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Effects of Small-Scale Agricultural Crop Commercialisation on Rural Household Welfare in Tanzania: A Case Study of Liwale District, Lindi Region

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Abstract: This study aimed at examining the effect of crop commercialisation on rural households' poverty in Tanzania. The household survey data was collected from a sample of 389 rural households. Commercialisation index was used to estimate the level of household crop commercialisation. The principal component analysis was used to develop a household welfare index which was then clustered to identify poor and non-poor households through cluster analysis, the method automatically guided the decision retaining two clusters by calculating the measure-of-fit that is Bayesian Information Criterion (BIC). To examine the factors affecting the household poverty status, a logistic model was employed. Results revealed that the majority (65.6%) of the households are poor. The level of crop commercialisation is averaged to 66% indicating a commercialised farming practice. The results further showed that crop commercialisation, women participation in crop income allocation, off-farm income, access to extension services and household size significantly reduce household poverty while household head's age had an adverse effect. The study suggests that the small and medium agricultural processing units in rural areas should be given priorities and strengthened since they are crucial to promoting the level of commercialisation among rural households. Furthermore, in periods of sufficient and excess harvest, the crops trade restrictions with the neighbour countries should be eliminated to increase the level of commercialisation and earnings to the local rural farmers.

Keywords: Agriculture, Commercialisation, Rural, Welfare

1. Introduction

Approximately half of the total world's population maintain their life in rural areas, that is 3.3 billion as compared to 3.9 billion in Urban areas in 2014 [1]. Among these rural dwellers, roughly 75%, earn their living from agriculture. Agriculture sector employs both the educated and non-educated, both sexes and population of all working age [2]. The sector is notable in alleviating poverty among the poor population [4]. In Africa, agriculture sector contributes to 33% of the gross domestic product (GDP) and 75% of employment in sub-Saharan Africa [3].

In Tanzania, the agriculture sector accounts for 24% of the country's gross domestic product [4]. It further accounts for more than half of the employed workforce, and therefore, provides a means of livelihood to approximately two-thirds of the population [5]. Despite the huge contribution of agriculture sector to Tanzania economy, it does not suffice to eliminate poverty among Tanzanians in rural areas and the main reason is that they lack agriculture processing units and manufacturing plants which could have added value to the raw farm output [4]

The pattern and growth of the economy are influenced by the transformation of the agriculture sector through value addition of primary products which influence investment in the industrial sector. The fifth phase government, through

National Five Years Development Plan 2016/17 – 2020/21 came up with a theme stating "Nurturing Industrialisation for Economic Transformation and Human Development" with the main objective of enhancing the pace of progress towards the Tanzania Development Vision 2025. It insists "The Tanzania of industrialisation", and therefore, prioritized some agricultural products as an intervention in fostering economic growth and industrial development, these crop products are maize, rice, sunflower, pulses, floriculture, cotton, sisal, grape, and sesame [6].

This necessitates the promotion of commercialisation of the mentioned crops to hit the target. In an attempt to promote crop commercialisation and improve the well-being of people in rural areas through crop production, Tanzania has enacted a number of policies supporting commercialisation, the current is the National Agricultural Policy of 2013. Among the policy issues under this policy document is value addition, improving marketing infrastructure, and to work on the quality and standard of the produce [7].

Just like other African countries, agricultural sector in rural parts of Tanzania is female-intensive. Farmers to non-farmers ratio is higher among women than men.

The female farmers are about 98% of all rural women [8]. Despite the high involvement of women in the agricultural production process, they have limited bargaining power in intra-household resource allocation and thus have less chance to provide their ideas regarding the use of the crop income which ultimately directly or indirectly affect the household welfare [9].

The levels of basic needs poverty and income inequality in the country differ from rural to urban areas. There has been a general improvement from the year 2007 where 34.4% households were poor to the year 2012 where the percentage dropped to 28.2%, however, this improvement was much observed in urban areas leaving behind rural households with a worse situation. The biggest city, Dar es Salaam, is substantially better off than the rest of the country while rural households are much poorer than those in urban areas. Around 1.5% of the poor population live in Dar es Salaam, 14.4% live in other urban areas and more than three quarters, that is, 84.1% live in rural areas [10]. The general trend of the poverty level in Tanzania mainland decreases throughout the periods from 39% in 2001 to 28.2% in 2012.

There exist a link between crop commercialisation and the rural household's welfare. A household producing crops for commercial purposes finds it important to seek for a way out to expand the production by raising more capital to purchase agricultural inputs through credits [11]. Increased quantity and quality of agricultural output raise the income of households participating in crop commercialisation which increases household income and the welfare of an individual household. Commercialisation may also increase employment, especially when labor demanding high-value commodities are targeted [12].

There have been efforts to develop agricultural production and enhancement of crop commercialisation towards achieving increased household welfare and food security in Tanzania [7]. Empirical evidence from other African countries indicates that commercialisation of smallholder farms has the potential to enhance incomes and welfare outcomes and take smallholder farmers out of poverty. However, in some rural areas, the empirical studies indicate the insignificant effect of crop commercialisation on household poverty and thus recommend other measures to tackle poverty instead of crop commercialisation [13]. In Tanzania, so far the literature on commercialisation of smallholders makes a little study on its impact on household's welfare in rural areas. The study by Eskola [14] used the household budget survey of 2000/01 to determine the effect of commercialisation on poverty at a household level. However, commercialisation was measured using the connectedness to market economy and welfare from the consumption side, the results showed the negative association between commercialization and household welfare.

Commercialisation might affect negatively welfare of the rural households by affecting the status of food security. In rural developing countries, farm households rarely rely on food markets for their subsistence requirements instead they cultivate their own food crops [15] and it is clear that cash and food crop productions compete for farm household resources. The competition is high when the production seasons for the two crops are the same and when it heavily depends on the natural rains, the situation which is the common practice in most of the rural areas in Tanzania [16]. Therefore, commercialisation is done at the expense of food security.

On top of that, Liwale is among the districts with villages practicing agriculture, they cultivate both food and commercial crops. However, the economic profile of the district indicates that the majority of people from the rural parts of the district are poor [17]. Therefore, this study aims at determining the effect of crop commercialisation on rural household welfare in Liwale. The study will add knowledge in different perspective, one is that the commercialisation has been formulated from the output side unlike Eskola [14] who used the connectedness to the market as a measure of commercialisation, and also the welfare has been measured using the welfare index which is a combination of asset ownership and sanitation unlike Mitiku [13] who used the income approach to measure the level of household welfare. Asset-based wealth better reflects long-term welfare as it is less volatile than both income and consumption [18].

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted in Liwale, which is one of the six districts of Lindi region in Tanzania. The district was selected due to its potentiality in crop production (commercial and non-commercial crops) most of which are in the prioritized crops by the government for promoting industrial development. The main two cash crops in Liwale are Sesame

and Cashew nuts. Other crops include maize, millet, paddy, cowpeas, cassava, sweet potatoes, and groundnuts. According to 2012 Census, about 91% of the labour force was employed in the agriculture sector and approximately 78% of total private households living in rural parts of the district [19].

2.2. Data Collection, Sample Size, and Sampling Technique

Primary data were collected from the field in 2017 using structured questionnaire among household heads who are small-scale farmers. Sampling followed

$$n = \frac{N}{1 + N(e)^2} \quad [1] \qquad (1)$$

Where 'n' is the sample size, 'N' is the total number of households in the district and 'e'is the sampling error (level of precision) which was 5% for this study. By using the formula in equation 1, a total of 389 rural households were sampled from 10 villages to represent 11,564 households in the entire rural areas of the district. In sampling technique, the multistage sampling technique was employed whereby at first stage Liwale District was purposely selected among Lindi region districts. At the second stage, the population was set into strata of zones by types of crop cultivated from which 10 villages were purposefully selected for the study, and lastly, the households were randomly selected for interview from the villages. The villages which were purposefully selected for study according to their type of crop produced were Mangirikiti, Mirui, Liwale 'B', Naluleo, Naujombo, Kinguluwila, Kimbemba, Mikunya, Kipule, and Kipelele. In these villages, nine crops were being produced; these include sesame, cashew nut, maize, paddy, millet, cowpeas, cassava, sweet potatoes, and groundnuts.

2.3. Tools for Analysis and Presentation

Statistical Package for Social Sciences (SPSS) was used for data entry and data management while data analysis and estimations were done using both STATA and R software. In addition, data and output have been presented in a narrative, tabular and in a graphical form of presentations to ease the reading and understanding of the subject matter.

2.4. Measuring Household Welfare

The principal component analysis (PCA) was used to estimate the welfare index. The PCA is used to assign different weights to different types of assets whereby the factor loadings from the components are used to form the 'weights' for individual assets [21, 22]. The study used eight physical assets (machete, hand-hoe, bicycle, motorcycle, radio, mobile phone, television, and solar system), goats/sheep, clean and safe water accessibility, sanitation, and housing facility in the analysis and estimating welfare index. Mathematically, for n numbers of variables, the k^{th} principal component is expressed as follows;

$$PC_k = \sum_{i=1}^{n} w_{ki} x_i \qquad (2)$$

PCk is the kth principal component, wki is the weight assigned to the variable Xi, and, Xi are variables used to calculate principal components. In PCA, the first principal component (PC1) accounts for as much of the variability in the data as possible, that is to say, PC1 has the highest eigenvalue and accounts for the highest percentage of variance. The second component (PC2) explains additional but less variation than PC1 and each succeeding component account for as much of the remaining variability as possible [21].

The number of components developed becomes as many as the number of variables used in the analysis. Since PCA is a variable reduction technique, few principal components were thus selected for welfare index estimation using the Kaiser criterion and the scree plot [22]. Therefore, the 'n' maintained principal components were considered in measuring household welfare index. These 'n' maintained components were given different weights according to their magnitude of a percent to which they account for the variation in the dataset. The formula given in equation 3 was thus used to estimate a Non-standardized Index of welfare (NSI_HWI). The ratio of variance explained by factor i to the total variance is the weight given to the respective factor i in forming the index.

$$NSI\_HWI = \sum_{i=1}^{n} \frac{V_i}{TV} * PC_i \qquad (3)$$

NSI_HWI is non-standardized household welfare index, n is the number of factors maintained, V_i is the percent of variation explained by factor i, TV is the total variation in the data explained by 'n' retained factors and PC_i is the ith factor. With equation 3, we get the non-standardized welfare index with positive and negative values. This index was thus standardized using equation 4 to obtain values ranging from 0 to 100.

$$HWI = \frac{NS\_HWI + (-)\min NS\_HWI}{\max NS\_HWI + (-)\min NS\_HWI} * 100 \qquad (4)$$

A similar procedure was adopted in previous studies [21] and [23] where the scores were later reversed to make the interpretation easier; the higher the value, the better the economic status of an individual household [24].

After running PCA, the Sampling Adequacy and Bartlett's Sphericity Test were tested. The sampling adequacy was tested using the Kaiser-Meyer-Olkin (KMO) statistic which shows the relevance and adequacy of the variables used in PCA. The conclusion was thus made on the basis of the value of KMO which is acceptable only if it is greater than 0.5. However, the adequate KMO should exceed 0.7 [22]. Also, the correlation matrix of the variables was tested using

1 The method was formulated by Yamane (1967:886). It provides the sample size with a 95 percent confidence level

Bartlett's test of sphericity with the null hypothesis that the correlation matrix is a diagonal matrix (that is, all non-diagonal elements are zero) in the sample. A small p-value (less than 0.05) favors the rejection of the hypothesis and proves the appropriateness of the use of PCA while larger p-value indicates that correlation is almost zero in other elements than diagonal with the meaning that PCA is inappropriate.

2.5. Household Cluster Determination

The constructed household welfare index (HWI) is a continuous variable ranging from 0 to 100, therefore, the homogeneous groups of cases, which are distinct were thus obtained using the cluster analysis [21]. The objective of cluster analysis is to identify the number of clusters and to assign observations to the specific groups (clusters) they belong based on the Bayesian Information Criterion (BIC).

2.6. Measuring Crop Commercialisation

As suggested by Strasberg et al. [11] crop commercialisation is measured by crop commercialisation index. From the output side, it is the ratio of the gross value of all crop sales over the gross value of all crop production multiplied by a hundred.

2.7. Econometric Analysis

The logistic model was used for econometric analysis. The dependent variable is binary response measuring a Household Poverty Status (HPS) with a value of 1 if the household is poor and 0 for the non-poor household. The main idea behind that model is to find the relationship between the probability (Pi) that dependent variable (HPS) takes a 1 value and the characteristics of considered individuals. Let the underlying response variable y_i^* be defined by the relationship;

$$y_i^* = \mathrm{Ln}\left[\frac{P_i}{(1-P_i)}\right] = \alpha_0 + \sum_{j=1}^{k}\alpha_j x_{ij} \quad (5)$$

In equation 5 y_i^* is not observable, as it is a latent variable. What is observable is an event represented by a dummy variable y defined by

$$y_i = \begin{cases} 1 & \textit{if the household is poor} \\ 0 & \textit{otherwise} \end{cases} \quad (6)$$

Whereby k is the number of variables in the model, y_i is the household poverty status, α_0 is the intercept, L_i is the log of odds ratio, P_i is the probability that a household is poor, 1-P_i is the probability that a household is not poor, x is the set of explanatory variables which determine household poverty status with the inclusion of crop commercialisation and α_j is the set of coefficients of explanatory variables.

3. Results

3.1. Descriptive Statistics

Table 1 presents the demographic and socioeconomic characteristics of the 389 sampled households. The survey findings show that 74% of the interviewed household heads were males while 26% were females. In most cases in African communities female becomes a household head in absence of a male capable of being the head, most of them are either divorced, separated or widow. The study further reveals that the estimated mean age of household head is 42 years. This information indicates that Liwale is characterized by young energetic and economically active group of people who can perform well the farming activities. Furthermore, the results show that the majority (80%) of the respondents attained a primary education and the level of illiterate in the household head stood at 7.5%. The level of secondary holders and above secondary are 11% and 1.5% percent respectively. Farmers normally have a rich knowledge of local conditions and valuable practical knowledge or experience of how best to successfully exploit their environment, however, they still require innovation information generated from research and development to boost their productivity.

Table 1. *Household Descriptive variables and their mean.*

Variables	Mean	SD
Household poverty status (1 = poor)	0.66	-
Household commercialisation index	66.27	36.18
Age of household head	41.65	13.87
Household size (Numbers)	4.29	2.11
Distance from the nearby market (km)	1.60	2.19
Size of the farm cultivated (ha)	5.93	4.92
Number of crops cultivated	2.27	0.96
Household gender (1 = male)	0.74	-
Women participation in income allocation (1=yes)	0.53	-
Access to credit (1 = yes)	0.105	-
Off-farm income (1 = yes)	0.09	-
Access to extension service (1 = yes)	0.13	-
Education level		
Primary (1 = yes)	0.80	-
Secondary (1 = yes)	0.11	-
Post-Secondary (1 = yes)	0.015	-

Note: Significance level: ***(p ≤0.01); **(p ≤ 0.05)
Source: Survey Results, 2017

3.2. Application of Principal Component Analysis

The analysis of PCA maintained five factors on the basis of the Kaiser Criterion and scree plot. The maintained factors account for the variance in the dataset for 61.29%. The sampling adequacy and Bartlett's sphericity test was run and the result is that KMO was 0.7334 which is acceptable [21] and the p-value for Bartlett's sphericity test was 0.000 which suggest the existence of a correlation between the variables in use and thus validates an application of PCA in the construction of welfare index.

For every component maintained, there is at least one variable which it accounts for. The results of the PCA show

that the first component (PC_1) accounted for 17.02% of the total variation. This component is a reasonable representation of an information system. It means that well-informed households are associated with radio, mobile phones, television and solar system which is supportive to informative devices as shown in Table 2 where these variables have higher factor loadings along the first component.

Table 2. *Results of Principal Component Analysis (PCA): Varimax rotation factor matrix.*

Variable	PC_1	PC_2	PC_3	PC_4	PC_5
Panga			0.8289		
Hand hoe			0.8839		
Bicycle			0.4829		
Motorcycle				0.5371	
Radio	0.6813				
Mobile phone	0.6642				
Television	0.7381				
Small stock				0.8204	
Solar system	0.773				
Toilet facility				0.4699	
house wall		0.7984			
house floor		0.7117			
house roof		0.6829			
Water source					-0.8517
Health Security					0.4632
Percent of variance (61.29%)	17.02%	14.28%	12.10%	9.63%	8.25%

Source: Survey results, 2017

The second component (PC_2) explains about 14.28% of the total variation. It is highly associated with the quality of the house wall, house floor, and house roof. We may, therefore, interpret it as a representative of the household housing system. The third component (PC_3) accounted for 12.1% of the total variation. It explains the variation in a panga, hand hoe, and bicycle. This component captures farming equipment including the means of transportation of crops from farm to home and to the market. Component four (PC_4) accounted for 9.63% of the variance and accounts for the variation in motorcycle, small stock and toilet facility and the last component maintained is component five (PC_5) which accounts for 8.25% of the total variation and explains the variance in water source and health security which altogether measures the health status and sanitation of the household.

3.3. Constructing Household Welfare Index

The five retained factors explain 61.29% of the total variation, with the first, second, third, fourth, and fifth factors, explaining 17.02%, 14.28%, 12.1%, 9.63%, and 8.25% respectively. Since the mentioned factors explain the variance in different levels of magnitudes, their importance in measuring overall household welfare condition is not the same. Applying formulae given in equation 3, a Non-standardized Index was developed using the proportion of these percentages as weights on the factor score coefficient as follows;

$$NS\_HWI = \frac{17.02}{61.29} PC_1 + \frac{14.28}{61.29} PC_2 + \frac{12.1}{61.29} PC_3 + \frac{9.63}{61.29} PC_4 + \frac{8.25}{61.29} PC_5 \quad (7)$$

Equation 7 gives the results of a non-standardized household welfare index (NS_HWI) which contains both negative and positive values ranging from -0.789484 (minimum value) to 1.747654 (maximum value). To standardize the index, the opposite sign of the minimum value was added throughout the non-standardized welfare index making the new minimum and maximum values read 0 and 2.537138 respectively, the values are then divided by the new maximum value and multiplied by hundred to get percentages as household welfare index ranging from 0 to 100, see Equation 8 which was developed from equation 4 as used by Hoque [21] and Krishnan [23].

$$HWI = \frac{NS\_HWI + (-)(-0.7894841)}{1.747654 + (-)(-0.7894841)} * 100 \quad (8)$$

3.4. Household Welfare Status Determination

The welfare index is a continuous variable, thus the cluster analysis was employed to identify the number of clusters to which a household belong. The method automatically guided the decision of how many clusters to retain by calculating measures-of-fit that is the Bayesian Information Criterion (BIC) [21] in which the existence of two clusters was detected.

Cluster one has the mean welfare index of 20.8 while cluster two has an average index of 44.2. The higher value of welfare index indicating a better economic status, therefore, households in the first cluster were categorized as 'poor' households and those in the second cluster as 'non-poor'. The clustering table shows that cluster one has a total of 255 (65.6%) households while cluster two has 134 (34.4%) households, this implies that the majority of households in Liwale villages are poor.

3.5. The Level of Household Crop Commercialisation

A total of nine crops cultivated in Liwale District were taken into the study and used to compute the household crop commercialisation index (HCI); these crops include sesame, maize, cassava, groundnuts, cowpeas, cashew nuts, rice,

millet, and sweet potatoes. The household crop commercialisation index for every household was constructed, and the commercialisation level for every crop was also computed. Generally, data depicts that the district crop production is commercialized with an average of 66.27 percent. Figure 1 shows the average level of commercialisation of each crop under sample study in the district. The top three crops with a high level of commercialisation are cashew nuts, sesame, and rice. Cashew nuts and sesame are purely cash crops and thus their indices are almost 100 percent, rice is commercialized at 57.6 percent.

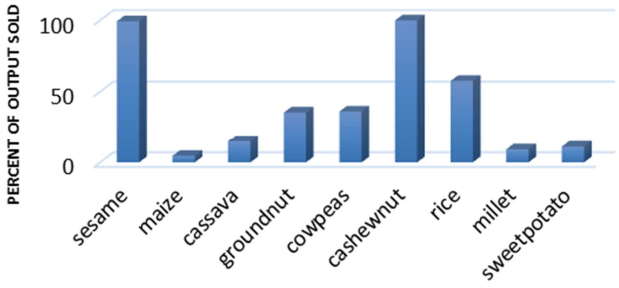

Figure 1. *Average commercialisation index for each crop produced.*

Three levels of crop commercialisation were formed and the households were categorized in accordance with these commercialisation levels. The first household category is the group of subsistence households with commercialisation less than 20 percent. The second is the semi-commercialised households, the households who are under transition from subsistence to commercialized farming. These are those with the level of commercialisation lying between 20 and 50 percent. The last group is the commercialized households, households with commercialisation index above 50 percent.

The majority (73.52%) of the households are commercialized, followed by household who perform subsistence agriculture (20.05%) and lastly those under transition who perform semi-commercialized crop cultivation (6.43%). In the District, after maize, pure commercial crops which are cashew nuts and sesame are highly produced. This leads to higher level of commercialisation among farmers. Cashew nuts which are among the pure commercial crops are permanent plantations. Those households who already own cashew nuts plantations rarely drop the production, thus remain in cashew nuts commercial farming, also those households with no cashew nuts plantations also rarely start new plantations, instead, a shift of ownership by selling and buying the already existing farms takes place. Thus the subsistence and commercialized farming households do not vary much with time and that is the reason for having a very low portion of households under transition.

Despite the same nature of distribution among the three levels of commercialisation for both gender of the household heads, the participation of females in the subsistence farming is higher than that of males. Results show that 26% of females against 18% of males engage in subsistence crop production. In rural areas, males are more equipped, educated and have time to do other generating income activities, unlike females who in most cases take care of the family as their primary duty [8]. This might be one of the reasons for most males to diversify and engage in commercialisation as compared to females who are based on subsistence farming.

3.6. Results of Econometric Analysis

This part of econometric analysis consists of the logistic estimation of the household welfare and several diagnostic tests of the model. The dependent variable (poverty status) is a binary response hence the logistic model was suitable for the estimation of the household poverty status. The model was tested for specification error, the goodness of fit and the multicollinearity of independent variables.

Results show that there was no serious problem of multicollinearity, the variance inflation factor (VIF) of all independent variables are below 2 which is less than the tolerable value of 4 and the mean VIF is 1.19. The results of the link test revealed the absence of specification error, that is, the linear predicted value was significant with a p-value of 0.000 and the predicted value squared was not significant with a p-value of 0.893. Lastly, the test for the fitness of the model shows that the model is fit as the Hosmer-Lemeshow (HL) p-value is 0.3447 which suggests that the model is fit.

The logistic regression results are presented in Table 3. A total of eleven variables influencing the household poverty status were included in the model. Out of them, six variables were found to be statistically significant. These include women participation in household income allocation, access to extension services, off-farm income, household commercialisation index and household size which are significant with a negative effect on poverty status and access to credit and age of household head which are significant with a positive effect on household poverty.

Table 3. *Logit estimation results for factors affecting rural household poverty status.*

Poverty status (1=poor, 0=non poor)	Odds Ratio	(Std. Err)
Constant	15.659***	(14.40597)
Household sex: 1=male, 0=female	0.9362	(0.28104)
Education: 2=primary	1.3314	(0.70778)
3=secondary	2.512	(1.72042)
4=after secondary	1.4446	(1.67678)
Women participation in income allocation	0.3026***	(0.08440)
Credit access	1.2159	(0.53643)
Access to extension services	0.2747***	(0.10443)
Off-farm income	0.2483 ***	(0.10868)
Household commercialisation index	0.983***	(0.00481)
Household age	1.027**	(0.01184)
Household size	0.759***	(0.05102)
Distance from the nearby crop market	1.0042	(0.05883)
Number of crops cultivated	0. 9569	(0.14332)
Number of Observations	388	
LR chi2 (13)	108.91	
Prob> Chi2	0.000	
Pseudo R2	0.2177	
Log-likelihood	-195.62	

Note: Significance level: ***(p ≤0.01); **(p ≤ 0.05)

Crop commercialisation is found to be significant (p ≤

0.01), holding other factors constant the odds ratio in favour of being poor decreases by a factor of 0.983 when household commercialisation index increases by a unit. Also, women participation in crop income allocation reduces poverty ($p \leq 0.01$), with no change of other factors, the odds in favour of being poor decreases by a factor of 0.3026 for a household in which wives participate in the allocation of crop income than those in which wives do not participate. Access to extension service significantly reduces poverty ($p \leq 0.01$), with other factors constant, the odds in favour of being poor decreases by a factor of 0.2747 for a household with access to extension services than a household with no access to extension services. Off-farm income significantly reduces household poverty ($p \leq 0.01$), under ceteris peribus condition, the odds in favour of being poor decreases by a factor of 0.2483 for households who had other sources of income apart from farming activities than those who solely generate their entire income from crop farming. The household poverty increases with an increase of the household head's age ($p \leq 0.05$), that is under ceteris peribus, the odds ratio in favours of poverty increases by a factor of 1.027 when the age of the household head increases by one year. Household size also reduces household poverty, holding other factors unchanged, the odds ratio in favours of poverty decreases by a factor of 0.759 as the household size increases by one member. Household size is a proxy for a number of labour used in farming activities.

4. Discussion

4.1. Crop Commercialisation

Crop commercialisation relates negatively to household poverty status. As a household commercialize more, the more likely it gets out of poverty. Similar results can be observed from the study by Muriithi, et al. [9] and Kirui & Njiraini [25] in Kenya despite the use of different study methodologies. Households with higher commercialisation index intensified themselves in the production of cash crops including cashew nuts and sesame. These crops are high paying and have a stable market. Farmers who produce these crops gain more income from sales and have high capacity in investing in other areas including farming itself. It eases the way to build a home with necessary facilities including but not limited to water pipes in the compound, well-improved toilet, a good house, transport and communication properties and household utilities which counts the welfare of the household.

However, in some African countries including Ethiopia, studies show the non-relevancy of commercialisation on reducing rural household poverty despite the fact that findings support the theory of negative correlation between poverty and the level of crop commercialisation [13]. Those results are not in line with our findings which proves the existence of the correlation between the two due to the fact that the composition of poor – non-poor households in the two areas differ. In the study in Jima-Ethiopia, the majority (56%) of the households interviewed were non-poor [13] contrast to our study whereby the majority (66%) were poor. The dependency on agriculture is determined by the level of poverty and the existing potential arable land. The immediate ladder which can take poor rural community out of poverty is agriculture [26]. Non-poor households have a high chance of diversifying their economic activities due to the availability of funds and access to education which makes crop production less important in income generation.

4.2. Women Participation in Crop Income Allocation

Participation of women in crop income allocation reduces poverty. A household in which a woman has a chance to participate in the allocation of crop income generated has a higher chance of getting out of poverty as compared to those with no chances. A household decision can be made either by one of the parents or both together. Women participation in agriculture production is remarkable and thus they have the right to participate fully in the allocation of income obtained from agriculture output sells. In this study, the majority (53%) of women do not participate in income allocation of the crop sales, only 47% do. Further findings are that in all households with both a husband and wife, the decision was made by either a husband himself or by both. Women who had a chance to decide themselves on what to do with the income are only those who are either single, widow, divorced or separated. This shows how women are not given priorities in family matters concerning money regardless of their remarkable efforts in food security and nurturing the family.

4.3. Access to Extension Services and Off-farm Income

Access to extension services and the ability to generate off-farm income by a household both have the possibility of reducing poverty. Agricultural extension helps in technology diffusion. It accounts for the transfer of improved agricultural technologies and information at the farm levels. Also, farming activities in Liwale district are seasonal and mostly depend on rain thus the yields are not stable. Therefore, households who depend solely on farm yields are prone to poverty during rain shortages. The stability of income flow is made by income coming out of farm which supplements the shortages during agricultural yields' shakes.

4.4. Household Head's Age

The age of the household head is significant at 5 percent probability level and has a positive relationship with poverty. Under ceteris peribus, the odds ratio in favor of poverty increases by a factor of 1.027 when the age of the household head increases by one year. In other words, it can be said that an increase in age increases the possibility of being poor. The expectation of the sign was negative with an intuition that older people are with high accumulation of wealth and they are more experienced in farming and thus can produce more efficiently and earn more to reduce the poverty level compared to younger household heads, however, the results

show a positive association of age with poverty. The reason is that younger people are more energetic and multitasks, they handle more than one income generating activity at once and are flexible to change to other economic activities like carpentry, boda-boda and other small businesses. Therefore, despite the fact that they earn little from agriculture they do supplement this by income from other economic activities than their counterpart older household heads thus are less likely to suffer shakes in agriculture that might negatively affect crop production.

4.5. Household Size

Household size negatively affects household poverty. The variable is significant at 1 percent probability level with an odds ratio of 0.759. Therefore, holding other factors unchanged, the odds ratio in favor of poverty decreases by a factor of 0.759 as the household size increases by one member. Household size is a proxy for a number of labor used in farming activities. Many households in rural areas use household labor than hired, therefore, an increasing number of members increases the possibility of having more output produced by supplying more labor. It is also the best way in which rural households can build a network of interactions between members to other people outside and thus accessing farming and marketing information easily than a household with few members. Through this, a household with bigger household size is in a better position of reducing poverty than a household with few members.

5. Conclusion and Policy Implication

The results show that the majority, equivalent to 65.6% of the total household in rural parts of Liwale District are poor and 34.4% are non-poor. The level of crop commercialisation is averaged to 66% and the majority (73.52%) of the households are commercialized, followed by household who perform subsistence agriculture (20.05%) and lastly those under transition who perform semi-commercialized crop cultivation (6.43%). Commercialisation has been found to significantly reduce the likelihood of a household to be poor. Household crop commercialisation increases the welfare and reduces the likelihood of a household to be poor. Also, the participation of women in post-harvest household income allocation was found to be a significant factor. Women ideas are crucial to development, giving them a chance to suggest and implement their ideas brings in development and nourishment of the household. Among the other significant factors that have a positive impact on rural household welfare are off-farm income, access to extension service and household size while the age of household head relates negatively to the household welfare.

The following policy actions are suggested. First, it should be insisted to rural farmers along with cultivating food crops, they should perform crop diversification by producing more commercialized crops including sesame, cashew nuts, and rice. This will help them generate enough income which they can use to purchase some basic household assets, equipment, and inputs for further and efficient production. Small and medium agricultural processing units in rural areas are crucial to promote the level of commercialisation among rural households. Furthermore, in periods of sufficient and excess harvest, the food crops trade restrictions with the neighbour countries should be eliminated to increase the level of commercialisation.

Secondly, extension service become an important element in promoting the welfare of rural households because it helps in technology diffusion. It accounts for the transfer of improved agricultural technologies and information at the farm levels. The Extension officials should strengthen their ways of reaching farmers and provide them with the farming techniques and how they can market their products. The government should motivate them well to regularly visit and monitor the progress of farm households.

Thirdly, women are the important engine in household development. Although the study reveals that a male-headed household is more likely to get out of poverty than female-headed households, still ideas of women count positively to the household growth and thus the women empowerment and participation in decision-making should be promoted in rural areas. Roughly half (47 percent) of household wives do not participate in crop income allocation. For the growth and development of a household and villages in general, this percent should be reduced. In a household with both a husband and wife, there was no husband who does not participate in income allocation decisions. Women should be empowered and given chances to give out their constructive ideas.

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