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INFLUENCE OF FARM SIZE AND ACCESS TO FUNDS ON UPTAKE OF IMPROVED PRODUCTION TECHNOLOGIES IN AVOCADO (PERSEA AMERICANA)

(Research Article)

Corresponding author:

David N. Nyamumbo Mose

Kisii University,Kenya

dvdmose@yahoo.com

Samson N. Maobe

Kisii University, Kenya

snmaobe@kisiiuniversity.ac.ke

Evans A. Basweti

Kisii University,Kenya

evansbasweti@kisiiuniversity.ac.ke

Biodatas:

David N. Nyamumbo Mose is currently Agricultural Extensionist in the Directorate of Agriculture, Livestock and Fisheries Development, Kisii County. He received Bachelor of Science Agriculture degree in the University of Nairobi and is currently M.Sc. Agricultural Extenion post-graduate student, Kisii University. His research interests are in agricultural education and extension.

Samson N. Maobe is an Associate Professor in the Department of Agricultural Sciences, Kisii University. He previously studied Bachelor's of Science Agriculture degree, Master of Science and PhD degrees in Agronomy from University of Nairobi. His research interests are in agronomy, agricultural extension and youth.

Evans A. Basweti is an Associate Professor in the Department of Agricultural Sciences, Kisii University. He received Bachelor of Science Animal production degree in Egerton University; Master of Philosophy in Agroforestry in Moi University and PhD Plant and Soil Sciences in West Virginia University. His research interests are in Forage agronomy, Animal nutrition and extension.

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David N. Nyamumbo Mose

dvdmose@yahoo.com

Samson N. Maobe

snmaobe@kisiiuniversity.ac.ke

Evans A. Basweti

evansbasweti@kisiiuniversity.ac.ke

Abstract

The study was carried out to evaluate influence of economic factors on uptake of avocado improved production technologies by small scale farmers to increase yields. The study was carried out in Kisii and Nyamira counties region, Kenya. The general objective of the study is to improve avocado production in the study region. The specific objective is to evaluated influence of farmer's economic factors; farm size and access to finance on uptake of the production technologies, respectively. Reduced avocado yields in the region could be due to low uptake of improved production technologies by small scale farmers. The study hypothesized that the low uptake could be due to chance and there is no significant influence of the farmer's economic factors; farm size and access to funds on the uptake. Descriptive survey research design was used. Stratified and purposive sampling procedures and Morgan's table of sample size determination were applied in choosing of respondents. There was one sub-county purposively sampled from each of the 4 agroecological zones in the region for study area. Thus from 4 sub counties with 1,211 households, a sample of 291 respondents was accessed using Morgan's table. Reliable structured questionnaires with Cronbach Alpha, α=0.724 were used to collect field data from 291 small scale avocado farmers. The data was analyzed using statistical package for social sciences (SSP) computer software. Descriptive analysis of variance, least significant difference and regression outputs were obtained. Results show that influence of farmer's farm size of more than 3 acres and access of funds from formal employment make significant difference and have positive correlation with uptake of avocado improved production technologies, respectively. Farmer's access of funds from banks or SACCOs does not have a significant influence on uptake of the avocado production technologies. Land subdivision among small scale farmers should be discouraged and affordable credit sources for them considered, respectively for increased uptake of avocado improved production technologies.

Keywords: Economic factors, avocado improved production technologies

Introduction

Avocado (Persea americana) is a tropical fruit tree of Lauralee family. Rudimentary production of the fruit tree originated in Mexico around 10,000 BC. It spread fast to northern and southern hemispheres then to tropical and subtropical countries courtesy of European settler influence (Human, 1987; Gaufa et al.,2011). Globally, farmers are now applying avocado improved production technologies to increase yields. The technologies are researched on ideas, innovations and products developed by agronomists to increase avocado yields. These include; improved avocado varieties, certified sources of improved avocado seedlings, crop husbandry hygiene and access to market (Whittaker et al., 1989).

Empirical evidence shows that application of improved production technologies including that of creates opportunities, efficiency and benefits for farm producers (Gurel, 1998). The application is a major tool in rural development (Mapila, 2011; Mulayim, 1995). It also increases farm yields and economic growth (Pinstrup, 1982; Nin et al., 2003; Emongor, 2010) and reduces costs, poverty and increases rural development (Stoorvogel et al., 1990). Avocado is the healthiest fruit (Guinness Book of Records, 2010); the crop yields highest returns per acre as compared to other crops and fruits (FAO, 2005); provides shade, windbreaks, posts and ornamentals (Albertin and Nair, 2004). Avocado plantations play a role in carbon storage and sequestration that mitigates on environmental pollution (Kirby and Potvin, 2007).

Despite these benefits, application of avocado improved production technologies is low in Sub-Saharan Africa while it has rapidly increased in other parts of the world. This explains the slow growth of avocado productivity in sub-Saharan Africa including Kenya (Morris et al., 2007). Avocado production was introduced in Kenya by Europeans in early 18th century. By 1939, they had planted improved avocado seedlings in the highlands and were spreading to other parts of the country (Griesbach, 2005). Kenya is a leading avocado producer in Africa and eighth in the world. Besides, it has a huge avocado production potential that has not been exploited (FAO, 2011). It's a major crop in Kenya's national economy both for food security and income (Griesbach, 2005). Avocado production has been prioritised in the study region. For example, in Kisii County, it's a flagship project where planting of improved Hass avocado seedlings, marketing promotion and training farmers are major activities (Kisii county county integrated development plan 2013-2017, 2013).

Despite avocado's enormous economic importance, high production potential, yields obtained in smallholder avocado farming are low and this is attributed little uptake of improved production technologies despite their documented benefits. Other challenges faced by avocado farmers in Kenya and other similar regions include; premature fruit harvesting, losses due to root rot fungal disease (MOA, USAId & HCDA Annual report, 2012; Dirou and Stovold, 2004) and planting of local varieties (MOA, USAid & HCDA Annual report, 2012; Gaufa et al., 2011). Local avocado varieties take long to mature, bear low fruit yields, the fruits are of poor quality and prone to high post-harvest handling perishability, have undesirable qualities and unmanageable growth vigour, utilize large land space and are not disease and pest resistant (The Royal Horticultural Society, United Kingdom, 2014).

Farmers and other enterpreneurs operate in an environment of natural and socio-economic factors (Elemo et al.,1984). Interaction of these factors lead to increased production costs, low production and other risks which make the actors to shy away from engaging in economic activities (Trieschmann & Gustavson, 1998). According to Rogers (1995), the factors may influence enterpreneurs including farmers to take up enterprise improved production technologies including avocado for increased production.

This study considers influence of farmer's economic factors on uptake of avocado improved production technologies. The economic factors determine the competitiveness of farmers. According to Rogers (1995), farmers who are endowed with economic capital are early takers of improved production technologies. The factors are; farm size and access to funds.

The Ministry of Agriculture,United States Aid and Horticulture Crops Development Authority horticulture performance report (2010-2012) rates production of major fruits and avocado per major producing county in Kenya in terms of percentage share by value. Fruits production are: 38% bananas, 22% mangoes, 16% pineapples, 6% pawpaw, 5% avocado, 4% melon, 3% oranges, 2% passion fruits and 1% tangerines. Avocado production per county are: 45% Nyamira, 11% Kisii, 11% Kiambu,7% Tharaka Nithi, 5% Migori and 4% Kirinyaga.

The data shows that despite avocado's documented high nutritive and economic value, its share by value nationally is unfortunately low at only 5% share by value.The value of avocado is low despite Kenya being the leading avocado producer in Africa and having a huge unexploited production potential (FAO, 2011). This implies that having strategies to increase uptake of avocado improved production by farmers, Kenya will achieve a comparative production advantage in Africa.The data also shows that Kisii and Nyamira counties, the study region, account for 56% share by value which is more than half of the national production in Kenya.This is in agreement with the findings of Food and Agriculture Organization, FAO (2011) that Kenya and by extension, the study region has a huge and under-utilised avocado production potential.

Low avocado production in the study region; Kisii and Nyamira counties, could be due to low uptake of avocado improved production technologies by small scale farmers. A study was carried out in the study region to evaluate influence of farmer's economic factors on uptake of avocado improved production technologies. The general objecive of the study is to improve avocado production in Kisii and Nyamira counties region, Kenya. The specific objective is to evaluate how the farmer's economic factors; farm size and access to funds influence uptake of avocado improved production technologies.The study hypothesised that low uptake of the technologies by the farmers could be due to chance and that there was no significant influence of the these economic factors on the uptake. This is the knowledge gap that this study sought to address. Therefore, the farmer's economic factors were evaluated for their influence on the farmer's uptake of avocado improved production technologies in Kisii and Nyamira counties region, Kenya.

2. Research Methodology

2.1 Setting

The study was conducted in Kisii and Nyamira counties region in Kenya. The region covers a total area of 2,230.4 Km2 out of which approximately 80% is arable land. The counties lie between longitudes 340 58'E and 350 05'E and latitudes 0035'S and 00 58'S. The region has 13 sub-counties and 65 wards where Kisii has 9 sub-counties and 45 wards while Nyamira has 4 sub-counties and 20 wards. The total population is approximated at 1,750,534 persons with an average of 6 persons per farm family thus giving 291,756 farm families or households. Most of the households own less than 3 acres of land each on average and are thus small scale mixed farmers (Kenya national bureau of statistics-KNBS, 2012; Independent electral and boundaries commission-IEBC, 2012). The altitude of the study region ranges between 1400-2250 meters above sea level (asl). Based on temperatures, amount of rainfall and distribution, soil and enterprises types, enterprise growing periods and production potentials, Jaetzoldet al. (2009) stratified the region into four agro-ecological zones (AEZs) or farm types. The AEZs

are: 1) Lower highland one, LH1 (tea-dairy zone covers 30%); 2) Lower highlands two, LH2 (wheat-maize-pyrethrum zone covers 5 %); 3) Upper midland one, two, threeUM1 (coffee-banana zone covers 60 %); and 4) Lower midland one, LM1 (sugar cane zonecovers 5 %). Farms in each AEZ have similar farming conditions but each zone has different and unique farming conditions from another in same region and across regions with similar situations (Jaetzold et al.,2009). With the different and unique defining climatic characteristics, each of the four AEZs was used as sampling site for a diverse study population. The region has fertile and well drained soils, reliable rainfall and tropical temperatures. The suitable clmate is ideal for production of diverse crops and livestock enterprises making farming the major economic activity of the region.

2.2 Research Design

A research design is an overall strategy within which research is conducted. It ensures that research problem is addressed. It involves collecting, measuring, and analysing data (Kothari, 2004). Descriptive survey research design was used for the study where quantitative data which describes situations hence descriptive, was collected from a sample of respondents (Kothari, 2004) through administering questionnaires hence survey (Orodho, 2009). Analysed information was used to make un-biased, reliable, factual descriptions and predictions on the sample and target population. Structured, reliable, closed ended itemized (Mugenda and Mugenda, 2003; Kumar, 2011; Mulusa, 1990) questionnaires with an acceptable reliability Cronbach Alpha, α=0.724 (Cronbach et al., 1955) were used to collect data.

2.3 Target Population

Target population is total number of individuals with common observable characteristics from which a random sample size for study is accessed (Mugenda & Mugenda, 2003). Target population for this study were the small scale avocado farmer households. The target population grow avocado for home consumption and could at least have excess to sell and they were 15% of the number of stratified farmer households per sub-county (Ministry of Agriculture, 2012).Thus target population was 3731 which was an aggregate of 15% on ratio of area of each subcounty to that of the region of number of farmer households per sub county. However, based on largest avocado hectarage of each subcounty in each agro-ecological zone (AEZ), the targeted farmer households in the study were: 1) 513 in Bobasi subcounty in lower highland one AEZ, 2) 391 in Borabu sub county in lower highland two AEZ, 3) 144 in Kitutu Chache North sub county in upper midland one,two,three AEZ and 4) 163 in Bonchari sub county in lower midland one AEZ giving a total of 1,211 farmer households.

2.4 Sample size and Sampling procedure

Sample size for the study was 291 farmer households (HHs). Stratified sampling was used to apportion farmer households to ensure uniform farmer representation per sub county in the study region. Sub counties were the data collection sites for the study. Purposive sampling was used to select 1 sub county with their respective farmer households (HHs) from each agro-ecological zone (AEZ) for all the 4 AEZs based on largest avocado hectarage as criteria for the sampling. Purpose of purposive sampling was to provide representative and reliable data, reduce time, cost of study and repetitions. Sub counties in each AEZ have similar farming conditions but each AEZ has different and unique farming conditions from another in same region and across regions with similar situations (Jaetzold et al.,2009). Thus the total farmer households from the 4 purposively sampled sub-counties was 1,211 HHs from where the sample of 291 respondents was accessed using Morgan's table of sample size determination (Krejcie & Morgan, 1970). Morgan's table of sample size determination states that, "no calculations are needed when using the table and as target population size increases the

sample size increases at a diminishing rate and remains relatively constant at slightly more than 380 cases" (Krejcie & Morgan, 1970). Thus Morgan's table summarizes population sizes and approves sample sizes to be used for a study.

2.5 Instrumentation

The study used structured questionnaires with closed ended items or questions to collect primary data. The questionnaires, formulated by the researcher, had set of coded questions addressing the study objectives and coded responses to the questions which were expected to assist in arriving at expected study outputs. Responses had provisions of yes, no, not applicable and likely and agree on Likert scale ratings. Form of responses was ticking on yes, no, not applicable or on a selection from a list of options on the Likert scale ratings which respondents selected and ticked the answer that best described their situation, attitude or opinion. Secondary data was obtained through desktop survey through gathering and analyzing information already available in print or published form.

2.6 Validity

Validity is the extent to which the research instrument measures what it is designed to measure(Mugenda&Mugenda, 2003; Kombo & Tromp, 2006). Thus the instrument and the study objectives were examined and assessed by an expert from Kenya Agricultural and Livestock Research Organization, Kisii and Kisii University supervisors. The experts examined and assessed face and content validity of the instrument to gauge if there was a logical link between the questions and objectives of the study and that it would assist in data collection. Input for improvement from the experts was incorporated thence making the instrument appropriate for data collection (Mugenda&Mugenda, 2003).

2.7 Reliability

Pre-testing or piloting of the instrument for reliability was done by administering the questionnaire for data collection to 20 farmers randomly sampled from small scale avocado farmers in Nyaribari Chache sub county. Sample size for pre-testing should be between one and ten percent of calculated study sample (Mugenda and Mugenda, 2003) in this case 291 farmer households. Farmers from this sub-county in study region were not taking part in the actual study. Piloting assist in detecting weaknesses, vague questions and ommissions and establishes the period it takes to be completed by respondents in the actual study (Hair et al., 2007; Muijs et al., 2008). Reliability is the ability of a research instrument to produce consistent results when used in different areas on similar conditions (Mugenda and Mugenda, 2003; Kumar, 2011;Mulusa, 1990). Correlation or internal consistency of items or questions of the instrument confirms its reliability thus Cronbach Alpha coefficient indicates how the items correlate and a high coefficient indicates high correlation hence the data collection instrument is consistent and reliable (Cronbach et al., 1955). The collected pre-testing data was cleaned, organized, coded and entered into statistical package for social sciences version 22. Reliability analysis was carried out and Cronbach Alpha showed that the questionnaire reached an acceptable reliability, α=0.724 indicating that the questionnaire was reliable.

2.8 Data Collection procedures

After approval of the proposal, the researcher obtained a letter of introduction from Kisii university addressed to the national commission for science, technology and innovations as required by law requesting for a research permit to facilitate the data collection. The research permit was granted and issued. Through sub county agricultural officers of the data collection sites, the researcher and 2 research assistants held focussed group discussions at

strategic sites to draw modalities for data collection. The researcher gave a brief on; purpose of the study and clarified any unclear issues on the questionnaire. Modalities of seeking respondent's consent for the data collection, ensuring their ethical and confidentiality and respect measures were discussed. It was emphasized that the data to be collected was purely for research purposes. The research assistants were asked to cascade the same briefing to the respondents on the data collection day. Researcher handed over the questionnaires to the respective research assistants after the briefing. On the data collection day, respective research assistants met the respondents at the strategic sites. After briefings, each respective research assistant randomly availed the questionnaires using drop and pick method to the respondents for filling. Then the respondents returned the questionnaires to the research assistants after completion. Confidentiality of the respondents was observed in that their anonymity was ensured.

2.9 Data Analysis

The collected data was cleaned,organized, coded and entered into statistical package for social sciences-SPSS Version 22 software in the computer for analysis (Field, 2013). Using SPSS; quantitative and social-demographic characteristics data was subjected to descriptive statistics for frequencies and descriptives. The outputs included frequencies, frequency distribution charts and tables, percentages and means thus allowing visual and accurate reflections on data variations. The data was subjected to analysis of variance-ANOVA test. The test analyses the predictive statistically significant variations or means of one independent variable at a time on the dependent variable based on their respective responses. Least Significant Difference post-hoc multiple comparisons of the variations or means test was used to state where the statistically significant mean differences occured among the various responses. The Least Significant Difference is a computed value, in this case by the software, which shows how much two means must differ to warrant rejection of the null hypothesis and concluding they are significantly different. The differences between all possible pairs of means are computed by subtraction. These mean differences are compared to the Least Significant Difference value. Any two means that differ at least by the LSD value or amount will be judged to be significantly different at the 0.05 level (Arkkelin, 2014). Lastly, the data was subjected to Spearman's rho regression analysis test to explore any statistically significant correlation between each independent and the dependent variable.

3. Results

3.1 Influence of farmer's economic factors on uptake of avocado improved production technologies

a) Farm size

Respondents rated three farm sizes and its influence on farmer's uptake of avocado improved production technologies. Analysis of variance test (Table 1) show that there is a statistically significant influence of farm size on uptake of avocado improved production technologies at the $p < .05$ level for the three groups, $F(2,288)$ $F=4.78$, p ($p < .05$)$= .009$. Thus the study hypothesis Ho, which hypothesized for non-significant influence of the farmer's farm size on uptake of avocado improved production technologies, tested at 0.05 level of significance, is rejected.

Least significant difference post-hoc analysis test (Table 2) show that all the three mean differences are significantly different from each other. The influence of more than 3 acres rating is more significant than between 1-3 acres and less than 1 acre ratings as ranked (Table

1). Meaning, influence of more than 3 acres farm size has more significant mean difference and descriptive mean (MD=0.412; M=1.61) on uptake of the technologies than between 1-3 (MD=0.207; M=1.41) and less than 1 (MD=-0.207; M=1.20) acre farm sizes.Thus respondents with more than 3 acres farm size take up avocado improved production technologies more than the other farm sizes.Spearman's rho regression analysis test (Table 3) show that the correlation between the two variables at the p< .01 level (2-tailed) is positive and statistically significant at N-2 degree of freedom, rs(288)=.188, p=.001.

Table 1: Descriptives, Least significance difference test mean difference ranking and Analysis of variance results on influence of farmer's farm size in acres on uptake of the improved technologies

Dependent variable: Uptake of avocado improved production technologies											
Independent variable: Farm size in acres											
Descriptives				LSD Mean Difference (MD)		ANOVA					
Response	Mean	Std. Dev.	Std. Dev.	LSD MD	MD Rank		Sum of Squares	df	Mean Square	F-value	P-value (Sig.)
Less than 1 acre	1.20	0.59	0.59	-.207*	3	Between Groups	5.176	2	2.588	4.78	.009
Between 1-3 acres	1.41	0.75	0.75	.207*	2	Within Groups	155.944	288	.541		
More than 3 acres	1.61	0.89	0.89	.412*	1	Total	161.120	290			
Total	1.39	0.75	0.75								
*. The mean difference is significant at the 0.05 level.											

Table 2: Least significant difference test results on influenceof farmer's farm sizein acres on uptake of the improved technologies

Multiple Comparisons				
Dependent variable: Uptake of avocado improved production technologies				
LSD				
(I) Size of farming land in acres	(J) Size of farming land in acres	Mean Difference (I-J)	Std. Error	Sig.
Less than 1	Between 1-3	-.207*	.102	.044
	More than 3	-.412*	.135	.003
Between 1-3	Less than 1	.207*	.102	.044
	More than 3	-.205	.120	.087
More than 3	Less than 1	.412*	.135	.003
	Between 1-3	.205	.120	.087
*. The mean difference is significant at the 0.05 level.				

Table 3: Spearman's correlation coefficient result on influence of farmer's farm size in acres on uptake of the improved technologies

Correlations				
			Uptake of improved avocado production technologies	Size of farming land in acres
Spearman's rho	Uptake of improved avocado production technologies	Correlation Coefficient	1.000	.188**
		Sig. (2-tailed)	.	.001
		N	291	291
	Size of farming land in acres	Correlation Coefficient	.188**	1.000
		Sig. (2-tailed)	.001	.
		N	291	291

**. Correlation is significant at the 0.01 level (2-tailed).

b) Access to funds

Respondents rated five sources of funds and its influence on farmer's uptake of avocado improved production technologies. Analysis of variance test (Table 4) show that there is a statistically significant influence of access to funds on uptake of avocado improved production technologies at the p< .05 level for the four groups, F (4,286) =3.28, p (p< .05)= .012.Thus the study hypothesis Ho, which hypothesized for non-significant influence of the farmer's access to funds on uptake of avocado improved production technologies, tested at 0.05 level of significance, is rejected.

Least significant difference post-hoc multiple comparisons test (Table 5) show that four out of the five mean differences are significantly different from each other. The influence of formal employment funds source rating is more significant than farm savings, table banking and self employment ratings as ranked (Table 4). Meaning, influence of formal employment source has more significant mean difference and descriptive mean (MD=0.463; M=1.59) on uptake of the technologies than farm savings (MD=0.400; M=1.53), table banking (MD=-0.255; M=1.27) andself employment (MD= -0.400; M=1.13) funds sources. However, the descriptive mean (M=1.31) for respondents who access funds from banks or SACCOs does not significantly differ from mean scores of the other four groups.Thus respondents accessing funds from formal employment take up avocado improved production technologies more than the other sources. Spearman's rho regression analysis test (Table 6) show that the correlation between the two variables at the p< .01 level (2-tailed) is positive and statistically significant at N-2 degree of freedom, rs(288)=.161, p=.006.

Table 4: Descriptives, Least significance difference test mean difference ranking and Analysis of variance results on influence of farmer's source farm improvement funds on uptake of the improved technologies

Dependent variable: Uptake of avocado improved production technologies											
Independent variable: Source of funds											
Descriptives				LSD Mean Difference (MD)		ANOVA					
Response	Mean	Std. Dev.	Std. Error	LSD MD	MD Rank		Sum of Squares	df	Mean Square	F-value	P-value (Sig.)
Table banking	1.27	0.65	0.08	-.255*	3	Between Groups	7.075	4	1.769	3.28	.012
Banks and SACCOs	1.31	0.72	0.10	Not Sig.	-	Within Groups	154.046	286	.539		
Self empolyment	1.13	0.42	0.07	-.400*	4	Total	161.120	290			
Formal employment	1.59	0.85	0.12	.463*	1						
Farm savings	1.53	0.83	0.09	.400*	2						
Total	1.39	0.75	0.04								
*. The mean difference is significant at the 0.05 level.											

Table 5: Least significant difference test results on influence of farmer's access to funds sources onuptake of the improved technologies

Multiple Comparisons				
Dependent variable: Uptake of avocado improved production technologies				
LSD				
(I) Access to sources of funds to improve avocado farming	(J) Access to sources of funds to improve avocado farming	Mean Difference (I-J)	Std. Error	Sig.
Table banking	Banks and SACCOs	-.045	.131	.735
	Self empolyment	.145	.155	.350
	Formal employment	-.318*	.134	.018
	Farm savings	-.255*	.118	.032
Banks and SACCOs	Table banking	.045	.131	.735
	Self empolyment	.190	.164	.247
	Formal employment	-.273	.143	.057
	Farm savings	-.210	.129	.105
Self empolyment	Table banking	-.145	.155	.350
	Banks and SACCOs	-.190	.164	.247
	Formal employment	-.463*	.166	.005
	Farm savings	-.400*	.154	.010
Formal employment	Table banking	.318*	.134	.018
	Banks and SACCOs	.273	.143	.057
	Self empolyment	.463*	.166	.005
	Farm savings	.063	.132	.631

Farm savings	Table banking	.255*	.118	.032
	Banks and SACCOs	.210	.129	.105
	Self empolyment	.400*	.154	.010
	Formal employment	-.063	.132	.631

*. The mean difference is significant at the 0.05 level.

Table6: Spearman's correlation coefficient result on the influence of farmer's source of funds to improve farming on uptake of the improved technologies.

Correlations				
			Uptake of improved avocado production technologies	Source of funds to improve avocado farming
Spearman's rho	Uptake of improved avocado production technologies	Correlation Coefficient	1.000	.161**
		Sig. (2-tailed)	.	.006
		N	291	291
	Source of funds to improve avocado farming	Correlation Coefficient	.161**	1.000
		Sig. (2-tailed)	.006	.
		N	291	291

**. Correlation is significant at the 0.01 level (2-tailed).

4 Discussion

4.1 Influence of farmer's economic factors on uptake of avocado improved production technologies

a) Farm size

The results show that farmer's farm size significantly influences them to take up avocado improved production technologies as shown by analysis of variance (Table 1). The uptake significantly increases with significant increase in farm size (Table 3) where influence of more than 3 acres has more significant mean difference (Table 2) and descriptive mean (Table 1) than between 1-3 and less than 1 acre farm sizes. Thus farmers that own more than 3 acres farm size show more uptake of avocado improved production technologies hence better for the technology uptake. Further land sub-division of arable land in the region should be curtailed in order to support the technology uptake as majority of farmers in region own between 1-3 acres of land.The finding is consistent with Abara and Singh (1993) in the United States of America, Gabre-Madhin and Haggblade (2001) in Kenya and Abunga et al.(2012) in Ghana.

b) Access to funds

The results confirm that farmer's access to funds influences them to take up avocado improved production technologies as revealed by analysis of vaiance (Table 4). The uptake significantly increases with significant increase in access to funds (Table 6) where influence of formal employment funds source has more significant mean difference (Table 5) and descriptive mean (Table 4) than farm savings, table banking and self employment fund sources. Thus farmers that access funds from formal employment show more uptake of avocado

improved production technologies hence better for the technology uptake. Besides farm savings, table banking and self employment, formal employment is the cheapest source of farm improvement funds. The vulnerables, women and youth do not access credit from formal banking facilities because it's unaffordable reason why SACCOs or banks is not a significant source of funds. There is need to estabish subsidized county farmer credit lending institutions. The finding on access to cheaper credit agrees with Curtis (2013) in Burundi, Ghana, Zambia, Kenya and Sierra Leone, Benin et al. (2009) and Abunga et al. (2012) in Ghana.

5.Conclusion

There is a significant influence and positive significant correlation of farmer's farm size ($F [2,288]=4.78$, $p [p< .05]= .009$; $rs[288]= .188, p= .001$) and access to funds ($F [4,286]=3.28$, $p [p< .05]= .012$; $rs[288]= .161, p= .006$) on and between uptake of avocado improved production technologies respectively. Farmers owning more than 3 acres and accessing farm improvement funds from formal employment take up improved technologies more significantly than farm sizes below 3 acres and farm savings,table banking and self employment fund sources respectively.

6. Recommendations

The study reveals that farmer's farm size and access to funds influence farmers to take up avocado improved production technologies. Farmers owning more than 3 acres more significantly take up the technologies than farmer's with farm sizes below 3 acres. This calls for stakeholders to curtail further sub-division of arable land in order to support the technology uptake. Besides, majority of farmers in region own between 1-3 acres of land. Farmer's accessing farm improvement funds from formal employment take up the improved technologies more significantly than farm savings, table banking and self employment fund sources. Formal employment is a guaranteed funds source while the rest of the sources are cheaper and affordable by the vulnerable, women and youth farmers. There is need to estabish subsidized county farmer credit lending institutions by the county governments to spur improved technology uptake by citizens in the counties.

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References

Abara, I. O. C. & Singh, S. (1993). Ethics and biases in technology adoption: The small farm argument. Technological Forecasting and Social Change, 43, 289-300.

Abunga, M.A.; Emelia, G. &Kwesi, D. (2012). Adoption of Modern Agricultural Production Technologies by Farm Households in Ghana: What Factors Influence their Decisions? Tamale, Ghana. Journal of Biology, Agriculture and Healthcare, Vol 2, No.3.

Albertin, A. & Nair P.K.R. (2004). Farmers' Perspectives on the Role of Shade Trees in Coffee Production Systems: An Assessment from the Nicoya Peninsula. Costa Rica, Human Ecol. 32:4.

Arkkelin, D. (2014). Using SPSS to Understand Research and Data Analysis. Psychology Curricular Materials. Book 1. http://scholar.valpo.edu/psych_oer/1.

Benin, S., Mogues, T., Cudjoe, G. &Randriamamonjy, J. (2009). Public expenditures and agricultural productivity growth in Ghana.Contributed Paper for International Association of Agricultural Economists in Beijing 2009.

Cronbach, L.J. &Meehl, P.E. (1955). Construct Validity in Psychological Tests. Psychological Bullettn, 52(4), 281-302.

Curtis, Mark. (2013). Improving African Agriculture Spending: Budget Analysis of Burundi, Ghana, Zambia, Kenya and Sierra Leone.Retrieved from: http://www.africa-adapt.net/media/resources/872/improving-african-agriculture-spending.pdf

Dirou, J.N.& Stovold, G.E. (2004). Avocado diseases. Retrieved from: http://www.agric.nsw.gov.au.

Elemo, K.A., Fisher, N.M., Y.A. Abdullahi., O. Ajayi., A.B. Bello., H.L. Musa., Ogungbile A.O. & J.P. Voh. (1984). An exploratory survey of the farming systems of southwest Plateau State of Nigeria. Ibadan, Nigeria.

Emongor (2010).ICRAF KARI Conference May 2010. End of Programme Report National Agriculture and Livestock Extension Programme, 2011. Manga District, Kenya.

FAO(2011).World Avocado Production: http://en.wikipedia.org/wiki/Avocado#cite_note-FAO-17.

FAO (2005). Market Segmentation of Major Avocado Markets, Sugar and Beverages Group Raw Materials, Tropical and Horticultural Products Service Commodities and Trade Division. FAO, United Nations.

Field, A.P. (2013). Discovering Statistics using IBM SPSS Statistics: and sex and drugs and rock 'n', 4th edition.Sage, London.

Gabre-Madhin, E.Z. &Haggblade S. (2001). Success in African agriculture: Results of an expert survey.International Food Policy Research Institute, Washington DC.

Gaufa, S. F., Notise, F. &Luaao, F. M. (2011). Samoa Avocado Oils: Processing into Export Products and Commercialization Opportunities. Scientific Research Organization of Samoa, pp 3-18.

Griesbach, J. (2005). Avocado Growing in Kenya. World Agroforestry Centre (ICRAF), Nairobi, Kenya.

Guinness Book of Records (2010). Trippy Food, Holy Guacamole. Carpentaria, California.

Gurel, A. (1998). A Study on the Factors Affecting the Behavious of Sunflower Producers to Technologic Innovations in Malkara District.Trakya University Tekirdag Faculty of Agriculture, Publication Number: 262, Research Number: 90, Tekirdag.

Hair, J.F., Arthur, H. M., Phillip, S. & Mike, P. (2007). Research Methods for Business. Chichester: John Wiley and Sons.

Human, T.P. (1987).Oil as a byproduct of the avocado.South African Avocado Growers Association Yearbook 10:pp159-162.

Indepent Electral and Boundaries Commission (2012). Final Report of bounaries and wards. Gazetted on 7/3/2012.pdf pp 196-203, Nairobi,Kenya.

Jaetzold, R., Schmidt, H., Hornet, Z.B. &Shisanya, C. (2009). Farm Management Handbook of Kenya.Natural Conditions and Farm Management Information.2nd Edition.Vol.11/ A. West Kenya, Nyanza Province.Ministry of Agriculture/GTZ, Nairobi, Kenya.

Kenya National Bureau of Statistics (2012).Nairobi,Kenya.

Khanna, M. (2001). Sequential adoption of site-specific technologies and its implications for nitrogen productivity: A double selectivity model. American Journal of Agricultural Economics, 83(1), 35-51.

Kirby, K. &Potvin, C. (2007). Variation in Carbon Storage among Tree Species: Implications for the Management of Small-Scale Carbon Sink Project. For Ecology Management. 246: 208-221.www.elsevier.com/locate/foreco.

Kisii County (2013). The First County Integrated Development Plan 2013 – 2017. Kisii County Government.

Kombo, D.K. & Tromp, D.L.A. (2006). Proposal Writing and Thesis Proposal; An Introduction.Nairobi, Kenya. Pauline's Publications.

Kothari, C. R. (2004). Research Methodology: Methods and Techniques. Retrieved from: http://www.2shared.com/document/CpY988Ro/2004__Kothari__Research_Method.html

Kumar, R. (2011) Research Methodology; A Step by Step Guide for Beginners, 3rd edition.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, pp.607-610.

Mapila, M. A. T. J. (2011). Rural livelihoods and agricultural policy changes in Malawi.Agricultural Innovations for Sustainable Development. In: Manners, G.andSweetmore, A., (Editors). Accra-Ghana, CTA and FARA, 3, 190-195.

Ministry of Agriculture., Horticulture Crop Development Authority & United States Aid.(2012). Validated Data on Horticulture Performance. Nairobi, Kenya.

Ministry of Agriculture (2012). Annual work plan: Kisii County/Nyamira County.

Morris, M., Kelly, V.A., Kopicki, R. &Byerlee, D. (2007). Fertilizer use in African Agriculture. Washington D.C., World Bank.

Mugenda, O. &Mugenda, A. (2003).Research Methods: Quantitative and Qualitative Approaches. Nairobi: Acts Press.

Muijs, D. & Lindsay, G. (2008).Where are we at?. An empirical study of levels and methods of evaluating continuing professional development. British Educational Research Journal, 34 (2): 195-211.

Mulayim, Z.G. (1995). The Cooperative System. Yetkin Publications, Ankara.

Mulusa, T. (1990).Evaluating Education and Community Development programmes. Deutsche Stitung for International Entwicklung and College of Adult and Distance Learning.

Nin, A., Arndt, C. &Precktel, P. (2003).Is agricultural productivity in developing countries really shrinking? New evidence using a modified nonparametric approach. Journal of Development Economics, 71, 395-415.

Orodho, A.J. (2009). Element of Education & Social Science Reaersch Methods. Kanezja Publisher, Maseno Kenya.

Pinstrup-Andersen, (1982). World Food Prospects: Critical Issues for the Early Twenty-First Century.

Rogers, E.M. (1995). Diffusion of Innovations, 4th Edition. Free Press, New York.

Stoorvogel, J.J. &Smalling, E.M.A. (1990). Assessment of Soil Nutrient Depletion in Sub-Saharan Africa: 1983-2000.Report 28, DLO-Winand Staring Centre, Wageningen, The Netherlands.

The Royal Horticultural Society, United Kingdom, (2014). Rootstocks for Fruit Trees.Retrieved from: http://ww.rhs.org.uk/advice.

Trieschmann, J.S. &Gustavson, S. F. (1998).Risk Management and Insurance, 10th Edition.South-Western College Publishing, Cincinnati, Ohio.

Whittaker, D.A. & Ronald, H. Thieme. (1989). Integration of Problem-Solving Techniques in Agriculture.AI Magazine Volume 10, Number 2 (1989) (© AAAI).