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CONTRIBUTION OF VEGETABLE FARMING TO LIVELIHOOD OUTCOMES AMONG THE YOUTH IN IHUMWA AND MTUMBA WARDS, DODOMA CITY, TANZANIA

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Abstract

In recent years there has been a growing literature on youth and livelihood opportunities in agriculture. However, the extent to which such engagement in agriculture improves the livelihood of youth has hardly attracted scholarly attention. Consequently, a convergent parallel mixed method design was adopted to examine the contribution of vegetable farming to livelihood outcomes among the youth. A two-stage sampling technique was used to select 250 respondents for the study. A checklist was used to gather qualitative data while structured questionnaire was used to gather quantitative data. Five livelihood indicators were used to construct the index. Each livelihood indicator was measured by three sub-indicators which were measured in a 3 point Likert scale (low, medium and high livelihood outcomes) Ordinal logistic regression model (OLRM) was employed to determine the chances of the youths' livelihood outcome levels being high due to vegetable farming. More than half (58%) of the respondents had attained high level of livelihood outcomes. Interestingly, a weak impact of vegetable farming was noted in improved human and social capital in such a way that improvement in the livelihoods can only be achieved by cultivating more land. Results from OLRM revealed that land size, vegetable variety and education were the most significant ($p \leq 0.05$) predictors of the livelihood outcomes. Conclusively, vegetable farming has the potential of improving livelihoods. However, the main challenge is not just one of engaging the youth in agriculture but equipping them with farming and entrepreneurial skills to enable them realise their ambition in farming. The local government in collaborations with the youth and academic/research institutions are urged to address these challenges when designing intervention for improving the livelihoods of youth through agriculture.

Key words: Livelihood outcomes, vegetable farming, youths, Tanzania

1.0 Introduction

Agriculture is the Africa's major economic sector supporting the livelihoods of 70-80 per cent of those involved in agriculture (Brooks et al., 2013). Several scholars have therefore shown that, in many African countries, only the agricultural sector has sufficient scale and growth-linkages to significantly provide employment and sustainable livelihoods for the youth (Agricultural Non-State Actors Forum, ANSAF, 2016). In fact, the formal employment sector in which most of the youth seek employment cannot absorb a large number of job seekers, which is estimated between 10 to 12 million per year (Alliance for a Green Revolution in Africa (AGRA), 2015; International Labour Organisation (ILO), 2013). In Tanzania, for instance, the youth account for 67 per cent of the labour force and each year 900 000 young Tanzanians enter the job market that is generating only 50 000 to 60 000 new jobs annually (United Republic of Tanzania (URT), 2016). This implies that, in Africa, the main challenge is not just one of creating jobs in the wage sector but creating productive livelihood activities for the youth in agriculture. Some scholars have gone even further to observe that the horticultural sector is attractive to the youth since even those with a minimal land space can secure a decent livelihood (Foeken, 2013; Rutta, 2012). Moreover, the incubation period for vegetables is rather short as compared to the annual or perennial crops and most youth are interested in making quick money to meet their life desires (Tanzania Horticultural Association (TAHA), 2014).

To harness the potential of agriculture in Tanzania, several policy strategies have been formulated to create a favourable environment for the Tanzanian youth who are in agriculture. Some of these strategies include formulation of Kilimo Kwanza strategy (Agriculture first initiative) (URT, 2009) whose 8th pillar

aimed at providing agricultural loans and land to entrepreneurial agricultural graduates so as to retain them in agriculture. In 2011, Sokoine University of Agriculture (SUA) launched Sokoine University Graduate Entrepreneurs Cooperative (SUGECO) to provide entrepreneurship skills that could enable its graduates to engage in agriculture. Similarly, the 2013 National Agriculture Policy underscores the importance of facilitating access to productive resources including labour saving technologies, surveyed land and irrigation infrastructure for the youth to engage in agriculture as a livelihood activity (URT, 2013).

The efforts are also reflected in the 2016-2021 National Strategy for the youths' involvement in agriculture which emphasizes on promoting decent livelihoods in the agricultural sector. These strategies have had appreciable impact as a number of the youth have resorted to various kinds of income generating activities in agriculture particularly vegetable production (Juma et al., 2018; Agboola et al., 2015; Gulamiwa, 2015; FAO, 2013). Despite the appreciable impact of the strategies and interventions, the extent to which such engagement in vegetable farming improves youths' livelihood has hardly attracted scholarly attention. Consequently, this paper sought to determine the contribution of vegetable farming to livelihood outcomes among the youth in Dodoma City. The findings are expected to contribute to the design of relevant youth policies, support programmes and interventions for engaging the youth in farming.

This paper draws on the sustainable livelihoods framework (DFID, 1999). It argues that the realization of the desired livelihood outcomes depends on access to livelihood assets (Physical Natural, Financial, Social and Human) and the ability to put these to productive use. However, youth farmers possess these assets to varying degrees sometimes driven by personal choices or traits such as age, sex and at other times by forces outside the individual's control (Mazibuko, 2013). Also, the structures and processes of the community and society to which the youth belong shape the livelihood of the youth in terms of both by determining who gains access to which types of assets, and defining what range of livelihood strategies are open and attractive to people for their livelihood outcomes (Krantz, 2001). Hence, the SLF is relevant for the paper

owing to its strength in explaining how the livelihood outcomes of the youth could be achieved through vegetable farming and how the livelihood assets they possess contribute to varying outcome levels of livelihood among them.

2.0 Methodology

The study was carried out in Ihumwa and Mtumba Wards in Dodoma City. Dodoma City, is one of the fastest growing urban areas in Tanzania and where the growth of the urban informal sector is envisaged to continue. In fact, the population of the area was estimated to have increased from 398 798 in 2012 to 700 000 in 2017 (URT, 2018). Moreover, Dodoma is a semi-arid region characterized by a long dry season starting late April to early December, and a short single rainy season starting December to mid-April. The average rainfall is 500mm annually, and about 85per cent of the rainfall comes in the four months of December through March (URT, 2014). Being a semi-arid region, agricultural production is largely unreliable due to the scarcity of rain. Hence, farmers go to an extra mile of engaging in vegetable farming and so do the youth. Ihumwa and Mtumba were prominent areas for vegetable farming in the city hence, the areas were purposefully selected for the study.

A convergent parallel mixed research method was adopted. The approach involves combining or integrating qualitative and quantitative research and data to provide a comprehensive analysis of the research problem (Cresswell, 2014). Contradictions or incongruent findings are explained or further probed in this approach. A two-stage sampling technique was used to select respondents for the study. The first stage involved the identification of the production area; the respondents were randomly selected in the second stage. All nine (9) production areas found in Ihumwa and Mtumba wards were covered to capture differences in the livelihood outcomes of youth vegetable farmers that might be associated with production sites.

A sampling frame which comprised a list of all vegetable farmers prepared by the Ward Executive Officers was used in the selection of youth farmers (15-35 years see URT, 2007). The sample size was determined by employing Yamane's (1967) formula as cited by Israel (2013) which is:

n = ^{N}/1 + N (e)^2, where: n = Sample size, N = Population size and e = Level of precision or sampling error, estimated in percentages (0.05). Therefore, n=680/1+680(0.05)^2=251

A checklist was used to gather data from 9 key informants (one City Agriculture Irrigation and Cooperative Officer, two Ward Community Development Officers, two Ward Executive Officers, two agro-input dealers and two Ward Agricultural Extension Officers). Moreover, nine focus group discussions (FGDs), each consisting of 9-12 youth farmers (Barbour, 2011), were held. The instruments' validity was ascertained by two agricultural extension experts and two horticulturalists. The experts confirmed that the research tools contained items that would solicit the intended responses. A pilot test involving 30 youth farmers from Msalato Ward was conducted to determine the reliability of the instruments. The Chronbach's alpha was 0.76 which is above the 0.70 minimum acceptable for educational research at a significance level of 0.05.

A considerable amount of transcripts from interviews and FGDs were transcribed and coded into emergent themes and analysed using the content analysis method (Mayring, 2014). Descriptive statistics, including frequency counts, means and percentages were used to describe the socio-economic characteristics of the respondents by using IBM SPSS.

Livelihood outcomes were measured by developing a livelihood outcomes index. The index sought to measure whether the engagement in vegetable production improved human capital, social capital, assets, household food security and household income. Each livelihood outcome indicator was measured by three sub-indicators which made 15 sub-indicators. These sub-indicators were measured on three a points Likert scale (low, medium and high livelihood outcomes) and coded as 1, 2 and 3. The overall score for each of the five indicators was found, and these scores were used in developing the livelihood outcome index. The highest possible score for the five indicators was obtained by multiplying 3 by 15 to yield 45, while the mid value was obtained by multiplying 2 by 15 to yield 30 and the minimum possible score was obtained by multiplying 1 by 15 to yield 15. So, the mid-cut value of 30 scores was coded as a medium, 15 to 29 low and 31 to 45 high.

The ordinal logistic regression analytical model was used to determine the likelihood of the youth livelihood outcome levels being high due to vegetable farming. The reason for using ordinal regression model was because the dependent variable was measured at the ordinal level in terms of ranked alternative responses (High level = 2, medium level = 1 and low level = 0 of livelihood outcomes) (Pallant, 2013). Explanation of the overall output from the model, among other things, focused on p-values at $p \leq 0.05$ which was considered statistically significant for testing the significance of the effect. The coefficients for measuring the directions of livelihood outcomes to higher or low category and the value for individual coefficients as indicated by a positive or negative sign. A positive sign is associated with an indication of a coefficient variable that increases the probability of being grouped in the category of a high level of livelihood and vice versa. The odds ratio (Exp (B) values) explained the chances for the outcome variable to occur subject to a predictor variable or when a predictor variable is increased by one. Wald statistics allied with measuring the strength of the influence on livelihood outcomes. The independent variables included socio-demographic variables as indicated in the ordinal logistic regression model below. The ordinal logistic regression model used in this study, which is presented in Equation (i), was adopted from Agresti and Finlay (2009) and is as follows:

$$P(Y) = \frac{e\alpha + \beta_1 X_1 + \ldots + \beta_k X_k}{1 + e\alpha + \beta_1 X_1 + \ldots + \beta_k X_k} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ Equation (i)}$$

Where: $P(Y)$ = the probability of the success alternative occurring, e = the natural log, α = the intercept of the equation, β_1 to β_k = coefficients of the predictor variables and X_1 to X_k = predictor variables entered in the ordinal regression model. Specifically in this study, $P(Y)$ = the probability of the youth being grouped in high level of livelihood outcomes; α = the intercept of the equation; $\beta_1 \ldots \beta_k$ = Regression coefficients; $X_1 \ldots X_k$ predictor or independent variables entered in the model, which were: X_1 = age of the respondent (measured in years), X_2 = education level of the respondents (0 = No formal education, 1 = Primary education), X_3 = Farming experience (measured in years), X_4 = Access to credit (Accessed 1, 0 otherwise), X_5 = Farm size (measured in ha), X_6 = Marital status (Married 1 and 0 otherwise), X_7 = vegetable variety

(improved 1,0 traditional) X_8 =Land ownership status (1 own, 0 hired) X_9 =Sex (Male 1, Female 0) X_{10} =Marital status(Married 1. Otherwise)

3.0 Results and Discussion

3.1 Socio-economic characteristics of the youths vegetable farmers in Ihumwa and Mtumba

The socio-economic characteristics of the youth vegetable farmers are presented in Table 1. The Table shows that about four-fifths (80.4 %) of the youth vegetable farmers were aged 26 - 35 years, while about a fifth (19.6%) were aged 15 – 25 years. The reason for having a low percentage of the youth aged 15-25 is because, at a tender age, a lot of options are still at the youths' disposal; hence, they cannot make concrete decisions on whether to farm or not. The observation is supported by the quote from one of the FGDs as follows:

> "…We have different goals and plans; some of us are here to get some cash and go back to school and pursue other career opportunities available…." (FGD Participants Mtumba, 29th March 2017).

Girei and Giroh (2012) affirm that the level of involvement in farming tends to increase with 26-35 age group and similarly starts to drop with an increase in age. The table also shows that slightly more than two-thirds (68%) of the youth involved in vegetable farming were males. The difficulties faced by women to inherit land due to cultural factors might have contributed to the difference as the study revealed that more than half (54.4%) of the respondents inherited land from family. In Tanzania, customary practices often require women to access land through their fathers, brothers, husbands or other male relatives who control the land (Moyo, 2016).

Table 1 shows that only 6 per cent of the respondents lacked formal education. This implies that the majority (94%) of the respondents were literate and able to acquire information on appropriate technologies for agricultural production from various sources such as brochures, newspapers, leaflets and posters. Educational status is an important personal trait as it tells an individual's level of understanding and comprehension of the government's policy and

strategies aimed at enhancing farm output, income and farmers' livelihood. In the female FGD conducted at Ihumwa, one of the participants had this to say,

> "…We don't know if there is an Agricultural Extension Officer in the area. For appropriate use of inputs, we read instructions from the labels of the products and share information among ourselves..." (FGD participant Ihumwa, 30th July 2017)

According to Douglas et al. (2017), literate farmers are more knowledgeable about current technologies for better production than illiterate farmers.

Study findings in Table 1 indicate that the majority (84.8%) of the respondents were married. Marriage entails some kind of responsibility including providing food for the family. This result was affirmed by one KI in Mtumba who said:

> "Marriage is a very important institution here. It is used as a criterion for a man to be assigned a portion of land for vegetable farming by his family or father" (KI Mtumba, 6th July 2018).

This was the reason why most couples have at least a portion of land for vegetable farming. Table 1 indicates further that the mean household size of the respondents was 4.3 persons while the minimum and maximum household sizes were one (1) and seven (7) persons respectively. Further, the study findings show that the greatest proportion of the households had family sizes from three (3) to four (4) persons which are below the national mean of 4.9 persons (NBS, 2013). The small size of the household contributes to enhancing savings, but could also adversely affect farm operations if household members provided the main source of labour. Given that vegetable farming is a labour-intensive activity, one will be forced to rely on hired labour resulting in increasing investment costs. For example, in one of the female FGDs at Ihumwa, it was reported,

> "…Vegetable farming is very paying for men because they get enough time to take care of their gardens, unlike women most of who are supposed, all the time, to balance child care with production…" (FGD with women held at Ihumwa, 18th July 2017).

Table 1: Socio-demographic characteristics of youth vegetable farmers (n = 250)

Table 1: Socio-demographic characteristics of youth vegetable farmers (n = 250)

Characteristic	n	%
Sex		
Female	80	32.0
Male	170	68.0
Age (Years)		
15-25	49	19.6
26-35	201	80.4
Education level		
No formal education	15	6.0
Primary	133	53.2
Secondary	102	40.8
Marital status		
Single	23	9.2
Married	212	84.8
Divorced	5	2.0
Land acquisition		
Inherited	136	54.4
Bought	70	28.0
Rented	44	17.6
Farm land size (acre)		
Below 2.6 (1ha)	196	78.4
Above 2.6	54	21.6
Experience in farming (years)		
Less than 5	43	17.2
5 – 10	67	26.8
More than 10	140	56.0

Table 1 shows that more than half (54.4%) of the vegetable farmers acquired land for farming through inheritance, followed by those who bought (28%) theirs and only a small proportion (17.6%) of the respondents rented theirs. This implies that the youth farmer's farm size is determined by what plot of land is allocated to him or her. However, evidence shows that access to farming land for personal projects has an impact on the youths' welfare in agriculture because there is a limitation to the type of activities that they could be involved in on the family land or as tenants. In an interview, one of the informants said;

> "In the African tradition, the youth usually farm on their parents' land until when the parents die or decide to allocate a piece of land for each

child. The situation has a negative bearing on the youths' perception towards farming since it limits their flexibility to plan activities and budget for their incomes..." (KI, 3rd July, Dodoma City).

The findings are in line with those reported by the International Fund for Agriculture Development (IFAD), (2011) revealing that land tenure issues affect every day's choices of farmers in terms of how much to invest in the land or to adopt new technologies and innovations.

 Further to the above, more than three-quarters (78.4%) of the respondents had land whose sizes were below 1 ha (2.6 acres). This is not far from the expectation as a decent livelihood can be realised from vegetable farming on even a small piece of land. This finding conforms to the finding of Ngegba et al. (2016) who found that a large proportion of vegetable farmers cultivate less than 1 ha of land in Sierra Leone. The results in Table 1 also show that more than half (56%) of the respondents had been in the farming business for more than ten years. The mean years of farming experience were 10.8 years. This implies that the majority of the respondents had been in the business long enough. This is an important factor for understanding the technicalities involved in vegetable production and marketing which are important in determining both the quantity of the yields and the levels of livelihood outcomes. Similar findings are reported in a study by Oluwasola (2015) who revealed that the majority of vegetable farmers in Oyo State Nigeria had a farming experience of more than ten years and that was sufficient to know how to determine production cost-effectively. Likewise, the more experienced in farming an individual becomes, the more he/she realizes the benefits and becomes aware of the importance of the industry (Agboola et al., 2015).

3.2 Main types of vegetables produced

The study findings in Table 2 show that the most preferred vegetable crop is Amaranthus. This is because it requires little investment in terms of time, and labour and matures within one month. On the other hand, beetroot which could earn the youth more money is only cultivated by about a third of the respondents. The reasons behind the limited involvement of the youth the in production of the latter is the expenses accompanied with it as shown in the quote below.

 "…Beetroots are very profitable; they are sold at about TZS 5 000/= per kg at the marketplace. However, growing them needs one to sacrifice everything to take good care of them because they are easily infested…" (FGD participants Ihumwa, 30th August 2017).

In the same vein, coat meal was limitedly produced though it could be more paying as a bunch of five to seven leaves can sell at TZS 500/= in the market. The plausible explanation for its low production could be because the product was not commonly consumed and most of the farmers in the area depended on the local market. It follows that the types of crops produced by the youth had implications on their vegetable enterprises and ultimately on their livelihood outcomes.

Table 2: Types of vegetables mainly produced by the youth (n = 250)

Vegetable type	Frequency	Percentage
Amaranthus	138	55.2
Chinese cabbage	126	50.4
Tomatoes	124	49.6
Onions	94	37.6
Beetroot	87	34.8
Coatmeal	58	23.2

*NB: The total number of response exceeds 250 because of multiple responses

3.3 Livelihood outcome levels among the youth vegetable farmers

Figure 1 shows that more than half (58.4 %) of the respondents scored 31 to 45 on the livelihood outcome index (LOI) scale that was used; thus, categorized as belonging to the high livelihood outcomes category. The finding suggests that the youth's involvement in vegetable farming is significantly and positively associated with their livelihood outcomes. The results can be explained by increased market opportunities for vegetable producers following the rapid urbanization of the city of Dodoma. According to Rai et al. (2019), vegetable farming has become an important asset of livelihood for the youth surrounding cities.

Figure 1: Levels of livelihood outcomes among the youth vegetable farmers

The analysis of individual indicators of livelihood in Table 3 shows that increased income and improved assets ranked high among the five indicators as 77.8 and 76.6 per cent of the respondents scored between 31 and 45 respectively on the LOI.

Table 3: Percentage distribution of respondents according to the improvement in livelihood outcome indicators (n = 250)

Indicators	Low		Medium		High	
	n	%	n	%	n	%
Improved assets						
Improving housing conditions	50	20.0	5	2.0	195	78.0
Improving household assets	53	21.2	4	1.6	193	77.2
Improved farm implements	49	19.6	2	0.8	199	79.6
Overall	**56**	**22.4**	**2**	**0.8**	**192**	**76.8**
Improved human capital						
Attending producer meetings involving cost	56	22.4	95	38.0	99	39.6
Attending training which require payments	61	24.4	102	40.8	87	34.8
Seeking advice from agric. extension experts	57	22.8	98	39.2	95	38.0
Overall	**60**	**24.0**	**100**	**40.0**	**90**	**36.0**
Improved food security						
Eating kind of food you prefer	85	34.0	27	10.8	138	55.2
Eating 3 meals per day	80	32.0	20	8.0	150	60.0
Reducing share of food	79	31.6	24	9.6	147	58.8
Overall	**82**	**32.8**	**25**	**10.0**	**143**	**57.2**
Improved social capital						
Access networking services	115	46.0	23	9.2	112	44.8
Increasing vegetable outlet through networks	110	44.0	27	10.8	113	45.2
Participate in social activities by contribution.	98	39.2	34	13.6	118	47.2
Overall	**112**	**44.8**	**28**	**11.2**	**110**	**44.0**
Increased household income						
Saving income from previous season	45	18.0	12	4.8	193	77.2
Diversifying into other economic activities	49	19.6	15	6.0	186	74.4
Increased production	40	16.0	10	4.0	200	80.0
Overall	**43**	**17.2**	**13**	**5.2**	**194**	**77.6**

The study findings in Table 3 show further that improved human capital and social capital ranked low among the indicators of livelihoods analysed in

this study. This means that the majority of the respondents scored 15 to 29 under these indicators on the LOI. This could be because farmers were likely to invest the profits accrued from their farms in the purchase of inputs and other equipment that would assist them to maintain their farms than investing it in other aspects of their livelihoods such as attending some training which involved cost. The findings conform to the findings in a study by Ibidapo et al. (2017) and Gurung et al. (2016) who reveal that strengthening technical farming skills for the youth has a positive impact on livelihood outcomes. On the other hand, the level of livelihood outcome of individual youth farmers is also dependent on the extent to which he/she is entitled to or lay claim to livelihood assets. This is supported by the OLRM results in Table 4 which show that factors such as access to credit, land size and level of education were very important in improving the youths' livelihood outcomes. Hence, this conforms to the SLF that those endowed with livelihood assets are more likely to be able to make positive livelihood choices.

Table 4: Determinants of livelihood outcomes levels among youth vegetable farmers

Variable	B	SE	Wald	Sig.	OR
Sex (Reference female)	0.428	0.413	1.075	0.300	1.53
Marital status (Reference Married)	-0.526	0.690	0.582	0.446	0.59
No formal education (reference secondary)	-2.155	1.295	2.769	0.046	0.12
Primary education (Reference secondary)	-0.176	0.830	0.045	0.832	0.84
Farm land size	0.200	0.028	50.640	0.000	1.12
Experience on veg. production	0.021	0.037	0.332	0.564	1.02
Age	-0.007	0.013	0.302	0.583	0.31
Access to credit (No access)	0.101	0.244	0.17	0.031	1.11
More improved varieties (Reference more trad)	0.005	0.072	7.291	0.007	1.01
Land ownership (Reference hired)	0.697	0.315	4.893	0.827	0.71

2 Log Likelihood (Intercept Only = 393.226, Final = 217.252) p = 0.000, Goodness of Fit = 1, Cox and Snell = 0.596, Nagelkerke = 0.691

The model fitting information in Table 4 shows a statistically significant chi-square (p $\leq$ 0.05) indicating the presence of the association between the dependent variable (livelihood outcomes) and a combination of independent variables that were entered in the model. Hence, the model gave better predictions of the outcome categories. The Cox and Snell Pseudo R-Square was 0.596 while the Nagelkerke Pseudo R-Square was 0.691, implying that 59.6 to 69 per cent of variation observed in youths' livelihood outcomes was explained by a combination of independent variables entered in the model. The 2 Log Likelihood (Intercept only = 393.226, Final =217.252) implies that additional independent factors improved the model.

Furthermore, Table 4 indicates that four out of ten independent variables (land size, access to credit, vegetable variety and education) were the most significant predictors of youths' livelihood outcomes in vegetable farming (p$\leq$ 0.05). The size of land under vegetable farming had a positive beta coefficient (0.200) and it is significant (p$\leq$0.05). This implies that, as the farm size increases, the probability of farmers being categorized in high livelihood outcome level increases. The odds ratio for land size is 1.22, meaning that a unit increase in vegetable farm size by 1 Ha increases the odds of moving from low to higher livelihood categories by 1.22, with the other variables in the model being held constant. This might be attributed to the fact that most of these farmers had not invested much on human capital notably improved farming practices as such the improvement in their livelihood is achieved by cultivating more land. This is in line with Machimu (2017) who established that with low farming technology, smallholder sugarcane farmers' net income in Kilombero Valley to a large extent depended on the land size cultivated. Furthermore, a report by IFAD (2011) demonstrates that due to little improvement in factors of production, agricultural growth in African countries is generally achieved by cultivating more land and mobilising a larger agricultural labour force which produces very little improvement in yields.

The beta coefficient (0.005) for cultivating more improved varieties is positive and statistically significant (p$\leq$0.05). Implicitly, cultivating more improved

vegetable varieties increases the probability of the youth attaining high livelihood outcomes. The odds ratio signifies that cultivating more improved varieties increases the likelihood of the youth being categorized into high livelihood outcomes by 1.01. This could be due to high yields. A study by Juthathip et al. (2014 affirms that farmers get higher household income from the adoption of improved or hybrid varieties of vegetable crops. A study by Oluwasola (2015) concluded that the production of improved vegetable varieties has a high impact on productivity and wellbeing of smallholder farmers.

Furthermore, the results in Table 4 show a positive beta coefficient (0.101) for access to credit and it is statistically significant ($p \leq 0.05$). The odds ratio of 1.11 implies that the respondents who accessed credit were 1.11 times more likely to be in the higher livelihood category than those who did not. The plausible explanation for this is that insufficient financial investment makes it difficult for the youth vegetable farmers to meet production costs such as purchasing inputs and improved farm equipment.

The negative coefficient (-2.155) on no formal education indicates that the youth vegetable farmers with no formal education were most likely to be found in low livelihood outcomes level. Moreover, the odds ratio revealed that the chances of those with no formal education were 0.12 less likely to be categorized in high livelihood outcomes compared to those with secondary education. Literature (Agboola et al., 2014; Amrouk et al., 2013) shows that educational level has a positive implication on farmers' livelihood outcomes. However, these results contradict the results in a study by Naamwintone and Bagson (2013) who established that farmers do not need any formal education. This might be because education has a higher payoff to productivity in modern than in traditional agriculture and that, the youth want to practice modern agriculture that uses more technical skills. For example, one of the government officials for Dodoma City said,

> "…It is not surprising for uneducated youth to complain that vegetable farming is not paying because they prefer technology-oriented kind of farming over the traditional one which they consider stressful but

technology requires some sort of formal education…" (KI, 30th August 2017).

In a related finding, Oduro et al. (2014) reported that education has two main effects on agriculture, the "worker effect" and the "allocative effect." The worker effect is when an educated farmer, given the same number of inputs, can produce a greater output compared with the uneducated one. With allocative effect, a worker is able to acquire information about the cost and characteristics of inputs and interpret the information to make decisions that will enhance output. This has been the case with the current study as educated farmers were more able to employ better farming strategies and produce vegetables cost-effectively because they had sufficient information about marketing and other available opportunities.

4.0 Conclusions and Recommendations

Based on the study, it is concluded that vegetable farming is an activity that can uplift the livelihood of youth as more than half covered by the study had attained a high level of livelihood outcomes, particularly on improved assets and income. However, a weak impact of vegetable farming was noted in improving human and social capital in such a way that improvement in the livelihoods of the youth can only be achieved by cultivating more land. Moreover, the results from the OLRM revealed that land size, access to credits and educational level had strong effect and positive implications on the youths' livelihood outcomes in vegetable farming. It is, therefore, recommended that the local government, in collaboration with other development partners and youths' farming schemes when designing intervention for improving the livelihoods of the youth engaged in farming, should target their different segments based on their capabilities. This could be done by considering their human capital, how the youth access funds for working capital, land size and education of the farmer which were found more significant factors in determining youths' livelihood outcomes in vegetable farming.

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