Invited paper presented at the 6th African Conference of Agricultural Economists, September 23-26, 2019, Abuja, Nigeria

Drivers of market participation among smallholder rabbit farmers: evidence from Kenya

Chrispinus Mutsami

Department of Agricultural Economics, University of Nairobi, Kenya

Email: ckhaleha@gmail.com

Abstract

Commercialization of smallholder production and enhancing their integration in markets and more inclusive value chains remain a challenge for most countries in sub Saharan Africa like Kenya. The current study determined the drivers of smallholders' participation and extent of market participation in the Kenyan rabbit sector. Multistage and systematic random sampling techniques were employed. Heckman two-step model was employed to determine factors influencing market participation. The study found that most of the respondents had attained basic level of primary education. Rabbit farmers who participated in rabbit markets had more experience in rabbit keeping as compared to their counterparts. Heckman two-step model results revealed that rabbit market participation was positively affected by household size, rabbit breed, credit access, group membership and access to training. The intensity of market participation was negatively affected by age and positively influenced by household size, education, rabbit breed, credit access, group membership and assets owned. Therefore, to enhance rabbit smallholders' participation in markets and modern value chains, the relevant rabbit stakeholders should work towards providing affordable and accessible credit to rabbit farmers. Rabbit farmers should also be encouraged to form groups so as to benefit from collective action.

Key words: Rabbit, Heckman two-step, Kenya

JEL: C21, Q01, Q02, Q 18

1. Introduction

Unavailability of land for livestock and crop production is particularly serious in countries with high rural and urban population densities such as Kenya. In Kenya, 40% of rural people reside on

5% of its rural land and the mean population density in these areas is 411 persons/km^2 of arable land (Muyanga and Jayne, 2014). With the increase in growth of population, income, urbanization and climate change, the need for a sustainable source of animal protein is increasing. This is mostly happening in developing countries. Among the available options, the rabbit (*Oryctolagus cuniculus*) has been identified as a suitable alternative (Mailafia *et al*., 2010; Hassan *et al*., 2012; Mailu *et al*., 2013) owing to its fast growth rate, high fecundity, freedom from odour, noiselessness, high feed conversion efficiency and early maturity. With good husbandry, rabbits can produce above 40 kits per annum compared to one calf for cattle and up to two kids in goats (Kitavi *et al*., 2015). In addition, rabbits are considered free from odour, are noiseless and can adapt many ecosystems unlike many of the larger ruminants (Dairo *et al*., 2012). Rabbit farming can be carried alongside other farming systems where they are fed on weeds, poultry waste, crop residues and even kitchen wastes (Antony and Madu, 2015).

Rabbit production is one of the fastest growing farming enterprises in Kenya (Ministry of Livestock Annual Report, 2005). Since the livestock census in 2009, the rabbit population in Kenya has been rising at an average rate of 13 percent from 483,000 in 2009 to 878,000 heads in 2014 (FAOSTAT, 2014). Initially, rabbit farming was considered as a hobby for young boys (Borter and Mwanza, 2011). Different communities in Kenya have had different perceptions about rabbit rearing and consumption. For example, some communities believed that rabbits should not be eaten by adults (MoLD, 2012). Due to the realization of the importance of rabbits in nutrition and poverty alleviation, Kenyan government and non-governmental organizations (NGOs) have recently been involved in promoting rabbit farming and consumption. For example, since 2000, the Government of Kenya (GoK) has been promoting rabbit production through National Agriculture and Extension Program (NALEP) (MoLD, 2012).

However, commercialization of rabbit farming is still low despite the attention it has received from different stakeholders (Mailu *et al*., 2014). This means that rabbit farmers have little participation in both input and output markets. Commercialization changes the focus of production from consumption to production for the market; it translates into high productivity, greater specialization and subsequently higher incomes for smallholder farmers (Moono, 2015; Ataul and Hossain, 2015). The low level of commercialization in rabbit farming may be attributed to poorly designed policies, inadequate access to improved technologies, institutional obstacles, weak

infrastructure and insufficient links to markets (Sharma *et al*., 2012). In addition, the asymmetric structure of many markets, high transactions cost and the lack of skills, information and organization may act as substantial barriers to accessing markets by small farmers in the country.

Despite the potential benefits of rabbit farming, no research has been done to verify the major factors responsible for low market participation by rabbit farmers, especially those in developing economies such as Kenya. This paper therefore attempts to fill the research gap and help in generation of policy evidence to enable realization of greater market participation among smallholder rabbit farmers. The main objective of this paper therefore is to determine the main factors that influence the market participation decision of rabbit smallholder farmers in Kenya.

The remainder of this article is organized as follows: the next section provides information on study materials and methods. This section provides a description of farmer sampling, theoretical framework and empirical estimation. Then results are discussed before conclusions and policy implications are presented.

2. Materials and Methods

2.1 Study area

The study was conducted in three counties of central Kenya namely Kiambu, Nakuru, and Nyeri. These study areas were chosen because they had the largest number of farmers keeping rabbits (see Wanyoike et al., 2013). Rabbit farming started being promoted by the National Agriculture and Extension Program (NALEP) in 2000 (Borter and Mwanza, 2010). The three study areas have a potential of accessing huge market because of their proximity to major towns such as Nairobi (capital city), Thika and Nakuru.

Smallholder mixed farming is the dominant activity in Kiambu, Nakuru and Nyeri. People in these areas are involved in growing food crops such as vegetables, maize, beans, pigeon peas, Irish potatoes; cash crops such as tea and coffee; and other livestock such as poultry, dairy cattle, goats and sheep. Majority depend on rain-fed agriculture with very few applying irrigation technology in their farming activities.

2.2 Sample of farmers

The study used a sample of rabbit farmers from Nakuru, Kiambu and Nyeri Counties of Kenya. Multistage sampling procedure was employed to arrive at a sampling size of 230. The three counties were purposively selected because the previous studies have shown that they are the main producers of rabbits in Kenya (Serem *et al.*, 2013). The next step involved the listing of all the sub-counties in each of the three counties. Two sub-counties were randomly selected from each county. In the fourth stage, a list of all the wards from the respective sub-counties was made and 5 wards were randomly selected from each sub-county. A mini-census was conducted in each ward and lists of rabbit farmers was prepared. Systematic random sampling was applied to select a total of 230 farmers.

Data were collected through face-to-face interviews using a structured questionnaire. The interviews were conducted in the local language with the household head or another household member who was responsible for the rabbit farming. The information captured included farm and household characteristics, rabbit production and marketing including quantities of rabbits sold, other sources of income and credit, membership in groups, challenges faced, asset ownership, and other information.

2.3 Factors influencing market participation and the extent of market participation

2.3.1 Theoretical framework

A household decision to produce and sell rabbits is grounded on the agricultural household model. The model tries to capture the household's consumption and production interdependences in a theoretically coherent manner (Muyanga and Jayne, 2014). In this model, the main objective of the rabbit farmer is assumed to be maximization of expected household utility subject to budget and other resource constraints. Agricultural production either contributes to household's resource constraint through consumption or through cash generation if farm output is sold at market. Therefore, agricultural production is incorporated as part of the household's budget constraints.

A rational household is assumed to maximize utility by choosing goods at a certain level to; produce (O_i), consume (C_i), buy (N_i), sell (S_i) and use as inputs (X_i). The household is then expected to maximize utility subject to a number of constraints (income, production technology and resource) (Jia and Petrick, 2014). Making an assumption that there exist perfect markets (zero

transaction costs) the farmer or household is then faced with the following constrained optimization problem;

Max u $(C_i Z^C)$

Subject to,

$\sum_{i=1}^{J} P_i^m S_i + B \geq \sum_{i=1}^{J} P_i^m N_i$ Income constraint

$O_i + E_i + N_i \geq X_i + C_i + S_i$ Resource constraint

$G(O, X, Z_q) = 0$ Production technology constraint

$C_i, O_i, X_i, N_i, S_i \geq 0$ Non-negativity constraints

Where:

P_i^m is the rabbit market price, E_i is the household endowment in a good, B represents exogenous income, Z^c and Z_q respectively illustrate household and technology attributes.

In a real world, perfect market assumption does not hold. Market participants incur transaction costs (Muyanga and Jayne, 2014). Including transaction costs, the income equation is extended to;

$$\sum_{i=1}^{j} \left[\left(P_i^m - \partial_i T_i^{ps} \right) S_i - \partial_i T_i^{fs} \right] \geq \sum_{i=1}^{j} \left[N_i \left(P_i^m + \varphi_i T_i^{pn} \right) + \varphi_i T_i^{fn} \right]$$

Where T_i^{fs} refer to the expenses incurred by households participating in the market irrespective of the total amount of marketed goods, T_i^{ps} is the proportional transaction costs are costs incurred depending on the amount of goods that are marketed, T_i^{pn} and T_i^{fn} refer to proportional and fixed transaction costs incurred by market agents respectively.

From the above equation, if a household sells in the market then δ_1 = 1 and 0 if otherwise. Equally, Ψ_i = 1 if the household participates in the market as a buyer and 0 if otherwise. Including

transaction costs for sellers in the market reduces the market price by both proportional and fixed transaction costs.

2.3.2 Model estimation

Various studies have used Heckman two-step, Double-hurdle and Tobit models to examine market participation of various farm commodities (Komarek, 2010; Sigei *et al*., 2014; Mutayoba and Ngaruko, 2015; Bobojonov *et al*., 2016). The Tobit modelling approach makes an assumption that the participation and sales volume decisions are made simultaneously and hence drivers of participation decision and the sales volume decision are the same which in real world might not be true (Sigei *et al*., 2014). In addition, Tobit model is not preferred due to the fact that it assumes that zero values traded are because of rational choice, which might be due to obstacles in market entry experienced by farmers (Komarek, 2010). The restrictive assumptions of Tobit model can be relaxed by using Double Hurdle model. The model is important because it allows a subset of the data to pile-up at some value without causing a bias in estimating the determinants of the continuous dependent variable in the second stage, hence it is possible to obtain all the data in the remaining sample for the participants. Therefore, in double models, there are no restrictions regarding the elements of explanatory variable in each decision stage. However, Double hurdle model suffers from sample selection bias. To address this problem, the current study applied the Heckman two-step model.

Heckman two-step model assumes that the missing value of dependent variable is unobserved (not selected). The model involves estimation of two equations: First, is whether a household participated in the rabbit market or not, and the second is the extent of market participation (proportion of rabbit sales). The proportion of rabbit sales were conditional on the decision to participate in the market.

In the first stage, the model uses a Probit regression with all variable data to estimate the probability of market participation as shown

$$pr(Z_i = 1 \mid X_i, \propto) = \emptyset\big(h(X_I)\big) + \varepsilon_i$$

Where Z_i is an indicator variable equal to unity for small-scale rabbit farmers that participated in marketing, $\emptyset$ is the standard normal cumulative distribution function, X_I a is the vector of factors affecting the decision to participate in rabbit market, α is the vector of coefficients to be estimated, and ε_i is the error term assumed to be distributed normally with a mean of zero and a variance σ^2. The variable takes the value of 1 if the marginal utility the household i get from participating in marketing of rabbits is greater than zero, and zero otherwise. This is shown as follows,

$$Z_i^* = \propto X_i + u_i$$

Where Z_i is the latent level of utility the small scale rabbit farmers get from participating in the market, ~ N (0, 1) and,

Z_i =1 if Z_i^*>0

Z_i =0 if Z_i^*≤0

In the second step, the Inverse Mills Ratio (IMR) is included as an additional regressor to correct for selection bias. IMR is calculated as shown below

$$\frac{\varphi\big(h(X_i\tilde{a})\big)}{\varphi(X_i,\tilde{a})}$$

The second step therefore is given by;

$$E = (Y_i \mid Z = 1) = f(X_i\beta) + \gamma\frac{\varphi\big(h(X_i\tilde{a})\big)}{\varphi(X_i,\tilde{a})}$$

Where E is the expectation operator, Y is the (continuous) proportion of rabbits sold, x is a vector of independent variables affecting the quantity of rabbits sold, and β is the vector of the corresponding coefficients to be estimated.

Heckman two-step model can thus be estimated as follows; in the first step of deciding whether to participate in rabbit market or not which is specified as;

$$rsold = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 hhsize + \beta_4 educ + \beta_5 breed + \beta_6 credit + \beta_7 group + \beta_8 contract + \beta_9 training + \beta_{10} lnasset + \beta_{11} exp + \varepsilon_i$$

The Second step which involves a decision on the extent of rabbit marketing is estimated by use of an OLS as follows;

$$qnrsold = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 hhsize + \beta_4 educ + \beta_5 breed + \beta_6 credit + \beta_7 group + \beta_8 contract + \beta_9 training + \beta_{10} lnasset + \beta_{11} exp + \varepsilon_i$$

The variables, their definitions and their hypothesized signs are presented in Table 1.

Table 1: Variables used in the models and their hypothesized effects

Variable	Description of variable	Hypothesized effect
rsold	sold rabbits(1=yes;0=otherwise)	Dependent variable
qnrsold	number of rabbits sold	Dependent variable
gender	gender of the farmer (1=male;0=otherwise)	+/-
age	age in years	+/-
hhsize	number of household members	-
educ	education in years	+
breed	rabbit breed (1=improved; 0=otherwise)	+
credit	access to credit (1=yes; 0=otherwise)	+
group	group membership (1=yes; 0=otherwise)	+
training	access to trainings (1=yes; 0=otherwise)	+
contract	contract with buyers (1=yes; 0=otherwise)	+
lnasset	natural logarithm of assets	+
exp	number of years keeping rabbits	+

3. Results

3.1. Characterization of Study Respondents

Both socioeconomic and demographic characteristics of both rabbit market participants and non-market participants are presented in Table 2. The mean age of all the respondents was 50 years. On average the respondents had 9 years of education. This implies that majority had attained only primary level of education. However, market participants had slightly significantly higher level of education than non-market participants. This finding corroborates with literature which suggests that an increase in the level of education increases level of household understanding of market dynamics which allows them to make decisions on market participation (Sigei *et al*., 2014).

Table 2: Socioeconomic and demographic characteristics of the study respondents

Variable	Market participant	Non-market participants	Mean (t-value)
	Mean (SD)	Mean (SD)	
age	54.52 (14.11)	46.9 (6.27)	7.64 (2.168)**
gender	0.55 (0.49)	0.47 (0.50)	0.08 (-1.63)
hhsize	4.75 (0.17)	3.21 (0.22)	1.54 (-2.17)**
educ	9.67 (3.66)	8.92 (3.87)	0.75 (2.69)***
breed	0.32 (0.41)	0.15 (0.04)	0.17 (2.07)**
credit	0.29 (0.04)	0.22 (0.13)	0.07 (1.59)
group	0.42 (8.92)	0.19 (1.59)	0.23 (0.47)***
training	0.21 (0.035)	0.07 (1.52)	0.14 (2.18)*

lnasset	17.09 (22.64)	15.12 (17.41)	1.97 (1.79)**
exp	8.92 (3.86)	7.21 (0.08)	1.71 (1.94)

The numbers in parentheses are standard deviations (SD)

*, **, and *** significant at 10, 5, and 1%, respectively

Results further show that that the study respondents had, on average, practiced rabbit farming for 8 years and therefore had considerable amount of experience in rabbit farming. The average number of household members among participants was 4.75, while 3.21 persons among non-participants. The difference between the two groups was significant at 5% implying that rabbit farmers had higher dependents thus a higher tendency for income diversification so as to cater for the needs of the large household sizes. The results agree with Muiruri (2015) who pointed out those farmers with high household sizes have to find out other ways and means to take care of their household members.

The study found that 42% of those who participated in rabbit market were members of groups while only 19% of non-market participants were in groups. This means that most of those who participated in markets had membership in groups. Sigei et al. (2014) argued that belonging in groups empowers farmers to bargain and negotiate for better terms with buyers. The findings in Table 2 also show that the mean value of the assets owned was more for market participants than non-market participants. Thus, market participants were more endowed with physical assets than their counterparts, as depicted by the results of t-test of differences in means. However, there was a wide variation in the value of these assets, as indicated by the large standard deviations.

3.2 Determinants of rabbit market participation and extent the of participation

Estimation results of the Heckman two-step model are as shown in Table 3. The likelihood-ratio test of independent equations is significant at $P<0.01$. It means that the null hypothesis of uncorrelated error terms across the two equations can be rejected at 1%. This implies that selection bias is present which justifies the use Heckman two-step model.

Table 3: The Heckman two-step model results

	Market participation decision		Extend of participation	
Variable	Coef.	dy/dx	Coef.	dy/dx
age	-0.12	0.04	-0.21***	0.18
gender	-0.15	0.06	-0.14	-0.17
hhsize	0.07**	0.02	0.04**	0.02
educ	-0.01	0.01	0.04***	0.04
breed	0.34**	0.06	0.20**	0.16
credit	0.15**	0.05	0.24***	0.19
group	0.17**	0.06	0.14**	0.12
training	0.23***	0.08	0.05	0.14
lnasset	0.02	0.00	0.16**	0.03
constant	6.92**		1.06*	

***, **, * significance levels at 1, 5 and 10 % respectively
N=230
RHO= 0.5730116
Sigma= 0.6502114
Lambda= 0.4487685
LR test of indep. eqns. (rho = 0): $chi^2(1) = 12.94$ Prob > $chi^2 = 0.0003$
Wald $chi^2(10) = 306.73$ Prob > $chi^2 = 0.0000$

The age of the household head was found to be insignificant for decision to participate in rabbit market but significantly affected the intensity of market participation at 1%. An increase in age by one year decreases the quantities of rabbits sold by 18%. This implies that younger people sold

more rabbits than older ones. Reason behind this is that old people are slow to adapt to changing market conditions and new technologies, and therefore do not respond quickly to market incentives to increase rabbit supply to the market (Chamboko *et al*., 2017). It also implies that young people are more business oriented, ambitious and entrepreneurial and therefore make use of improved inputs to increase rabbit production, thus increasing volume of sales.

The household size positively and significantly influenced the decision to participate in the market and the quantities supplied. This means that households which were larger participated and sold more as compared to smaller ones. Large family sizes in smallholder rabbit enterprise indicate availability of labour for smallholder rabbit production which increases market participation (Demissie *et al*., 2014).

As expected, years of were found to have a positive and significant influence on the extent of market participation. A one year increase in the level of education increased quantities of rabbits supplied to the market by 4%. It is expected that household heads that are educated can easily understand contractual terms and access various information sources needed to enhance and sustain their levels of participation in rabbit market (Kiwanuka and Machethe, 2017).

The results further revealed that that the use of an improved rabbit breed would increase the probability of participating in a market by 6%. In addition, keeping improved rabbits would increase the volumes supplied to the market by 16%. This may be as a result of high production levels of improved rabbits which allow farmers to be in a position to participate supply the market with rabbit meat.

It was also revealed that access to credit positively and significantly influenced both market participation and the extent of participation. This finding agrees with that of Olwande and Mathenge (2012) who found that access to credit positively and significantly influenced a household's decision to participate in the market. This implies that credit access increases farmers' access to productive inputs and assets which increases productivity surplus for the market.

As hypothesized, membership in groups positively influenced both market participation and quantities of rabbits supplied to the market. A unit increase in membership in a group increased the probability of participating in a market by 6%. In addition, a unit increase in group membership increased the quantities supplied to the market by 12%. This finding implies that groups enabled

rabbit farmers to pull their resources together and take advantage of economies of scale. Kirsten and Vink (2005) argued that belonging to a group empowers farmers to bargain and negotiate for better trading terms which act as incentive for them to participate in markets and increase quantities of produce marketed.

Access to training was found to positively and significantly influence the decision of participating in a rabbit market. This implies that households who attended training concerning rabbit production and marketing participated more in rabbit markets than their counterparts. This may be attributed to access to market information (Fischer and Qaim, 2011).

Household asset index had a positive effect on the intensity of rabbit commercialization. A unit increase in the assets owned by farmers increased quantities supplied by 3%. Wealthy households have access to resources such as; transport, market information and large land sizes which are all impetuses for commercialized agriculture (Siziba *et al*., 2011).

4. Conclusion and policy implications

Commercialization of smallholder production and enhancing their integration in markets and more inclusive value chains remain a challenge for most countries in sub Saharan Africa like Kenya. This is a serious problem especially for micro-livestock such as rabbits. This study determined the factors influencing smallholders' participation and extent of market participation in the Kenyan rabbit sector. The study used a sample of rabbit farmers from Nakuru, Kiambu and Nyeri Counties of Kenya and multistage and systematic random sampling techniques were employed to reach 230 farmers.

The study found that most of the respondents had attained basic level of primary education with most of them being old. In addition rabbit farmers who participated in rabbit markets had more experience in rabbit keeping as compared to their counterparts. It was found that a higher proportion of those who participated in rabbit market were members of groups. Heckman two-step model results revealed that rabbit market participation was positively affected by household size, rabbit breed, credit access, group membership and access to training. The intensity of market participation was negatively affected by age and positively influenced by household size, education, rabbit breed, access to credit, group membership and assets owned.

Therefore, to enhance rabbit smallholders' participation in markets and modern value chains, it is important that the government, private sector and other supporting agencies increase their efforts aimed at enhancing smallholders' productivity such as access to credit, marketing information and animal breeding programs. Specifically, the government probably with the help of other rabbit stakeholders should work towards providing affordable and accessible credit to rabbit farmers in order to improve their ability to cover costs associated with production and marketing of rabbits. Ensuring that interest rates are lowered to a level affordable by smallholder farmers and simplifying application and disbursement procedures of loans should be made a priority. In addition, poor access to credit can be addressed by encouraging farmers to adopt table banking concept, which relies on peer review and group membership. Membership in groups was found to positively affect both the decision to participate in markets and the quantities supplied. Therefore, rabbit farmers should be encouraged to form active groups so as to benefit from collective action.

Acknowledgement

We thank African Economic Research Consortium (AERC), German Academic Exchange Service (DAAD), and the National Commission for Science and Technology (NaCOSTI) for facilitating this study by providing research funds.

Conflicting Interests

None

References

Anthony VP, Madu I (2015). Survey of the Current Status and Seasonal Problems Associated with Rabbit Production in Kaduna Metropolis. *Journal of Basic and Applied Research* 1 (1): 36-39.

Bobojonov, I., Teuber, R., Hasanov, S., Urutyan, V., and Glauben, T. (2016). Farmers' export market participation decisions in transition economies: a comparative study between Armenia and Uzbekistan. *Development Studies Research*, *3*(1), 25-35.

Borter DK, Mwanza RN (2011). Rabbit production in Kenya, current status and way forward. In Proceedings of Annual Scientific Symposium of the Animal Production Society of Kenya.

Driving Livestock Entrepreneurship towards attainment of Food sufficiency and Kenya Vision (Vol. 2030, pp. 13-19).

Chamboko, T., Mwakiwa, E., and Mugabe, P. H. (2017). Determinants of Milk Market Participation and Volume of Sales to Milk Collection Centres of the Smallholder Dairy Value Chain in Zimbabwe. *Journal of Agricultural Science*, *9*(10), 156.

Dairo FS, Abai HM, Oluwatusin FM (2012). Social Acceptability of Rabbit Meat and Strategies for Improving its Consumption in Ekiti State Nigeria. *Journal of Livestock Research for Rural Development* 24 (6).

Demissie, B., Komicha, H. H., and Kedir, A. (2014). Factors affecting camel and cow milk marketed surplus: The case of eastern Ethiopia. African Journal of Agricultural Science and Technology, 2(2), 54-58. Retrieved from https://www.oceanicjournals.com/ajast/pdf/2014/Feb/XXXXX%20et%20al..pdf

Fischer, Elisabeth; Qaim, Matin (2011) : Smallholder Farmers and Collective Action: What Determines the Intensity of Participation?, Proceedings of the German Development Economics Conference, Berlin 2011, No. 28, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

Hassan HE, Elamin KM, Yousif IA, Musa AM, Elkhairey MA (2012). Evaluation of body weight and some morphometric traits at various ages in local rabbits of Sudan, *Journal of Animal Science Advances,* 2(4): 407-415.

Jia, Lili and Petrick, Martin (2014) : How does land fragmentation affect off-farm labor supply: panel data evidence from China, Agricultural Economics, ISSN 1574-0862, Wiley, Hoboken, Vol. 45, Iss. 3, pp. 369-380, http://dx.doi.org/10.1111/agec.12071

Kitavi SM, Kibet LK, Lagat JK, Koech W (2015). Evaluation of Technical Efficiency of Rabbit Production in Buuri Sub-County, Meru County, Kenya. *Asian Journal of Agricultural Sciences*, 7(3), 24-35.

Kiwanuka, R. N., and Machethe, C. (2016). Determinants of smallholder farmers' participation in Zambian dairy sector's interlocked contractual arrangements. *Journal of Sustainable Development*, *9*(2), 230.

Mailafia S, Onakpa M, Owoleke E (2010). Problems and Prospects of Rabbit Production in Nigeria – A Review, Bayero. *Journal of Pure and Applied Sciences, 3(2): 20 – 25.*

Mailu S, Wanyoike M, Serem, J (2013). Rabbit breed characteristics, farmer objectives and preferences in Kenya: A correspondence analysis.

Moono, L. (2015). *An Analysis of Factors Influencing Market Participation Among Smallholder Rice Farmers in Western Province, Zambia* (No. 243459). Collaborative Masters Program in Agricultural and Applied Economics.

Muiruri MPD (2015). Mapping of the honey value chain and analysis of changes in gender roles and factors influencing women empowerment among beekeepers in Kitui county, Kenya (Msc. dissertation, University of Nairobi).

Mutayoba, V., and Ngaruko, D. (2015). Determinants of Farmers' participation in high value crops in Tanzania. *African Journal of Economic Review*, *3*(2), 102-116.

Muyanga, M., and Jayne, T. S. (2014). Effects of rising rural population density on smallholder agriculture in Kenya. *Food Policy*, *48*, 98-113.

Olwande, J. and Mathenge, M. (2012). Market participation among poor rural households in Kenya. *Contributed paper presented at the International Association of Agricultural Economists (IAAE) Triennial conference, Foz do Iguacu, Brazil, 18-24 Aug, 2012.*

Serem JK, Wanyoike MM, Gachuiri CK, Mailu SK, Gathumbi PK, Mwanza RN, Borter DK (2013). Characterization of rabbit production systems in Kenya. *Journal of Agricultural Science and Applications*, *2*(3).

Sharma, V. P., Jain, D., Sourovi, D. (2012): Managing agricultural commercialization for inclusive growth in South Asia, Agriculture Policy Series, Briefing Paper No. 6/2012, GDN, New Delhi, India.

Sigei, G., Bett, H., & Kibet, L. (2014). Determinants of market participation among small-scale pineapple farmers in Kericho county, Kenya.

Siziba, S., Nyikahadzoi, K., Diagne, A., Fatunbi, A. O., & Adekunle, A. A. (2011). Determinants of cereal market participation by sub-Saharan Africa smallholder farmer. *Journals of Agriculture and Environmental Studies, 2(1).*