, total cost, yield, revenue, access to credit, market price and transport. The following equation as adopted from Bruin (2011) was used.

$Y = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X1 + \beta_2 X2 + \ldots\ldots + \beta_k Xk + \varepsilon$ Where; Y = Log of odds ratio, X_1 …Xk= explanatory variables of the model. In relation to farmers' preference for selecting rice varieties, 1 represents a farmer who uses HYVs and 0 for a farmer who uses LYVs. β_0 is a constant, β_1, $\beta_{2\ldots\ldots}$ β_k are coefficients of explanatory variables estimated for k=1 up to k=16, ε is an error term and X1 to X17 represent = age, gender, education level, household size, marital status, experience in using HYVs, membership of social networks, membership of farmer association, total land holding, land for growing rice, cost of production, yield harvested, income from selling rice, access to credit, source of rice seeds, market price, and transport. The 95% probability level was used as the criterion for determining significance. The impact of independent variables on the dependent variable was done by observing the signs of the logistic regression coefficients (B values) whereas the relative importance of independent variables was determined by observing the magnitudes of Wald statistics and their concomitant levels of significance.

Results

Descriptive analysis

The result on the distribution of HYVs and LYVs farmers in the ward level was shown on Table 3. It revealed that HYV and LYV farmers at Kibaoni ward were 65.7% and 34.3% respectively, which accounted for the highest number of HYV farmers in the study area. At Kiberege ward, the HYV and LYV farmers were 44.4% and 55.6%, and at Lumemo, the HYV and LYV farmers were 17.0% and 83.0%, respectively.

The descriptive statistics results of socio-economic factors such as age, gender, education level, marital status, household size, experience in using

HYVs, membership of social networks, membership of farmer association, total land holding, land for growing rice, cost of production, yield harvested and income from selling rice, access to credit, source of rice seeds, market price and transport were presented in Table 2. The result showed that majority of LYV farmers (38.8%) were young age between 16 to 36 years while the majority of HYV farmers (38.8%) were middle aged between 37 - 48 years. Regarding gender, male LYV farmers accounted for 54.5% and HYV farmers 53.7% while female LYV farmers were 45.5% and HYV farmers 46.3%. On the descriptive analysis on education level, household size and marital status showed that 79.1% of LYV farmers and 83.0% of HYV farmers attained the primary level of education. The highest number of family members was between 4 – 5 people with 40.4% of LYV farmers and 41.5% for HYV farmers. On the other hand, it showed that 78.0% of LYV farmers and 81.6% of HYV farmers were married whereas divorced couples accounted for 10.2% of HYV farmers and 6.8% of LYV farmers. Furthermore, the experience in using HYVs, 94.2% and 48.3% of LYV and HYV farmers had experienced over five years in using HYVs.

LYV farmers were neither members of social networks (91.6%) nor members of farmers associations (80.6%) while HYV farmers were not involved in any kind of membership in social networks (93.2%) or farmers associations (82.3%). It was observed that majority of LYV farmers (38.7%) had large land ranging between 1.21 – 8.00 ha while the majority of HYV farmers (41.5%) held land between 0.71 – 1.20 ha. Total land holdings, the maximum area used for growing rice was ranged between 0.9 – 1.0 ha which represented 57.6% and 54.4% for LYV and HYV farmers, respectively. The cost of production showed that majority of LYV farmers (37.2%) had the cost of production between 16.09 – 97.25 USD/ ha, and the majority of HYV farmers (38.8%) spent the highest cost ranging between 162.15 – 877.64 USD/ha. It indicated that the highest income from selling rice ranged between 332.81 – 1334.60USD/ha for 24.5% of HYV farmers and 18.8% of LYV farmers. The majority of LYV farmers revealed 26.2% who sold their rice between 1 – 93.6 USD/ha.

Access to credit, market prices and transportation were regarded as institutional factors which can have impacts on farmers' preferences for the selection of rice varieties. This study indicated that only 11.0% of LYV farmers and 30.6% of HYV farmers in Kilombero had accessed to credit facilities while the rest 89.0% and 69.4% of LYV and HYV farmers had no access to any credit facilities, respectively. Moreover, it investigated the availability of LYV and HYV seeds in the area and found that the majority of LYV (93.2%) and HYV (69.4%) farmers obtained their seeds from friends or regrew their own seeds. It was discovered that only 3.1% and 10.2% of LYV and HYV farmers

bought their seeds from agro input shops while 0.5% of LYV farmers and 12.2% of HYV farmers obtained their seeds from Kilombero Agriculture Training and Research Institute (KATRIN) as shown in Table 2.

Binary logistic regression analysis

A binary logistic regression was conducted to examine whether independent factors had a significant effect on the odds of observing the preference for using HYVs. The model was evaluated based on an alpha of 0.05 and the overall model was significant with chi square ($\chi 2$) = 21.640, $p < .006$, suggesting that it had a significant effect on the odds of observing the HYV category of variety type. Furthermore McFadden's R-squared was used for calculation to examine the model fit, where values greater than .2 were indicative of models with excellent. The McFadden R-squared value calculated for this model was 0.34 (Table 3).

Table 1. The distribution of the respondents at ward level

	HYV farmers		**LYV farmers**		**Total**	
Ward	**n**	**%**	**n**	**%**	**N**	**%**
Kibaoani	65	65.70	34	34.30	99	100.00
Kiberege	67	44.40	84	55.60	151	100.00
Lumemo	15	17.00	73	83.00	88	100.00
Total	**147**	**43.50**	**191**	**56.50**	**338**	**100.00**

[1]/ HYV = High yielding varieties, LYV = low yielding varieties

Table 2. The Descriptive of socio-economic factors of LYV and HYV farmers

Socio-economic factors	**LYV farmers**		**HYV farmers**	
	n	%	N	%
Age				
16 - 36	68	35.6	39	26.5
37 - 48	62	32.5	57	38.8
49 -80	61	31.9	51	34.7
Gender				
Male	104	54.5	79	53.7
female	87	45.5	68	46.3
Education level				
Illiterate	19	9.9	5	3.4
Primary	151	79.1	122	83.0
Secondary	19	9.9	19	12.9
College	2	1.1	1	0.7
Household size				
1 - 3	57	29.8	52	35.4
4 - 5	77	40.4	61	41.5
6 - 11	57	29.8	34	23.1
Marital status				
Single	26	13.6	9	6.1
Married	149	78.0	120	81.6
Divorce	13	6.8	15	10.2

Table 2. Continued

Socio-economic factors	LYV farmers		HYV farmers	
	n	%	n	%
Widow	3	1.6	3	2.1
Experience in using HYV				
< 2 years	6	3.1	18	12.2
2 – 5years	5	2.7	58	39.5
> 5 years	180	94.2	71	48.3
Membership of social networks				
Yes	16	8.4	10	6.8
No	175	91.6	137	93.2
Membership of farmers associations				
Yes	37	19.4	26	17.7
No	154	80.6	121	82.3
Total land holding (ha)				
0.20 - 0.7	47	24.7	47	32.0
0.71 - 1.2	70	36.6	61	41.5
1.21 - 8.0	74	38.7	39	26.5
Land for growing rice (ha)				
0.20 - 0.7	52	27.2	42	28.6
0.71 - 0.9	29	15.2	25	17.0
0.91 - 1.0	110	57.6	80	54.4
Cost of production (USD/ha)				
16.09 - 97.25	71	37.2	40	27.2
97.26 - 162.14	67	35.1	50	34.0
162.15 - 877.64	53	27.7	57	38.8
Yield harvested (tons/ha)				
0.042 – 0.672	60	31.4	29	19.7
0.673 – 1.312	74	38.7	56	38.1
1.312 – 5.250	57	29.9	62	42.2
Income from selling rice (USD/ha)				
(743.25) - 0.00	33	17.3	33	22.4
0.01 - 93.86	50	26.2	19	13.0
93.87 - 183 46	41	21.5	24	16.3
183.47 - 332.80	31	16.2	35	23.8
332.81 - 1334.60	36	18.8	36	24.5
Institutional Factors				
Access to credit				
Yes	21	11.0	45	30.6
No	170	89.0	102	69.4
Source of rice seeds				
Agro input shop	6	3.1	15	10.2
Village extension	2	1.0	11	7.5
Government store	4	2.1	1	0.7
Research institution	1	0.6	18	12.2
Others (Farmer friends and regrown seeds)	178	93.2	102	69.4
Price of rice				
Low	109	57.0	74	50.3
Medium	32	16.8	21	14.3
High	50	26.2	52	35.4
Product transport				
Low	46	24.1	25	17.0
Medium	72	37.7	77	52.4
High	73	38.2	45	30.6

1/: HYV = High yielding varieties, LYV = low yielding varieties

Table 3. The socio-economic and institutional factors affecting farmers' preferences for selecting rice varieties

	B	S.E.	Wald	Df	Sig.	Exp(B)
Age	0.556	0.186	8.927	1	0.003	1.743
Gender	-0.526	0.297	3.128	1	0.077	0.591
Education level	0.956	0.336	8.114	1	0.004	2.601
Household size	-0.174	0.188	0.86	1	0.354	0.84
Marital status	0.166	0.296	0.314	1	0.575	1.181
Experience in using HYVs	-2.1	0.318	43.667	1	0.000	0.122
Membership of social networks	0.568	0.58	0.958	1	0.328	1.765
Membership of farmers associations	-0.61	0.462	1.741	1	0.187	0.544
Total land holding	-0.367	0.181	4.088	1	0.043	0.693
Land for growing rice	-0.192	0.16	1.444	1	0.229	0.825
Cost of production	0.288	0.226	1.623	1	0.203	1.334
Yield harvested	0.403	0.346	1.353	1	0.245	1.496
Income from selling rice	-0.139	0.196	0.501	1	0.479	0.87
Access to credit	0.626	0.537	1.361	1	0.243	1.87
Source of rice seeds	-0.576	0.137	17.651	1	0.000	0.562
Market prices	0.225	0.162	1.92	1	0.166	1.252
Transport	0.058	0.157	0.139	1	0.710	1.060
Constant	5.231	1.742	9.014	1	0.003	186.898

[1]/: Chi-square =21.640,2/: -2 Log likelihood = 348.173, 3/: The McFadden R-squared 0.34; 4/: B = Constant, S.E. = Standard error, df = Degree of freedom, P-value = Probability value (<0.05), Exp (B) = Odd ratio

Discussion

The results revealed that the majority of respondents was low yielding rice farmers which accounted for 56.5% or 191 respondents while HYV farmers were 43.5% or147 respondents. This is the first indicator for less adoption of HYVs. It was observed that the majority of farmers preferred LYVs as our survey was carried out to observe all the HYV farmers in the area and the maximum number was only 147 respondents. Further results of binary logistic regression showed that age, education level, experience in using HYVs and total land holding of farmers were significant and appeared to be important factors in decision to use HYVs. The preferences for HYVs by farm households increased with age and educational level of the household head while decreased with experience in using HYVs and total land holding. It suggested that age had positive and significant influences on farmers' preferences for using HYVs. This implies that an increased in the age of the farmers would lead to significant increased likelihood of decision to use HYVs. In other words, middle and old aged farmers are expected to be more eager in adopting rice technologies on their farms than young farmers. This results are in line with the research done by Ghimire *et al*. (2015), who reported that old aged farmers were more adoptive than young farmers. However, in contrary to this study,Gockowski and Ndoumbé (2004) reported that younger farmers were more likely to use new innovation than old aged farmers.

Moreover, the results of positive significance (B = 0.956, *p* = 0.004) on education level suggested that educated farmers were more likely to use HYVs because they can grasp the idea and transform the information more rapidly than illiterate farmers. This result is consistent with earlier literature (Asfaw *et al.,* 2012; Kassie *et al.,* 2011). The regression coefficient for experience was significant (B = -2.100, OR = 0.122, p < .000), indicating that the longer the farmers' involvement in using HYVs, the less they are engaged in using LYVs. This kind of negative relationship between farming experience and adoption of new technology was also reported by Gockowski and Ndoumbé (2004) with intensive mono cropping of horticultural crops in southern Cameroon. Likewise, the regression coefficient for source of seeds showed negative significance (B = -0.576 OR = 0.562, p < .000), indicating that the increased in using HYVs decreases seeds availability. This means farmers were not able to access either seeds at their places or on time, so they were demotivated to use HYVs. To assess the effect of total land holding of the farmers on the preference for using HYVs, the regression coefficient for total land holding was significant (B = -0.367, p = 0.043), indicating that there was a negative relationship between farm size and the decision to use HYVs. It was reported that large land holding contributed to the adoption of new agricultural technology as farmers were able to take risks by growing alternative crops (Uaiene *et al.,* 2009; Lavison, 2013). This was contrary to the results of this study in which the majority of farmers with large land size (of 1.21 - 8.0 ha) were LYV farmers (38.7%) while the HYV farmers were 26.5%.

The regression coefficients on other social economic factors such as household size, membership to farmers' associations, land for growing rice and the income from selling rice indicated that they had a negative and insignificant influence on farmers' preferences for using HYVs. Contrary to the result, some researchers reported that household size had a positive influence on the choice of rice varieties as an increased in household labor tended to increase the level of using HYVs as the new technology that requireed extensive labor (Mignouna *et al.,* 2011). Similarly, Abdalla *et al*. (2013) reported a large household size influences diversification in farming activities and may cut out the cost of hiring labor from outside. Furthermore, the regression coefficients for marital status, membership to social networks, yield, access to credit, and membership of farmers associations, market price, and transport had positively and non significant affected on farmer preferences for using HYVs.

Marital status is an important social factor having manifestation in the social standing and the sense of responsibility of married individuals in society (Lemma, 2007). It is assumed that married couples share experience in adoption of recommended agricultural technologies (Mgonzo, 2011). The

results on regression coefficient on marital status showed that marital status of the household heads positively and insignificantly influenced farmers' preferences for using HYVs, which was suported by Mlyuka (2011), who found that adoption of fertilization packages was not determined by marital status of the household head.

Normally, clear information about new technology is very powerful on the adoption decision making. It was hypothesized that farmers who are members of social networks like Facebook, WhatsApp, Instagram, etc. may increase adoption of new technology as the spread of new information will be faster to member groups than non member groups. The regression coefficient for membership of social networks was positive but had no significant effects on the odds of observing the preferences for using HYVs (B = 0.568, p = 0.328). In today's world, social networks like WhatsApp, Facebook, Instagram and others are very powerful methods of spreading information to the society. The result of this study found that there was a positive and insignificant relationship between social networks and farmer's preferences for HYVs. The positive relationship on the involvement of social media was reported by Ward and Pede (2015) who stated that hybrid farmer's involvement in social networks fostered the spreading of new technology. Farmers who are in one social network can easily share information to other social groups and speed up spread of technology. Bandiera and Rasul (2006) indicated that there was a positive relationship between adoption of new technology and farmers' involvement on social networks.

Yield is an important factor that can influence the farmer's decision to select rice varieties. The regression coefficient for yield was not significant (B = 0.403, p = 0.245), which suggests that yield did not have a significant effect on the odds of observing the farmers' preferences for using HYV. This result disagreed with the research done by Monela, (2014); Saka *et al*. (2005) and Trong and Napasintuwong (2015).

The regression coefficient for access to credit was positive but not significant. The credit facilities help farmers to purchase necessary farm inputs including HYV seeds, fertilizers, pesticides and other farm machinery (Mutanyagwa, 2017). According to the results of this study, there was low access to credit by both HYV (30.6%) and LYV (11.0%) farmers. It was found that the formal credit facilities imposed difficult condition for borrowers. The farmers should have registered or certified collateral and short repayment period. All these discourages smallholder farmers from accessing credit facilities (Wossen *et al.*, 2017). It is reported by Aslam (2016) that agricultural production involveed huge investments requiring availability of credit facilities to enhance and encourage adoption of technologies.

It was hypothesized that market prices for paddy rice and rice as well as on and off farm transports are some of the institutional factors which have effects on the farmers' preferences for selecting rice varieties. The regression coefficients for market prices and transport was positive and insignificant (B = 0.164, p = 0.305 and, B = 0.058, p = 0.710, respectively). This indicateed that the increase in prices of rice and reliable transport may increase farmers'decisions to use HYVs. The insignificant relationships indicated that there were low market prices and transport for the HYVs. It proved that during the conversation between farmers and the researcher for buyers of rice and paddy rice. It was discovered that the majority of HYV farmers including the Kilombero Agriculture Training Research Institute (KATRIN) sell their paddy rice directly to single buyers around the area known as Kilombero Plantation Limited (KPL). This created monopoly and less price comparison. KPL Company in Tanzania is the biggest rice farm investor. On the other hand, a low number of markets for LYVs was due to dependence on local buyers which fluctuated from season to season (Nkuba *et al.*, 2016). In Kenya, the permanent market of HYVs was reported to be competitive between independent milling traders and the government, so adoption of HYVs increased significantly (Atera *et al.*, 2018).

Based on the findings, it is recommended that the government should design research and development programs by taking into consideration the socio-economic and institutional factors such as age, education level, experience in using HYVs, and total land holdings which significantly affect farmers' preferences regarding selection of rice varieties.

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