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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 (Pi) = 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.

REFERENCES

Abebe, G., Bijmana J., Pascuccia S. and Omtaa O. (2013). Adoption of improved potato varieties in Ethiopia: The role of agricultural knowledge and innovation system and smallholder farmers' quality assessment. *Agricultural Systems,* 122 (2013), pp. 22–32.

Acharya, S. (2006). Sustainable Agriculture and Rural Livelihoods *Agricultural Economics Research Review* 19, pp. 205-217.

Akinbode, W. and Bamire, A. (2015). Determinants of adoption of Improved Maize Varieties in

Osun State Nigeria. *Journal of Agricultural Extension and Rural Development*, 7(3), pp. 65-72.

Asfaw, S., Shiferaw, B., Simtowe, F. and Lipper, L. (2012). Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. *Food Policy*, 37(3), pp. 283– 295.

Ayalew, A. (2011). *Factors Affecting Adoption of Improved Haricot Bean Varieties and Associated Agronomic Practices in Dale Woreda*, SNNPRS. A Dissertation for the Master of Science Award of Hawassa University, Hawassa - Ethiopia. 121 pp.

Beebe, E., Rao, M., Mukankusi, C. and Buruchara, R. (2012). *Improving resource use efficiency and reducing risk of common bean production in Africa, Latin America, and the Caribbean*. Centro Internacional de Agricultura Tropical (CIAT). 10pp.

Bekele, G. and Mekonnen, A. (2010). Investment in Land Conservation in Ethiopia Highlands: A Household Plot level analysis of the roles of Poverty, Tenure, Security and Market Incentives. Discussion Papers dp-10-09-EFD, Resources for the Future.

Binagwa, H., Bonsi, K., Msolla, N., and Ritte, I. (2016). Morphological and molecular identification of Pythium spp. isolated from common beans (Phaseolus vulgaris) infected with root rot disease. *African Journal of Plant Science*, 10(1), pp. 1-9.

Birachi, E., Ochieng, J., Wozemba, D., Ruraduma, C. and Niyuhire, M. (2011). Factors Influencing Smallholder Farmers' Bean Production and Supply to Market in Burundi. *African Crop Science Journal*, 19(4), pp. 335 – 342.

Bruce A., Donkoh S., and Ayamga, M. (2014). Improved rice variety adoption and its effects on farmers output in Ghana. *Journal of Development and Agricultural Economics*, 6(6), pp. 242-248.

Bryman, A. (2012). *Social Research Methods*. Oxford University Press, New York. 766pp.

Chianu J., Nkonya E., Mairura F., Chianu J. and Akinnifesi F., (2010). Biological nitrogen fixation and socioeconomic factors for legume production in sub-Saharan Africa: A review. *Agronomy for Sustainable Development*, 31 (1), pp. 139-154.

FAO (2009a). Declaration from the Second World Seed Conference: Responding to the challenges of a changing world: The role of new plant varieties and high-quality seed in agriculture. Rome, September 8-10, 2009.

FAO (2009b). *Promoting the Growth and Development of Smallholder Seed Enterprises for Food Security Crops: Best Practices and Options for Decision Making*. Plant Production and Protection Paper Case studies from Brazil, Côte d'‟Ivoire and India. 24pp.

Fisher, K., Norvell, J., Sonka, S. and Nelson, J. (2000). Understanding Technology Adoption Through System Dynamics Modeling: Implications for Agribusiness Management. *The International Food and Agribusiness Management Review*, 3(3), pp. 281-296.

Gollin, D. (2014). *Smallholder agriculture in Africa: An overview and implications for Policy*. IIED Working Paper. IIED, London. 20pp.

Hamzakaza, P., Katungi, E., Reyes, B., Maredia, M., Muimui, K. and Ojara, M. (2014).Assessing Access and Adoption of Common Bean Improved Varieties in Zambia. Research Technical Report, Pan-Africa Bean Research Alliance. 42pp.

Kanyama, A. and Damian (2015). The Challenges of Adaptation of Maize and Beans Farming due to Rainfall Variability in Mwanga. District, Tanzania. *International Journal of Modern Social Science*, 4(2), pp. 105-117.

Karane, S. (2016). *Factors Influencing On-Farm Common Bean Profitability: The Case of Smallholder Bean Farmers in Babati District, Tanzania*. Thesis for Master of Science Award at Egerton University, Uganda. 90pp.

Kelsey, J. (2013). "*Constraints on the adoption of agricultural technologies in developing countries*." Literature review, Agricultural Technology Adoption Initiative, J-PAL (MIT) and CEGA (UC Berkeley). 69pp.

Kolb, S. (2012). Grounded Theory and the Constant Comparative Method: Valid Research Strategies for Educators. *Journal of Emerging Trends in Educational Research and Policy Studies* 3 (1), pp. 83-86.

Mariano, M., Villano, R. and Fleming, E. (2012). Factors influencing Farmers' adoption of Modern Rice Technologies and Good Management Practices in the Philippines. *Agricultural Systems* 110 (2012), pp. 41-53.

Mchopa, A. D. & Jeckoniah, J. N. (2018). *Sunflower and Livelihood Outcomes among Smallholder Farmers' Households in Iramba District Tanzania*. Proceeding of the International Conference on Planning and Development held at Institute of Rural Planning Dodoma from June 28-30, 2018

Mkonda, Y. and Xinhua, He. (2016). Production Trends of Food Crops: Opportunities, Challenges and Prospects to Improve Tanzanian Rural Livelihoods. *Natural Resources and Conservation*, 4(4), pp. 51-59.

Monela, A. (2014). Access to and Adoption of Improved Seeds by Smallholder Farmers in Tanzania: Cases of Maize and Rice Seeds in Mbeya and Morogoro Regions. Dissertation for Master Award from Sokoine University of Agriculture, Morogoro Tanzania. 88pp.

Mukandala, L. (2010). Diversity and Genotype X Environment interaction of Bean Landraces in Bukoba and Missenyi Districts of Tanzania. Dissertation for award of Master Degree at Sokoine University of Agriculture. Morogoro: Tanzania. 109pp.

Nang'ole, M, Mithöfer, D. and Franzel S. (2011). *Review of Guidelines and Manuals for Value Chain Analysis for Agricultural and Forest Products*. World Agroforestry Centre. 47pp.

Obasoro A., Iwinlade A., Popoola O. and Adeoti, I. (2015). Effect of Adoption of Improved Soybean Variety on Productivity of Farm Households in Benue State, Nigeria. *Legume Genomics and Genetics*, 6(6): 1-9Poole, N. (2017). *Smallholder Agriculture and Market Participation*. Food and Agriculture Organisation. Practical Action Publishing, Warwickshire. 210pp.

Petry, J., Sebastiano, S., Martins, E. and Barros, P. (2019). Innovation and the Diffusion of Technology in Agriculture in Floodplains in the State of Amazonas. Journal of Contemporary Administration, 23(5), pp. 619-635.

Qaim, M. and Kouser, S. (2013) Genetically Modified Crops and Food Security. *PLoS ONE* 8(6): e64879. doi:10.1371/journal.pone.0064879

Rogers, E. M. (1976). New Product Adoption and Diffusion. *Journal of consumer Research*, 2(4), pp. 290-301.

Rogers, E. M. (2003). *Diffusion of Innovation* (5th ed.). York, NY: Free Press.

Ronner, E. and Giller, E. (2013). Background information on agronomy, farming systems and ongoing projects on grain legumes in Tanzania. *N2Africa Milestones*, 17, pp. 09-13

Rubyogo, J., Birachi, E. A, Mukankusi, C. M. and Katungi, E. (2015). Regional Bean Breeding And Seed Systems Approaches For Increased Impact: Evidence From East And Central Africa Bean Research Network (Ecabren). 11pp.

Saimon. K., Mshenga, P. and Birachi, A. (2016). Factors influencing on-farm common bean productivity in Manyara region in Tanzania. *Proceeding of the Fifth RUFORUM Biennial Regional Conference*, 17-21 October 2016. Cape Town, South Africa.

Siri, B. N., Martin, N., Samuel, B. E., Martin, F., Mboussi, M., Celestine, N. and Laurent (2016). Factors Affecting Adoption of Improved Common beans (*Phaseolus Vulgaris L.*) Varieties in the Western Highlands of Cameroon. 13pp.

Tahirou, A., Bamire, A., Oparinde, A. and Akinola, A. (2015). *Determinants of Adoption of Improved Cassava Variables among Farming Household*sin Oyo, Benue and Akwa Ibom state of Nigeria, Harvest Plus Working paper, No.20.

Uaiene, N., Arndt, C. and Master, A. (2009). *Determinants of Agricultural Technology Adoption in Mozambique. Discussion papers* (67E). National Directorate of Studies and Policy Analysis, Ministry of Planning and Development, Republic of Mozambique: 1–31.