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1.0 SOCIO-ECONOMIC DETERMINANTS OF COMMUNITY HEALTH FUND MEMBERSHIP IN KALAMBO DISTRICT, RUKWA REGION, TANZANIA

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Abstract

The study aims at determining the influence of factors affecting CHF membership. The paper analyses socio-economic determinants of Household HH's membership to CHF. Across-sectional research design was used in the study whereby data were collected using a household questionnaire survey, Focus Group Discussions (FGDs), Key Informants Interviews (KIIs) and documentary review. Quantitative data were analysed using descriptive statistics and inferential statistics whereby a binary logistic model was used. Qualitative data were analysed using content analysis. The sample size was 354 households, which were determined by Yemen's formula. The results of this study show that, in the eleven variables used in the binary logistic model, three were found to be significant predictors of CHF membership at ($p < 0.05$). These are awareness of existence of CHF, Ex-CHF membership and income. It is concluded that many households have not joined the fund due to lack of awareness on the existence of CHF and lack of income. Therefore, Local Government Authorities (LGAs) should initiate concerted educative measures to community members on the existence and importance of CHF to their health. Furthermore, LGAs should set a reasonable amount of money to be contributed by HHsin enrolling for the fund, basing on the district socio-economic profile.

Key words: Community Health Funds, CHF membership

1. INTRODUCTION

The Community Health Fund (CHF) is one of social security funds found in Tanzania. Social security is the protection provided to individuals and households to ensure access to healthcare and guarantee income security particularly in sickness cases, injury at work place, maternity, invalidity, or loss of a breadwinner (ILO, 2018). CHF as one of the health insurance schemes, is a voluntary community based financing whereby households owe paying contributions to finance part of their basic health care services to complement the government health care financing efforts (URT, 2001). Globally, there are sixteen countries that have promoted better healthcare systems by improving health services to its people (Martin, 2017). These include Luxembourg, Singapore, Switzerland, Netherlands, Sweden, Germany, Belgium, New Zealand, Norway, France (Europe), Hong Kong, Japan (Asia), Israel, Qatar (Middle East), Australia, and Canada (North America). Experience shows that European and North American countries have promoted health security to the extent that life expectancy of their people is relatively higher than is the case in the rest of the countries in the world. For example, inLos Angeles, USA, disparities in the structure of social economic resources vary and are remarkably perceivable (County of Los Angeles, 2013). Such disparities can mean differences between life and death or a life filled with vigour and good health as opposed to ill health. Education level, employment, earnings, family size and social backing and community security are all the components of socio-economic determinants of health security (Kamuzora *et al.,* 2007).

In Sub-Saharan Africa (SSA), socio-economic factors have been a barrier against membership to community health protection. Households desperately cling to savings, possessions, and procure loans or borrowing from family members and friends to cope with high out-of-pocket payments (Carapinha *et al.,* 2010). About 30percentof families in 15 SSA countries are financing their health care by borrowing or vending their assets. Out-of-pocket payments can lead to poverty as they only mean to wring out endlessly whatever household possesses whenever health service is needed. Such payments are in turn likely to impede HHsin joining health insurance schemes by exhausting their belongings that would otherwise facilitate the joining process. Rwanda was among the countries in SSA that were doing well in Community Health Insurance (CHI) since its introduction in 1999 as mentioned by WHO (2003). One of the reasons for good performance in Rwanda was people's awareness on community health insurance schemes. Accordingly, members are invited in scheme's general assembly to interact with the administrative scheme councils and discus needs, concerns, and suggest how to improve CHI. In Tanzania; the Government spearheaded the move by being a key player in the provision of health services from 1961 to 1991 under the socialist ideology (URT, 2008). Private health care facility suppliers were barred in 1977 under the Private Hospitals (Regulation) Act (URT, 1977). In the 1990s,the health sector embraced structural reforms that went hand in hand with improvement in the quality of health care services of which cost sharing in health services was introduced. CHF was introduced in 1996 and was piloted in Tabora Region, Igunga District in particular, and was later extended to other districts (Macha *et al.,* 2015). In Kalambo District Council, CHF was

introduced in 2012 after the founding of Kalambo District Council that was formally a part of Sumbawanga District Council.

Community Health Fund was established with the intention of being an alternative for user fees payments for people who work in the informal sectors of whom many are victimized by low earnings and are vulnerable to diseases (Mtei G and Mulligan J, 2007). Since its founding, it has not operated satisfactorily. Its coverage has remained very low, around 4.5percentof households are covered while the national target was 30percent of households to be covered from 2008 to 2015 (Ndomba *et al.,* 2019). The trend in population level of health insurance coverage in Tanzania has been changing year after year: it was 8.3percent in 2011/12, 7.3percent in 2012/13 andwas 7.3percent in 2013/14 (URT, 2015).

Community Health Fund is important in covering contingencies such as sickness and the like when a patient has no cash (Morestin, 2009), but the majority of households are not members of CHF in Tanzania. Thus, this paper aims at showing how socio-economic factors have played a decisive roleon CHF membership. There is a need for active membership, good management and good health facilities for effective operation of the fund (HPSS, 2018). Despite its importance as stressed in its Act, which is to enable members have access to reliable and effective health care by creating a sustainable financial mechanism (URT, 2001), few HHs have joined the fund. This requires a study to determine the factors influencing the CHF membership among HHs. Several studies that have been conducted show that not only registration trend was declining, but also the enrolled group kept narrowing as some fund members were withdrawing from the scheme (Msuya. *et al.,* 2004; and Marwa *et al.,* 2013).

Theoretically, the study adopted the Social Presence Theory (SPT) (Short *et al.,* 1976). The theory was found by Short, Williams, and Christie in 1976. This approach was used as groundwork for many theories on new medium effects. The core assumptions are that a medium's social effects are the results of the degree of social presence that it affords to its users. By this theory it means that a communicator's sense of awareness of the presence of an interaction partner is essential. This is important for the process by which man comes to know and think about other persons, their characteristics, qualities, and inner states in order to improve their relationship. Thus, increased presence leads to a better person perception hence achievements of the targeted goal. In relation to this study, the theory emphasizes on awareness and interaction between CHF and HH members. The idea is that CHF memberships principally caused by the degree of socio-economic factors which influence CHF users who, in this context, are HHs that are to be either fund beneficiaries or otherwise. This is important for improvement of the services because CHF as an organ is in a position to know its members, their concerns, their traits, which are socio-economic factors for this study, and internal matters, which are the roles of institutions in implementing CHF policies, which in turn monitor the performance of CHF to its members.

Conceptually, the outcome variables show the way socio-economic factors influence communities towards CHF membership. It shows also the role of institutions in influencing CHF policies in monitoring CHF activities that can result into CHF benefits on health services that influence CHF membership as well. Thus, socio-economic factors and the role of institutions in influencing CHF policies can trigger an individual's decision into joining or refraining from joining the scheme. Members can also decide to proceed with their membership or withdraw depending on how they benefit from the fund as membership is not something compulsory but rather voluntary.

Based on the provided trend, socio-economic factors such as age, sex, awareness on CHF, education level, income, assets, family size, access to finance and occupation are the indicators that could influence people into joining CHF as revealed in this paper. Therefore, the main objective of this study was to determine the socio-economic factors that influence CHF membership. The paper essentially focused on analysing socio-economic determinants of HH's membership to CHF. The questions that were answered by this paper are, do socio-economic factors influence HHs to join the CHF? What measures should be taken in recruiting fund members .Waheke (2015) reveals that socio-economic factors were major determinants of CHF membership in her study area. The situation has remained the same because CHF workers has remained reluctant on following the results and recommendations that brought by previous studies. This study will be useful in indicating the causes of poor performance of CHF, and the measures to be taken by CHF in order to increase its membership.

2.0 METHODOLOGY

The study was conducted in Kalambo District Council, which is one of three districts of Rukwa Region in Tanzania. The district was chosen basing on economic activities whereby the majority of its people are employed in the informal sector, which is the main target of CHF for its coverage (URT, 2004). The main economic activities are crop farming, livestock keeping, fishing, trading, and bee keeping. In addition, Kalambo District is one of those areas with few CHF members basing on HSSP III targets in Rukwa Region. Only 7.5percent of the population is covered, while in Singida Region 54.4percentare covered and in Mbeya Region 43percent are covered with the CHF (UTR, 2015).

The study used a cross-sectional research design (Creswell, 2014). This has a greater degree of accuracy in social science studies than other designs (Casley and Kumar, 1998). It employs a survey method, which can be used to establish the relationships between variables for the purposes of testing hypotheses. The design also allows minimal use of labour, time, and money because it is done in one time (Baltazari *et al.*, 2012). The sample size of HHs was determined using Yamane`s (1974) formula as cited by Israel (2013) which is:

$n = \frac{N}{1+N(e)^2}$ =3060/1+3060 $(0.05)^2$ = 354.

Where: n is the sample size, and N is the population. In this study, N is the estimated number of households in five selected villages. Since there were few CHF members, simple stratified sampling was used to select equal numbers of CHF members and non-members (Hansen *et al.*, 1953). The names of all household heads were obtained from village offices that showed CHF members and non-members. The sample size was divided equally basing on simple stratified sampling between CHF members and non-members by the following formula:

$$a = \frac{n}{N} \times b$$

Where: a, is the sample size for each village, n is the total number of sampled households for 5 villages, N is the target households for the 5 villages, and b is the target households in each village. A total sample size of 354 HHs was obtained (Table 1).

Table 1.0: Number of sampled households in each study village

Ward	Village	Total households (N)	Sampled households (n)	CHF members	CHF non-members
Msanzi	Msanzikati	599	599/3060*354 = 69	20	49
Matai	Singiwe	300	300/3060*354 = 35	8	27
Mkowe	Mbuza	564	564 /3060*354 = 65	11	54
Kisumba	Kasote	500	500/3060*354 = 58	14	44
Kasanga	Kasanga	1097	1097/3060*354 = 127	33	94
Total		**3060**	**354**	**86**	**268**

Both qualitative and quantitative data were used. A questionnaire survey was used to collect data from the respondents. The types of information that were targeted here were HHs demographic characteristics and socio-economic factors that determine CHF membership. In addition, Focus Group Discussions (FGDs) with small but variable numbers of discussants between 6 and 8 were conducted (Byers, 1996). Two FGDs were conducted per each village in order to collect qualitative data to complement the data collected through the questionnaire survey. The information captured in FGDs was about challenges leading to low membership, as well as strengths and weaknesses of CHF. Participants who were considered in FGDs were those who were working in informal sectors, which are the targeted group of CHF. Gender balance was another factor that was considered for FGDs whereby equal numbers of men and women were selected. Moreover, Key Informant Interviews (KIIs) were conducted specifically with those who were working with CHF such as the District Commissioner (DC), the District Medical Officer (DMO), Clinical Officers (COs), Nurses, Ward Executive Officers (WEO), Ward Community Development Officers and Village Executive Officers (VEO). A checklist for Key Informant Interviews was used to guide the interviews. The types of information that were found

in this method were based on the achievements of CHF and barriers for the majority of HHs from joining CHF together with strengths and weaknesses of CHF.

Quantitative data were coded and analysed using Statistical Package for Social Science (SPSS) whereby descriptive statistics such as frequencies and percentages were employed to describe demographic socio-economic information. Additionally, a binary logistic regression model was used to analyse the influence of social economic factors on CHF membership. The logistic regression model was chosen because it accepts a mixture of continuous and categorical independent variables and for the current case the dependent variable was categorical (0 non-CHF member and 1 CHF member). The likelihood of a household to join was predicted using the following binary logistic model: The model used was as shown below:

$$\text{Logit}\left[p(x)\right] = Log\left[\frac{p(x)}{1-p(x)}\right] = \alpha + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \ldots + \beta_{13}X_{13} + \varepsilon_{13}$$

Where:

Logit $p(x)$ = ln (odds (event)), that is the natural log of the odds of being a CHF member.

$p(x)$ = prob (event), that is the probability of being a CHF member.

$1-p(x)$ = prob (non-event), that is the probability of not being a CHF member.

$Log\left[\frac{p(x)}{1-p(x)}\right]$ = is the logarithm of the ratio of probability of being a CHF member

α = constant of the equation.

$\beta_1 - \beta_{13}$ = coefficients of the predictor variables.

ε = Error term.

$\chi_1 - \chi_{13}$ = predictor variables entered in the model,

which are: χ_1 age (number of years of the respondent), x_2 gender of the household head(1= male, 0 = female),x_3 Education level of the household head (number of years in schooling), and x_4 awareness (1 if respondent is aware of CHF existence, and 0 if not). Others include, x_5 Benefits (1 if member benefited from CHF, and 0 if not), x6 Income (HH earnings of money per month in TZS), x_7 assets (member`s items with monetary value),$x_8$ family size (number of people per household), and $x_9$ Distance (from member`s residents to place of health services provision in km). Others were x_{10} social groups (1 if member of social groups and 0 if not), x_{11} access to credit (1 if having qualifying conditions to get loan, and 0 if not), x_{12}occupation (member`s

economic activities), and x_{13}marital status (1if married and 0 if otherwise like; single, widow, separated).

Qualitative data were analysed using content analysis approach. These are the data obtained from FGDs and KIIs. Therefore, by means of content analysis method, the data collected through verbal discussions were analysed in details whereby recorded discussions were broken down into smallest meaningful units of information.

3.0 RESULTS AND DISCUSSION

3.1 CHF Membership and reasons of not being a member

Community Health Fund (CHF) members in the study area were 86 households (HHs) which accounted for 24.3percent, while 268 HHs which accounted for 75.7percent were non-members of CHF (Table 2). Some of the reasons that were given as to why the majority of the households were non-members of CHF were lack of money and lack of awareness about CHF existence. These reasons accounted for 37.9 and 24.3percent of the respondents respectively (Table 2).These reasons were cited during FGD held in Kasanga Village on 18th December 2018. During FGD, it was revealed that, majority of people are not well informed about the existence of CHF because CHF officials do not visit them for seminars and meetings. Studies by Jane *et al*. (2014) and URT (2001) have reported that, the reasons for low coverage of CHF included poor health services, lack of comprehensive benefit package, and the existence of out of pocket payments. Others included lack of adequate medical supply and equipment at the health facilities, unaffordable health care services, lack of adequate skilled and motivated health providers, long distance from HHs to health facilities, and lack of referral to CHF members. As Msuya*et al.* (2004) argue, CHF has improved access to health facilities for the poor because its members are most likely to seek health care from formal health care providers compared to non-members. In the field, this was evidenced by one household head at Mbuza village who argued that:

> *"… CHF is helpful, though sometimes we do lack medicines from the dispensary, but at least weget advice from Clinical Officers on our problems by using our CHF membership cards instead of out of pocket payments as non-members of CHF are doing…"(Household head from Mbuza village, 14th December, 2018).*

Table 2: CHF Membership and reasons of being not member (n = 354)

Variable	n	%
CHF Membership		
Members	86	24.3
Non-members	268	75.7
Reasons for not being CHF Member		
Lack of money	143	37.9
Lack of awareness	86	24.3
Poor services	44	12.4
Use of private pharmacy	3	0.8
Use of local herbs	1	0.3

Note: n = number of respondents (HHHs), % = percent

3.2 Households' Socio-demographic Characteristics

The HHs characteristics are presented in Table 3. The table reveals that there were 10.5 and 89.5 percent Female Household Heads (FHHHs) and Male Household Heads (MHHHs) respectively compared to national levels of24.5 and 75.5 percent proportions of FHHHs and MHHHs respectively (World Bank, 2015). This implies that FHHHs were fewer compared to MHHHs. This may be due to the reason that many HHs in Tanzania are headed by males. Traditionally, males in many HHs in Tanzania are not close to their families' care for health security. The family's health security issues have been under female domain as females are most of the time close to families. UNFPA (2019) reported that, women should be empowered by men because in most cases they are more involving in caring for family members than men do. Once a family member falls sick, women are the ones responsible for providing health services. Studies (e.g. Waheke, 2015;d Chingonikaya e*t el.*,2018)revealed that FHHHs have fewer chances of participate in community organisations because most of these HHs are headed by males who take liabilities of participating in those organisations whose membership unit is the household. Females believe that by of participating in CHFs in place of men make these women socially accepted and thus have their marriages protected. According to Sikira *et al.* (2010), women who had control over land had also control over the family house. This implies that having control over most valuable resources gives women the means of owning a family house.

The age of the respondents was another factor in this study. The results show that the ages of HH heads ranged from 35 to 59 years (73.5%), compared to those with the age range of 60 years and above (26.5%) (Table 3). This shows that the majority of HHs headed by the elderly may not have the passion of joining the CHF as they are in the age of stable health, leading them to forget those who are in vulnerable age range such as children under 5 years and older people of 60 years and above. UNFPA (2019) revealed that most of married men in the old age are busy with productive jobs hence they do not take care of their dependants. Jane *et al.* (2014) observed that CHF membership tends to increase with an increase of dependants who are at the age range, which is more vulnerable to diseases.

Marital status had similar results to those under sex variable because the questionnaire was mainly administered to household heads (HHHs); and in the study area, as in many other areas in Tanzania, patrilineal system is dominant. That is why men appeared more to be HHHs of married couples. The male respondents were the majority (89.5%), as opposed to female respondents. The respondents marital status were as follows with their percentages in brackets: single. (3. 8%), divorced (1.4%), separated (2.8%) and widows (2.5%). Waheke (2015) conducted a similar study in Songea District, in Ruvuma Region, Tanzania and found that married, widowed, single, separated, cohabiting, and divorced accounted for 71.4, 4.3, 4.3, 4.3, 2.9, and 2.9percent respectively. This means that, in most of the communities in Kalambo District, there are more married respondents than are the respondents in other categories. As Narayan (2010) indicates, married household heads are more likely to engage in community organs than are household heads in other categories. This is perhaps because married couples have great numbers of dependants including children aged below 5 years, hence are at higher risk of having sick members than is the case with HHHs who are single.

As for years of schooling, the results of the current study revealed that 96.9percentof the respondents had 7 years of schooling while 3.1percent had attended 8-11 years of schooling. This means that almost all HHHs had primary education. This finding implies that many respondents had little knowledge on health insurance schemes, specifically the CHF. During the KIIs, this was testified by one of the key informants, on 14th December 2018 at Mbuza village in Mkowe Ward as saying:

> *"…The majority of sick people are complaining of lack of medicines; they don't believe that dispensaries always do not have medicines once they see boxes in shelves, but those boxes are of family planning medicines, gloves, and condoms which are not medicines to heal their diseases. They do not understand what is inside those boxes because they are labelled in English language. Most of the medicines that we do ask for from the Medical Store Department (MSD) are not the ones we are supplied with. This is a challenge that is out of our control…''.*

A study conducted by Waheke (2015) reported that, out of 70 respondents, 68.6percent were primary school leavers; 24.3percent had no formal education and 7.1percentcompleted ordinary secondary school education. In another study, Bahaman *et al*. (2009) revealed that the majority of workers in the informal sector always have low education.

As for the number of HH dependants/members, the results show that the majority (85%) of HHs had 1-10 members, while 15 percent of the HHs had 11-15 dependants (Table 3). This implies that fertility rate was higher in the study area compared to the average Tanzanian household, which has five persons (URT, 2012). This discourages HHs from joining CHF, because the fund limits only six members percard. When the number exceeds 6 members, the HH should have

another card. Furthermore, the majority of HHs in the study area are low-income earners, accounting for 93.8percent of the HHs which had their incomes below 100 000 TZS per month (Table 4). This was reported during FGDs in Singiwe village that, they did not have that amount for joining CHF membership because of lack of market for their crops, which they depend for their livelihood. This is in contrast to what is reported in a study by Narayan (2010). The author indicated that because of having higher numbers of dependants married couples are most likely to engage in social schemes than is the case with single HHs. this is particularly because married HHs are at higher risk of having a sick household member as oppose to HHs who are in other categories.

Table 3: Households' Socio-demographic Characteristics (n = 354)

Variable	N	%
Sex of the Household Heads		
Male	317	89.5
Female	37	10.5
Age		
35-59	260	73.5
60-above	94	26.5
Marital status		
Married	317	89.5
Single	13	3.8
Divorced	5	1.4
Separated	10	2.8
Widow	9	2.5
Education (years of schooling)		
7 years	343	96.9
8-11 years	11	3.1
HH Dependants		
1-10	301	85
11-15	53	15

Note: n = number of respondents (HHHs), % = percent. Further, Table 2 presents marital status, ages of HHHs, education level and family size/HH dependents.

3.3 Households' Monthly income, Assets ownership, and distance from HH to the health facility

Assets ownership was among the variables investigated in the study. Table 4 shows that 336 HHs (94.9%) owned various valuable assets, while 18 HHs (5.1%) had no valuable assets. The assets owned include houses, farms, fishing equipment, livestock such as cattle and goats, furniture, motor cycles and renting buildings. Despite that, most of the HHs owned assets, these asset owners were not members of CHF. This implies that asset ownership has no influence on CHF membership. In Mbuza village FGDs participants reported that their assets were not accepted by the Banks as collateral for loan; therefore, they did not enjoy the benefits of loan. In another

study, Odeyemi (2014) reported that membership to CHF reduces the risk of HHs selling their assets for the sake of getting money for treatment during outbreaks of diseases. This paper, therefore, encourages the HHs to join the fund in order to avoid selling their assets during sickness.

Distance from HHs to Health facilities was one of the factors of concern in this study. The study results (Table 4) revealed that 99.1percentof the households were living close to health facilities, as the distances were not exceeding one kilometre. On the other hand, only 0.9 percent of the respondents were living more than one kilometre from health facilities. This indicates that distance was not a strong factor for HHs not joining CHF because each village in the study area had a dispensary, which was found at the central part of each village and which was easily reachable. Macha *et al*. (2014) revealed that, most of the HHs who lived more than km from health facilities were not members of CHF due to long distance.

Table 4: Households' Monthly income, Assets ownership and a distance from HH to health facility (n = 354)

Variable	n	%
Monthly income (TZS)		
10 000-99 000	332	93.8
100 000-200 000	22	6.2
Assets ownership		
HH owning assets	336	94.9
HH not owning assets	18	5.1
Distance from HH to Health facility (in km)		
Km	350	99.1
1.1-5 Km	4	0.9

Note: n = number of respondents (HHHs), % = percent. Further, Table 3 presents monthly income, assets ownership and distance from HH to health facility in km

3.4 Occupations of the respondents, Loan accessibility, and the use of loan for CHF contribution

Occupation of the respondents was another factor, which was considered under economic activities (Table 5). The results show that the respondents were involved in multiple economic activities including farming (65.8 %,), fishing and farming (17.2%), and small business and farming (8.2%). This shows that majority of the respondents did not depend on one source of income because some of their jobs such as farming were seasonal which takes only four months out 12 months per year. During FGDs on 17th December 2018 participants in Kisumba Village, reported to have been trying to invest in different economic activities but they still had minimal returns due to lack of improved technology. As Waheke (2015) reported, 77.1percent of the respondents in the area of study were farmers; 17.1percent were elderly; 2.9% were involved in business activities; 1.4percentwere pastoralists and 1.4percent were private servants. This implies that the majority of Tanzanians were farmers.

As for loan accessibility, the results showed that 94.4 percent of the HHs had no access to loan, while only 5.6percent had access. as for group of respondents with access to loans, only 4percent used that loan for CHF contribution. This implies that the majority had no access to loans due to the nature of their economic activities which were not friendly to banks and other loan processing institutions. Therefore, they did not enjoy the loan benefits, which would have enabled them in joining CHF. The findings are in line with the findings in a study by Ntuli *et al*. (2017) who revealed that access to credit facilities can increase health security to borrowers and their dependants by directly accessing health services financed by that credit, or indirectly managing contributions of health insurance.

Table 5: Occupations of respondents, Loan accessibility and the use of loan for CHF contribution (n = 354)

Variable	n	%
Occupations of respondents		
Farming	233	65.8
Livestock keeping and small business	22	6.2
Small business holding and farming	29	8.2
Fishing and business	6	1.7
House keeping	1	0.3
Fishing and farming	61	17.2
Farming and livestock keeping	2	0.6
Loan access		
Accessing loans from social groups	20	5,6
Not accessing	334	94.4
Use of loan for CHF contribution		
Uses for contribution	14	4
Not uses	340	96

Note: n = number of respondents (HHHs), % = per cent.

3.5 Factors Influencing CHF Membership among HHs

Binary logistic regression was used to model the selected variables that influence households into becoming CHF members, and the results are as presented in Table 6. The model fitted very well as indicated by the Omnibus Test of the model coefficient which was 317.537 with $p<0.001$ and Hosmer and Lemeshow Test being 1.992 with $p = 0.960$. Because the Omnibus Chi-square was significant ($p = 0.001$), this shows that the overall model predicted the outcome well. Wald coefficients associated with individual independent variables help to realize the relative importance of each independent variable. According to Powers and Xie (2000), the non-zero Wald statistic values indicate the presence of relationships between the predictor and the outcome variables. A greater Wald statistic implies that the independent variable associated with it has a higher contribution to the happening of the dependent variable. In Table 6, the Wald statistic value for Ex-CHF Membership was 10.557 and was statistically significant at $p < 0.001$. The implication of this finding is that people who had already benefited from CHF were most

likely to re-join the fund as they had realized its advantage compared to those who had never been CHF members before.

The results (Table 6) show that, among the eleven (11) variables that were used in the model, three (3) were found to be important predictors of CHF membership as ($p<0.05$). These are awareness of CHF existence, Ex-CHF membership, and HH income. The strongest predictor was Ex-CHF membership, which had a positive regression coefficient (b) of 4.987 and the odds ratio (Exp B) of 146.481. This means that a unit increase in this variable, which was statistically significant at the probability of 0.1percent ($P<0.001$), would increase the chances of a household being a member of CHF by 146.481 units, other factors held constant. This was followed by HH income, which had a negative regression coefficient (B) of 4.474 and the odds ratio (Exp B) of 0.011. This implies that a unit increase in this variable, which was statistically significant at the probability of 0.1percent ($p < 0.001$), would decrease the chances of HHs membership to CHF by a factor of 0.011. Though the majority of HHs in the study area were low income earners, some of the CHF regulations that could encourage an increase of membership were not followed. For example, the CHF policy stipulates that people in the District Council concerned should be involved in setting annual contribution rate, was not followed in the study area. The results are in line with the results in a study by Ndomba *et al*. (2019) which found that, shortage of CHF membership in Mtwara District was caused by lack of awareness of existence of CHF and lack of money for contributing to CHF membership. This was evidenced by all FGDs in the study area; the participants rejected to be involved in setting annual contribution rate as they said that the task was to be done at the District Council level. Also, the policy says that there will be an exemption of payments by poor people who cannot manage to pay annual contribution rate, but this was not practised in the field during FGDs in all areas of this study, similar observation was made by FGDs head at Kasote village on 17th December 2018 as follows:

> *"… I was a CHF member when I had no enough wealth, for now I don't expect to renew my membership because I can afford to go to Sumbawanga Town for health treatment together with my dependants…"*

This finding is in line with the findings of a study by Kamuzora*et al.* (2007) who reported that inability of paying annual contribution is a barrier of poor HHs from joining CHF, from mentioned study, about 38.7percentof rural HHs and 27percent of urban HHs declared that they were mostly not able to pay for health care.

Ex-CHF membership and household income as factors had high influence on households joining CHF membership followed by awareness of CHF existence which had a negative regression coefficient (B) of 2.281 and the odds ratio (Exp B) of 0.102. This implies that a unit increase in this variable, which was statistically significant at the probability of 5percent ($p=0.036$), would decrease chances of CHF membership by 0.102 unit. As reported by Turkson (2009) and Waheke (2015) households that lacked awareness of CHF existence led to a failure ofmany HHs in joining the scheme.

In this study, sex had a negative regression coefficient (B) of 32.367 and the odds ratio (Exp B) of 0.000 (Table 6). This implies that being a male or a female, which was statistically significant at a probability of 5 (P=0.995) had no influence on the chances of household becoming members of CHF. Sex of HHHs may influence CHF membership because the main determinants of the HHs joining the fund are income and awareness. As URT (2017) reported, both Gender Development Index and Gender Inequality Index indicate that women are more likely to suffer from lack of human development than men are due to inequalities in access to education, health services, and economic opportunities. the p-value for HH income was highly significant compared to others, however this was not taken as a leading variable because the regression coefficient was negative. Positive signs in the variables, which had insignificant statistical p-values, were not strong predictors in influencing the CHF membership compared to the variables with statistically significant p-values. However, all the variables used in the model had influence on HHs membership to CHF.

Money saving had a negative regression coefficient (b) of 33.386 and the odds ratio (Exp B) of 0.000 (Table 6). This implies that a unit increase in this variable, which was statistically insignificant at a probability of 5percent (p=0.995), would decrease CHF membership chances by a factor of 33.386. This is because savings may either influence a particular HH into joining the scheme as he/she is able to pay the fee obtained out of the savings, or the HHs may not join the fund, as they can afford to pay for health care services due to possessing of enough savings. Studies (e.g. Mtei and Mulligan, 2007;Marwa*et el*., 2013) indicate that wealth of HHs or money can affect positively or negatively households` chances of joining CHF membership. It is always the case that middle-income and poor HHs join the scheme the most compared to high income earning HHs.

Training on CHF matters among HHHs had a negative regression coefficient (b) of 1.208 and the odds ratio (Exp B) of 0.299 (Table 6). This implies that a unit increase in this variable, which was statistically insignificant at a probability of 5percent (p=0.647), would decrease the chances of CHF membership by a factor of 1.208. Training of any HH member on CHF matters had a negative regression coefficient (b) of 3.017 and the odds ratio (Exp B) of 0.049(Table 6). This implies that a unit increase in this variable, which was statistically insignificant at a probability of 5percent (p=0.246), would decrease the chances of CHF membership by a factor of 3.017. Training on the CHF, results from the regression provide contrastive expectation of the existing knowledge that those who had attended training had higher possibility of acquiring the intended vision and joining the fund. Studies by Temba *et al*. (2013) and Turkson, (2009) reported that HHHs training on CHF existence and its benefits could stimulate the adoption of its membership. This was also observed during the FGDs held at Kasote village on 17th December 2019 and Kasanga Village on 18th December 2019 that there was no training from CHF officials that had been offered to any of these villages.

Assets ownership had a positive regression coefficient (B) of 0.364 and the odds ratio (Exp B) of 1.439 (Table 6). This implies that a unit increase in this variable, which was statistically

insignificant at a probability of 5percent (p=0.725), would increase the chances of CHF membership by a factor of 0.364. This is probably due to the reason that most of the HHs in the study area had homogeneous characteristics in terms of assets ownership as Table 4 shows that 94.9percent owned assets of similar kind. Those with a low stock of resources to draw on in the times of need are asset poor (Robert, 2008). This asset poverty may leave them vulnerable to unexpected economic events making them unable to take advantage of the broad opportunities offered by a prosperous society. On the other side, Msuya *et al*. (2004) reported that membership to the CHF reduces the risk of HHs selling their assets for the sake of getting money for treatment during diseases outbreak.

The use of received loan had a negative regression coefficient (B) of 13.434 and the odds ratio (Exp B) of 0.000 (Table 6). This implies that a unit increase in this variable, which was statistically insignificant at probability of 5percent (p=0.997), would decrease the chances of CHF membership by a factor of 13.434. This means that HHs with higher loans were considered as economically good and could afford the costs of health services out of CHF, compared to those with fewer loans.

Table 6: Socio-Economic factors influencing Community Health Fund membership

Variables in the Equation	Coefficient B	S.E.	Wald	Sig.	Exp(B)
Sex	-32.367	5476.972	0.000	0.995	0.000
Awareness	-2.281	1.086	4.408	0.036*	0.102
Money saving	-33.386	5476.969	0.000	0.995	0.000
Ex-CHF membership	4.987	1.535	10.559	0.001*	146.481
HHH training on CHF	-1.208	2.640	0.209	0.647	0.299
HHM training on CHF	-3.017	2.602	1.344	0.246	0.049
HH income	-4.474	1.101	16.519	0.001*	0.011
Assets ownership	.364	1.034	0.124	0.725	1.439
Type of HHH	36.320	5476.973	0.000	0.995	5.937E+15
Access to loan	15.631	3867.309	0.000	0.997	6142576.286
Use of loan	-13.434	3867.309	0.000	0.997	0.000
Constant	29.899	5476.969	0.000	0.996	9.664E+12

Omnibus Tests of Model Coefficients (Chi-square = 317.539; Sig. = 0.001); Cox & Snell R Square = 0.592, Hosmer and Lemeshow Test (Chi-square= 1.992; Sig. = 0.960); Nagelkerke R Square = 0.884.

Generally, the model showed that the used variables fitted well; and among the eleven variables, which were used, three of them were found to be significant to this study. These include awareness of CHF existence in study area, income that showed that the majority of HHs were too poor to join the Fund, and the third factor was ex-CHF members who would most likely renew their membership.

4.0 CONCLUSION AND RECOMMENDATIONS

Binary logistic regression results showed that ex-CHF membership, household income, and awareness of the existence of CHF had significant influence on the chances of households being members of CHF. Therefore, it is concluded that CHF membership is more influenced by these factors. With regard to ex-CHF membership, the study results showed that households that previously benefited from CHF would more likely renew their membership after the expiry of their membership, which always lasts for a year. Unlike ex-CHF membership and community awareness, which had negative influence on HHs joining the fund, the majority of HHs were not aware of CHF in their areas and thus could not join CHF. Household incomes as one of the significant factors in this study were observed as a barrier to CHF membership. It reduced the influence of people from joining the fund because many HHs had similar earnings and low income. In addition, their income is not much stable due to the nature of their economic activities, which were mainly agricultural based, depends on crops yields, which were seasonal. Therefore, they only earn money during crops selling seasons.

In view of this conclusion, it is recommended that the Local Government Authorities (LGAs) which, according to the CHF Act, have the mandate of supervising the existence and strength of the fund should make close supervision for CHF operations according to their policies whereby people in the District Council concerned should be involved in setting contribution rates. In addition, poor people who are incapable of contributing the amount approved should be exempted as the policy says. The Ministry of Health, Community Development, Gender, Elderly, and Children (MoHCDEC), through the Medical Stores Department (MSD), should supply medicines to dispensaries according to their needs. In addition, CHF members should be given referrals from dispensaries to higher levels of health services. Seminars should be conducted so that many people are exposed to CHF as much as possible for the study confirms that little awareness on CHF is one of the factors limiting many HHs from joining the fund. Rating the amount of money as a factor for HH membership to CHF should reconcile with HHs members in the area. This can put them in a position of asserting that the amount to be paid should be that which HHHs can afford. Those who are confirmed as too poor to afford paying the agreed amount should be given special cards that would assure them of better access to health services free of charge. Finally, CHF beneficiaries should be encouraged to retain or revive their membership after the expiry as the study shows that most of them show a desire of remaining members considering the benefits they have been receiving in the course of their membership. If implemented, these recommendations will lead to sustainability of the CHF and improvement of health care services in the respective communities as per the main objective of introducing the CHF.

5.0 Contribution of the study to the body of knowledge

Generally, this study contributes knowledge generated by other studies showing that majority of people are not covered by CHF due to lack of awareness of its existence. The contribution rate of amount is higher compared to actual earnings of targeted group. Therefore, this study will assist CHF official to boost poor performance of the scheme, which has been caused by the failure of taking recommended measurements for improving the fund. Among these, include involving individuals in setting the amount, which is affordable by HHHs as per the health policy that instructs for an increase of availability of drugs in the health facilities and conducting seminars on community awareness on the existence of CHF.

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2.0 INTRODUCTION OF THE CASSAVA PROCESSING TECHNOLOGY ADOPTION SCALE (CPTA) AS A MEASUREMENT TOOL FOR ADOPTION OF IMPROVED CASSAVA PROCESSING TECHNOLOGY

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Abstract

With existence of everyday innovated agricultural technologies, researchers' curiosity on the adoption of farming technologies in general and on improved cassava processing technology in particular by farmers is increasingly. However, lack of effective instrument of measuring farmers' adoption of the improved cassava processing technology in particular has been restricting researchers from successfully predicting and describing the potential of farmers' adoption of technology. With such a restriction in mind, this paper intends to introduce Cassava Processing Technology Adoption scale (CPTA), as a valid and reliable instrument for measuring the adoption of improved cassava-processing technology. The tool was pilot - tested using across – section survey design conducted in Serengeti District in Mara region of Tanzania. The survey aimed at testing validity and reliability of the instrument among 200 participants purposively selected among cassava farmers, of these, 101 were males and 99 were females. The instrument measured three components of the adoption of improved cassava processing technology namely, involvement in the pre - processing tasks, involvement in the processing tasks, and utilization of the processed cassava products. The results indicate that the scale managed to categorize three implementation stages (sub - scale s) of adoption and reached reliability of $\alpha = .86$. $\alpha = .71$, and $\alpha = .79$ for involvement in the pre - processing tasks, involvement in the processing tasks, and utilization of the processed cassava products respectively. The reliability for the total adoption scale was $\alpha = .93$. There were low to moderate correlations among the three sub- scales indicating that they measured the same trait while at the same time they singly measured one implementation stage of the adoption of improved cassava processing technology. The instrument was further able to categorize participants in their performance by sex, age, and levels of education. The CPTA is, therefore, valid and reliable tool with multidimensional nature,

which is relevant in measuring the adoption as a construct. It is, however, recommended that the tool requires further validation studies for more refinement as it is potential for application in other samples within and outside Tanzania. The paper discusses the potential applicability of the tool in the field of agriculture and its theoretical implications.

Key words: Socio - economic factors; Smallholder farmer; Value chain

1. Introduction

The existence of everyday innovated agricultural technologies attracts researchers' curiosity on farmers' adoption of farming technologies in general and on improved cassava processing technology in particular. However, lack of effective instrument of measuring farmers' adoption of improved cassava processing technology in particular has been restricting researchers from successfully predicting and describing the potential of farmers' adoption of the same. The term adoption has been defined in many ways depending on the field of study (Mwangi and Kariuki, 2015). For example, in the diffusion of innovation studies the term adoption is defined as a mental process through which an individual passes from hearing about an innovation to its implementation that follows awareness, interest, evaluation, trial, and implementation stages (Honagbode,2001). Adoptionis also defined as the integration of a new technology into the existing practice (Loevinsohn, Sumberg, and Diagne, 2012).More specifically in the agricultural technologies, the term refers to the extent to which farmers put into practice a new innovation in the future, given adequate information about the technology and the potential benefits (Ntshangase, Muroyiwa, and Sibanda, 2018). While the latter definition seems more relevant in the field of agriculture, it is unclear as to why farmers are expected to put into practice the innovations in the future rather than at the onset of the technology. The present paper agrees that adoption should be conceptualized as a process as Honagbode (2001) puts it, yet the definition remains too broad to measure. It is therefore, arguable that unless the process is reduced into measurable implementation stages, the term adoption will lack the common understanding among researchers.

Adoption is a very important behaviour when it comes to the development of any technology innovation. This is because the ongoing innovated technologies have become a key to economic, social, political, and cultural development in human history since time immemorial though today the world is rapidly changing. Regarding agricultural technologies, the process of diffusion of innovations seems to follow the pattern whereby the source of innovation is usually agricultural researchers and food technologists while farmers play the recipient role of innovations through the education provided by extension agents (TARP II SUA, 2005). This pattern makes farmers' respond to the innovated technologies in terms of acceptance or rejection, to play the determinant role as to whether the technologies will be supported or not; and thus, achieving the purposes of innovating the technology. Common understanding is thus required among researchers and

professionals on what constitutes adoption and how it can be measured, analyzed, summarized, and interpreted,

To measure successfully the adoption of farming technologies such as improved cassava processing, decisions must be made regarding how to measure adoption because a range of its conceptual definitions are not in common measurable criteria. In spite of the need to incorporate each criterion defining adoption of farming technologies in all implementation stages (Honagbode, 2001), it is usually difficult to implement this need in practice, since the contexts in question might determine what to include. For example, studying the adoption of Conservation Farming (CF) in Zambia, Arslan*et al*, (2013) excludes information on rotation in the adoption of CF despite their acknowledgement of the role of inclusion of all practices associated with the same in the ideal definition.

Thus, it is possible to distinguish farmers who have adopted a particular type of technology from their counterparts who have not based on the set criteria. From the reviewed literature in Tanzania, many researchers have measured the adoption in a discrete nature with binary response variables. This was simply done by indicating that the farmer was either the adopter or non-adopter of the technologies taking values of zero for the non-adopter and one for the adopter (Udensi *et al*,2011; Tarawali*et al*, 2012; Nyanda, 2015; Mombo, Pieniak, and Vandermeulen, 2016; Salum, 2016; Ntshangase,Muroyiwa, and Sibanda, 2018).

The argument in the present work is that this dichotomous approach in measuring adoption is suitable where the technology in question and the adoption assessment criterion are common to both the researcher and the farmers. Where the technology, is new and where the adoption criteria are many and not unanimously known among researchers and farmers, the criteria for measuring the adoption need to be known in measurable terms and in advance. For example, in measuring the adoption of chemical weed control among farmers in Panama, Martinez and Sain (1983) measured four measurable variables such as chemical weed control, the type of product, application time, and application rate. To measure chemical weed control, researchers measured whether the farmer used chemical weed control; and the type of product was measured by checking whether the farmer used Gesaprim or Gramoxone; application time was measured by looking at whether the farmer applied the Gesaprim within 0-5 days after planting and whether the farmer applied Gramoxone within 0-35 days after planting. Lastly, application rate was measured by looking at whether or not the farmer applied Gesaprim 1-3kg/ha, and Gramoxone at 1-3lt/ha. Such a multi variables approach of measuring the adoption of agricultural technologies is favoured in this work. However, the review found lack of measurement instrument specifically for measuring the adoption of cassava processing technology, thus, the necessity of developing Cassava Processing Technology Adoption scale (CPTA).

According to Social Cognitive Theory (SCT) Bandura (1997) informs that human behaviour is influenced in a reciprocal relationship by both personal and environmental variables. According to SCT, self and society, personal determinants such as cognitive, affective, and biological

stimulus; behavioural patterns and environmental stimulus interactively determine each other in a bidirectional way (Bandura, 1997). From such a theoretical line of argument, exposure to the object is a key to the development of behaviour through observational learning. As one interacts with the object, one learns to become or imitates the rewarding aspects of the object and rejects the punishing aspects of the same object. This theoretical view enlightens our understanding of how social or environmental factors that influence individual's cognitive processes, which in turn, influence the adoption of the improved cassava processing technology. Therefore, guided by the SCT, this study intended to study CPTA focusing on three components, namely, involvement in the pre - processing tasks, involvement in the processing tasks and utilization of the cassava-processed products. These components are hereby defined as implementation stages of the adoption of improved cassava processing technology. Authors in this paper define the term involvement in the pre - processing tasks, as the activities that usually, accompany the improved cassava processing technology that need to be accomplished before cassava is sent to the processing units. The term involvement in the processing tasks is defined in this work as the engagement in activities directly carried out during processing such as immediately washing after pealing and taking the washed cassava to the cassava processing machines to obtain High Quality Cassava Flour (HQCF). The term utilization of the processed cassava products is hereby described as the use or consumption of the products made of cassava such as HQCF, biscuits, burns, bread, and the like.

2. Methodology

2.1 Development and Design

The study took a quantitative approach under which cross – sectional survey design was employed, whereby data were concurrently collected. The study was carried out in Serengeti District, which is located on the Eastern part of Mara region. The district was selected because it is one of the areas hosting the improved cassava processing units; it is also potential for the actual cassava growing plans and practice (Serengeti Agriculture Office, 2018). Development of the CPTA was crucial following a need of measuring farmers' adoption of cassava processing technology specifically in Tanzania. Illuminated by the past technology adoption measures, the measuring criteria were developed basing on the tasks which were expected to cover cassava processing technology. The criteria were further established through discussions with three Senior Agricultural Officers who have experience in cassava processing technology. As such, the adoption of the improved cassava processing technology is defined as the extent of farmers' involvement in the pre- processing and processing tasks, and utilization of the processed cassava products, given adequate information about the technology and the potential advantages. The processed products involve but not limited to high quality cassava flour (HQCF), biscuits, bread, starch, ethanol; just to mention a few (Hirschnitz-Garber*set al*, 2015). The technology employs the use of machines, accompanied by some requirements such as timely harvesting (between 6

and 12 months after planting depending on the cassava variety), processing done within 24 hours after harvesting, pealing and washing of the roots to remove impurities. It also involves grating and dewatering using modern mechanized machines such as grater and the press respectively; drying or roasting as well as milling and packaging.

The discussion resulted into 18 items, which were then translated into Kiswahili language. The translation was done by two experienced translators. The first translator translated from English to Kiswahili and the second expert back translated the Kiswahili version into English. Both translations were harmonized by the researcher and then discussed with the three experts in the field of agriculture to obtain the version which was pilot tested. The pilot tested CPTA comprised of 18 items, presented in a 5-point scale including always involved, usually involved, sometimes involved, rarely involved, and not involved. Data collection followed a cross section design in the sense that data were collected at one point in time since information was self-reported from the same individuals and could be reported concurrently without affecting the results.

The study targeted the population of farmers cultivating cassava around the areas where the improved cassava processing units exist. Two categories of farmers were identified namely, cassava growers who also processed cassava using improved cassava processing technology, and farmers who were growing cassava and processing their cassava using traditional methods. With indefinite population frame and the scattered nature of the target population, purposive sampling was opted for through invitation whereby a farmer who consented and appeared in the cassava-processing unit was included in the sample. About 200 participants in all two processing units available in the district were selected. The sample-involved participants of diverse nature as indicated in Table 1. Age classification was done during the analysis basing on the report by Fin Scope Tanzania (2017). According to Fin Scope Tanzania (2017), farmers in Tanzania are of diverse nature including youth and the elderly whereby dedicated farmers aged between 18 and 24 years constituted 26percent of all farmers; between 25 and 44 years were 45 percent and 45+ years were 21 percent. Thus, participants were within the productive age (18 – 64). The same report informs that farming is carried out by both educated and non-educated farmers as follows, no formal education were 15 percent, primary education were 65 percent, secondary education were 18 percent and tertiary education were 3 percent. In addition, farming is usually done by both males and females practicing farming in a combination of other economic activities. Table 1 is the detailed categorization of the sample and their proportion in the study.

Table 1: Characteristics of Participants

		Proportion	
Variables	Levels	*f*	%
	Males	101	50.5
Sex	Females	99	49.5
	<= 35	67	33.5
Age	36 – 44	76	38.0
	45+	57	28.5
	No formal education	37	18.5
The Highest Education level of the	Primary education	77	38.5
Respondent	Secondary education and above	86	43.0
	Only farming	102	51.0
Economic Activities	Farming and business	83	41.0
	Farming and other economic activities	15	7.5

Other economic activities mentioned by 7.5 percent as indicated in Table 1 include cattle rearing, poultry, driving motor cycles for commercial purposes, carpentry, selling charcoal and firewood, and bull-cart pushing/dragging. As Table 1 indicates, the results from CPTA using characteristics of the sample would be reliable given both representative and prototype nature of the sample included.

2.2 *Data collection and analysis*

After introduction and explaining the purpose of the visit, farmers were asked for their informed consent to participate in the study. Among the participants, few farmers could not read and write properly. This group was separated and have their questionnaires filled with the assistance of researchers who had to read for the farmers and document the responses. On the other hand, , the CPTA questionnaire, pencils and rubbers were distributed to the group of farmers who had no problems with writing and the researcher read the items and the participants wrote their responses on the questionnaire.

The 18 items of the of the Cassava Processing Technology adoption scale (CPTA) were entered in the SPSS version 21. The CPTA consists of both negatively and positively worded items. The negatively worded items were reversed so that high score in a particular sub– scale indicated high level of adoption while low score indicated low adoption. The reversed items were CPTA10, CPTA11, CPTA13, CPTA14, CPTA15, CPTA16, CPTA17, and CPTA18. Each sub - scale was then totalized separately to obtain the scores for each sub – scale. The three sub – scales are:

Involvement in the pre- processing tasks: The sub - scale is made of 8 CPTA items. The items are CPTA1, CPTA2, CPTA3, CPTA14, CPTA15, CPTA16, CPTA17, and CPTA18. The central theme bringing these items in a common cluster is their intent to know whether the farmer is practicing the tasks mandatory to be accomplished before cassava is placed in the machines.

Involvement in processing tasks: The sub - scale is made of 3 CPTA items. The items are CPTA4, CPTA5, and CPTA6.These items assess farmers' involvement in the tasks, which are directly carried out during the processing in the factory.

Utilization of the processed products: The sub - scale is made of 6 CPTA items. The items are CPTA7, CPTA8, CPTA9, CPTA10, CPTA11, and CPTA12. This sub – scale high level of adoption where the farmer not only has adopted cassava processing technology for the business purposes but has also enjoyed the consumption of the products made of the cassava processed using the improved technology.

The score for the entire CPTA scale was obtained by totalizing the scores for each of the sub - scale. To categorize the groups of adopters, the total scores for each sub - scale and for the entire CPTA scale were binned in a one-third ratio so that the three categories reflected the original responses in the CPTA. The lower one third represented the non-adopters category, the middle one third represented the partial adopters 'category and the higher one third represented the adopters' category.

3.0 Results

Reliability of the CPTA

CPTA is a three-factor measurement scale comprised of 18 items measured in a three-point scale; namely, Not Involved, partially involved, and Involved. The three factors (sub - scale s) of the CPTA are involvement in the pre - processing tasks, processing tasks, and utilization of the processed products. The analysis of results revealed that both sub – scales and the entire scale reached an acceptable reliability index (greater or equal to 0.7, Tabachnick and Fidel, 2007; Field, 2009; Pallant, 2011). These were $\alpha = .86$. $\alpha = .71$, $\alpha = .79$, and $\alpha = .93$ for involvement in the pre - processing tasks, the processing tasks, utilization of the processed products, and total adoption scale respectively. Concerning validity, there were low to high correlations among sub - scales and between each sub - scale and total scale.

Validity of the CPTA

The correlations were: significant moderate negative correlation ($r = -.32$, $p < .01$) between the involvement in the pre - processing tasks and the involvement in the processing tasks sub - scale

s. There was low but significant negative correlation (r = -.23, $p < .01$) between the involvement in the pre - processing tasks and the utilization of the processed products. And there was low but significant negative correlation (r = .270, $p < .01$) between the involvement in the pre - processing tasks and the utilization of the processed products. Other correlations were: significant moderate positive correlation (r = .35, $p < .01$) between the involvement in the pre - processing tasks and the total adoption scale. There was significantly high positive correlation (r = .60, $p < .01$) between the involvement in the processing tasks and the total adoption scale. And there was high positive correlation (r = .61, $p < .01$) between the utilization of the processed products and the total adoption scale. These correlations imply that the sub - scale s measure common trait of adoption and at the same time each sub - scale can be used as a measure of an independent subtheme.

Performances in the CPTA Scale

The analysis of results has indicated that, CPTA was able to discriminate farmers in their adoption of cassava processing technology by sex, age group, and education level. All these demographics were distinguished in all three implementation stages (sub – scales) of the adoption of cassava processing technology. Tables 2 through5 present farmers' performances in the three-implementation stages (sub – scales) of the adoption (involvement in the pre – processing tasks, the involvement in processing tasks and utilization of the processed cassava products) by farmers' demographics

Table 2: Performances in the CPTA

			Responses					
			Not Adopted		Partially Adopted		Adopted	
Sub-scale	Mean	Std. Deviation	*f*	%	*f*	%	*f*	%
Involvement in the Pre - processing Tasks	24.22	3.81	85	42.5	49	24.5	66	33.0
Involvement in the processing tasks	7.88	3.62	77	38.5	67	33.5	56	28.0
Utilization of the Processed Products	18.71	3.25	70	35.0	68	34.0	62	31.0
Total Adoption Scale	50.80	5.49	75	37.5	60	30.0	65	32.5

Table 2 indicates that, about most (75) (37.5% of the) participants were non - adopters compared to 32 percent (65) of adopters in the total CPTA. Similar results were observed in all the sub - scales of the CPTA. In addition, though relatively, partial adopters were fewer than were in each of the rest of the groups in the total CPTA, their proportion was significantly high, promising the potential increase of the adoption in the future.

Table 3: Performances in the CPTA Scale by Sex

Sub-scale	Responses											
	Males (N=101)						Females (N=99)					
	Not Adopted		Partially Adopted		Adopted		Not Adopted		Partially Adopted		Adopted	
	F	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Involvement in the Pre - processing Tasks	42	41.6	26	25.7	33	32.7	43	43.4	23	23.2	33	33.3
Involvement in the processing tasks	30	29.7	40	39.6	31	30.7	40	40.4	28	28.3	31	31.3
Utilization of the Processed Products	43	42.6	32	31.7	26	25.7	34	34.3	35	35.4	30	30.3
Total Adoption Scale	32	31.7	40	39.6	29	28.7	43	43.4	20	20.2	36	36.4

Table 3 indicates that more females about 36.4 percent (36) than males about 28.7 percent (29) reported to have adopted cassava-processing technology in the total CPTA. On the other hand, more males about 39.6 percent (40) than females about 20.2 percent (20) reported partial adoption, promising potential increase of adoption among males in the future

Table 4: Performances in the CPTA Scale by Level of Education

Sub-scale	Responses																	
	No formal Education (N = 37)						Primary Education (N = 77)						Secondary and Above (N = 86)					
	Not Adopted		Partially Adopted		Adopted		Not Adopted		Partially Adopted		Adopted		Not Adopted		Partially Adopted		Adopted	
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Involvement in the Pre - processing Tasks	14	37.8	9	24.3	14	37.8	32	41.6	20	26.0	25	32.5	39	45.3	20	23.3	27	31.4
Involvement in the processing tasks	15	40.5	11	29.7	11	29.7	30	39.0	25	32.5	22	28.6	32	37.2	31	36.0	23	26.7
Utilization of the Processed Products	12	32.4	13	35.1	12	32.4	29	37.7	24	31.2	24	31.2	29	33.7	31	36.0	26	30.2
Total Adoption Scale	10	27.0	16	43.2	11	29.7	35	45.5	16	20.8	26	33.8	30	34.9	28	32.6	28	32.6

Table 4 indicates that more farmers 33.8% (26) with primary education than followed by 32.6 percent (28) with secondary education and 29.7 percent (11) with no formal education adopted improved cassava processing technology. However, the difference was minimal

Table 5: Performances in the CPTA Scale by Age Group

Sub-scale	Responses																	
	<= 35 (N = 67)						36– 44 (N =76)						45+ (N = 57)					
	Not Adopted		Partially Adopted		Adopted		Not Adopted		Partially Adopted		Adopted		Not Adopted		Partially Adopted		Adopted	
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*
Involvement in the Pre - processing Tasks	34	50.7	11	16.4	22	32.8	28	36.8	22	28.9	26	34.2	23	40.4	16	28.1	18	31.6
Involvement in the processing tasks	24	35.8	23	34.3	20	29.9	30	39.5	26	34.2	20	26.3	23	40.4	18	31.6	16	28.1
Utilization of the Processed Products	23	34.3	22	32.8	22	32.8	31	40.8	25	32.9	20	26.3	16	28.1	21	36.8	20	35.1
Total Adoption Scale	**26**	**38.8**	**20**	**29.9**	**21**	**31.3**	**28**	**36.8**	**21**	**27.6**	**27**	**35.5**	**21**	**36.8**	**19**	**33.3**	**17**	**29.8**

Discussion

The analysis of results has indicated that, CPTA is an effective instrument of measuring farmers' adoption of improved cassava processing technology. The instrument is potentially useful in its application both as research tool for researchers and as a self-assessment tool among farmers. It can be used to assess individual differences in the adoption of improved cassava processing technology and as a framework for the development of measurement instrument for other agricultural technologies among farmers. As a self-assessment instrument, farmers can use CPTA reflectively to measure and raise awareness on several aspects related to the ongoing improved cassava processing technologies. The instrument is also potential for generalizability in other samples and contexts provided the level of cassava processing technology is similar to the level of technology where the instrument has been pilot-tested. There are also possibilities of its applicability with the adoption of all other agricultural technologies provided the restatement of the items is geared towards the crop or technology in question. Its applicability to other farmers is possible due to the heterogeneous distribution nature of the sample at which the instrument has been tested.

In the present sample, the proportion structure of farmers in terms of education level [no formal education (18.5%), primary education (38.5%), secondary education and above (43%) and tertiary education (3)], was slightly different from what was reported by Fin Scope Tanzania (2017) [no formal education (15%), primary education (65%), secondary education and above (21%)]. However, the results in terms of the adoption reflect the same picture whereby the adoption of the technology increased with an increase of the level of formal education. Likewise, the results revealed that the adoption was higher among farmers with middle and older age (between 36 and 54) than in young ages (< = 35). These findings are similar to those in Fin Scope Tanzania (2017) that revealed that dedication of farmers in the productive age group was lower among farmers in the young age group (16 -24) and higher among farmers aged between 25 and 54 years. However, the application of the CPTA with other studies needs to be handled with care due to some likelihood of its limitations. First, since the instrument was pilot – tested for the first time in the cassava processing technology among farmers in Tanzania, it was not possible to make comparison with other past studies in terms of reliability and validity of the instrument. Second, the instrument was developed and tested among farmers in the country with low level of cassava processing technology. This implies that the instrument might need to be contextualized with the increasing levels of cassava processing technology. For example, in cultures with high levels of cassava processing technology, and where the processing is automated, the items related to processing stages such as washing and pealing, which are purely manual, might need to be restated to reflect the levels of technology reached. Yet such items are relatively too negligible to raise doubts against the applicability of the CPTA.

The analysis of CPTA has brought to light a serendipitous observation. Most of the respondents reported involvement in the pre - processing tasks, which are necessary before the genesis of processing tasks and the utilization of the processed products. The number of adopters decreased in the involvement in the processing tasks but increased in the utilization of the processed tasks. This might mean that those who adopt the pre - processing tasks are the foundation or potential adopters of the next stage tasks; namely, the involvement in the processing tasks; however, it is not necessarily that only the adopters of the early stages will adopt the last stage of utilization of the processed products. This means that even non - adopters of the early two categories of tasks might adopt the last stage of utilization of the processed products provided they are exposed to the products. This assumption is in line with the arguments propounded in the social cognitive theory (Bandura, 1997). The theory holds that observational learning brings in cognitive skills, preconceptions, and value preferences of the observers, all of which determine what a person is more likely to adopt. For a person to be influenced by the observed object, he/she must be able to remember the object. In addition, for more possibility of adoption, the retention of the object in one's mind must take place because what a person retains in the mind regarding the object exerts biases about the object. At the same time, acquisition of the behaviour undergoes an evaluation of positive and negative outcomes because people are more likely to engage in a modelled behaviour if the behaviour brings the valued outcomes than is the case if it brings unrewarding or punishing outcomes to the role model. In this regard, people might adopt some tasks of the same technology that they consider rewarding and consciously decide to reject those aspects of the technology that they consider punishing. Even when people realize the advantages of an action, they do not automatically adopt it but rather they compare the action with their personal moral standards. Then people are more likely to pursue the actions that they judge as self-satisfying and that bring them worth in the society and reject the activities that they personally disapprove. In

the same line of argument, Krosnick *et al.* (2005) holds that a person is likely to possess in the mind so many connections with a particular object, each of the connections might have evaluative implications. When a summary of the person's evaluation toward the object is required, then one gives an index of the total summary depending on the points of emphasis the researcher requires. The mechanism for translating cognition into action involves both transformational and generative operations. The execution of a skill must be constantly varied to suit the changing circumstances. Adaptive performance, therefore, requires a generative conception rather than a one-to-one mapping between cognitive representation and action (Bandura, 2001).

4.0 Conclusions and Recommendation

This paper intended to introduce Cassava Processing Technology Adoption scale (CPTA), as a valid and reliable instrument for measuring the adoption of improved cassava processing technology. The results indicate that the tool is structured into three implementation stages (sub - scales), namely; the involvement in the pre - processing tasks, the involvement in the processing tasks, and utilization of the processed cassava products. Both sub - scales and the entire scale reached an acceptable reliability indices and discriminant validity among sub - scales indicating their ability to measure common behaviour (adoption) and at the same time independently measure different implementation stages of the adoption of improved cassava processing technology. It is therefore concluded that the CPTA is an effective tool for measuring the adoption of improved cassava processing technology. It is also a valid, reliable, and potential instrument for farmer's self-assessment regarding their adoption tendencies. Further, the adoption of farming technology is well captured when its diverse aspects of implementation stages are included in the measurement scales than when it is measured as a uni-dimension trait. It is recommended that researchers in the adoption of the improved cassava processing technology should use CPTA scale in measuring farmers' adoption of cassava processing technology and the adoption of technology across other crops. However, before generalizing these findings to other samples, researchers need to consider the level of technology and the exposure of the technology, whose adoption is to be evaluated. This is because according to SCT, which has been supported by these results, exposure to the object is a key to the development of behaviour through observational learning. Thus, the adoption of improved cassava processing technology as a cognitive process can successfully be measured where the technology has been introduced and farmers have been exposed to it**.** Future research can focus on improving the instrument through validation studies by testing its effectiveness in measuring the adoption of technologies in other crops.

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3.0 CONSUMER'S ATTITUDE TOWARDS AFRICAN INDIGENOUS VEGETABLES IN MOSHI, TANZANIA

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Abstract

Numerous agri-food studies have been done to promote African Indigenous Vegetables (AIVs) with food security, nutritional benefits, and value chains being the focus. However, consumer behaviour on AIVs has been less studied thus creating a missing link in agri-food studies. This study investigates the consumer attitudes towards AIVs in Moshi Tanzania. Specifically, the study intended to identify the factors that influence consumer's purchase of AIVs, examine drivers for buying AIVs, and consumers' perceived benefits of AIVs. The Tricomponent Attitude Model was used to describe the interrelatedness of the three components: the cognitive, affective, and conative in developing sound marketing strategies for changing and consolidating consumer attitude towards a product for a superior market performance. About 130 sampled households in Moshi Municipal were involved in survey using a structured questionnaire. Consumer attitudes were measured using attitude scales and were analysed using descriptive analysis with the use of percentages, means, and overall mean of the key factors. It was found that the majority of households consume AIVs where Amaranth leaf, Nightshade leaf, and African eggplant are most frequently used AIVs. Consumers perceive AIVs as healthy, as having high nutritious value, and free from chemical fertilizers and pesticides. High nutritive qualities, environmentally friendly, and convenience were highly rated as consumer's drivers of buying AVIs. It is concluded that, consumers have a positive attitude towards AIVs. Investment on marketing communication and education on the relative health and economic importance of AIVs among consumers are the key recommendations of this study.

Key words: Consumer's Attitude, African Indigenous Vegetables (AIVs), and Tricomponent Attitude Model

1. INTRODUCTION

African Indigenous Vegetables (AIVs)[1] have attracted a growing concern as they play a very important role in addressing food security, essential nutrients, African diet, economy and their environmental friendliness (Mphafi *et al.,* 2019; Kansiime *et al.,* 2018). AIVs are considered as primary sources of food for many people. AIVs are cheap and easily accessible source of vitamins, particularly A, B, and C, and minerals such as calcium and iron as well as supplementary protein and calories (Muhanji *et al.,* 2011). This therefore makes AIVs a crucial component of traditional diets in sub-Saharan Africa (Vandebroek & Voeks, 2019).

Compared to other vegetables, marketing of AIVs is steadily increasing with a number of advantages in terms of reliable supply. They are also available at minimal cost (Muhanji, *et al.,* 2011; De Putter, *et al,* 2007). Economically, AIVs boost job opportunities and household incomes (Karanja, *et. al.,* 2011). The vegetables are marketed for income generation rather than used for subsistence purposes; thus, their market share and value are substantially increasing (Gido *et al.,* 2016; Ngungi *et al,* 2007). AIVs are considered prime contributors to farmers' household income by 13 per cent and farmers' market share by 88 per cent globally (Weinberger & Msuya, 2004). AIVs are easy to grow, as they require little external inputs, less capital requirement and little financial losses with no significant difference in gross profit between retailers of exotic and those of tradition leafy vegetables; thus, even resource-poor farmers and households can participate in the marketing of AIVs (Gido, *et, al.,* 2016).

Over the centuries, different types of AIVs have been consumed. The consumption of AIVs by various local communities in the country has been part of their cultural inheritance; however, with the introduction of exotic vegetables, consumers shifted their eating habits in favour of these exotic vegetables (Abukutsa-Onyango, *et, al.,* 2007). This resulted to an increased diminishing interest in the consumption of AIVs especially among the younger generations in the urban areas; furthermore, limited market transparency has led to weak vertical coordination of the supply chains and this has reduced the cultivation of IVs. There have been intensive efforts by researchers of promoting the consumption of AIVs (Musotsi *et al.,* 2017).

Studies (e.g. Mphafi, *et al.,* 2019; Kansiime, *et al.,* 2018; Muhanji, *et al.,* 2011; Karanja, *et. al.,* 2011; Abukutsa-Onyango, *et, al.,* 2007) have identified a number of benefits of AIVs including economic, nutritional, health, and agronomic. All these have stood at strong selling points for AIVs, and therefore facilitating transformation in the eating habits in favour of AIVs among consumers in local communities. However, the consumption of AIVs just like any other food item is influenced by many factors including its availability, accessibility and choice, which in turn may be influenced by geography, demography, disposable income, socio-economic status, urbanization, globalization, marketing, religion, culture, and consumer attitudes. For the sustainability of consumer's attitudes to be realized, more studies on consumer's purchase intentions, drivers for the purchase, the perceived benefits, and cultures of AIVs need to be done beyond the past and present approaches, which mainly focused on AIV's benefits in terms of food security, nutritional benefits, and value chains. In this light therefore, this paper examines consumer attitudes towards AIVs in Moshi Tanzania. Specifically, the study intended to identify

[1] We adopt the definition by Smith and Eyzaguirre (2007) who defined African Indigenous Vegetable (AIVs) as a crops species or varieties both indigenous and traditional vegetables that have been part of the food systems in Sub-Saharan Africa (SSA) for generations.

the factors that influence consumer's purchase of AIVs, examine drivers for buying AIVs, and consumers' perceived benefits of AIVs.

2. LITERATURE REVIEW

2.1 The Tricomponent Attitude Model

The model postulates that attitude comprises of three fundamental components which include cognitive, affective, and conative (Schiffman & Kanuk, 2010). The cognitive entails ones cognition or knowledge and perception about the object. It forms an information part of an attitude and it is expressed as a reflective belief (Kibera & Waruingi, 1998). Such cognition is a function of acquired direct experience by consumers on the perceived and the interrelatedness of knowledge sources on the object (Sowdagur, 2006). The knowledge and the perception take the form of belief; consumers in this sense believe that an object specific attributes and behaviour will bring about specific results. Consumers' belief in this category can be either informational or evaluative. Belief related to product attributes are informational, while those associated with product benefits are evaluative beliefs (Schiffman & Kanuk, 2010). The consumer's belief thus forms an integral part to marketers of AIVs for effective positioning of their products in a competitive landscape. AIVs marketers should therefore make aggressive use of market research to realize consumer's cognition and therefore maximise market potential.

The affective component of the model is built on consumers' feelings and emotions in line with a particular product or object (Schiffman, 2007; Botha, Brink and Machado, 1997). Affective responses or perceptions are very motivational in either a positive or negative direction as they can encourage or discourage the effect on the object/product depending on the nature of the thinking (Kardes, 2002; Sowdagur, 2006). As Schiffman and Kanuk (2010) stated, consumer's emotions or feelings about a product constitute the affective part of an attitude. Being evaluative in nature, the affective component normally captures personal or worldwide assessment of the attitude or object depending on favourableness and unfavourableness of the subject in question (Schiffman, 2007). To establish the overall feeling about a product or service, market researchers strive to identify the affective attitude of consumers by understanding the overall feeling on the likes and the dislikes of a particular product or object.

The conative component deals with the possibility of showing a particular behaviour with regards to an attitude-object (Schiffman & Kanuk, 2007). Schiffman *et al.*, (2007) maintain that the conative component is regarded as an expression of the consumer's intention to buy a certain brand for a particular purpose (Kibera & Waruingi, 1998). The intention to buy does not entail an actual buying due to confounding factors such as consumer's taste and preference for a substitute brand. The marketing implication is that to ensure market performance the knowledge of consumer's conative attitude towards a product is very important. However, these factors are subjective, they differ significantly, and it is difficult to have a full control on them.

For marketers of AIVs the tricomponent attitude offers useful insight on the study of consumer behaviour due to high level of internal consistency on the three components of consumer attitude. A marginal change in one attitude component induces change in others. Tricomponent attitude helps consumer researchers to develop and maintain effective strategies of accommodating and recognising the ever-changing consumer attitude towards a product as an essential ingredient for

successful market programme. This according to Blythe (1997) can only be achieved by evaluating and altering the current salient belief to make it more realistic and effective. Consequently, this integrates the three attitude components (cognitive, affective, and conative) into a holistic structure that results into a better understanding and predicting consumer behaviour. In this study, an attempt was made to discuss the attitudes of the AIVs consumers of Moshi, Tanzania within the scope of tricomponent attitude model.

2.2 Overview of African Indigenous Vegetables (AIVs)

African Indigenous Vegetables (IVs) have historically been consumed throughout the continent given its enormous range of species not only as a source of diet but also as a catalyst for socio-economic development (Weinberger & Pichop, 2009; Pasquini & Young, 2006; Grubben & Denton, 2004). They contribute abundantly in micronutrients and other related benefits to users, which include but not limited to high nutritive qualities in proteins, vitamins, oils, and micronutrients; they do not need many inputs such as fertilizers and pesticides; farmers keep their own seeds; they are easy to grow since they grow very fast. They are considered as a rich source of nutrients especially zinc and iron and are regarded as a source of income (Jacobi, *et, al.,* 1998). In addition, AIVs are adaptable to the local growing conditions; they are a major income generating activity and provide very important food security for poor-resource families in rural areas. Just like other vegetables, AIVs are mostly produced and consumed in cities; and Jacobi *et, al.,* (1998) observe, more than 90 percent of leafy vegetables supply in Dar es Salaam Tanzania is coming from production in the city itself.

2.3 AIVs markets in Tanzania

According to Osano (2010) and Eskola (2005), AIVs are generally sold through five different chains with varying characteristics. These include local village markets, regional markets, national market, export market, and supermarkets.

Table 1: Characteristics of AIVs Markets

	Local village Markets	Regional Markets	National Markets	Export Markets	Super Markets
Location	At Cross roads near villages	Region centres and/or district capitals	Dar es Salaam	Foreign	Large cities
Traders	Women and children	Large, medium and small traders	Large traders	Foreigners	Local and foreigners
Supply Products	Unreliable local/limited choice/low quantity	Regional / broad range / low to large quantity	Reliable	Reliable national / focused on special crops / large quantity	Reliable

Source: Adapted from Osano (2010) and Eskola (2005) and modified

3. METHODOLOGY

This study was carried out through descriptive research design. The target population for this study were consumers of AIVs in Moshi Municipal. Two research techniques were used: (i) A survey research technique; this involved 130 sampled consumers of AIVs in Moshi Tanzania whom were obtained using the formula by Fisher *et al*. (1991), and (ii) Qualitative research technique which involved an in-depth literature review from the global to Tanzania AIVs markets. The study adopted purposive and proportionate stratified sampling techniques. Consumers of AIVs were purposively sampled from both formal and informal vegetable markets in Moshi Tanzania. Proportionate stratified sampling technique was used by dividing the population into sub-groups based on sex, occupation, and income levels and then the simple random sampling was specifically employed in each stratum using the fish bowl method to select a representative sample. The study used structured questionnaire with fixed alternative questions to collect primary data. Theoretical part of the article significantly used secondary sources such as review of scholarly journals, books, research articles, reading materials, while quantitative findings and interpretations depended on primary data. Data were analysed descriptively through the help of Statistical Product and Service Solutions (SPSS) and presented in the form of percentage and mean.

4. FINDINGS AND DISCUSSIONS

4.1 Demographic Characteristics of Consumers

The respondents in this study were both males (40%) and females (60%). Their age ranged from 20 to 60 years, whose monthly income levels ranged from Tshs. 150, 000/= to in excess of Tshs. 3,000, 000/= (1US$ = Tshs. 2,327.00/=)[2]. The respondents included both those in the formal and those in self-employment.

Table 1: Demographic Characteristics of Consumers'

Category	Consumer's Demographic factor	Frequency (n=130)	Percent (%)
Age	**20 to 60 Years**	**130**	**100**
Sex	**Female**	**78**	**60**
	Male	**52**	**40**
Occupation	**Employed**	**65**	**50**
	Self –employment	**65**	**50**
Income Level (Monthly) (in Tshs).	**Below 150, 000**	**8**	**6**
	151, 000- 999, 000	**13**	**10**
	1, 000, 000- 1, 999, 000	**78**	**60**
	2000, 000-3, 000, 000	**26**	**20**
	Above 3, 000, 000	**5**	**4**

4.2 Consumers' Preference and Use of AIVs

Consumers were asked to rank different AIVs according to their preference and frequency of use. The ranking was from 1 (most used) to 10 (least used). The findings in Table 2 show that the top

[2] [https://www.bot.go.tz] Accessed 04/05/2020

three AIVs in the degree of impulse are amaranth leaf, Nightshade leaf, and African eggplant. This trend is largely attributed to their availability, regular supply in the market, affordability, and health benefits including richness in vitamins (Escola 2005). These findings are similar to the findings in a study by Weinberger and Pichop (2007) and IndigenoVeg survey data, (2007) that ranked amaranth *(Amaranthus spp.) as the* most important and frequently used AIVs in many urban and peri-urban areas in sub-Saharan Africa inclduing Tanzania. Amaranth *(Amaranthus spp.)* is followed by African nightshade (*solomun scabrum, S. villosum, S. nigrum, and S. amercanum),* African egg*p*lant *(Solamun scamacrocarpon, S. aethiopicus an S. canum),* vegetable cowpea *(Virgna enguiculata),* Ethiopian mustard *(Brassica carinata),* jute mallow *(Corchorus olitorius),* okra *(Abelmoschus esculentus),* spider plant *(cleome gynandra), and* pumpkin *(cucurbita moschata).*

Table 2: Consumer Preference Use of AIVs

S/No.	Common Name	Scientific Name	Swahili Name*	Mean	Rank
	African eggplant	*Solanum aethiopicum* (L.)*; S. macrocarpon* (L.)	*Nyanya chungu, ngogwe*	2.86	3
	Amaranth leaf	Amaranthus spp.	Mchicha	3.42	1
	Cassava leaf	*Manihot esculenta* (Crantz)*; M. glaziovii* (Mull. Arg.)	*Kisamvu*	2.83	4
	Cowpea leaf	*Vigna unguiculata* (L.) Walp)	*Kunde*	1.96	8
	Ethiopian mustard leaf	*Brassica carinata* (A. Braun)	*Sukuma wiki*	2.76	6
	Ipomea leaf	*Ipomea batata* (L.)	*Matembele*	2.80	5
	Nightshade leaf	*Solanum scabrum* (Mill.) *S. villosum* (Mill.) *S. americanum* (Mill.)	*Mnavu*	3.10	2
	Okra	*Abelmoschus esculentus* (L.) Moench.	*Bamia*	2.65	7
	Spiderflower leaf	*Cleome gynandra*	*Mgagani*	1.60	10
	Squash leaf	*Cucurbita pepo* (L.)	*Maboga*	1.66	9

***Swahili is the National language of Tanzania; it is also used in other East African countries like Kenya, Uganda, Rwanda, Burundi, and Congo Democratic Republic.**

4.3 Areas where consumers' often buy AIVs and characteristics of consumer markets

The respondents were asked to indicate as to where they often purchase AIVs. The findings in Figure 1 indicate that 8 percent of the respondents said that AIVs are sold at super market, 20 percent cited street vendors, 16 percent indicated farm gates, and 36 percent indicated informal markets, 12 percent green grocers, and 8 percent indicated intermediaries (collectors, brokers, transporters). This indicates that most of the consumers buy AIVs from informal markets as is shown in Figure 1. These informal markets are found in the village and regional markets dominated by small traders mostly women. In the village markets, the supply is unreliable, low in quantity, and limited in choice. Regional markets have broad range of varieties and large quantities that widen consumers' choice. Marketers of AIVs in the supermarkets and intermediaries should make strong marketing communication to make consumers aware of the existence of AIVs in their markets where percentage of awareness is low.

As for *Farm gates,* AIVs are sold by farmers at their farm-gates. The prices realized here according to Sanga, Ngailo and Kazungu (2013) do not include transport and marketing costs thus making them cheaper than in the other markets. Sellers at farm gates are characterised by low level of education, low technical knowledge of AIVs (Pichop, 2007), poor-resource farmers,

disorganized, and are operating under semi commercially oriented basis; they lack inputs and skills necessary to meet the dynamic market requirements. According to Ngugi, Gitau, and Nyoro (2006) this pushes them away from accessing high value markets such as supermarkets and therefore ending up being exploited by the intermediaries.

Furthermore, Intermediaries perform different and specific activities along the chain and are in such categories as collectors, brokers, wholesalers, and transporters. Collectors on the one hand are engaged in pooling activities and gathering vegetables from small producers into quantities large enough to satisfy wholesalers' demand. They are often, but not always commissioned by wholesalers (Weinberger and Pichop, 2009). Brokers on the other hand identify price differentials along the market. They normally buy IVs where prices are low and sell them where prices are high and through this, they earn a profit. As for wholesalers, they are the main suppliers in urban and peri-urban areas and who have sourced the produce from production areas and markets. Transporters or farmers normally hire a pick-up that delivers the produce from the collection point in the locality of the farmers to the supermarkets. The costs to the transporter includes fuel and lubricants, rent or bribing traffic police, and City council charges thus making a margin which is not accounting for depreciation of the vehicle (Ngugi, et al., 2006).

Street vendors include those who sell on the streets, or at the traditional market places in the villages or in towns. According to Weinberger and Pichop (2009), the bulk of the retailers comprises of wet market vendors, hawkers, and street vendors. This displays a typical African public market setting, where the produce is displayed either on a counter or a stall or on the floor. Unlike other members of the AIVs supply chain, actors in the retail markets are generally younger with low level of education.

Supermarkets usually give guidelines on the quality and quantity required to furnish the increasing demand for indigenous vegetables. Visual inspection is used to assess the desired quality. According to Ngugi, *et al,* (2006), supermarket gives orders with quality specifications, failure to which the products are rejected. In this case, the quality standards set by the supermarkets are that the vegetable units be clean, neat, not attacked by insects (no holes), right length (between 12 and 18 inches), right quantities (weighing between 500 and 700 grams), harvested before they flower or develop seeds and fresh (not wilted), and be delivered between 6.00am-7.00am on the day of delivery. Some supermarkets procure IVs via their subsidiary companies while other from producer organizations (farmer-groups) and from preferred individuals who supply consistently and in large quantities and all these are paid on delivery and not in advance (Ibid, *et al.,* 2006).

Green Grocers are located around the cities; they buy directly from the indigenous vegetables' farmer-groups at the prices, which are the same as in the supermarkets. Experience from Nairobi shows that the buying price is US$ 0.23 per Kg and the grocers sell the same at US$ 0.34, this makes a US$ 0.11 margin (Ngugi, *et al.,* 2006). In selling to green grocers, indigenous vegetable farmers face the challenge of receiving smaller order quantities as opposed to what they get from the supermarkets.

Informal markets are mostly on the outskirts of the cities. They sell to traders-cum-wholesalers who then sell to consumers. Farmer groups rarely sell their vegetables to the informal markets. Nevertheless, these too do not buy as large quantities as is the case with the supermarkets (Ngugi, *et al.,* 2006).

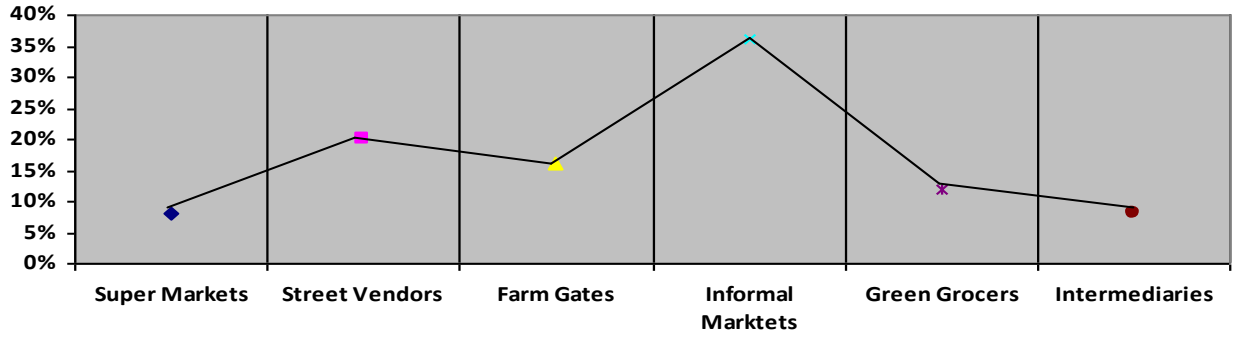

Figure 1: Areas where AIVs are often sold

4.4 Family Buying Unity and Degree of Impulse

Findings in Table 3 indicate that 62.3 percent of the respondents reported that the one who is responsible for buying AIVs in the family is the mother; 12.3 percent mention the father as the one responsible for buying AIVs. About 16.2 percent said that other members of the family are responsible and 9.2 percent said that both mother and father are responsible for buying AIVs in the family. Thus, based on African traditions, mothers are the ones who mostly buy foodstuffs, as are the ones who are more involved in making sure that the children have good health. Thus, mothers should get a special training on the importance of these vegetables so that they can keep on buying and convincing their families to consume AIVS always. This therefore calls for increasing awareness of AIVs among women, as they constitute a significant part of food buying unit at a household level. This observation is in line with the observation made by Schiffman and Kanuk (2007) that, the conative component (in the tricomponent attitude model) shows the consumers intention to buy AIVs is in line with the needs and interests of the family members.

In order to understand consumers' degree of impulse (frequency of buying), respondents were asked to indicate the frequency of buying AIVs. The findings in Table 3 show that majority (60%) buys AIVs between 5 and 7 times during the week. Another 25.4 and 10 percent buy AIVs once to twice a week respectively. At the extreme end, about 4.6 percent buy AIVs once a month. This indicates that AIVs are consumed on daily basis by the majority of the households in Moshi. Therefore, this trend explains its dietary and economic importance along the chain from producers to consumers in Moshi. This refers to the affective component of the tricomponent model that the frequency of buying AIVs is attached to the affective perceptions that are highly motivational in encouraging frequent purchase as commented by Sowdgur (2006).

Table 3: AIVs Family Buying Units

Variable	Category	Frequency (n = 130)	Percent (%)
Responsible in buying	Mother	81	62.3
	Father	16	12.3
	Both	12	9.2
	Other family members	21	16.2

Frequency of buying	5-7 times a week	78	60.0
	2-3 times a week	13	10.0
	1-2 times a week	33	25.4
	Once in a moth	6	4.6

4.5 Attributes of African Indigenous Vegetables (AIVs)

The other area of interest was finding out how consumers perceive AIVs nutritional value. The findings indicated that about 79 percent of the respondents strongly agreed and 18 percent agreed that AIVs had high nutritional value. Only 2 percent of the respondents seemed indifferent (table 4). These indicated that more consumers strongly agreed with the attribute that AIVs are healthy. This implies that consumers understand the importance of AIVs but most of them fail to buy AIVs. Consumer's idea about AIVs being free from chemicals, fertilizer, and pesticides that would either encourage or discourage them from purchasing these vegetables was also a concern of this study. The findings in Table 4 point out that about 88.2 percent of the respondents strongly agreed and 11.8 percent agreed that AIVs were free from chemicals, fertilizer, and pesticides. This indicates that more consumers strongly agreed that AIVs have high nutritional value. It was also revealed that 16 percent of the respondents strongly agreed, 48 percent agreed, and 36 percent were neutral that AIVs are produced in a more environmentally friendly way. The implication of this observation is that people consider AIVs as a part of their daily diet as are very nutritional, free from chemical fertilizers, pesticides and are produced in a an environmentally friendly way.

Table 4: Attributes of African Indigenous Vegetables

Attribute	**Percentage (%) of responses in 5 Likert Scale**					**Mean**
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	
AIVs have high nutritional value	79.4%	17.6%	2.0 %	1%	0%	4.75
AIVs are free from chemical fertilizers, and pesticides	88.5%	11.5%	0%	0%	0%	4.88
AIVs are produced in a more environmentally friendly way	16%	48%	36%	0%	0%	3.8

4.6 Rating the drivers for the purchase of AIVs

The study also intended to understand factors that influence the purchase of AIVs. The study rated these factors as most important (5points), important (3 points), and less important (1 point). It is very important to understand factors that influence consumers' intention of purchasing AIVs. The various weights were multiplied by the number of respondents who gave a particular rate and then divided by the total number of respondents to get the weighted mean. The expected mean was the weight of 3 points, which of course is the weight, allocated for important rate. The findings in Table 5 indicate that all the drivers for the purchase of AVIs had a mean value above the expected mean (3 points). High nutritive qualities had the highest mean value of 4.44, followed by environmental friendliness and then conveniences each with 4.11 while, price and tradition prestige had the lowest mean of 3.8. This signifies that, all the five factors were viewed

as more than important influencing factors of AIVs consumers buying decisions. However, high nutritional quality was found to be a highly influencing factor for the purchase of AIVs (at a mean of 4.44) than was the case with the other factors. The marketing implication for this is that, consumers have a positive attitude towards AIVs as they have high nutritive qualities and that there is a link between cognitive and conative components of the tricomponent model. From the cognitive component, consumers have acquired direct experience of AIVs as a source of nutrients through regular consumption. The conative component is more of intention to buy a certain brand for a given purpose. Consumers in this study have displayed a great need of purchasing AIVs with the intention of accessing high nutrition in the diet.

Table 5: Rating the drivers for buying AIVs

Factors influencing purchase of AIVs	Very Important	Important	Not Important	Total	Mean Weight
Weight	5	3	1		
Price	335	189	-	524	4.03
High nutritive qualities	470	108	-	578	4.44
Environmental friendly	480	54	-	534	4.11
Conveniences	405	120	9	534	4.11
Tradition prestigious	335	189	-	524	4.03

4.7 Consumer's perceived benefits of AIVs

The study findings in Table 6 indicate that about 52.9 percent of the respondents strongly agreed, 35.3 percent agreed, 5.9 percent were neutral and about 5.9 percent strongly disagreed that AIVs are sold at cheap prices. This shows only few percentage of consumers are after the importance of this vegetables, as they are not limited by the price even if it is high. In addition, to determine whether consumers buy AIVs if the household income is high, the question was set, and the findings indicated that about 8.8 percent of respondents strongly agreed, 32.4 percent agreed, 17.4 percent were neutral that the households would buy AIVs even if their prices were high. On the other hand, 8.8 percent of the respondents strongly disagreed, 29.4 percent disagreed, and about 2.9% said, they did not know whether would buy AIVs even if their prices were high. This also show that the income of the family matters in deciding whether to buy or not to buy the vegetables.

To understand accessibility of AIVs in the market, the question was set, and the results show that about 58.8percent of the respondents strongly agreed, 32.4% agreed, 2.9% of respondents were

neutral, 2.9% strongly disagreed, and about 2.9 percent of the respondents disagreed that accessibility of AIVs in the market influenced customers' decision of buying the vegetables. Therefore, the producers need to produce in high quantity so that they can be as much as possible available in the market.

In addition, to assess whether consumers buy AIVs when they have better appearance, a question was set, and the findings indicated that about 47.1percent of the respondents strongly agreed, 23.5 percent agreed, 23.5 percent were neutral, and 5.9 percent disagreed that better appearance was a factor influencing consumers' decision of buying AIVs. These findings indicate that most of the consumers purchase AIVs when they are cheaply priced, when consumers have more household income, when AIVs are more accessible in the market, and when AIVS have better appearance,

as it indicated in Table 6. The implication of this is that consumers do not know the importance of AIVs in their body so education should be provided to consumers that AIVs are the most important part of their daily food.

As far as the implication on health is concerned, the findings in Table 6 indicate that 79.4 percent of the sampled respondents strongly agreed 17.6 percent agreed, and 2.9 percent were neutral that AIVs are good for health. Likewise, about 42.1 percent of the respondents strongly agreed, 22.5 percent agreed, and 21.5 percent were neutral that AIVs are free from diseases. On the other hand, 7 percent disagreed and 6.9 percent strongly disagreed that AIVs are free from diseases. In the same way, 47.1 percent of respondents strongly agreed, 23.5 percent agreed, 23.5 percent were neutral, and 5.9 percent strongly disagreed that AIVs have body immunity. Overall, with a

mean of 4.05 it was observed that consumers were aware of the perceived benefits of consuming AIVs. This observation reveals that the benefits associated with the use of AIVs as explained by the cognitive component of the tricomponent attitude model are subjective and depend on the knowledge and perception of the consumer.

Table 6: Consumer's perceived benefits of AIVs

Consumer's perceived benefits of AIVs	Percentage (%) of responses in 5 Likert Scale					Mean
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
AIVs taste good	28.7	49	22.3	0	0	4.06
AIVs More cheap price	52.9	35.3	5.9	5.9	0	4.35
More disposable household income	8.8	35.6	17.4	8.8	29.4	2.85
AIVs are easily accessible in the market	58.8	32.5	2.9	2.9	2.9	4.4
AIVs are good for health	79.4	17.6	2.9	0	0	4.76
AIVs are free from diseases	42.1	22.5	21.5	7	6.9	3.86
AIVs Increases body immunity	47.1	23.5	23.5	0	5.9	4.07

4.8 Overall mean of the key factors

The first factor is Consumer Use of AIVs; this had the lowest mean score of 2.56 than the overall mean score of 3.81. This means consumers were not aware of most of the indigenous vegetables in the market where the top three AIVs in the degree of impulse were amaranth leaf, Nightshade leaf, and African eggplant. Consumers' idea about African Indigenous Vegetables was the second factor and it had the highest mean score of 4.47. This demonstrates that consumers were aware of

AIVs and therefore there is a great possibility of consuming the products very efficiently. The third factor was factors influencing consumers' decisions to purchase AIVs and this had a mean score of 4.14, which is greater than the average mean value of 3.81 as all the variables in that factor rated higher than the mean value.

It was very important to know factors that were of priority to consumers when buying these vegetables. In this case, nutritive qualities, environmentally friendly, conveniences, price and tradition prestige were considered as important in influencing consumers decisions of buying AIVs. The final factor was consumers' perceived benefits of AIVs, which had a mean score of 4.05, which was also greater than the average, mean value of 3.81. This implies that all the

variables in that factor were rated higher mean value; this means that consumers perceive AIVs as having a lot of benefits as they think that they taste good, sold at cheaper price, good for health, free from diseases, increase body immunity, and leave them with more disposable income. The fact that all the overall mean value are higher than the average mean value, signifies that consumers in Tanzania have a positive attitude towards AIVs. From the findings, it was revealed that, while the affective and conative components of the tricomponent model reflect the frequency of buying AIVs, the cognitive component deals with the benefits and experience associated with the use of AIVs as a source of nutrients through regular consumption. Further, the conative component is more of intention to buy AIVs by the consumers for a high nutrition in the diet. This triangular relationship between the cognitive, affective, and conative components shows the viability of the tricomponent attitude model in influencing consumer's attitudes toward AIVs.

Table 7: Overall mean of the key factors

Factors	Overall mean value
Consumer Use of AIVs	2.56
Attribute of AIVs	4.47
Factors influence consumers' decisions to purchase AIVs	4.14
Consumer's perceived benefits of AIVs	4.05
Average Mean Value	**3.81**

5. CONCLUSION AND RECOMMENDATIONS

This paper examined consumer attitudes towards AIVs in Moshi, Tanzania. More specifically it looks at consumer's awareness and use of AIVs, attributes of AIVs, drivers for buying AIVs, and consumers' perceived benefits of AIVs. The Tricomponent Attitude Model was also used in this study to explain the relevance and interrelatedness of the three components: the cognitive, affective and the conative that consumer researchers blend to develop viable marketing strategies for changing and consolidating consumer attitude towards a product as may well be required for a superior market performance. The study therefore concludes that consumers consider AIVs as having many benefits. The overall integration of the three components signifies that consumers in Tanzania have a positive attitude towards AIVs. This scenario therefore substantiates the need for tricomponent attitude model in studies related to consumer behaviour.

The study thus recommends to the Ministry of Agriculture Food and Cooperatives, the Ministry of Health, Community Development Gender, the Elderly and Children through Local Authorities and other stakeholders to invest more one educating local communities on the relative health importance of AIVs as a livelihood strategy and consider them as the most important part of their daily food. This study also the recommends that, people should consider AIVs as part of their daily food and should be consumed daily, as they are very nutritional, free from chemical fertilizers, pesticides and are produced in a more environmentally friendly way. Finally, to producers and traders in the AIVs value chain there is a need for strong marketing communication to enhance consumers' awareness of the existence of AIVs in other markets with low knowledge and understanding of these vegetables.

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4.0 IMPLICATIONS OF WOMEN ENGAGEMENT IN VEGETABLES AND FRUITS VENDING ON HOUSEHOLD ASSETS OWNERSHIP IN MOSHI MUNICIPALITY

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ABSTRACT

Despite the progress made by women towards participation in vegetables and fruits vending, their contribution in improving household assets ownership is yet to be adequately recognised. The study specifically analysed assets ownership among women before and after been engaged in vegetables and fruits vending and thereafter compared assets ownership between participants and non-participants in vegetables and fruits vending. A cross-sectional research design guided the study whereby a household survey and key informant interviews were used for data collection. Accidental sampling technique was used to select participants and non-participants of vegetables and fruits vending. Data were analysed using paired sample t-test to compare the means of the two groups in terms of assets ownership and determine whether there is a significant difference among them. The findings show that participating households were better off compared to their counterparts, non-participating households. This is because the assets ownership of the former improved after participation as accounted by 51.5percent with high assets ownership, as opposed to 15.4 percent before participation. Despite that majority of the households had high assets ownership, there were few households with low assets ownership, and these accounted for 28.6 percent of the households. A comparison of household assets ownership before and after participation shows a significant difference in the scores ($t= 6.753$; $p = 0.000$). Therefore, it is concluded that participation in vegetables and fruits vending has an influence in household assets ownership though it is not spontaneous. Since participating households had more household assets as opposed to their counterparts, it is recommended that non-participating households should consider vegetables and fruits vending as an alternative income generating activity. This would eventually and gradually enable them generate more household income and increase assets ownership within their households.

Key words: Women Vendors, Household Assets, Participant, Non-participant

1.0 Introduction

Globally, there has always been a strong gender bias to poverty. Throughout world's history, women have been poorer than men have been (Khamis, 2015). It is often declared that 70 percent of the world's poor are women. In Mali, Burkina Faso, Benin, and Niger in West Africa, between 48 and 65 percent of women live in poverty (Khamis, 2015). Given the prevailing poverty conditions among women, various coping strategies have been adopted in different parts of the world. One of the main survival strategies among women is the creation of self-employment through involvement in various types of entrepreneurial activities. Among informal the entrepreneurial activities include street vending, which has grown rapidly in the recent years. In particular, vegetables and fruits vending among other activities has become a predominant livelihood strategy among poor women in most urban centres throughout the world (Matenga, 2018; Ayanwale and Amusan, 2014).

Though it is not possible to quantify the extent of women participation, it is obvious that the vending sub-sector is highly dominated by women entrepreneurs worldwide (Wang, 2012; Mudzvidzwa, 2005). In developing regions, it is estimated that 75 percent of women are in the informal entrepreneurial activities such as vegetables and fruits vending s (ILO, 2018). In South Asia, over 80 percent of women are in the informal entrepreneurial activities, whereas in Latin America and the Caribbean, women in the sector account for 54 percent of vendors (Uwitije, 2013). In a few countries where cultural norms are restrictive against women's participation in economic activities, women account for 10 percent or less of vendors of vegetables and fruits. In Africa, the majority of street vendors, specifically of vegetables and fruits are women, who account for 88 percent of vendors in Ghana, 68 percent in South Africa, and 63 percent in Kenya (Roever, 2014). According to Roever and Skinner (2016), women constitute more than two-thirds of street vendors in the main cities of Benin, Côte D'Ivoire, Ghana, Mali, and Togo, and more than half in Kenya, Madagascar, Senegal, and South Africa.

In Tanzania, vegetables and fruits vending sector is recognised as playing an important role in the urban setting by generating employment and providing income to a significant percentage of women. This in turn supports their household livelihood, particularly those with no formally approved skills to join the formal sector employment (Tillerman, 2012). Furthermore, vegetables and fruits vending provide a workable alternative for subsistence living among women. It also acts as a barrier against anti-social practices such as theft and prostitution (Uwitije, 2013). Despite the aforementioned potentials and contributions, women engagement in vegetables and fruits vending is shrouded with challenges such as gender biases surrounded by tribal and socio-cultural aspects (Lincoln, 2012). This highly limits their contribution towards improving household wellbeing and assets ownership. Among the initiatives taken by the government in addressing the challenges, include the provision of soft loans to women groups to boost their capital, the setting of special opportunities to supply their products in public entities as well as the provision of funds set aside by the local governments to support women, youth, and people with disabilities. The results of the initiatives undertaken are yet to be manifested broadly in the wellbeing of the households of women vegetables vendors.

Therefore, this study was indented to highlight the increasing importance of vegetables and fruits vending as one of the informal entrepreneurial activities that provide employment and generate livelihoods and most importantly the aspect of household assets ownership. Guided by the

Sustainable Livelihood Approach (DFID, 2001), the study focused on analysing the participation of women in vegetables and fruits vending as well as its implications on household assets ownership. The SLA provided the foundation for qualifying the livelihood parameters and some of the household assets basing on the pentagon of assets that includes natural, social, human, physical, and financial capital. A number of hypotheses guided the study including "household assets before and after engaged in vegetable and fruit vending have remained the same among households of women vendors."

2.0 Methodology

A cross-sectional research design guided the study because it allowed the collection of data once on the subject under the study for many different variables that can be analysed at once (Labaree, 2009). In addition, a counterfactual approach was used to establish the influence basing on variables pattern, level of significance (p values) and magnitude (t test and eta square statistics) of the differences between the control (non-participant) and treated (participant) groups. The study was carried out in Moshi Municipality in the Kilimanjaro Region. Moshi Municipality has a large number of businesses owned by the residents who are widely known for their entrepreneurial rigour (Olomi, 2009; Mashenene *et al.*, 2014). Moreover, in recent years there was an increase of women entrepreneurs who engage themselves in vegetables and fruits vending in Moshi Municipality.

Data were collected from participating and non-participating women in vegetables and fruits vending in order to compare the level of assets possession across their households. The aim was to establish livelihood outcomes and see what influence vegetables and fruits vending have on the possession of household assets. The sample size of both participating and non-participating women in vegetables and fruits vending was 384 respondents estimated using Fisher *et al* (1991) sampling formula. The formula was chosen because it provided room for selecting respondents with characteristics (p) and without characteristics (1-p) which was critical in this study. However, the response rate was 76.3 percent (293 respondents) which is statistically acceptable as recommended by Babbie (2010) that a response rate of 70 percent and above is statistically acceptable and significant. Among the 293 respondents, 241 were participating women and 52 were non-participating women in vegetables and fruit vending business.

The study used accidental and purposive sampling techniques. Accidental sampling technique was used to select participating and non-participating women of vegetables and fruits vending. This is because the list of all the members of the population could not be obtained and participating women were readily available. Data were analysed using descriptive statistics, eta square and paired sample t- test. Assets ownership among participating and non-participating women of vegetables and fruits vending was measured by developing an asset index. The indicators before and after engagement in vegetables and fruits vending comprised of household assets such as a house, land, motorcycle, bicycle, bed, and television. A paired sample T-test was then conducted to compare the mean differences of assets ownership before and after but also between participating and non-participating women in vegetables and fruits vending. Eta square was used to determine the magnitude of the differences. Since the study was counterfactual, the presence of differences before and after participation as well as between participating and non-

participating women in vegetable and fruits vending would indicate the influence of participation in vending towards asset ownership respectively.

3.0 Findings and Discussion

3.1 Demographic Characteristics

The respondents were profiled in order to determine the results of livelihood and clearly define the comparisons as depicted in Table 1. The findings showed that the maximum age of the respondents was 53 years for participants and 59 years for non-participants of vegetables and fruits vending. The minimum age was 27 years for participants and 30 years for non-participants. The median age was 37 for participants and 48 for non- participants of vegetables and fruits vending. With the median ages between the participating and non-participating women of vegetables and fruits vending of 37 and 48 years; the findings indicate that most of the participants were energetic and at this age, family responsibilities would at the highest level. This consistent with the findings in a study by Mshana (2013) who found that women between the age of 31 and 37 participate mostly in vending activities because of household responsibilities over their shoulders.

Household size was also profiled whereby the median household size for participating households was 6 people with the maximum number of 9 and the minimum number of 3. Among non-participants, the median household size was 3 people, the maximum number was 5 and the minimum number was 3. This indicates that majority of participants had 6 people in their households, which means; most of the respondents had the responsibility of taking care of at least 6. This probably influenced them into getting involved in vegetables and fruits vending since they did not have other means of generating income for taking care of their household members.

Table 1: Age and Household Size (n=293)

Variable	Respondents	Maximum	Median	Minimum
Age	Participants	53	37	27
	Non-participants	59	48	30
Household Size	Participants	9	6	3
	Non-participants	5	3	3

The level of education is critical in the business perspective as it provides the ability to comprehend business operations. The findings indicate the majority of participants had primary education while the non-participants had college education ranging from vocational to business. The findings in Table 2 show that 78.4 percent of participants and 11.5 percent of non-participants had primary education, 13.7 percent of participants and 17.3 percent of non-participants had ordinary-level education, 7.9 percent and 48.8 percent of participants and non-participants respectively had completed advanced-level

education, while 42.4 percent of non-participants had completed college education. This suggests that majority of the respondents engaged in vegetables and fruits vending had completed primary

education, and this limited them from engaging in more demanding business ventures. These results are consistent with those reported in a study by Nzyoki (2014) and Saha (2011) who found that majority of women entrepreneurs attained primary education or had no formal education at all, something that limited their business education exposure.

Table 2: Education Level (n=293)

Education Level	Participants (n=241)		Non-participants (n=52)	
	Frequency	Percent	Frequency	Percent
Primary	189	78.4	6	11.5
Ordinary	33	13.7	9	17.3
Advanced	19	7.9	15	28.8
College	00	00	22	42.4

The study looked at marital status of the respondents in terms of married, single, widow or divorced. The study results that show that 34.9 percent of participating respondents were single followed by 24.5 percent who were divorced. Others were married (23.2%), and widowed 17.4 percent of the sample studied as indicated in Table 3. Thus, the majority of participants were either single or divorced which implies that most of the women who were engaged in vegetables and fruits vending were the heads of their households. This implies they were engaged in vegetables and fruits vending in order to earn income to meet and meet their household basic needs. These findings are similar to those reported by Uwitije (2016) who found that 50 percent of the surveyed respondents engaged in vegetables vending were either single or divorced. However, majority (57.7%) of non-participants were married, 23.1 percent were single, and the remaining 13.4 and 5.8 percent were either widowed or divorced respectively. This suggests that majority of the non-participants were married unlike the participants of vegetables and fruits vending activities that were found single and divorced. Married women have limited powers of making decisions since they are not the head of their households unlike the single women. These married women were more likely to be affected by an unequal division of family labour, spending a greater amount of time on household and family related activities that limits their ability to engage in other productive activities such as fruit vending.

Table 3: Marital status (n=293)

Marital status	Participants (n=241)		Non-participants (n=52)	
	Frequency	Percent	Frequency	Percent
Married	56	23.2	30	57.7
Single	84	34.9	12	23.1
Widow	42	17.4	7	13.4
Divorced	59	24.5	3	5.8
Total	241	100.0	52	100.0

3.2 Household ownership of assets between participants and non-participants

The study compared household assets ownership between participants and non-participants of vegetables and fruits vending. The findings indicate that households of participants scored higher index unlike those of the non-participants. The findings indicate that households of participants had a minimum score of 5 a mean of 7.01 with a maximum of 9 compared to the households of

non-participants who had a score of 5.41 and 5.41 for minimum and mean respectively with a minimum of 3. This implies that households of participants were better off as compared to their counterparts, non-participants, but most importantly, they provided an indication that they possessed more assets compared to the non-participants over the years of vegetables and fruit vending. Further, participation in vegetables and fruits vending enabled women to increase ownership of assets including beds, radio, bicycles, sofa sets, motor cycles, television sets, land, houses, and motor vehicles.

3.3 Levels of household assets ownership among participants

Levels of household assets ownership were computed in scores before and after participation into vegetables and fruits vending activities in order to determine the household assets ownership for each household. Assets ownership scores before engagement in vegetables and fruits vending were computed as a starting point, the findings showed that respondents had low household assets ownership before participating in vegetables and fruits vending as indicated in Table 4 whereby 58.5 percent of the households had lower assets ownership. This implies that lower assets ownership among households was a result of not being able to generate more income. Thus, the observations show that not participating in entrepreneurial activities affect women assets ownership negatively. However, to some extent some of the households managed to achieve higher assets ownership as evidenced by 15.4 percent of the households who had high assets ownership before they were engaged in vegetables and fruits vending.

After participating in vegetables and fruits vending assets ownership among households improved significantly. The findings in Table 4 show that the levels of assets ownership among respondents' households improved. About 28.6 percent had low level while 19.9 and 51.5 percent had moderate and high levels of assets ownership respectively. The levels indicate that households were endowed differently depending on how they were granted access to and use of livelihood assets. Hence, generally, assets ownership of the respondents improved after participating in vegetables and fruits vending; and this accounted for 51.5 percent with high assets ownership level compared to 15.4 percent who had high assets ownership level before participating in vegetables and fruits vending.

However, despite that, the majority of households had high assets ownership, there were few households with low assets ownership and these accounted for 28.6 percent as indicated in Table 4. It was revealed that these households were facing some challenges including lack of credit and loans for their business expansion. Hence, they were not able to generate enough income for their household assets. Thus, despite participation in vegetables and fruits vending, some of the respondents were not able to achieve high assets ownership levels as it is not an automatic endeavour.

Table 4: Levels of assets ownership among participants (n=241)

Levels of Assets ownership	Before vending		After vending	
	Frequency	Percent	Frequency	Percent
Low	141	58.5	69	28.6
Moderate	63	26.1	48	19.9
High	37	15.4	124	51.5

A comparison of household assets ownership before and after engagement in vegetables and fruits vending showed that there was a significant difference in the scores before and after engagement in vegetables and fruits vending (t= 6.753; p = 0.000) as shown in Table 5. This implies that, through participating into vegetables and fruits vending respondents were able to gain more assets than was the case before. Thus, the null hypothesis that assets ownership among households of vegetables and fruits vendors do not vary was rejected since the assets ownership before and after engaging in vegetables and fruits vending differed significantly. The sustainable livelihoods approach is built on the belief that people need assets to achieve a positive livelihood outcome. This is similar to Tshuma and Selome (2014) who found that women vendors made a difference by facilitating ownership of assets in the households. It was also reported that households that owned land were more likely to invest in natural capital through operations such as soil conservation (Bekele and Mekonnen 2010, Pender and Kerr 2012) as they may use such assets as collateral for accessing to financial resources (Petracco and Pender 2009). They may also be more likely to invest in education for their children, thereby increasing human capital for their households (Katz and Chamorro 2012).

Table 5: Comparison of assets ownership before and after (n=241)

Household assets ownership	Paired Differences					T	Df	Sig.
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Levels After-Levels Before	**0.660**	**1.517**	**0.098**	**0.852**	**0.467**	**6.753**	**240**	**0.000**

After the t-test results, Eta squared test was computed in order to determine the magnitude of differences of assets ownership before and after women participation in vegetables and fruits vending activities. Eta squared analysis yielded a statistic of 0.063 as shown in Table 6, which indicates a moderate effect size (magnitude) obtained before and after participation in vegetables and fruits vending activities. A moderate effect size (magnitude) indicates that possession of assets among respondents was not the same before and after participation in vegetables and fruits vending activities. Basing on significant levels as shown in Table 6, the study therefore failed to accept the null hypothesis. Women engagement in vegetables and fruits vending was found to have contributed to household assets ownership. The Sustainable Livelihood Approach (DFID, 2001) suggests that practical intervention should make households' efforts of building their livelihood assets easier. Examples of practical measures include programme counselling, education, financial literacy and savings programmes, and support for the growth of informal businesses.

Table 6: Eta square results on assets ownership comparison among participant households (n=241)

Source	SS	Df	MS	F	Sig.	Eta Squared
Model	2.683[a]	2	1.341	9.704	0.000	0.063
Intercept	171.513	1	171.513	1240.723	0.000	0.811
OCAFTER	2.683	2	1.341	9.704	0.000	0.063
Error	40.089	290	0.138			
Total	241.000	293				
Corrected Total	42.771	292				

a. R Squared = 0.063 (Adjusted R Squared = 0.056)

4.0 Conclusion and Recommendations

The study concluded that women's involvement in the sale of vegetables and fruits promote household ownership of assets since most of them got income from selling vegetables and fruits that enhance the ownership of household assets. This indicates that they were able to increase more wealth in their households. Since assets ownership among household members appeared to have been influenced by women participation in vegetables and fruits vending activities, more women should be self-motivated to join vegetables and fruits vending as an alternative income generating activity. This would eventually enable them generate income and increase assets ownership within their households. This can be done through District Trade Officers, Women Vendors Associations and other interested parties through sensitisation as well as providing entrepreneurial and marketing training among women on vegetables and fruit vending.

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5.0 DETERMINANTS OF EMPOWERMENT AMONG WOMEN PRODUCERS OF IMPROVED CHICKENS IN BARIADI AND MUHEZA DISTRICTS, TANZANIA

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ABSTRACT

Women empowerment is a dynamic and multidimensional process whereby various factors could influence differently the extent to which women are empowered in different contexts. Rigorous evidence on the determinants of women empowerment in specific agricultural projects is scantily documented. Therefore, the paper examines the determinants of women empowerment in keeping improved chickens in Bariadi and Muheza Districts. The study adopted a cross-sectional research design. A sample size of 240 women was involved, including 120 beneficiaries of African Chicken Genetic Gain (ACGG) and 120 non-beneficiaries. Data were collected through a questionnaire-based survey, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs). Quantitative data were analysed using descriptive statistics and ordinal logistic regression while qualitative data were analysed using content analysis. A Composite Empowerment Index (CEI) was used to gauge women empowerment. Women engaged in the ACGG project were categorized into higher level of empowerment than were non-beneficiaries (CEI = 0.714 and 0.529 respectively). Ordinal logistic regression results showed that age, religion, forms of marriage and involvement in ACGG project were the main predictors for women empowerment ($p < 0.05$). The findings showed that the ACGG project provided the enabling environment for increasing women's agency through supporting women's access to productive resources and women control over the benefits. In addition, ACGG project through Community Innovation Platforms (CIPs) provided opportunities for stakeholders networking, not only along chicken value chain, but also along other value chain among stakeholders responsible for gender integration and community development at large. The study recommends for development stakeholders such as Local Government Authorities (LGAs), Non-Governmental Organizations (NGOs), Faith Based Organizations (FBOs), and private sectors to scale up improved chicken intervention to other areas. These entities should also engage in the provision of capacity building on how to empower women along the chicken value chain at the district level.

Key words: Women empowerment, Composite Empowerment Index, African Chicken Genetic Gain

1.0 INTRODUCTION

There is an emerging consensus within the international development community that gender equality and women's empowerment are important goals for human rights and for achieving a range of economic and social development objectives (Assaad *et al.*, 2014; Johnson *et al.*, 2017). Women's empowerment occupies a prominent place among 17 global goals and 169 indicators adopted by the UN General Assembly in 2015 as of the 2030 agenda for sustainable development (Lee and Finlay, 2017). Women empowerment came into the limelight at Beijing conference in 1995 (UN, 2015). However, twenty years after the Fourth World Conference on Women, no country has fully achieved equality and empowerment for women and girls (van Eerdewijk *et al.*, 2017; UN, 2015; UN, 2014).

Power imbalance between women and men originates from gender inequalities, which are exacerbated by the on-going discrimination and weaknesses in laws, policies, institutions, and social relations (Fox, 2018). The power imbalance or disempowerment manifests itself in women's lower education level, less income, less control over their own income, less bargaining power, less participation in decision making bodies, and less access to production inputs and resources than is the case with men (Hossain and Jail, 2011).

Women empowerment is an active, complex, and multidimensional process, which enables women to realize their full potential and power in all spheres of life (Mathialagan, 2014; Mathialagan, 2015; Pan, 2017; Gupta, 2017). Women empowerment comprises various dimensions such as economic, socio-cultural, familial/interpersonal, legal, political and psychological (Malhotra *et al.*, 2002; Assaad *et al.*, 2014). Women empowerment is a complex concept, which can be defined and interpreted differently from diverse standpoints. In this paper, women empowerment is considered from socio-economic dimensions. Thus, women socio-economic empowerment is a process whereby women gain access to and control over economic resources, and ensuring that they can use these to exert increased control over other areas of their lives (Hunt and Samman, 2016; Taylor and Pereznieto, 2014).

The conceptualization of women empowerment is mainly based on three defining elements namely agency, resources, and achievement that are common to the empowerment frameworks (Kabeer, 2005). The first defining feature is that of agency, which is the "ability to define one's goals and act upon them" (Kabeer, 1999) or the ability to control various aspects of one's life (Kishor and Gupta, 2004). The second element is access to and control over resources (materials, human and social) that a woman acquires from multitudes of relationships in the various domains of family, market, and community. Finally, the broader setting that characterizes the circumstances of a woman's life such as marriage, living arrangements, household wealth, and characteristics of influential family members shape the opportunities and choices available to her (Kabeer, 1999).

Throughout the world, development partners such as governments, NGOs, and development organizations are concerned with women empowerment. Many efforts to empower women at household and community levels have been focusing on raising women's status through education, and training (Hunt and Samman, 2016; Aslam, 2013; Jeckoniah *et al.*, 2012). Other efforts have been on access to health and family planning services, increased women representation in decision making organs, involving women in credit and microfinance

programmes as well as legal counselling and support (Jeckoniah *et al.,* 2012; Kumar, 2015). In recent times, development practitioners have incorporated women empowerment objectives into the design and implementation of their agricultural projects and programmes (Jeckoniah *et al.,* 2012; Johnson *et al.,* 2017). For instance, in the livestock sector, the African Chicken Genetic Gain (ACGG) project in Tanzania has introduced genetically improved chicken breeds in rural areas with the aim of increasing smallholder chicken productivity and women empowerment (ACGG, 2015). Due to the complexity and multidimensional nature of women empowerment, various factors could influence differently the extent to which women are empowered in different contexts (Akter *et al.,* 2017; Assaad *et al.,* 2014). Rigorous evidence on the determinants of women empowerment in specific agricultural development projects is limited (Johnson *et al.,* 2017; Tesfaye *et al.,* 2018). Therefore, this paper examines the determinants of women empowerment in the context of improved chicken production in selected districts.

The paper was guided by women empowerment theory. Kabeer (2005) considers empowerment as comprising three dimensions namely, agency, structures, and relations. Agency represents the processes by which choices are made and put into effect. A person or group's agency can be largely predicted by their asset endowment. Assets are the stocks of resources that equip actors to use economic, social, and political opportunities to improve their lives (Alsop *et al.,* 2006). Structure comprises institutions that govern people's behaviour and influence the success or failure of the choices that they make. Institutions can be formal or informal. Formal institutions include the sets of rules, laws, and regulatory frameworks that govern political processes, public services, private organizations, and market. Informal institutions include "unofficial" rules that structure incentives and govern relationships within organizations, informal cultural practices, value systems and norms that operate in households or among social groups (Alsop *et al.,* 2006). Structure can have recognizable forms, such as how households are organised (monogamous, polygamous, etc), producer groups, development agencies, government institutions and laws (Farnworth *et al.,* 2013).

Relations are closely linked to structures and agency. Relation is the ability to create, participate, and benefit from networks or coalitions. Relations are about the connections people have both within and outside their communities. Thus, relations are about women's freedom to participate in women's groups; women's freedom to take part in coalitions to claim their rights to land and other resources; women's being directly acknowledged and worked with by development partners; women's participating actively in value chain partnerships, such as in producer and marketing groups and in value chain platforms (Farnworth *et al*.. 2013). In this paper, the theory assumes that the determinants of women empowerment could be determined through the dimensions of agency, structure, and relations. Women empowerment could be realised if the agency increases to the extent that women can influence positive change to the social institutions and actively network with other stakeholders.

2.0 METHODOLOGY

The study was conducted in Bariadi and Muheza District Councils in Simiyu and Tanga Regions respectively. Bariadi and Muheza District Councils were among the areas that had benefited from the ACGG project. Other District Councils that had benefited from ACGG project are Masasi, Newala, Ruangwa, Lindi Rural, Mbeya Rural, Ileje, Njombe Rural, Wanging'ombe, Manyoni, and Iramba. Others are Bahi, Chamwino, Kilombero, Morogoro Rural, Korogwe, Maswa, Misungwi, and Sengerema. Bariadi and Muheza Districts were purposefully selected as study areas due to the socio-cultural and socio-economic differences between them. Bariadi District is dominated by agro-pastoral Sukuma people, in the hinterland, while Muheza District largely comprises diverse ethnic groups, relying on agriculture and with more inclination to coastal culture. Therefore, the difference between the two districts perhaps could bring a different picture in terms of the determinants of women empowerment. In each district, three villages were included that is Mwamoto, Byuna and Ibulyu from Bariadi District and Kwaisaka, Kisiwani Nkumba and Mlingano villages from Muheza District.

The study adopted a cross-sectional research design, which enables the observation of two or more variables at a single point in time. The design is useful for description purposes as well as for the determination of relationships between variables (Babbie, 1990). The design is commonly used in survey research to differentiate at least two categories of people (Malamsha, 2014). This paper determined the relationships between the selected independent variables and women empowerment (dependent variable) in the context of keeping improved chicken.

The sampling unit of the study was women aged 18 years and above. The population of the study comprised both beneficiaries and non-beneficiaries of African Chicken Genetic Gain intervention. The beneficiaries of ACGG intervention were those who were provided with improved chickens, whereby each participating household received 25 pre-brooded and pre-vaccinated chickens. Lists of ACGG beneficiaries and of non-beneficiaries from village registers were used as sampling frames. Simple random sampling using lottery method was used to select sample from the list of names selected from each village. The sample size was 240 women (120 beneficiaries and 120 non-beneficiaries from Bariadi and Muheza Districts respectively). These were determined using Cochran's formula (1977). $n = {}^{N}/\ 1 + N\ (e)^{2}$ Where: n = Sample size; N = the population size; *e* = the level of precision or sampling error, estimated in percentages (0.05).

Mixed methods of data collection were used whereby quantitative methods were used to determine cause-effect relationship among the variables, respondent's characteristics, trends, and beliefs of people while qualitative methods were used to get in-depth information about the variables. Mixing of the methods was considered useful as it provides triangulation of information (Creswell, 2013). A structured questionnaire was used to gather quantitative data on household socio-economic characteristics, assets ownership, access to productive resources and socio-cultural settings related to the production of improved chicken. Qualitative data on women empowerment and improved chicken were collected from May to June 2018 using Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). The criteria of selecting KIIs and FGDs participants were based on their knowledge and skills on improved chicken production and

gender issues. Focus Group Discussions (FGDs) involved women and men keeping improved chickens or those participated in various trainings on the management of improved chicken. The

issues that were discussed in FGDs included the role of stakeholders in chicken value chain that is from access to productive resources, production, marketing, and consumptions of the chicken products. Twelve FGDs were conducted in six villages. In each village, two FGDs comprised men only and women only. The number of participants in each FGD ranged from 8 to 10, this is in line with advice by Barbour (2011) and Bryman (2004) that if the FGD participants are too many some of them just sit idle without giving their opinions and that if they are too few they may not be able to discuss difficult topics effectively.

Key Informant Interviews (KIIs) were held with people who were believed to have in-depth understanding and knowledge on chicken production and the role of improved chicken keeping in promoting women empowerment. Key informants included 2 District Livestock and Fisheries Officers (DLFOs), 2 District Community Development Officers (DCO), 6 Village Extension Officers (VEO) and 2 ACGG zone coordinators. The issues that were explored during key informant interviews included leaders and individuals' views on women issues in the context of chicken production. Qualitative data were analysed using content analysis technique after organising the data into different themes that addressed the objectives. A tape recorder and a checklist were used as tools for data collection in both FDGs and key informant interviews.

Content analysis was used to analyse qualitative data. Transcriptions were done after every interview and FGD. Data were organized into different themes and were interpreted to reflect the objectives of the study. Quantitative data were entered into Statistical Package for Social Sciences (IBM SPSS version 20) computer software and analysed by using descriptive statistics (frequencies, percentages, and mean), F test, and ordinal regression model. Women empowerment was measured by developing a Women Empowerment Index (WEI). Commonly used indices for measuring women empowerment included Household Decision Making Index (HDMI), Domestic Consultation Index (DCI), Personal Autonomy Index (PAI), Economic Decision Making (EDM), and Freedom of Movement Index (FMI) (Haque *et al.,* 2011; Jeckoniah *et al.,* 2012; Kundu and Chakraborty, 2012). However, in this paper, a Household Decision Making Index (HDMI), a Domestic Consultation Index (DCI), a Personal Autonomy Index (PAI), and a Freedom of Movement Index (FMI) were adapted to construct a Composite Empowerment Index (CEI). The CEI denoted by Y in equation (1) was constructed by averaging the above four women empowerment indices, which are HDMI, DCI, PAI, and FMI.

Y = 1/4 (HDMI+DCI+FMI+PAI)……..…. (Equation 1)

The Composite Empowerment Index (CEI) was further categorized into four levels of empowerment, "no empowerment" for an average of 0, "low empowerment" for an average range from 0.1 to 0.5, "medium empowerment" for an average range from 0.6 to 0.7, "high empowerment" for an average score from 0.8 and above. The empowerment levels were categorized based on Human Development Index developed by UNDP (2005).

Factors that influence women empowerment were determined using ordinal logistic regression model. The model was relevant because the dependent variable (Y) was classified in terms of ordered empowerment levels (low, medium, and high). Ordinal logistic regression is appropriate when the dependent variable is at ordinal level with more than two categories (Agrest and Finlay,

2009). The model is defined as:

$$P(Y) = 0\frac{e^{\alpha+ \beta 1x1 + \ldots \beta kxkk}}{1 + e^{\alpha+ \beta 1x1 + \ldots \beta kxk}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(Equation 2)}$$

Where:

P(Y) = the probability of the success alternative occurring, Y = dependent variable, e = the natural log, α = the intercept of the equation, β_1 to β_k= coefficients of the predictor variables, X_1 to X_k = independent variables entered in the regression model.

In this study, the dependent variable Y represented three levels of empowerment. Thus, the model was used to estimate the factors that influence the probability of being in a certain level of empowerment (Composite Empowerment Index (CEI)). The independent variables (Xs) included age, family size, education, religion, type of marriage, involvement to ACGG interventions, organization member, and Community Health Insurance Funds (CHIF) member.

3.0 RESULTS AND DISCUSSION

3.1 Socio-economic profile of the respondents

The respondents from both ACGG beneficiaries and non-beneficiaries had a mean age of 42 years, which is a productive and active working age group. This means that age suggests that the selected women were the best representative sample since most of them were experienced and well informed on issues concerning decision making in the household and were engaged in various economic activities. Details on the age of the respondents are shown in Table 1.

Table 1: Distribution of respondents by socio-economic characteristics (n=240)

	ACGG Beneficiaries (n=120)		**Non-Beneficiaries (n=120)**		**All**	
Variable	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Age						
15-24	2	1.7	6	5	8	3.3
25-54	92	76.7	91	75.8	183	76.3
55-64	16	13.3	20	16.7	36	15
65 and Above	10	8.3	3	2.5	13	5.4
Education						
Informal education	28	23.3	27	22.5	55	22.9
Primary	83	69.2	87	72.5	170	70.8
O-level	9	7.5	5	4.2	14	5.8
A-level	0	0	1	0.8	1	0.4
Marital status						
Single	12	10.0	9	7.5	21	8.8

Married	98	81.7	97	80.8	195	81.3
Separated	3	2.5	4	3.4	7	2.9
Widow	7	5.8	10	8.3	17	7.0
Marriage forms						
Monogamy	68	69.4	73	75.3	141	72.3
Polygamy	30	30.6	24	24.7	54	27.7
Religion						
Christian	56	46.7	55	45.8	111	46.3
Muslim	36	30.0	39	32.5	75	31.3
None	28	23.3	26	21.7	54	22.5
Economic activity						
Crops & livestock	100	83.3	102	85.0	202	84.2
Crops, livestock & petty trade	20	16.7	18	15.0	38	15.8

The majority that is, 69.2 and 72.5 percent of the ACGG beneficiaries and non-beneficiaries respectively among the respondents had attained primary education. This level of literacy was enough to allow access to information and integrate it in various economic activities including access to productive resources.

The results showed further that over 80 percent of the respondents were married. Monogamy was the most common form of marriage with 72 percent of the respondents falling into this category. All ACGG beneficiaries and non-beneficiaries depended on agricultural activities (crop production and livestock keeping) as their main economic activities through which they derived their livelihoods. Moreover, livestock keeping was mostly dominated by chickens.

3.2 Women empowerment levels and socio-economic factors

The findings reveal that, overall, women in the study area were categorised into medium level of empowerment (CEI = 0.622). Women who participated in keeping improved chicken had higher empowerment (CEI = 0.714) level compared to those who did not (CEI = 0.529) (Table 2). The CEI of the ACGG beneficiaries were statistically different from that of non-beneficiaries ($F = 40.20$, $P < 0.001$).

Statuses of women empowerment by socio-economic variables are shown in Table 2. The empowerment of women in Bariadi District was a little higher (CEI = 0.648) than that of women from Muheza District (CEI = 0.595). This is because Bariadi is dominated by agro-pastoral Sukuma people whereby women are mostly engaged in poultry keeping while men dominated in keeping large animals such as cattle. Therefore, decisions regarding chicken keeping were mainly under women control. It was found further that empowerment level among the widowed, separated, and single women (CEI = 1.000) was higher than that among married women (CEI = 0.534).

Table 2: Status of Women Empowerment by Selected Socio-Economic Variables

Socio-demographic variable	Mean index		
	Muheza	Bariadi	Muheza & Bariadi
1. District	0.595	0.648	0.622
2. Participation			
-Women with ACGG chicken	0.685	0.743	0.714
-Women without ACGG chicken	0.505	0.553	0.529
3. Marital status			
-Single	1.000	1.000	1.000
-Married	0.466	0.594	0.534
-Separated	1.000	1.000	1.000
-Widow	1.000	1.000	1.000
4. Marriage(Form)			
-Polygamy	0.586	0.621	0.617
-Monogamy	0.456	0.572	0.503
5. Wives reside the same compound with the husband			
No	0.600	0.657	0.648
Yes	0.458	0.571	0.511
6. Education status			
- No formal education	0.522	0.728	0.695
- Primary education	0.604	0.589	0.598
- Secondary education	0.575	0.833	0.627
7. Age group			
15-24	0.625	0.350	0.488
25-54	0.557	0.629	0.594
55-64	0.650	0.738	0.689
65 and Above	0.900	0.917	0.908
8. Economic activities			
-Farming and livestock keeper	0.623	0.647	0.635
-Farming, livestock and petty trade	0.447	0.658	0.553
9. Religious			
-Christian	0.615	0.608	0.611
-Muslim	0.582	-	0.582
-Paganism	-	0.698	0.698

Based on the type of marriage, women who are in polygamous marriage had higher level of empowerment (CEI = 0.617) compared to women in monogamous marriage (CEI = 0.503). The findings indicate that women in polygamous marriage who spend most of their time alone are not directly affected by the patriarchy system at the household level. They were engaged in most of decision making about their lives; therefore, they had the opportunity of being empowered because decision making rests on women themselves.

The empowerment level was found to increase with an increase in the level of education of the respondents in Muheza District, while in Bariadi District the trend was different perhaps because of having big numbers of women with no formal education. In Bariadi 38.3 percent had no formal education as compared to 7.5 percent of the respondents with no formal education in Muheza District. In this case, tacit knowledge accumulated over life experiences could have played a significant role on women empowerment. Furthermore, women empowerment level was found to be increasing with age for all groups of respondents. Christian women (CEI = 0.6170) were found to be more empowered compared to Muslim women (CEI = 0.5787) perhaps because patriarchal belief is more common in Islamic than in Christian religion.

3.3 Determinants of women empowerment

Ordinal logistic regression model is used to model the relationship between an ordered multilevel dependent variable and independent variables (Lu, Wang and Tolliver, 2019). For this study, the values of the dependent variable (women empowerment) had a natural order; and they were measured at low, medium, and high levels of empowerment. Therefore, the model was appropriate in determining the influence of independent variables on women empowerment. Model fitting information showed statistically chi-statistic ($p \leq 0.05$). This indicates the presence of association between the dependent variable and independent variables. The Pseudo R- Square was 0.590 Cox and Snell while Nagelkerke was 0.677, implying that 67 percent of variation in women empowerment was explained by a combination of the independent variables entered in the model. The results on the test of parallel lines observed ($p > 0.05$) signify that the lines are parallel.

The results of ordinal logistic regression model (Table 3) reveal that age, religion, type of marriage and involvement in ACGG project were the most important factors for women empowerment in Bariadi and Muheza Districts ($p < 0.05$). The age of the respondents significantly influenced women empowerment. The positive coefficient of age implies that women empowerment increases with age. As women become older, the level of respect increases due to the recognition of their contribution to the household. Therefore, older women gained confidence in decision making at the household level, domestic consultation, freedom of movement and personal autonomy. This result conforms to reports by Heshmati (2017); Nyange *et al*. (2017); Peterman *et al.* (2015). In contrast to this result, Jeckoniah *et al*. (2012) found that women at younger ages and those aged above 50 years had lower level of empowerment. This implies that the influence of age on women empowerment varies according to the context and nature of intervention. In the current study, women beyond 50 years were also found to have high level of empowerment.

Involvement of women in ACGG had negative coefficient and strong influence (Wald = 76.88) on women empowerment. This implies that women who were not involved in ACGG intervention were relatively less empowered than were their counterparts. The involvement in ACGG project enabled women to access resources, training, and advice related to the production of improved chickens and gender relations. In FGDs, most of the participants who benefited from the ACGG revealed that their level of income was increased due to the support provided by the project. This finding was affirmed by a key informant who reported that:

> *"Women who are engaged in the ACGG project are more empowered than non-beneficiaries. Access to productive resources of improved chickens enables them to benefit from the selling of eggs and cocks. Therefore, women's earnings from improved chickens provide opportunities for them to contribute to the households and to be involved in decision making" (KII one at Kwaisaka village, 10.05.2018).*

Similar findings, as reported by Haghighat (2014), showed that access to resources enables women to advance their social status and power. However, the findings in this study showed that apart from women's access to productive resources, ACGG project provided enabling environment for stakeholders' engagement particularly in challenging the existing social structures that hinder women empowerment. The realization of women empowerment depends on how interventions are tailored to increase women's agency, to challenge harmful social institutions and to enhance networking for mutual benefits.

Table 3: Factors influencing Women empowerment (n=240)

Variables	**Coefficient**	**S.E**	**Wald**	**Sig.**	**95% C. I**	
					L.B	U.B
Age	.048	.019	6.373	.012	.011	.086
Family size	-.042	.071	.343	.558	-.182	.098
Education	.067	.065	1.051	.305	-.061	.194
Type of marriage	-1.481	.462	10.264	.001*	-2.387	-.575
ACGG beneficiary	-4.598	.524	76.883	.000*	-5.625	-3.570
CHIF member	.051	.399	.016	.899	-.731	.832
Organizational member	-.297	.374	.630	.427	-1.030	.436
Religion	-1.956	.498	15.451	.000*	-2.931	-.981

p = 0.000; Goodness of Fit=1; Cox and Snell R^2= 0.590; Nagelkerke R^2= 0.677; Test of Parallel line = 0.849

It was further revealed that there was significant variation in women empowerment across religions ($P < 0.01$). Christians were more empowered than were Muslims and therefore Bariadi District is more empowered than Muheza as it is comprised mostly of Christians (66%) and traditional beliefs, while Muheza is comprised of 62 percent Muslims (Table 4). Christianity beliefs provide opportunities for women to have certain powers of control over household assets as compared to Islamic beliefs that ascribe man as the overall controller of the household resources and benefits. The results are in line with Njoh and Akiwumi (2012) who reported that Christianity has positive influence on women empowerment than Islamic religion. Christianity beliefs put more emphasis on the collaboration of women and men on the issues pertaining to

access to and control over the household resources. For example in the Bible, Paul insisted cooperation among women and men in social life (Gal 3:28; 1 Corinthians 11:11; Galatians 3:28). However, this depends on how people are affirmed to Christianity beliefs.

Moreover, the results indicated that most of the Sukuma people being Christians in Bariadi have strong affiliation to their cultural norms and beliefs, which actually subordinate the position of women and girls. For example, one of the key informants reported that:

> *"... the traditional dance known as mbina promotes early marriage whereby girls are denied the right to education" (KII two, Bariadi District, 05.06.2018).*

In addition, another key informant reported that:

> *"...girls are advised not to work hard in schools by their mothers. When it happens that girls pass their exams in primary school, mothers are likely to be divorced. Girls are expected to get married soon after primary schooling so as to bring wealth in terms of dowry price to their fathers" (KII three, Mwamoto Village" , 01.06.2018).*

The results are in line with those reported by James (2018) that religious beliefs are among the driving forces for discriminatory practices against women. The result implies that social institutions including most of religious beliefs and practices continue to restrict women from accessing productive resources, income, and education that in turn constrain women empowerment efforts. Changes of the harmful institutional settings (structure) and religious beliefs in particular could enhance women empowerment especially through improving women access to productive resources and women control over the assets.

Table 4: Distribution of respondents by religious affiliations (n=240)

Muheza			**Bariadi**		
Religion	**Frequency**	**%**	**Religion**	**Frequency**	**%**
Christian	46	38.3	Christian	79	65.8
Muslim	74	61.7	Muslim	1	0.8
Traditional beliefs	0	0.0	Traditional beliefs	40	33.3
Total	120	100.0	Total	120	100.0

Moreover, there was significant women empowerment variation among the types of marriage ($p < 0.01$). In a monogamous system, the man's power over the control of resources is stronger than in a polygamous system whereby one woman may be left alone to make her own decisions. Muheza District with a high proportion of Muslims is dominated by monogamous system of marriage contrary to the report by Newbury (2017) who said that polygamous system is more common in Islamic societies. The difference could be location specific and other socio-economic forces that have changed attitude towards small manageable families.

Majority of participants in the FGDs reported that women in polygamous marriage were more empowered than were those married in monogamous marriage. In polygamous societies, women who reside on different compounds with their husbands, have chances of being more empowered. They have the opportunities of making own decisions particularly when the husband is absent or frequently living with another wife. These results were affirmed by one of the key informants at Ibulyu village in Bariadi who said:

> *"One of the women benefits in polygamous system is responsibility of making most of the household decisions including management of improved chickens because the husband spends most of the time with another wife. (KII four, 26.05.2018).*

Similar results have been obtained by Newbury (2017) who noted that most of the women in polygamous unions exercise a level of control over the use of resources generated from small income generating activities. However, patriarchy dominance in many settings continues to persist (Lauwo, 2018). For example, one of the key informants from Muheza District reported that:

> *"Patriarchy dominance is very common in Muheza District, overall decisions over the control of productive resources and benefits accrued from income generating activities continue to be under men's control" (KII five, 09.05.2018).*

This implies that in both polygamous and monogamous forms of marriage, there is a certain level of men dominance at the household level. Therefore, even if women are supported with productive resources, which improve their income generating activities, their motivation is likely to be restricted by patriarchy culture.

4.0 CONCLUSIONS AND RECOMMENDATIONS

ACGG project provides the enabling environment for increasing women's agency through supporting women's access to productive resources and women access to benefits. In addition, ACGG project mobilized engagement of diverse stakeholders for increasing women's agency, challenging harmful social institutions, and enhancing networking along the chicken value chain.

Social cultural institutions play an important role of either supporting or hindering women empowerment efforts. For instance, women empowerment was higher in polygamous system than in monogamous systems of marriage because polygamous system provides opportunities that promote women self-autonomy. However, a patriarchy culture dominates among both monogamous and polygamous systems of marriage. Despite the positive influence of Christianity beliefs on women empowerment, traditional institutions continue to restrict women from accessing productive resources, income and education which in turn constrain women empowerment efforts.

In view of the above results and conclusions, it is thus, recommended that

- Policy makers and development partners should integrate components of gender equality in policies, programmes, and projects.
- Development stakeholders such as Local Government Authorities, Non-Governmental Organizations, Faith Based Organizations, private sectors, donors, and individuals should provide improved chicken intervention to other areas.
- Capacity building on how to empower women should be done by various stakeholders along the chicken value chain.
- Awareness creation on harmful religious and traditional beliefs should be done at various levels from the community to the national level.

The study propose that further studies should look at (i) How cultural beliefs and practice influence socio-economic women empowerment in different context (ii) How different religious beliefs and practices enhances or hinders women's access to productive resources and women

access to benefits and (iii) The relationship between co-ownership (legal) of household assets and socio-economic women empowerment.

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6.0 SOCIO-ECONOMIC FACTORS INFLUENCING THE ADOPTION OF IMPROVED SEED VARIETIES AMONG SMALLHOLDER FARMERS IN BEAN VALUE CHAIN IN MISENYI DISTRICT, TANZANIA

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ABSTRACT

In Africa, the initiatives targeting bean value chain have been implemented in order to improve bean seeds varieties. Despite the initiatives, some studies indicate that smallholder farmers have been sceptical and reluctant to adopt the improved varieties, which seem to be potential in improving productivity. This paper analyses the socio-economic factors influencing the adoption of improved varieties among smallholder farmers in bean value chain. A cross sectional research design involving 166 smallholder farmers including adopters and non-adopters was used for comparative purposes. The household survey and key informant interviews were used for data collection. Qualitative data were analysed using content analysis while quantitative data were analysed using multiple response analysis, chi square, and binary logistic regression. The findings indicate that sex of the head of the household, availability of extension of services, education level, and membership to farmers' groups or associations were significant socioeconomic predictors in the adoption of improved bean variety ($p<0.005$). The study concluded that the adoption of improved bean seeds variety is not impulsive as it depends on a number of pull and push socio-economic factors among smallholder farming households. The study recommends that the provision of extension services and training should be improved through the provision of advanced trainings on usefulness and application of improved varieties to enable smallholder farmers acquire the necessary skills and knowledge. This would enable them improve productivity, household incomes, and subsequently their livelihoods.

Key words: Socio-economic Factors, Adoption, Smallholder Farmers, Household, Value Chain

1.0 INTRODUCTION

Smallholder agriculture in most of the developing countries remains a major engine of rural growth and livelihood improvement as well as a pathway of removing large members of the rural poor out of poverty (Mchopa and Jeckoniah, 2018; Gollin, 2014). The pathway can be in terms of exchange or market-based livelihood whereby rural households that produce surplus food crops or non-food agricultural products or by-products earn their livelihoods by selling such products. In addition, it can be in terms of labour-based livelihoods whereby most of the households derive livelihoods by selling their labour in different agricultural activities (Acharya, 2006). In this regard, massive efforts and resources are being spent on improving agricultural production, productivity, and promoting market access by smallholder producers (Nang'ole *et al.,* 2011).Thus, the majority of smallholder farmers' households depend on agriculture directly for food security and economic livelihood support.

Among the food crops potential for food security is the common bean, which is among the widely produced food crops by smallholder farmers in the Eastern and Great lakes Region of Africa (Binagwa *et al.,* 2016;Birachi *et al.,* 2011). Beans are the cheap source of calories making them a cheaper source of protein for the poor. Accordingly, they are termed as "poor man's meat "in sub-Saharan Africa(Chianu, 2010). In addition, they are among the strategic crops given priority towards eradication of household poverty and food insecurity (FAO, 2009b).In Tanzania, common bean is the most important grain legume grown for direct consumption and as a source of farm income (Karane, 2016).As a result, a number of value chain initiatives targeting bean value chain have been designed and implemented by stakeholders in order to improve the livelihoods of smallholder farmers.

In particular, the Ministry of Agriculture, Food Security and Co-operatives has been promoting the initiative of producing and distributing Quality Declared Seed (QDS) designed to make the best use of limited technical resources, and encourage the production of good quality seed that will meet national demand. The initiative allows private seed companies to expand seed business opportunities targeting hard to reach farmers in the value chain network. In other areas, decentralised seed production systems using the existing community structures were effective in promoting the infusion of new varieties into traditional production systems. Genetically improved varieties of staple crops can play an important role in ensuring the availability of sufficient food for a growing population (Qaim and Kouser, 2013). Improved Varieties (IVs) have better yields and are more resistant to late blight, virus, and bacterial wilt (Abebe *et al.,* 2013). Improved seeds can be defined as seeds that aim at increasing the quality and production of crops by having characteristics such as drought tolerance, high yielding, and early maturity (FAO, 2009a). Unlike the traditional seeds that farmers recycled year after year after harvest, the improved seeds (hybrid seeds) result from crossbreeding of two parent plants genes that have desirable traits.

Despite the government's initiatives of improving bean value chain practices the decision of adopting improved seed varieties are vested to smallholder farmers. Their decisions to adopt or reject agricultural technologies highly depend on their objectives and constraints as well as cost and benefit accruing from it (Kelsey, 2013). In addition, peer influence, past experiences, prevailing market prices, and indigenous knowledge have been attributed to be the influencing factors in the adoption of agricultural technologies. Therefore, smallholder farmers will largely adopt only technologies that suit their needs. This explains why some farmers are still reluctant to

adopt improved bean seeds variety and continue relying on less productive traditional seeds, which have been less productive and have been affected by pest and diseases. In addition,

productivity is still far below the potential, which has also affected profitability (Saimon *et al.*, 2016). Ayalew (2011) found out that bean smallholder farmers are largely hesitant against adopting the complete package of practices recommended due to different agronomic factors that appear to have some bearing on the farmers' decision to adopt the improved bean production package. The factors include but not limited to seed rate, spacing, fertilizer rate, and pesticide application at the recommended rate. Thus, the adoption and sizeable improvement in improved bean seeds production and productivity depend on the extent to which a household has applied the recommended package practices (Ayalew, 2011).

Smallholder farmers encounter multiple socioeconomic and value chain constraints such as inadequate information about new production technology and inadequate capital to acquire the inputs and supplies (Birachi *et al.,* 2011). Bean productivity itself is constrained by pests and diseases, poor soil fertility and drought, price instability, shortage of extension services (Kanyama and Damian, 2015; Beebe *et al.*, 2012), and low utilization of appropriate technology (Ronner and Giller, 2013). This has led to low agricultural productivity per given inputs which reduces smallholder farmers potential of meeting the growing demand of consumers in the market (Mkonda and He, 2016; Birachi. *et al.,* 2011). Therefore, this study aimed at analysing socio-economic factors influencing the adoption of improved seed varieties among smallholder farmers in the bean value chain.

2.0 THEORETICAL UNDERPINNINGS

The adoption and diffusion of agricultural technologies entail a certain degree of complexity in the decisions taken by small-scale farmers (Petry *et al.,* 2019). Smallholder farmers face increasingly dynamic and complex decision-making scenarios, which demand a range of different innovation tools for decision-making in an ever- challenging environment (Fisher *et al.,* 2000). To a certain extent, the complexity lies in the lack of certainty with relation to the benefits of such technologies before they are adopted (Petry *et al.,* 2019). Among the mostly pronounced puzzling decisions is the adoption of improved or modified seeds and farming technologies due to limited knowledge and adverse peer influence based on myths. Therefore, to study the improved beans adoption process and practices, Diffusion of Innovation Theory (DOI) (Rogers, 1976; 2003) was adopted to guide the study. The theory deals with the process of innovation and development that provides the main foundations for understanding diffusion in terms of relationship between technological innovations and social relations (Petry *et al.*, 2019). For the case of agriculture, innovations are transferred from its source to the smallholder farmer through an intermediary such as an extension system;thus, the diffusion of such a technology depends on the characteristics of the farmer.

Diffusion is a process by which an innovation is communicated within a social system which consists of a mental process of acceptance of an idea or new practices which passes through stages of awareness, interest, evaluation, trial, and adoption (Rogers, 2003). Among the pronounced characteristics that influence adoption and diffusion of improved agricultural technologies among smallholder farmers include farm size, risk exposure and capacity to bear

risks, labour availability, land tenure, access to financial and producer markets, access to information, participation in the off-farm activities, household characteristics and ecological and environmental factors (Monela, 2014). In this study, the adoption of improved bean varieties was considered as one among the agricultural technologies that were adopted by smallholder farmers in order to improve productivity. Therefore, socio-economic factors (characteristics) such as education level, farming experience, farm size, availability of extension services, membership to farmers' association (social capital), and government support were considered essential in understanding the adoption process among smallholder farmers in bean value chain.

3.0 METHODOLOGY

The study adopted a cross sectional research design since it allowed the researcher to collect data for multiple variables from a representative sample with varied characteristics in order to detect variables' patterns of associations as observed by Bryman (2012). The design allowed data to be collected rigorously within a specified time in order to draw inferences with regard to the key variables of the study. Data were collected from Misenyi District, which is one among eight districts of Kagera Region. The district was purposely selected because it is the leading in bean production with yields of about 95000 metric tons per year despite limited land size compared to other districts in the Region (District Agricultural Statistics, 2016). The study used mixed methods approach hence; triangulation of data collection methods was important as it allowed the corroboration of results within the study. A combination of Household Survey (HS) and Key Informant Interviews (KIIs) were used to collect quantitative and qualitative data respectively. The survey questionnaire was administered to all 166 respondents while a total of 5 KIIs were done with 1 District Agricultural Extension Officer, 3 Village Agricultural Extension Officers and 1 Input Supplier who had knowledge relating to bean value chain and the adoption of improved variety.

Data were collected from smallholder farmers of both the adopters(treated group)and the non-adopters(control group) of improved bean variety for comparison purposes. The total sample size was 166 respondents including 47 adopters and 19 non-adopters selected using simple random technique of lottery. Qualitative data recorded in the field notes and recorded audio conversations were transcribed, categorised, coded, and thereafter grouped into themes with reference to the study objectives. Thereafter, constant comparison technique was done through comparing incidents applicable to each category and delimiting data to the theoretical assumptions as recommended by Kolb (2012). Binary Logistic Regression was also used to analyse the influence of socio-economic factors on the adoption of improved beans varieties. The model was selected since the dependent variable (adoption) was dichotomous (1 = adopted while 0 = otherwise).

$$\text{Logit}(Pi) = \log\left[\frac{p(x)}{1-p(x)}\right] = \alpha+\beta_1x_1+\beta_2x_2+\beta_3x_3+\ldots\ldots\ldots\ldots\ldots\beta_px_p+\varepsilon$$

Logit (P*i*) = Y is a binary dependent variable (1 = adopted; 0 = otherwise)
α = intercept of the equation
β_1 to β_p = predictor variables regression coefficients
x_1 to x_p = predictor variables
ε = error term

Table 1: Variable Matrix

Variable	Definition	Expected Sign
X_1Sex	1 = Male 1; 0 = Female	+
X_2Education	Years in School	+
X_3Experience in Farming	Years	+
X_4 Farm size	Acres	+
X_5 Extension Services Availability	Frequency of services	+
X_6 Farmers Association Membership	1 = members; 0 =	+
X_7Government Support	otherwise	+
	1 = received support; 0 = not received	
X_8 Household size	Number of residents in a Household	+

4.0 FINDINGS AND DISCUSSION

4.1 Production Practices among Bean Smallholder Farmers in Value Chain

4.1.1 Awareness and usage of the Improved Bean Variety Seeds

The study found that at least one of the improved common bean varieties were used by the adopter households. The commonly used bean varieties used included *Lyamungo* 90, *Njano Uyole*, *Jesca* and *Lyamungo* 85. The non-adopter households were found growing local bean varieties bought from the local markets or the bean varieties preserved from previous harvest and used for home consumption. A scenario that was also observed by Monela (2014) revolved around a recycling of local seeds among the reluctant households on the adoption of improved seed varieties due to lack of awareness, resistance, or inability to acquire the improved seed varieties.

Regarding awareness, the findings indicate that 99.3 percent of the adopters by had prior information or were aware of improved bean variety. This is unlike their counterparts whereby the majority (63%)were not aware of improved bean seeds variety. This could be one of the reasons of not adopting. Awareness among adopters' households increased through extension services provided by Extension Officers and Input Suppliers. Both of these experts provided information on such matters as the existence of improved seed, how to acquire them and usage of the seeds depending on the planting season. The findings are in line with the trend of adoption as proposed by the diffusion of innovation theory (Rogers, 2003) assumptions that an individual should have a sufficient level of how-to-knowledge prior to the trial of innovation in order to increase the chance of innovation adoption. Thus, prior knowledge becomes more critical for relatively complex innovations. The findings are also consistent to those reported by Ekong (2003) revealing that awareness of improved agricultural technologies is the first stage in the adoption process since an individual or a group first learns about the existence of a technology.

4.1.2 Supply Sources of Improved Bean Variety Seeds

Sourcing of quality seeds was observed as pivotal by smallholder farmers since it was a major determinant of the yields. Results in Table 1 indicate that, smallholder farmers obtain improved bean variety seeds largely from Licensed Seed Shops in the district (60 counts) followed by Farmer Groups/Associations as the preferred outlet (54 counts). The two are the most trusted sources due to regulators' compliance requirements as well as regulators time-to-time inspections that bind farmers to selling Quality Declared Seed (QDS). In addition, some of the adopters obtained the seeds from other sources such as recycling seeds from previous seasons (17 counts), Friends and Neighbours (16) as well as Local Markets (10 counts).Findings suggest that, the adopters were mostly able to buy certified seeds from Licensed Seed Shops in the district and Farmer Groups/Associations because of the awareness initiatives carried out by Extension Officers, NGOs, and Seed Suppliers as observed earlier. Likewise, Rubyogo *et al.* (2015) report that commercial seeds are of higher quality, this is because of quality check and certification unlike the seeds preserved by smallholder farmers in their households. This implies that, improved seeds have high quality and resistance to diseases since they are certified and that can result to high yield in return. Similarly, Abebe *et al.,* (2013) observe that improved varieties have better yields and are more resistant to late blight, virus, and bacterial wilt.

Table 11: Sources of Improved Bean Variety Seeds*

Source of IMV	Counts	Rank
Seed shops at the District	60	1
Seed Outlet at the Village	09	6
Local Markets	10	5
Farmers Groups/Associations	54	2
Seeds from last Season	17	3
Friends and Neighbours	16	4

multiple response

4.1.3 Usage of Farm Implements and Fertiliser in Production

The use of proper farming implements is a key towards improved farming practices aiming at improving productivity. Among the used farm implements, findings in Table 2 show that out of the 147 adopters, 54 (36.7 %) were using Ox-drawn Ploughs, 31 (21.1 %) used Tractors, 2 (1.4 %) used Power Tiller while 60 (40.8 %) were using Hand Hoes. Unlike the adopters, among the non-adopters, 16 (84.2 %) were using Hand Hoe, whereas 2 (10.5 %) and 1 (5.3 %) were using Ox-drawn Ploughs and Tractors respectively. Though there were no significant figures regarding the usage of improved tools for farming, the findings indicate that adopters have changed from growing beans in '*Kibanja'* (mixed with Banana, Coffee and other Food Crops) to pure stand where they use Ox-drawn Ploughs to a larger extent as well as Tractors and Power Tillers to some extent. However, generally, the overall mean of hand hoe users was still high (62.5 %), indicating that improved bean variety production is still low due to traditional methods used by the majority of smallholder farming households. Also, the chi-square results ($\chi^2 = 12.790$; $p = 0.050$)indicates is a significant association between the use of the implements and the adoption of improved bean variety seeds. The use of Tractors, Power Tillers, and Ox-draw Ploughs by adopters had

influenced smallholders into adopting improved varieties since they spend short time to plough the farm and increase the acres ploughed compared to hand hoes.

Table 22: Implements used by Adopters and Non-adopters (n=166)

Implement Type	Adopters		Non-Adopters		Mean Score	χ^2	sig.
	Frequency	Percent	Frequency	Percent			
Tractor	31	21.1	01	5.3	13.2	12.790	0.050
Power Tiller	02	01.4	00	00	00.7		
Ox-drawn Plough	54	36.7	02	10.5	23.6		
Hand Hoe	60	40.8	16	84.2	62.5		

In addition, the use of fertilizer as one among the important inputs was cited as a determinant for high yields. The findings from survey (Table 3) revealed that, adopters use both organic (58.5 %) and inorganic (41.5 %) fertilizers in the bean production. Similarly, the results also show that 4 (21.1 %) of the non-adopters used organic manure whereas 15 (78.9) out of 19 non-adopters use

inorganic fertilizer. The use of inorganic fertilizer was reported to be applied in pure stand of bean field, whereas organic manure is mostly applied in 'Kibanja' around the homestead, this finding was also observed by Mukandala (2010). This implies that the organic fertilizer applied has the potentials of increasing in the output because it improves the fertility of the soil thus increasing bean yields. One of the key informants during an interview explained the differences of using organic fertilizer compared to inorganic that:

> *"…most of farm manure are not properly prepared and that make the required nutrients needed is low which makes the growth of bean plants as poor...but it is prepared such as covering them so as to maintain its nutrients could be as good as organic manure which is well prepared and tested to have all the necessary nutrients for plant growth, thus, highly potential to increase yield..." (District Agricultural Extension Officer, 24th April 2017 at Misenyi District).*

Similar findings have been reported by Mukandala (2010) that fertilizer does not only assist in increasing yields and promoting healthy growth of plants but it also assists in their development. The fertilisers contain Nitrogen that acts as a growth booster, which can be characterized by the green colour of plants. Phosphorous substance in fertilizers aids in the faster formation of seeds and roots development. Some of the key informants pointed out that the mostly used fertilizers by the smallholder farmers were DAP, TSP and CAN.

Table 3: Usage of Fertilizer among Adopters and Non-adopters (n=166)

Respondents	Organic Fertilizer		Inorganic Fertilizer		Mean	SD
	Frequency	Percent	Frequency	Percent		
Adopters	86	58.5	61	41.5	1.43	0.49
Non-adopters	04	21.1	15	78.9	1.21	0.41

4.2 Socio-economic Factors influencing the Adoption of Improved Bean Variety

The binary logistic regression model was used to estimate the influence of the socio-economic factors on the adoption of improved varieties among smallholder farmers in the bean value chain. The overall significance of the model was assessed using an Omnibus tests of model coefficients, which produced the Chi-square of 66.065 and p-value of 0.000 and Nagelkerke's $R^2$of 0.645 indicating a strong relationship between prediction and grouping. Among the tested variables, 5were found to have a significant influence on the adoption of improved varieties among smallholder farmers in bean value chain at $p<0.05$. The significant variables included sex, education, extension services availability, prior training, and membership to farmers 'association. The remaining variables that include experience in farming, farm size, government support, and household size were not significant towards influencing the adoption of improved seeds, thus, $p>0.05$ as presented in Table 4.

Sex of the head of the household significantly and positively influenced the adoption of improved bean varieties at $p = 0.042$ and Exp (B) = 3.848. Likewise, the model produced a Wald statistic of 2.925 that predict that sex contributes significantly towards influencing the adoption of improved seeds variety. Being male headed household increases the probability of the adoption of improved bean varieties by 4.848 causing the log odds of 1.399implying that male headed household were 1.399 more likely to have influenced adoption of improved varieties. As a result of socio-cultural set up, , men unlike women have an upper hand towards access to resources, decisions towards resources utilisation, and access to training opportunities. This is consistent with the findings reported by Ayalew (2011) who revealed that socio-cultural values and norms have made males have freedom of mobility and participation in different extension programs and consequently have made males have greater access to information about new products. The findings also compare with those of Hamzakaza *et al.*, (2014) who reported that men were the major decision makers in bean production as they make most of the decisions for land preparation, input use, crop management, and the use of harvest. Thus, male-headed households were more likely to adopt improved varieties.

Availability of extension of services was found as a good predictor of the adoption of improved bean varieties among smallholder farmers; and this was statistically significant at $p = 0.000$, Exp (B) = 0.051 with Wald statistic = 1.271 (as presented in Table 4). It was found that when extension of services increases by 0.051 causes an increase of the odds ratio by 2.984 times, implying that household heads who adopted improved varieties in bean value chain production are 2.980 more likely to have higher influence on the adoption of improved varieties than those who had no contact with extension of services. Thus, household heads who attended at least on extension services were highly influenced in adopting improved bean varieties due to information shared to them by Extension Officers. Through interview, a Village Agricultural Extension Officer pointed out, "...provision of extension services in the villages enabled most of the smallholder farmers to be aware of the improved bean seed varieties and how to grow them successfully..."

This suggests that the availability of extension services increased positively and significantly, the adoption of improved varieties in bean value chain among households of smallholder farmers. The results are consistent with the results in a study by Asfaw et al., (2012) and Mariano (2012) who reported that farmers who had access to extension services adopted improved farming technologies and had a higher productivity growth rate than those who had no access to extension

services. Similarly, Akinbode and Bamire (2015) reported that households that had regular contacts with extension agents were more enlightened through advisory services and therefore appreciated more the benefits of new technology. An increase in the frequency of contact with extension agents also increased the intensity of the use of improved varieties as found by Siri et al., (2016).

Table 4: Influence of Socio-economic Factors on adoption of Improved Bean Variety

Variables	B	S.E	Wald	df	Sig	Exp(B)
Sex	1.399	0.818	2.925	1	0.042*	4.848
Education	4.301	1.034	7.305	1	0.000*	3.756
Farming Experience	-0.227	0.268	0.722	1	0.407	0.797
Farm Size	-0.367	0.439	0.699	1	0.066	0.693
Extension Services Availability	2.984	2.647	1.271	1	0.000*	0.051
Farmers Association Membership	1.172	1.262	0.862	1	0.005*	0.310
Government Support	0.390	1.369	0.081	1	0.067	1.476
Household Size	-0.207	0.962	0.046	1	0.830	0.813
Constant	-2.233	3.475	0.413	1	0.000	0.107

Omnibus Tests (Chi-square = 66.065; sig. = 0.000); Log likelihood= 152.039[a]; Cox & Snell R Square = 0.328, Hosmer & Lemeshow Test (Chi-square= 16.492; sig. = 0.36); Nagelkerke R Square = 0.645

Education level among smallholder's farmers was another strong significant factor with some influence on the adoption of improved variety at p=0.000, Wald statistic =7.305 and Exp (B) =3.756. A Wald statistic of 7.305 demonstrates that education level significantly influenced the adoption of improved seed varieties while beta exponent value indicates the increase of education by one odd, meaning that household head heads with higher level of education are 3.756 more likely to adopt improved bean varieties. The positive significant influence implies that the higher the level of formal education the higher the probability of adopting improved seed varieties because smallholder farmer can comprehend and process information more rapidly unlike the less educated ones. Among the adopters,87 (59.2 %) had attended primary school while 59 (40.1 %) had attended secondary education. Hence, this gave them more ability to comprehend instructions through reading the best practices from training materials provided by Extension Officers. Similar results are reported by Tahirou *et al.,* (2015) that the more educated the households are the greater the tendency of adopting improved varieties. Likewise, Bruce *et al.,* (2014) found that formal education helps farmers to understand the information that in turn facilitates the adoption. Formal education gives smallholder farmers the ability to perceive, interpret, and respond to new information much faster as observed by Bekele and Meckonnen (2010) and Uaiene *et al.,*(2009).

Membership to farmer groups or associations was also an important influencing factor at p = 0.05, Exp (B) = 0.310 and Wald = 0.862. The findings show further that when farmers organization increases by 0.310 membership the odds ratio is 1.172, implying that households membership to farmers' organization is 1.172 more likely to have higher influence on the adoption of improved varieties than is the case with non-membership. Many smallholder farmers were members to farmers groups or associations such as Agriculture Marketing Co-operatives (AMCOS) and Saving and Credit Co-operative Societies (SACCOS). These significantly influenced the adoption of improved bean seed varieties since the groups/associations were the avenues for being acquainted with new ideas, improved seeds, farm inputs, pesticides, and most importantly accessing credit to support production.

The finding are consistent with those reported by Obasoro (2015) who found that about 58 percent of farmers belonged to a Co-operative, which availed the smallholder farmers with the opportunity of obtaining not only credit and agricultural inputs but also information on how to improve their farming activities. This implies that smallholder farmers belonging to farmer groups/associations had more access to information and resources that could help to improve productivity and yields as observed by Akinbode and Bamire (2015) who found that more than half (52.8%) of the respondents were members to farmers' association and their membership influenced the adoption decision among small holder farmers' households. During an interview a Village Agricultural Extension Officer pointed out the following,

> *"...belonging to a farmer association/group creates an avenue for smallholder farmers to be aware of improved agricultural technologies, to access subsidised and standard inputs, and to credit for procuring inputs such as fertilizers, improved seeds, herbicides, pesticides and payment for hired labour..."(Village Agricultural Extension Officer, 26th April 2017 at Misenyi District)*

5.0 CONCLUSION AND RECOMMENDATIONS

The adoption of improved bean seeds variety is influenced by a number of multiple socio-economic factors including sex, education level, availability of extension services and membership to farmers' associations or groups. Thus, for smallholder farmers to adopt improved bean variety a number of push factors (such as extension services, market assurance) were necessary. Therefore, it is concluded that the adoption of improved bean varieties is not impulsive since many efforts and initiatives had been made to smoothen the process. The socio-economic significant towards influencing households in adopting improved varieties since they combine both the push and pull factors. Hence, households should continue to capitalise on their strong socio-economic factors and find a mechanism of hedging the shortcomings collectively through sharing resources. Among the predictors, the provision of extension service sand education level were among the strong predictors. Hence, it is recommended that there is a need of continuing with the provision of basic and advanced trainings on the production of improved varieties. This can be done to both adopters and non-adopters respectively to enable small holder farmers acquire the necessary skills and knowledge. In addition, the dissemination of improved bean varieties should go hand-in-hand with strengthening of farmers' training sessions on common bean management practices by improving extension services and availability.

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7.0 EXTENT OF ADOPTION OF SELECTED INNOVATIONS AMONG SMALLHOLDER PADDY FARMERS IN MVOMERO DISTRICT, TANZANIA

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Abstract

Presently, different stakeholders play a key role in paddy production by introducing innovations to paddy farmers in Tanzania. However, the farmers tend to adopt innovations at different rates, which call for an establishment of the extent of the adoption of introduced innovations. This study was conducted in Mvomero District, Morogoro, Tanzania to determine the extent of adoption of innovations in paddy production. A cross-sectional research design was adopted and 299 respondents were sampled using simple random technique. Data were collected using questionnaire and in-depth interviews. Three Focus Group Discussions (FGDs) with 6 to 12 participants and Key Informant Interviews were conducted. Qualitative data were analysed using content analysis. The extent of adoption of innovations was analysed with fundamental statistics values, namely, frequencies and percentage. Study findings revealed that the adoption of systems of rice intensification (SRI) is concentrated into 3 to 7 practices and few respondents adopted 1 to 2 and 8 to 11 SRI practices. The adoption of Power Tillers (PTs), Wooden Threshers (WTs) and Combine Rice Mills (CRMs) were difficult accounted for 47, 5 and 18percent of all the respondents, respectively. It is complex for a smallholder paddy farmer to adopt full a package of an innovation in which its composition has several production principles. Extension Officers are advised to design context-specific extension programmes for easy adoption of paddy innovations to rural farmers.

Key words: SRI, adoption, innovation, paddy, smallholder farmer

1.0 Introduction

The adoption of paddy innovations is important to rural farmers. It is the decision of farmers to accept and make use of paddy innovation, which is perceived beneficial in achieving a sustainable increase in farm productivity leading to improved well-being of the respective farmers (Rogers, 2003). Adoption, in this case, occurs when there is a continued use of paddy innovations by farmers. Scholars define innovation as an idea, farming practice, and or a system that is perceived as new by individuals (Rogers, 1995; Leeuwis, 2004). In this paper, innovations refer to new paddy production practices, production tools, and threshing, and processing tools. The paddy innovations in this paper are System of Rice Intensification (SRI), Power Tillers (PTs), Wooden Thresher (WTs) and Combine Rice Mills (CRMs). These tools are considered innovations because they are new in paddy production and processing in the study area. Thus, this paper refers to adoption of SRI, PTs, WTs and CRMs in paddy production as the application of SRI techniques, the use of PTs in land preparation, threshing paddy using WTs and processing paddy using CRMs, respectively.

In this paper, SRI is defined as a set of paddy production practices which involve twelve practices namely; the selection of seeds using floating-sink method, raising of seedlings in nursery, transplanting seedlings of 8-15 days old, uprooting and transplanting within 15-30 minutes, keeping uprooted seedlings in moist conditions, and single transplanting. Other practices include transplanting at shallow depth, spacing at 25cm x 25cm, early and regular weeding, water control by alternate flooding and wetting, application of compost manure, and disuse of herbicides. PT, WT, and CRM are the single entity tools by themselves, which are used for land preparation, threshing, and processing of paddy respectively.

The application of innovations in paddy production and processing has many advantages to rural farmers. For example, several scholarly works indicate that the adoption of SRI by paddy growers increases yields per hectare usually by 50 to 200 percent or more; reduces water requirements by 25 to 50 percent, and reduces the cost of production by 8 to 20 percent (Islam *et al.,* 2014; Katambara *et al.,* 2013). Other benefits include minimal capital costs, which make SRI methods more accessible to poor farmers who do not need to borrow money; the rice plants under SRI have been noted to be more robust against extreme weather events, pests, and diseases due to plant vigour and strength (Gujja and Thiyagarajan, 2010; Dobermann, 2004). Also, the adoption of PT and WT is anticipated to save time, increase yields, profits, incomes and employment, expand the area under cultivation, and reduce workload and labour required in paddy production and threshing (Sims and Kienzle, 2016; Miah and Haque, 2015; Quayum and Ali, 2012). The Combine Rice Mills (CRMs) are the processing machines, which perform many operations that produce higher quality and yields of white rice from paddy (Nambi *et al.,* 2017). In other words, CRMs add value to the processed rice, which leads to fetching lucrative market and earning higher income among the respective farmers.

The government of Tanzania (GOT) has made efforts to introduce and promote paddy innovations among rural farmers including those in Mvomero District with the aim of improving production, productivity and farmers' wellbeing. Since 2005, the GOT introduced paddy innovations to farmers including rice varieties such as SARO 5 (TXD 306), IR05N 221 (named Komboka, be liberated) and IR03A 262 (named *Tai,* eagle), and good agronomic practices such as SRI, water-saving irrigation technologies. Others are rice planting techniques, integrated pest

management (IPM), tools and implements-reapers, PTs, threshers, combine harvesters, and processing machines (URT, 2009; URT, 2013). The SRI, PTs, WTs, and CRM innovations have been in use in the study area since 1999 (Katambara *et al.*, 2013). However, the practice shows that paddy farmers do not readily accept innovations immediately due to lack of awareness. Up to 2015, the Government of Tanzania (GOT), through Agricultural Sector Development Strategy (ASDP) Phases One and Two has been promoting better access and use of agricultural knowledge, technologies, and infrastructure to paddy farmers in 20 irrigation schemes including Mkindo and Dakawa. Similarly, extension agents have been advocating these innovations to ensure that smallholder paddy farmers take adoption in full. Despite the efforts made by the government and extension agents and the benefits of the adoption of paddy innovations, the level of adoption of paddy innovations introduced in Mvomero District is not yet established. Therefore, this study assessed the adoption of four selected paddy innovations among farmers. Specifically, it determined the extent of adoption of the selected innovations. The study findings will contribute to the body of knowledge on the extent of adoption of SRI, PTs, WTs, and CRMs in the study area. In addition, the findings of this study will inform policy makers and paddy production stakeholders on the readiness of farmers to adopt paddy innovations.

This study adopts a sociological model of adoption of innovation. The model considers adoption as a learning process and that every person goes through mental steps during that learning process about innovation (Semgalawe *et al.*, 1998; Rogers and Shoemaker, 1971). The process involves four stages, awareness, evaluation, trial, and adoption. In awareness stage, a farmer learns about the new idea, evaluation stage involves comparison of the expected benefits of the innovation with his/her conventional ones, while in the trial stage a farmer decides to try an innovation in a small plot/quantity of paddy and then use it on a larger plot/ quantity of paddy. The adoption stage involves complete application (confirmation) or otherwise discards the innovation. In this study, adoption implies a process in which a farmer continues using an innovation. One of the limitations of this theory is that, it does not take into account an individual's resources or social support to adopt a new behaviour (or innovation). This study addresses this limitation by establishing the extent of adoption of SRI, PTs, WT, and CRMs thereby calling for the intervention from different paddy production stakeholders to support farmers to adopt such innovations through various initiatives such as training and other relevant interventions.

2.0 Methodology

Research Design

Cross-sectional research design was adopted whereby data were collected once in time at the study area. Data collection exercise was conducted in June 2016 during when most of the farmers were transplanting seedlings.

Study Area

The study was conducted in Mvomero District in Morogoro Region and two paddy irrigation schemes namely Mkindo and Dakawa were selected (figure 1). These schemes are the only smallholder irrigation schemes where the selected innovations were introduced. The district was chosen because this is where the two irrigation schemes are located.

Sample and Sampling Design

This study involved paddy farmers from two schemes who were selected using simple random technique in different points and corners of the schemes. A sample size of 299 paddy farmers was estimated by Yamane's formula (Yamane, 1973). Proportionate sampling technique was used to obtain 96 and 203 respondents from Mkindo and Dakawa respectively.

Data Collection Methods

The study involved a mixed-methods approach, which facilitated the deployment of both qualitative and quantitative methods in data collection. Primary data were gathered using a questionnaire and in-depth key informants' interviews (KIIs). Three Focus Group Discussions (FGDs) with 6 to 12 participants were conducted using FGD guide; and three KIIs were conducted using a checklist. Key informants (KIs) were obtained using heterogeneous purposive sampling since KI one was the Principal of Mkindo Farmers Training Centre while KI two was a Combine Rice Mill operator and KI three was a researcher in Cholima research station.

Data Analysis

Qualitative data were analyzed through content analysis, whereby pieces of information from the KIIs were condensed, coded, and organized into different themes and compared based on the study objectives. The extent of the adoption of innovations was analyzed with fundamental statistics values, mainly, frequencies, and the percentages for adopters and non-adopters. This approach was also used by other scholars such as Oman *et al*. (2010), Mackrell *et al*. (2009), Miller *et al*. (2008). In this study, the extent of adoption of PTs, WTs, and CRMs was presented in frequencies and percentages of farmers who adopted, while for SRI the extent of adoption depicted the number of practices applied by farmers whereby there were non-adopters who did not adopt any practice to full adopters who applied all 12 SRI practices.

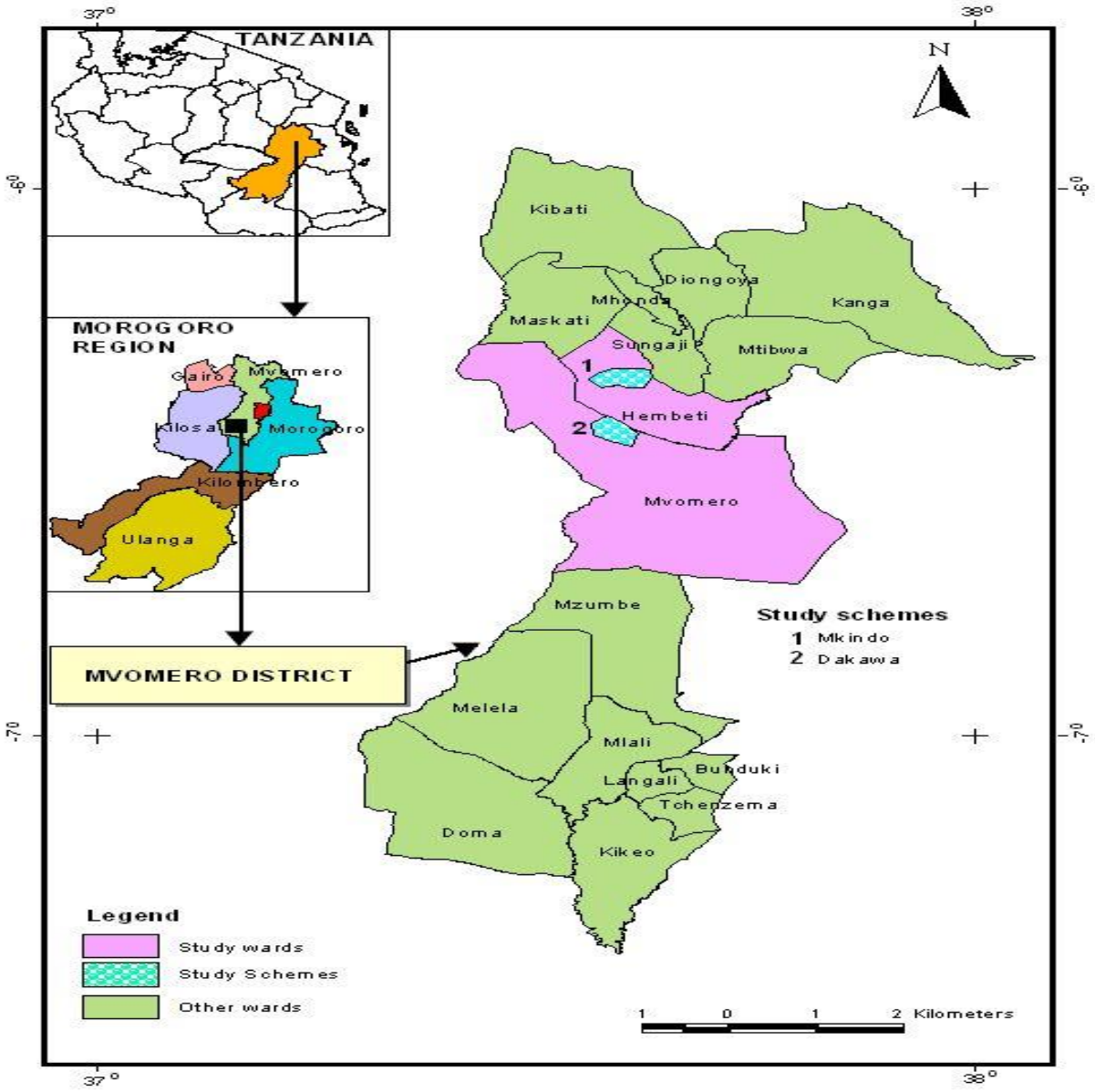

Fig. 1: Map showing the study area

3.0 Results and Discussion

3.1 Extent of Adoption of SRI

Taking into account that System of Rice Intensification (SRI) is composed of twelve practices, this study presents and discusses the extent of adoption in terms of the number of practices adopted by farmers. The findings on the extent of adoption of SRI indicated that 10 percent of famers did not adopt any practice, 4percent adopted one practice e 6percent adopted two practices 15.4percent, adopted three practices 15.1percent, four practices 13.1 percent, five practices and 11percent six practices. other results indicate that 10.4 percent adopted seven practices, 3.7 percent eight practices 2 percent nine practices; 3.7 percent ten practices, 1.3percent eleven and the respondents who adopted twelve practices (full adoption) were 3.7% (Table 1).

Table 1: Extent of adoption of SRI

Adoption status of SRI (practices)	Frequency	%
00 practice (Non-adoption of SRI)	30	10.0
1 practice	12	4.0
2 Practices	18	6.0
3 Practices	46	15.4
4 Practices	45	15.1
5 Practices	41	13.7
6 Practices	33	11.0
7 Practices	31	10.4
8 Practices	11	3.7
9 Practices	6	2.0
10 Practices	11	3.7
11 Practices	4	1.3
12 Practices (full adoption of SRI)	11	3.7
Total	299	100.0

The findings show that 10 percent of all the respondents did not adopt any of 12 SRI practices (Table 1). This means that 90percent of all the respondents adopted SRI practices ranging from one practice to a varying combination of two to twelve SRI practices. However, the results indicate that the distribution of the adoption of SRI is concentrated around 3 to 7 practices, with a limited percentage of respondents adopting 1 to 2 and 8 to 12 SRI practices. This implies that when a package of paddy innovation is blended with several practices, there is a possibility that some practices are more complex to understand than others thereby making them difficult for farmers to follow all of them at once. This eventually slows the rate of adoption.

3.2 Extent of Adoption of PT, WT and CRM

The extent of adoption of the three innovations differs from one another based on the percentage of farmers who adopted each innovation.

3.2.1 Extent of Adoption of Power Tillers (PTs)

The finding demonstrates that PTs were the frequently adopted innovation compared to WTs and CRMs accounting for 47percent of the farmers (Table 2). It is clear from the findings that more than half of all the respondents did not adopt this innovations. This implies that the PTs were difficult to be adopted in the study area. A similar observation is reported by Ngegba (2016) in rice farming community from six different villages of Northern Sierra Leone. The study found that less than 15percent of the farmers had adopted power tillers because of difficulties in operating the said innovation.

Table 2: Extent of adoption of Power tillers, Wooden threshers and Combine Rice Mills (n=299)

Innovation	Adopters		Non-adopters	
	Frequency	%	Frequency	%
Power tillers	140	46.8	159	53.2
Wooden threshers	16	5.4	283	94.6
Combine Rice Mills	53	17.7	246	82.3

In addition, information from Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) supports the conclusion that low rate adoption of PTs was its difficultness to operate by farmers. For instance, a KI from Chollima Agro-Scientific research centre argues that:

> *"...power tillers are environmental-specific innovations whose operations are difficult in Dakawa Irrigation Scheme because of heavy soil whose texture is clay in nature. Furthermore, majority of farmers possess large plots" (KII three, 24th May 2016).*

This quotation suggests that power tillers work best on sandy soil and work efficiently in small farms compared to large farms. Heavy soil retards PT's speed and the PTs work longer than expected on large farms, thus, influence farmers' decision on adoption.

3.2.2 Extent of Adoption of Woden Threshers (WTs)

According to the findings, only 5.4 percent of all the respondents adopted WTs (Table 2). The findings show that more than half of all the respondents did not adopt WTs. This implies that WTs are difficult to adopt in the study area. Similarly, a study conducted in Northern Sierra Leone by Ngegba (2016) found that less than 15percent of the farmers adopted paddy threshers and the majority did not adopt due to complications in operating them.

In addition, operation costs is another aspect that militates against the adoption of WTs. The results obtained from KIIs indicate that it was difficult to adopt WTs in the study area due to high costs involved, as key informant says,

> *"...it is costly to operate WT in the field because it requires purchasing big canvas and timbers plus transporting these to and from the field during threshing period" (KII one, 19th March 2016).*

This result implies that high costs attached to the adoption of innovation can act as a constraint against farmers' application of such an innovation, since adds to the costs of operation and the reduction of profit to be realized.

3.2.3 Extent of Adoption of CRMs

The findings indicate that 17.7percent of all the respondents adopted CRMs (Table 2). In other words, the majority of paddy farmers did not adopt CRMs. This implies that majority of farmers do not process their paddy using CRMs. The processing of paddy using this innovation requires paddy to be dried well enough to reduce breakage of milled kernels; in contrast, majority of rural farmers dry their paddy locally. Therefore, the local paddy drying system sustains high breakage during milling thereby producing little whole white rice kernels.

In addition, qualitative information shows that the processing of paddy using CRMs requires a large quantity of paddy at one time. One Key informant (KI), this to say about the adoption of CRM:

> *"...small-holder paddy farmers prefer convention mills than CRM because processing paddy with CRM requires large quantity in order to operate the machine" (KII two, 22nd March, 2016).*

The costs involved in the adoption of an innovation, which in turn add to operation costs, minimise profit a farmer anticipates to realize from paddy production.

4.0 Conclusions and Recommendations

4.1 Conclusions

The combination of many practices for System of Rice Intensification (SRI), made it difficult for rural farmers to apply all practices concurrently. This is why the adoption pattern was concentrated into 3 to 7 SRI practices with limited adoption in a combination of 8 to 11 SRI practices. The adoption of PT, WT, and CRM was difficult in the study area because the innovations were inappropriate to farmers' situation.

Recommendations

- It is advised that Extension Officers have to educate and train farmers to understand clearly and eventually practice the innovations whenever introduced in a rural setting.
- Active participation of paddy farmers in agricultural empowerment interventions is needed because their willingness is important in the adoption of innovations.
- Extension Officers and agricultural interventionists should design farm-level innovations that reflect the paddy production and processing attributes of the potential recipients in the rural farmers' communities.

Area for Further Research

This study found that each innovation had different extent of adoption. Therefore, it is suggested that further research should be conducted to assess the level of awareness of the farmers on each innovation. This is because ignorance on the innovations by paddy farmers may worsen the collection of quality information.

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