Off-Farm Activities and Food Security Status: A Study of Smallholder Farmers in Kilifi South Sub-County, Kenya

ABSTRACT

Food security is critical to the economic, social, religious, political and cultural development worldwide. This study goes deeper to investigate the role of off-farm as a livelihood strategy on food security in Kilifi South Sub-county. This Sub-county is one of the areas where food insecurity incidences are prevalent as a result of unpredictable rainfall patterns, sandy soils and high evaporation rate which as a result leads to numerous undesirable effects, such as frequent crop failure, high food commodity prices and famine. The study adopted survey design. The aim was to identify and analyze the role of off-farm activities on food security status among the smallholder farming community members in Kilifi South Sub-county. The objective of this study is to determine the influence of off-farm activities as a livelihood strategy on household food security status among the smallholder farming community in Kilifi South Sub-county. The study administered a standard questionnaire to a sample of 384. Sampling was done by use of systematic sampling procedure. Data was collected on food security status and analyzed using descriptive and inferential statistics. From the information gathered through personal interviews, to determine the influence of participation in off-farm activities the results indicates that kiosks and green grocers were practiced by 32% food secure, while those selling fish were 25% food secure, those operating commercial motorcycling were 15% food insecure and lastly those selling charcoal were 28% food secure. It was therefore concluded that households involved in off-farm activities were food secure. This shows that although off-farm activities are not promising, they are important component of livelihood strategies. To further enhance food security and improve food security status in Kilifi South Sub-county, engagement in off-farm activities should be encouraged. The findings of this study would be beneficial to leaders, stakeholders and policy makers in decision making process pertaining suitable interventions in attainment of food security in Kilifi South Sub-county

Keywords: Food security; off-farm activities; livelihood strategy; multiple regression; smallholder farmers.

1. INTRODUCTION

Food insecurity has been of great concern worldwide, and has emerged as one of the key challenges in Kenya since independence. Kenya has been fighting hunger and food insecurity over the years [1]. Most farmers and local communities engage in off-farm activities to ensure food security in various ecosystems. Off-farm activities can help tackle the effects of climate change by diversifying in various commodities suitable for this area. The diversified commodities should be the ones which have been proved to be alternative to agricultural practices for the study area. Such knowledge may help a farmer to be aware options sought to look for solutions. According to FAO [1], WFP [2] and IFAD [3], this can be an important basis to ensure food security in the world today. A study by IFAD [4] revealed that off-farm activities have been identified as important to smallholder farmers. Lack of knowledge results to increased food insecurity and poverty to many households in the world. Extreme weather conditions are increasing and therefore, urgent responses are needed in order to reduce the risks related to climate change. According to FAO [4], many smallholder farmers practice both agriculture and off-farm activities as solutions to climate change impacts such as droughts.

Despite past efforts to improve agricultural production in Kilifi South Sub-county by farmers, poverty and hunger continue to be felt. Unpredictable rainfall patterns, sandy soils and high evaporation rate have resulted into numerous undesirable effects, including frequent crop failure, high food commodity prices and famine [5]. Eighty five percent of households in Kilifi South Sub-county are characterized by high levels of undernourishment, hunger and lack of education [5]. This means that farmers rely on purchased food which is not adequate. This is because the community members are jobless and thus poor. High food prices are a problem of access because community members lack other stable sources of income [6]. Illiteracy and ignorance of better farming technology has resulted to low agricultural production which puts the community in a vicious cycle of poverty. Past studies have shown that livelihood resources as well as off-farm activities determine food security status of communities. These are important at influencing the adoption of agricultural technologies and thus improve the food security status. However, the determinants of food security status in Kilifi South Sub-county have not been identified since there is scanty information if any. The aim of this study was to bridge this gap with focus being the role of household in involving themselves in off-farm activities as livelihood strategies in food security status in Kilifi South Sub-county.

According to [7], the main limitation to purchasing food is inadequate and unstable income resulting from lack of diversification of income sources. He further observed that households in rural areas might improve their food security if they combine subsistence farm and non-farm employment. Another study by [8] reported that non-farm employment enabled households to cope with external shocks and deficits in agricultural production. [9], also observed that non-farm employment had also been found to help households increase their subsistence production through increased investment in agriculture which resulted in enhanced food security. However, [10] in his study on effects of non-farm income on food security reported that although non-farm income may be necessary for the improvement of household food security, it is not sufficient. He stated that this is because it is likely to cause changes in tastes/preferences, and hence shifts in food purchasing and in labor and resource allocation patterns. [11] demonstrated that fears have been expressed about the possibility of reduced agriculture involvement if there is an increase in participation in non- farm activities by rural households. Additionally, they observed that this is particularly in communities where men migrate to seek employment and in areas where non-farm employment opportunities are easily accessible.

According to [12], some labor is lost when non-farm employment is taken up and this result to serious repercussions for subsistence production and thus food insecurity. They further reported that a decrease in food production normally results if the incomes earned from non-farm income are inadequate to meet basic household needs, including food or for hiring of additional labor to replace the labor that has migrated. However according to them, if earning levels allow, and if households are willing, hired labor and other inputs can be used to substitute the family labor released for non-farm activities. [13] observed that, households with non-farm income are also able to take risks they would not otherwise have done without an assured alternative source of livelihood. However, a study by [14] found out that a shift in labor of a few family members to non-farm employment does not affect family labor in agricultural activities if there are people in the household who can shift their labor to replace those engaged in non-farm income. Non-farm employment activities include trading, fishing, government employed, crafts, service delivery, burning and selling charcoal and casual labor. Households with non- farm employment usually take risks they would not have taken without an assured alternative source of livelihood. A shift in labor of a few family members to non-farm income does not affect family labor in the farm if there are other people in the household who can shift their labor to replace those engaged in non-farm employment. However, [15]

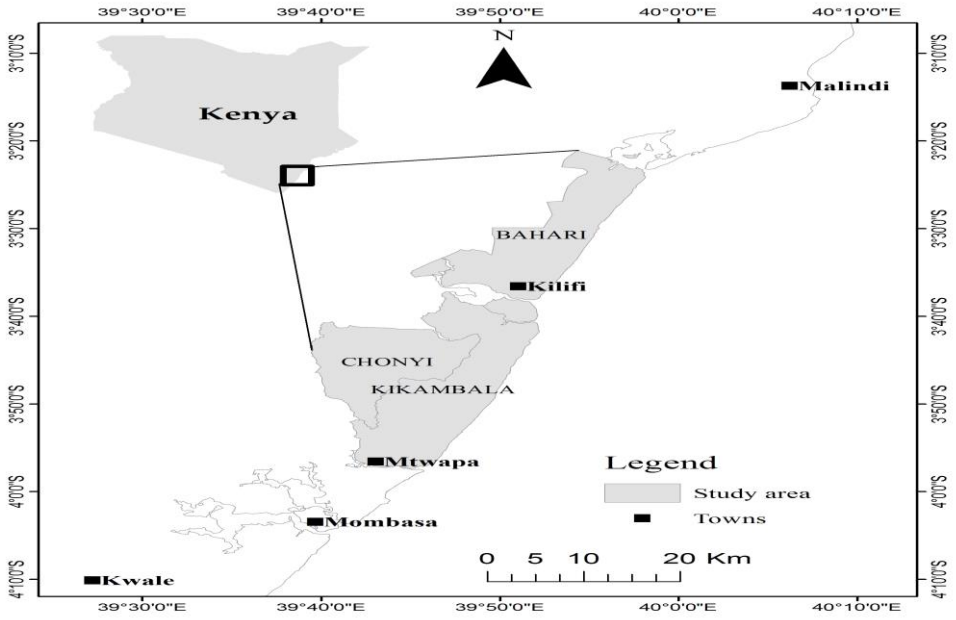
demonstrated that in the event of increased non-farm employment, there is reason for substitution if there is a reduced allocation of cash capital to farming activities. This implies that many households will rely on the market for family food needs.

]9] affirmed that if indeed non-farm employment does not negatively affect the allocation of family resources to subsistence food production, then promoting non- farm employment opportunities is justified as a means of improving household food security by increasing the purchasing power while [16] observed that if non-farm employment affects subsistence production negatively, then there is need to find out its effect on food security. The study, therefore aimed at evaluating the influence of off-farm activities on food security status among smallholder farming communities in Kilifi South Sub County.

2. RESEARCH METHODOLOGY

2.1 Research Area

Map 1 : THE MAP SHOWING THE LOCATION OF KILIFI SOUTH SUBCOUNTY



SOURCE: Author 2022

Kilifi South Sub-county comprises of Bahari, Chonyi and Kikambala divisions all located in Kilifi County in Coast region. Kilifi South Sub-county is situated along the Kenyan coastal line. The area receives an average annual rainfall of between 400-1250 mm per year which is biannual and unpredictable. Limited research has been carried out on food security in the area. The inhabitants are the Mijikenda community. According to 2009 population census, fourty seven percent of the population were males while fifty three percent were females (Kilifi District Development Plan 2012). Kilifi South Sub-county is both arid and semi-arid, with erratic and unreliable rainfall. Most of the areas are generally hot and dry leading to high rates of evaporation. This combined with unreliable rainfall, limits intensive and meaningful land use and related development activities. The long rains last from March to May and short rains from in November to December. The periods falling between June to September and January to

February are usually dry. Kilifi South Sub-county was chosen from other sub-counties because of the magnitude of food insecurity [5].

2.2 The Research Design

This study used survey design and inferential statistics which are methods of collecting information by interviewing and administering questionnaire to a sample of individuals and then subjecting the data to multiple regressions [17]. This research design is appropriate due to its safeguard against bias and its ability to maximize reliability.

2.3 Target Population

The target population of this study was the rural households of Kilifi South Sub-county. According to Kenya Bureau of statistics population Census (2009), Kilifi South Sub-county has a total population of 28 074 inhabitants comprising of 6 184 households spread across Bahari, Chonyi and Kikambali divisions.

2.4 Sample Size and Sampling Procedure

2.4.1 Sample Size

A sample size of 384 households' collected based on procedure by Cochran (1963) was used in this study. This was obtained after data cleaning as some of the questionnaires were incomplete

$$n = \frac{Z^2pq}{d^2} \quad \text{.....equation 1}$$

Where n = the desired sample
Z = the standard normal deviate at the required confidence level.
p = the proportion in the target population estimated to have characteristics being measured.
q = 1-p
d = the level of statistical significance set.
n= (1.96)
$(0.05)(0.05)/(0.005)^2$
n= 384

2.4.2 Sampling Procedure

This study used systematic random sampling which involved drawing every nth household in the population starting with a randomly chosen household in each of the villages in the three divisions. The nth household was the 5th household. The respondents were the head of the household or any available responsible adult. Kilifi South Sub-county was chosen from other sub-counties because of the magnitude of its food insecurity whose causes have not been researched or documented.

2.5 Research Instruments

Prior to the commencement of data collection, the researcher obtained all the necessary documents, including a certificate from Pwani University Ethics Review Committee. The main data collection instruments that were used in this study included a questionnaire. This was used for the purpose of collecting primary quantitative and qualitative data. Additionally, the questionnaire was used for the following reasons: its potentials in reaching out to a large number of respondents within a short time, able to give the respondents adequate time to respond to the items, offers a sense of security (confidentiality) to the respondent and it is

objective method since no bias resulting from the personal characteristics (Gay, 1992).The questionnaire was divided according to the objectives as the main areas of investigation. The study used primary data questionnaires, oral interviews from respondents on their opinion, preferences, feelings, judgments and attitudes to describe the factors that influence household food security among rural households in Kilifi south Sub-county.

2.6 Piloting of the Instruments

A pilot study was conducted as a technique of testing the reliability of the data collection instruments especially the questionnaire and the interview schedules. In this study, a sample of 6 respondents was selected for piloting out of the target population. Piloting helped to identify any unforeseen limitations that could adversely affect the results of the findings of research. Such limitations and challenges were addressed before the actual study started in a bid to mitigate their effects on the study outcome. Piloting of research instruments assisted in increasing their reliability since any defects and possible contradictions, ambiguity or otherwise of the instruments such as the survey questionnaire was identified and corrected before the actual data collection for the study.

2.7 Validity and Reliability of the Instruments

A panel of three officers in the Department of Agriculture in the sub county was requested to assess the relevance of the content used in questionnaire development. Their recommendations were incorporated in the final questionnaire. The researcher administered the questionnaire twice to selected separate but similar responses to the sample in the study using the test, re test method. The Pwani University supervisors together with other experts from the Crops Department also assessed the instruments to test their adequacy in terms of depth, relevance and clarity. According to [18] validity refers to the extent to which a test or an instrument measures what it is intended to measure. [17] defined validity in the sense raised as the degree to which the empirical measure of the concept, accurately measure the concept. [19] observed that content validity is a matter of judgment by the researcher and professionals in the specific area of study.

The reliability of research instrument covers the extent to which the tool yields the same results on repeated trials hence, the tendency towards consistency found in repeated measurements in what is referred to as the reliability of the research instrument. In this study reliability followed the following steps, the developed questionnaire was given to 6 identical respondents subjects not included in the main study the answered questionnaires were filled manually. After two weeks the same questionnaire was administered to the same group of subjects. Thus, test–retest method was used, the consistency in the answers provided assurance of reliability of the instrument. This showed that questionnaires were reliable and therefore they were used for the final study.

2.8 Data Management and Analysis

Descriptive statistics was used to analyze the data. The resulting statistics formed inferential analysis basis. Regressions were used to validate the findings of the descriptive statistics because it controls other confounding variables at the same time [20]. Significant relationships between categorical variables were also established. Multiple regression measures the relationship between the categorical dependent variable and independent variables which are usually continuous by estimating probabilities [20].

The regression equation is y= a+ B1X1 ……equation 2

where z is the number of independent variables, y is the dependent variable, a is the constant and the Xs are independent variables. The Bs are listed in a column of coefficients.

Food security = α + 39.667(Off-farm activities) The study used Adjusted R Squared of 0.691. That is, 69 percent of a change in the dependent variable can be explained by changes in the independent variables. Before running statistical analysis, variables were examined for the presence of stochastic trends using normality test in order to confirm whether data conforms to ordinary least squares (OLS) assumptions. Using the P-P plots of regression, the data were found to be normally distributed.

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According to [21], identifying an appropriate food security measure is a difficult issue as not all aspects of food security can be captured by any single outcome measure. This is because the household composition is variable, and the household is in itself subject to varying interpretations; there may be multiple income sources among adult members of one household who have strong incentives not to reveal to each other the full extent of their individual earning power or assets; the responsibility for the production of food may be shared among the adults; and finally, subsistence production is harvested piecemeal and is neither measured nor recorded. In order to avoid this difficulty; most analyses depend on measuring food consumption. Food security can be analyzed in terms of food availability as compared with requirements [11]. They further reported that the net food available after selling the surplus to the market is a function of domestic production at household level. Food security at household level is best measured by food calorie intake [22]. FAO Recommended Daily Calorie Intake was used to determine food security index as shown below.

$$\text{Food security index } Zn = \frac{\text{Household's daily per capita calorie availability (A)}}{\text{Household's daily per capita calorie requirement (B)}}$$

$$\text{Food security index } (Zn) = \frac{Yn}{R} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ equation 3}$$

Where Zn is food security index of nth household
Yn is the actual daily calorie intake of the nth household
R is the Recommended Daily Calorie Required by nth household.

If food security index of each household is greater than or equal to 2060 Kilocalories it means that the household is food secure.

Results and Discussion:

Table 1: Influence of off-farm activities as a livelihood strategy on household food security status.

Variables	Sample	Percentage	Food secure	Food insecure

		%	%	%
Off-farm activities				
Selling fish	95	25	25	0
Commercial motorcycling	56	15	0	15
Selling charcoal	108	28	28	0
Kiosks & green grocer	125	32	32	0
Total	**384**	**100**	**72**	**28**

Source: Field survey April-August 2024

The study revealed that although kiosks and green grocers were kept by households in the area more than the other off-farm activities the number was low. Kiosks and green grocers were kept by 32%, selling fish 25%, commercial motorcycling 15% and selling charcoal 28% (Table 1). Households keeping kiosks and selling green grocer were 32% food secure, those selling fish were 25% food secure, the ones operating commercial motorcycling were 15% food insecure while those selling charcoal were 28% food secure. This shows that although off-farm activities are not promising, they are important component of livelihood strategies. This is similar to a study by [23] who reported that 48% of the rural households cited diversification of off-farm activities as playing a great role in ensuring the food security.

Table 2: Multiple Regressions of Determinants of Food Security status

Variables	**Coefficients (B)**	**std error**	**t**	**P values**
Selling fish	39.667	1.658	0.418	0.005
Commercial motorcycling	42.960	11.291	1.710	0.007
Selling charcoal	78.253	3.225	1.653	0.001
Kiosks & green grocer	72.833	1.947	1.403	0.005

Dependent variable: Food security status, R^2=0.691, F=1.731, df=15

Off-farm activities were found significant and positively influencing food security status apart from commercial motorcycling which was not significant (P=0.007). Selling fish was found significant and positively influencing food security status (p=0.005), the other variables were reported significant and positively influencing food security status as follows: Selling charcoal hand P=0.001, while kiosks & green grocer was also significant with p=0.005. The relationship between the dependent variable and independent variables was strong (R^2 =0.691). This is consistent with the findings of [24] who reported that food security is enhanced through strategies which build the capacity of institutions to increase household access to, and management of natural resources. This is due to decrease of food in the household. The findings are also consistent with a study conducted by [25] who observed that households with

off-farm income are also able to take risks they would not otherwise have done without an assured alternative source of livelihood. It also agrees with a study by [8] who found that farmers' level of off-farm income was an important factor affecting the food security status among households.

The findings indicate that household participation in off-farm activities, are determinants of food security status. This means the current demand for food cannot be met with application of off-farm alone. A multi-pronged approach is recommended.

Conclusions and Recommendations

Off-farm activities practiced by small scale farmers in Kilifi sub county were selling fish, commercial motorcycling, selling charcoal and operating kiosks and green grocer. Kiosks and green grocer was widely practiced followed followed by selling charcoal, selling fish and commercial motorcycling was least. Off-farm activities were found to significantly improve food security in the study area with households operating kiosks and green grocer being the most food secure (32% food secure). The data analysis sought to find out whether off-farm activities are determinants of food security status among smallholder farmers in Kilifi South Sub-county. The conclusion is that households with heads participating in off-farm activities are more food secure. The county government should promote off-farm income generating activities such as fish selling, commercial motorcycling and charcoal selling because this study has shown they enhance food security. Promotion of trades for enhancing food security must be purposeful and they should be controlled in order to ensure continuous flow of income even during the drought season. This should be promoted because they enhance food security. Therefore, to ensure success, an integrated and multi-pronged approach is the surest way towards food security and a minimum intake of 2260 kcal per day.

Ethical Approval:

During the exercise, every effort was made to ensure that the household heads were able to perform their daily activities without being disrupted. The researchers explained to the respondents about the research and that the study was for academic purposes only.

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REFERENCES

1. FAO, (2006). The State of Food and Agriculture 2006. Food Aid for Food Security? Food and Agric Organization of the United Nations. Rome.
2. WFP, (2009). Kenya Food Security Uptake. World Food Programme. NewYork.
3. FAO, (2005). The state of Food and Agriculture. Food and Agric Organization. Rome.
4. FAO (2008). Climate change and food security: a framework document, FAO, Rome.
5. KFSSG, (Kenya group food security steering group) (2012).The 2012 short rains season assessment report. The coastal marginal agricultural livelihood cluster.
6. Kihara, F. L. (2004). Evaluation of rainwater harvesting system in Laikipia District, Kenya. Case study report. Kenya rainwater association, Nairobi, Kenya.
7. Kirimi L, Gitau R, Olunga M. (2013). Household Food Security and Commercialization among Smallholder Farmers in Kenya.
8. Awoyemi, T. T, (2004). Rural Non-Farm Incomes and Poverty Reduction in Nigeria. A Report Submitted to AERC, Nairobi, Kenya.
9. Haggblade, S., P. Hazell and T. Reardom (2007). Transforming the Rural Non-farm Economy. Baltimore: Johns Hopkins University Press.
10. Binswanger, (1998), Production relations in semi-arid African agriculture. The Economic theory of agrarian institutions ed P Bardhan Oxford.
11. Babatunde R. O. And M. Qain (2008). The role of off-farm income diversification in rural Nigeria: Driving forces and household access. Draft of German Academic Exchange Service (DAAD) Sponsored Research Paper: pp 1-26.
12. Sikwela, M.M. (2008), “Determinants of Household Food Security in The Semi-Arid Areas of Zimbabwe: “A Case Study of Irrigation and Non-Irrigation Farmers in Lupane and Hwange Districts”
13. Jules, N. (2001). Regenerating agriculture: Policies and practice for sustainability and self-reliance. London, Earthscans Publication Ltd.

14. Katz, E. (2002). Innovative Approaches to Financing Extension for Agriculture and Natural Resource Management: Conceptual considerations and analysis of experience. LBL, Suiss center for Agricultural Extension, Eschikon 28, CH-8315 Lindau, Switzerland.
15. Dercan, J. (2002). The feeding of the nine billion: Global Food Security for the 21st century. A Chatham House Report. London.
16. Dessy, S. E., Woudou, J and Oullet, I. (2006). Understanding the persistent low performanceof African Agriculture; CIRPEE Working Paper 06-22.
17. Orodho, J (2005) Essentials of educational and Social Sciences Research methods.Nairobi: Masola publishers.
18. Mbeza, J. K (2006) Introduction to management Research. A Student Handbook. Modern management consultants publishers Nairobi, Kenya.
19. Gay, L (2012) Educational Research: Competencies for Analysis as Application. 4th Edition, Macmillan, New York.
20. Kothari C. R. (2004). Research methodology. Methods and Techniques. Second revised edition. New age international publishers.
21. Legendre P. (2005). Species associations: the Kendall coefficient of concordance revised. Journal of Agricultural, Biological and Environmental Statistics 2005: (10): 226-245.
22. Ojogho, O. (2010). Determinants of food insecurity among arable farmers in Edo state, Nigeria. Agricultural journal; 2010; 5: 151-156.
23. Reardon, T. A., and C. P. Timmer. 2012. Transformation of the agrifood industry in developing countries: patterns, determinants, and impacts. Annual Review of Resource Economics 4.
24. Lemba, J. (2013). Intervention designs for household food security. Lessons from Kenya. African Development Review, Vol 25, No 2, 2013, 231- 242.
25. Chinn, F. (1979) & Collier (1984). Rural poverty and the structure of farm household income in Developing countries. Evidence from Taiwan. Economic development and cultural change vol 27 pg 283-301