TRAINING OF SMALLHOLDER FARMERS AND FOOD SECURITY IN SIAYA COUNTY, KENYA

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Abstract

The way training of smallholder farmers contributes to food security remains a key challenge not only in Kenya but also worldwide. Despite the fact that smallholder farmers are the main rural actors in agriculture, they still experience food insecurity due an array of socioeconomic challenges that exists. The study was set to analyze the contribution of training smallholder farmers to food security in Siaya County, Kenya. Correlation design was used. The target population was 199,034 smallholder farmers selected from 6 Sub Counties of Siaya. Sample size of 384 was arrived at through Fisher's model. Sampling technique was stratified sampling. The research tool was structured questionnaire, which was tested for validity and reliability before administration. Training had a statistically significant weak positive correlation (R=.253; p<.05) with food security. Training had a statistically significant contribution to food security (F_{ratio} = 23.910; p< .05) attributing 6.4% variance. It showed that for every one standard deviation increase in training initiatives, food security improved by .253 units. In conclusion, training of smallholder farmers made negligible contribution to food security in Siaya County, Kenya. The study recommends that: field agricultural officers should intensify training initiatives with a view to enhancing sustainable food security; and Siaya County Department of Agriculture should invest in research to identify various training interventions to be used for sustainable food

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security. The study was justified because it revealed training interventions that supports the realization of smallholder farmers' food security situation not only in Kenya but worldwide.

Key words: training; smallholder farmers; and food security

1. Introduction

In this section, the topic of the study is discussed. In particular, training, smallholder farmers and food security are discussed.

1.1   Training

Manpower Services Commission U.K. (1981) defined training as a planned process for modifying attitude, knowledge, skills or behavior through learning experiences to achieve effective performance in any activity or range of activities. Its purpose, in the work situation, is to develop the abilities of the individual to satisfy current and future manpower needs of an organization. According to Sloman (2005) training endeavors to impart knowledge, skills and attitudes necessary to perform job-related tasks. It is characterized as an instructor-led and content-based intervention designed to bring desired change in behavior.

Opinions differ as to whether a change of attitude should be included in the definition of training. According to Wills (1994) attitudes are notoriously difficult to quantify and training a lone is insufficient to bring about major long-term changes in attitude. Instead, he defines training as the transfer of measurable knowledge or skills. Hare *et al* (1996) reported training as any activity or course of action either formal or informal, which helps in acquiring the knowledge and skills important in doing a job.

According to Overman (1994) what peoples' heart feels are easily forgotten and what they see are easily remembered. Hughey and Mussnug (1997) likewise observed that most employees simply do not learn very well when they are talked to. Employees therefore need to be more actively involved in training and learning experiences so as to improve their efficiency and effectiveness.

The origin of training as a concept can be traced back to the middle Ages in the form of apprenticeships. Training evolved into vocational schools in the early 1800's and apprenticeship programs were shortened and what is now known as job instructional training was developed around the First World War (Desimone, Werner & Harris, 2002).

A variety of training methods have taken shape over the years. Lectures/demonstrations are the oldest forms and most traditional means of training. In its most basic state, lectures and demonstrations simply present information from the trainer to the trainee. On-the-job training is considered as a form of traditional training, which occurs in the workplace. It consists of methods such as apprenticeship, internship, mentorship among others (Blanchard & Thacker, 2009).

Audio visual enhancements also provided a means for the trainees not only to absorb knowledge in a traditional basic way but also to gain insight by exploiting the auditory sense. In this case, retention is more easily transferred when easy viewing is exercised and technical difficulties eliminated. Today, audio visuals are made available by computer technology and it is hard to imagine the workplace where employees training take place without computer-generated assistance (Blanchard & Thacker, 2009).

1.2 Smallholder farmers

Smallholder differs between countries and between agro-ecological zones. In agriculturally favorable areas with high population densities they often cultivate less than one hectares of land, whereas they may cultivate 10 hectares or more in semi-arid areas, or manage 10 heads of livestock. Smallholders represent a large number of holdings in many developing countries. Evidence from the World Census of Agriculture for small number of selected countries in Africa showed that between 1980 and 1990, the percentage of agricultural holdings of less than one hectare had increased from 50 percent to about 78 percent (FAO, 2010).

Most smallholders have diverse sources of livelihood including significant off-farm income, yet are still vulnerable to economic and climatic shocks. Their characteristics differ by country and farming system zone. The actual farming system, household strategies, household behavior, and

livelihood patterns are determined by resource endowments and institutional factors such as access to markets, organization of markets and information, finances, towns, public institutions and services (Ellis, 2008).

In East Africa smallholders have faced several historical constraints such as: land tenure, access rights, and land management; credit access; access to input and output markets; infrastructure; extension services; institutional problems; climate change and food security; and global financial, food, and fuel price crises(Adeleke, Abdul & Zuzana,2010). The agricultural sector remains the backbone of the Kenyan economy, employing 70 per cent of the rural population who are predominantly smallholders (GOK, 2010).

1.3 Food security

Food security is a measure of having consistent access to safe, adequate and nutritious food for an active and healthy life. According to FAO (2010) food security, at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Most hungry people in the world depend on the market for much of their food, including smallholder subsistence farmers who usually do not produce enough to meet their food needs year round. For more than one billion people who live on less than $1 a day (half the world nearly three billion people live on less than $2 a day), much of their income is spent on food. In Brazil, the crop protection market exceeded in value that of the US, with sales growing at 5.4% per year compared to 3% for the rest of the world. Despite making these strides, Brazil still face challenges related to agricultural input access and output marketing, coupled with high cost of credit facilities (Jel, 2008).

From 2008, Kenya has been facing severe food insecurity problems. These are depicted by a high proportion of the population having no access to food in the right amounts and quality. Official estimates indicate over 10 million people are food insecure with majority of them living on food relief. Households are also incurring huge food bills due to the high food prices. Maize

being staple food and due to its preferences it is in short supply. Also, most households have limited choices of other food stuffs (GOK, 2010).

Despite the fact that Kenya has been implementing a number of food security projects, over 10 million Kenyans still suffer from chronic food insecurity and between two and four million people require emergency food assistance at any given time. The 2010 Economic Review of Agriculture also indicates that 51 per cent of Kenyan population lack access to adequate food (GOK, 2010)

Siaya County Integrated Development Plan 2013/2017 shows that the county produces food that can last only for nine months in a year. The output is nonetheless not stable and thus food gaps go up to eight months in poor seasons. The three to four months food difference is sourced from the neighboring counties and even Uganda (Mango, 1999).

2. Objective
To analyze the contribution of training of smallholder farmers to food security in Siaya County, Kenya

3. Hypothesis
H_0: There is no statistically significant contribution of training of smallholder farmers to food security in Siaya County, Kenya.
H_1: There is statistically significant contribution of training of smallholder farmers to food security in Siaya County, Kenya.

4. Literature
Community food security position of dietitians of Canada recognized that community food security has broad scope that emphasizes systematic and comprehensive approach to promote food security for everyone. It also implicitly recognized the role of the larger food system in ensuring food security. It reported that community food security involves long-term planning with a wide range of stakeholders working together toward a healthy, just, and sustainable food security system (Public Policy Statements, 2007).

Agricultural training intervention is any type of program that aims at facilitating transfer of knowledge or skills on topics that are of agricultural benefit to farmers. Training interventions for farmers vary considerably. Some interventions focus directly on teaching farmers new skills using top-down 'training and visit' methods. Governments often package such interventions as extension services, a broad term for programs which aim to support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills and technologies (Anderson 2007).

Although traditionally considered a top-down approach, training and extension services have over time become more participatory in nature. Farmers' field schools in particular, which may be one component of broader agricultural extension services, use a more bottom-up approach to training and knowledge transfer. Such schools are participatory, empowering and experiential in nature, focusing on problems and priorities identified by the farmers, rather than on issues and challenges determined by outsiders (Waddington & Howard, 2014).

World Summit declaration on Food Security held in Rome in 2009 reported that food security exists when all people, at all times, have physical and economic access to sufficient, safe, nutritious food to meet their dietary needs and food preferences for an active life (FAO, 2011).
An assessment of the composition of the poor and hungry indicates that they are mainly smallholder farmers, including livestock keepers, crop farmers and those dependent on natural resources such as forests and fisheries for their livelihoods. Roughly half of the 1 billion hungry in 2009 were smallholder farmers, 22 % are rural landless, 20 % are the urban poor, and 8 % are populations that depend mainly on natural resources, such as fishers, herders, and forest dwellers (Scherr, Wallace & Buck 2010). However questions remain on whether these groups can organize to have to express their needs in improving production so they can have secure livelihoods.

These clusters imply the eventual emergence of different interest groups around agricultural production but without adequate mobilization and support structures for these communities to make an input into the policies designed to improve their lives, chances are that they will remain locked in a dependence cycle that leaves them vulnerable to all kinds of shocks natural and

economic. The sheer numbers of households dependent on smallholder agriculture for their livelihoods makes this an important aspect of food security in the developing world, particularly in Sub Saharan Africa (Pasteur, 2009).

5. Methodology

In this section research methodology is outlined. In particular, it addresses: research design; target population; sample design; research instrument; piloting; data collection procedure; and data analysis and presentation.

5.1 Research design

Research design is a way a study is designed to be carried out. It is a plan that is used to generate answers to research problems. It is a blueprint for conducting a study with maximum control over factors that are likely to interfere with the validity of the findings (Kothari, 2011). The study employed both descriptive survey and correlation designs. Descriptive survey design was considered suitable because it did not only involve analysis of the situation as it was without manipulation of data but also involved measurement, classifications, comparisons and interpretation of data (Kothari, 2011). In view of the current study, descriptive design was used to describe how training of smallholder farmers relates to food security situation in Siaya County, Kenya. According to Saunders, Lewis and Thornhill (2009), correlation is the degree to which two or more variables relate. Correlation design was used to assess the degree of relationship that existed between training and food security situation in Siaya County.

5.2 Target population

A population is a complete set of elements, persons or objects that possess some common characteristics. Target population is a particular group of people that is identified as the recipient for the purpose of a study or a set of elements having a trait of concern that are being investigated (Mugenda & Mugenda, 2003). The target population of the study comprised an aggregate of 199,034 smallholder farmers from Siaya County (Institute of Economic Affairs, 2011). The distribution is shown in table1.

Table 1: *Distribution of the target population*

Sub County	Respondents	Respondents (%)
Alego	42,593	21.4
Bondo	29,457	14.8
Rarieda	28,462	14.3
Gem	29,059	14.6
Ugunja	29,059	14.6
Ugenya	40,404	20.3
Total	**199,034**	**100.0**

Source: Institute of Economic Affairs (2011)

5.3 Sample design

Sample design is a joint procedure of identifying the population of interest, estimating the sample size, deciding on appropriate sampling technique and selecting representatives from the population (Yogesh, 2006). In order to arrive at the required sample size, Fisher's model as cited in Mugenda and Mugenda, (2003) was used. In the model, when the target population is more than 10,000 the sample size may be approximated by

$$n = \frac{z^2 pq}{d^2}$$

where

$p =$ Proportion of target population with traits being investigated;

$q =$ Proportion of target population without traits being investigated represented by $(1-p)$;

$d =$ Statistical level of significance set; and

$z =$ Normal statistical deviation

The model further outlines that if the proportion of the target population with the trait being investigated is not known then 50% is considered appropriate. At 95% confidence level

$$\therefore \quad n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2}$$
$$\approx 384$$

The distribution of the sample size is shown in table 2.

Table 2: *Sample size distribution*

Sub County	Respondents	Respondents (%)
Alego	82	21.4
Bondo	57	14.8
Rarieda	55	14.3
Gem	56	14.6
Ugunja	56	14.6
Ugenya	78	20.3
Total	**384**	**100.0**

Source: Adapted from Institute of Economic Affairs (2011)

To collect data from the estimated sample size, the study adopted stratified sampling. The strata were sub counties within Siaya County from which smallholder farmers were selected from randomly. The units of the study were small holder farmers in each sub county. The sample size in each sub county was apportioned in proportion to the target population. This technique was most appropriate because of its ease of administration and homogeneity of small holder farmers in each Sub County (Mugenda & Mugenda 2003). According to Denscombe (2007), the technique was more appropriate because the researcher could assert some control over the selection of the sample in order to guarantee that crucial smallholder farmers or factors were covered in proportion to the manner in which they existed in the wider population. This helped in making generalizations from the findings of the study.

5.4 Research instrument

The study used structured questionnaire as data collection instrument. A questionnaire is a research tool designed to collect data, which can subsequently analyzed. It consists of a written list of questions. Each person who answered a particular questionnaire read identical set of questions and this allowed for consistency and precision (Denscombe, 2007; Kothari, 1990; Oso & Onen, 2009). Questionnaire was considered appropriate for the study because it was: of relatively low cost; easy to arrange; standardized in answers provided to the extent that all respondents were exposed to exactly the same set of questions; and pre-coded in answers for

easy management at analysis (Denscombe, 2007). In particularly, standardized questionnaire showing networking of small holder farmers and food security indicators was used. The questionnaire was divided into three sections, namely; demographic characteristics of small holder farmers, training and food security. Demographic characteristics included: sex; age; marital status; highest level of education; primary occupation; land ownership; and types of crops grown. Training constructs included conferencing, seminars, coaching, continued learning, and mentoring. Food security considered physical, social and economic conditions of the smallholder farmers.

5.5 Piloting

Piloting is trying out a study in small scale to determine whether or not the study will produce expected results (Creswell, 2009). This stage was crucial in research process because it enabled the researcher to detect problems or weaknesses that could have been encountered during the main research. Piloting was conducted with smallholder farmers in Rarieda Sub County. According to Yogesh (2006) in order for piloting results to be valid, it should involve respondents' equivalent to 10% of the sample size. In the current study, 38 smallholder farmers were randomly selected and engaged in piloting the questionnaire.

Validity is the extent to which the results of the study can be accurately interpreted and generalized to the populations (Mugenda & Mugenda, 2003). The questionnaire was tested to check its content, construct and face validity. Content validity was done to ensure that contents of the instrument contained adequate sample of the domain of content it was supposed to represent. Face validity deals with the format of the instrument and includes aspects like clarity of printing, font size and type, adequacy of workspace, and appropriateness of language among others. Construct validity determine the nature of psychological constructs or characteristics measured by the instrument. Validity was ensured through the use of research experts who were research supervisors at Jomo Kenyatta University of Agriculture & Technology. The questionnaire was given to the supervisors to evaluate and rate each item in relation to the objectives as not relevant or relevant on the 1-4 scale. Validity index was determined from the ratio $n_{3/4}/N$ as .82, where $n_{3/4}$ was the number of items marked 3 or 4 by both supervisors, and N

was the total number of items assessed. The score was above the recommended minimum validity index of .70 (Oso & Onen, 2009). The questionnaire was therefore valid.

Reliability is the extent to which research results are consistent and replicable (Kothari, 2011). Reliability is the consistency of scores when the research instrument is administered from one set of items to another, and also from one point in time to another (Frankel & Wallen, 2006). The instruments was pre-tested for reliability using Cronbach alpha (α) with a sample of 10% of smaller holder farmers randomly selected from the Rarieda Sub County. Ten percent was chosen for pre-test because it is the smallest number that yields meaningful results in data analysis of a survey research (Yogesh, 2006). The reliability index of .809 was computed and since it was greater than 0.7 the minimum recommended value the questionnaire was accepted as reliable.

5.6 Data collection procedure

Permission to collect data was sought from The School of Graduate Studies Jomo Kenyatta University of Agriculture and Technology. Notification letters were thereafter sent to the village heads in the Sub Counties. While doing this, the researcher was cautious that short-circuiting proper channels of authority could have led to difficulty in getting data (Denscombe, 2007). Research assistants were: thoroughly trained on research ethics; made to understand the instructions and content of the instruments; instructed to take all measurements in the most consistent manner across all respondents; and advised to record and compile data accurately.Data collection took two weeks. A check list was used to monitor the despatch and return of questionnaires.

5.7 Data analysis and presentation

Data analysis is the examination of what has been collected and making deductions and inferences hence a process which involves uncovering underlying structures, extracting important variables, detecting any anomalies and testing any underlying assumptions (Yogesh, 2006). Preliminary to entering data in Statistical Package for Social Sciences version 20.0 ready for processing, completed questionnaires were: edited for consistency; and coded to enable the responses to be grouped into appropriate categories. Both descriptive statistics and inferential statistics were used to analyze quantitative data. While descriptive statistics was used describe the practice of training and the position of food security in the county, inferential statistics was

used to analyze data on how training contributed to food security. In particular, while descriptive statistics involved the mean, standard deviation, skewness and kurtosis, inferential statistics involved simple linear regression model. The general simple linear regression model used was

$$y = \beta_0 + \beta_1 x + \varepsilon \qquad \qquad (1)$$

In model 1, y represented food security and x represented training. The term ε was the *residual* or *error and* represented the deviation of the observed value of food security from that expected from the model. β_0 *and* β_1 were taken as constants to be determined. Results of the analysis were presented through tables with written interpretations and discussions of results.

6. Results and discussions

The contribution of training of smallholder farmers to food security was analyzed, presented, interpreted and discussed. Descriptive results of valid data items, means, standard deviations, skewness and kurtosis for training and food security were shown in table 3.

Table 3: *Descriptive statistics for training and food security*

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Training	351	4.12	.45	-.69	.13	1.82	.26
Food Security	351	4.30	.36	-.53	.13	1.90	.26

Key: 1.0 - 1.4- strongly disagree; **1.5 - 2.4-** disagree; **2.5 - 3.4-** not sure; **3.5 - 4.4-**agree; **4.5 - 5.0-**strongly agree

   Source: Survey data (2017)

Table 3 shows the means and standard deviations for training (M=4.12; SD= .45). There was general agreement that training programs were being practiced in Siaya County. Training was achieved through: engagement in seminars; engagement in conferencing; continued professional development; coaching programs; mentoring programs; and literacy improvement programs. Table 3 also shows the mean and standard deviation for food security (M=4.30; SD=.36). There was general agreement that Siaya County had improved food security; that is, there was improvement in food availability, accessibility; utilization and stability.

Though table 3 showed training was being practiced among smallholder farmers in Siaya County and there was improved food security, it could not show how training contributed to food security. Moreover, the mean for food security was higher than that for training by some points casting doubt as to whether there was a correlation between them. Simple linear regression model 1 was therefore sought. Preliminary tests on model 1 were satisfied. The hypothesis, 'there is no statistically significant contribution of training of smallholder farmers to food security in Siaya County, Kenya" was tested at 5% significance level. The results were shown in table 4.

Table 4: *Regression statistics for training and food security*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.584	.148		24.179	.000
	Training	.174	.036	.253	4.890	.000
	Best line of fit					
	R=.253^a					
	R^2=.064					
	Adjusted R^2=.061					
	F$_{ratio}$=23.910					
	P<.05^b					

a.   Dependent Variable: Food Security

b.   Predictors: (Constant), Training

 Source: Survey data (2017)

Table 4 shows a statistically weak degree of positive correlation (R=.253) between training and food security. R-square of .064 measured part of food security, which was explained by training. It showed that approximately 6.4% of the variation in food security was attributed to variation in training practices**.** The adjusted R-square provided an idea of how the model could have been generalized. It should have been close to R-square as much as possible if not the same. In the study, the difference from the final model was small; i.e. .003 or .3%. This meant that if the model was derived from the population rather than a sample, then it could have accounted for approximately .3% less variance in results. The linear regression model was statistically

significant (F_{ratio} = 23.910; p< .05). Standardized beta coefficients, showed that for one standard deviation increase in training practices, food security improved by approximately .253 units.

Table 4 and model 1 also provides the optimum simple linear regression equation between training and food security as

$$Y = 3.584 + .174x \qquad\qquad\qquad\qquad (2)$$

The linear regression model 2 provided a statistically significant correlation (R = .253; p<.05) between variation in food security and training. The model was 6.4% explained by the variation in training. The linear regression model 2 also showed that without training, food security situation was measured by approximately 3.584 units and for every unit increment in training, food security situation improved by .174 units.

While the current study described training of smallholder farmers as: engagement in seminars; engagement in conferencing; continued professional development; coaching programs; mentoring programs; and literacy improvement programs, Anderson (2007) described training of farmers as teaching farmers new skills using top-down approach through extension services aimed at supporting and facilitating people to engage in agricultural production for food security management. Despite this, Waddington and Howard (2014) viewed training as participatory in nature and uses bottom-up approach to transfer knowledge identified as priorities by farmers, rather than issues and challenges determined by outsiders. Though the current study linked training to food security, studies conduct by Anderson (2007) and (Waddington & Howard, 2014) failed to link training to food security. Moreover, while the current study revealed use regression models, Anderson (2007) and (Waddington & Howard, 2014) were not particular about models of analysis.

World Summit declaration on Food Security(2009) described food security to exist when all people, at all times, have physical and economic access to sufficient, safe, nutritious food that meets their dietary needs and food preferences for an active life. In this perspective, food security was viewed as the availability of food and one's access to it (FAO, 2011). The description of food security by FAO (2011) was in concurrence with what was described in the current study. The current study described food security as availability of food, access to food, utilization of food and stability of food. More so, while FAO (2011) report did not link food

security to training, the current study advanced knowledge by linking training to food security. This was advanced by bringing the contribution of training to food security.

7. Conclusion

There was a statistically significant weak positive correlation between variations in training and food security. Training of smallholder farmers attributed to the variation in food security. The contribution of training to food security in Siaya County though present was negligible.

8. Recommendations

Training contributed to improved food security in Siaya County. The study therefore recommends that field agricultural officers should intensify training with a view to enhancing sustainable food security. Training involve wide field with numerous operational interventions. Siaya County Department of Agriculture should therefore invest in research to identify various training interventions to be put into use for sustainable food security.

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