EFFECT OF EXTENSION AND TRAINING KNOWLEDGE SHARING PROGRAMS ON COCONUT FARMING IN KILIFI COUNTY, KENYA

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ABSTRACT

Purpose of the Study: The study aimed to establish the effect of extension and training knowledge-sharing programs on coconut farming in Kilifi County, Kenya.

Problem Statement: Despite coconut farming contributing approximately KSh 13 billion annually to Kenya's economy, productivity has been declining due to outdated farming methods and inadequate extension services, limiting farmers' access to modern agricultural knowledge and practices.

Methodology: The study adopted a descriptive survey design using questionnaires and interviews on a sample of 399 farmers and 7 extension officers from 162,648 coconut farmers in Kilifi County, with data analyzed in SPSS version 29 through descriptive and regression analysis.

Findings: The study found that extension and training knowledge-sharing programs have a positive and statistically significant effect on coconut farming productivity in Kilifi County.

Conclusion: Extension and training programs enhance farmers' access to expert guidance, improve farming skills, and promote sustainable production practices, leading to better yields and value addition in the coconut sector.

Recommendation: The study recommends regular workshops, demonstration plots, mobile-based advisory services, and partnerships with research institutions.

Key Words: *extension and training, knowledge-sharing programs, coconut farming, Kilifi County.*

INTRODUCTION

Coconut production is an important agricultural activity in tropical and subtropical regions across the world. Indonesia, Philippines and India are the leading coconut producers in the world (Zainol *et al*., 2023). Coconut provides raw materials for coconut oil, copra, coconut water and desiccated coconut which explains why it is an important agricultural activity. The coconut industry dubbed "the sleeping giant sub-sector" is a key economic driver of the Kenyan coastal counties that include Lamu, Kilifi, and Mombasa. The coconut trees support over 100,000 families who rely on coconut cultivation for their livelihood. Coconuts were first introduced in the country by Portuguese around the 16th Century (Saddam, 2022). Their cultivation spread immensely and by the 20th century they were considered industrial crops. Coconut production and marketing was mainly handled by Arabs and white settlers with vast plantations. In the 19th century however, small-scale farmers began coconut cultivation and now over 80% of households depend on the crop for their livelihoods (Saddam, 2022).

Though coconut production has become a significant economic activity, the industry faces numerous challenges such as aging trees, lack of farmers' understanding of different species, fluctuating market demand and climate change (Arumugam & Hatta, 2022). Coconut farmers are not well-informed about the best farming practices, markets and value addition among other things that can enable them to succeed in coconut farming. This can be explained by lack of proper knowledge sharing approaches that explains why this study is important (Moreno *et al*., 2020). Knowledge sharing approaches comprise implementing farmer-to-farmer learning, extension and training programs, mentorship programs, and leveraging social networks and partnerships, all while adapting approaches to local contexts and needs (Izuchukwu *et al*.,2023; Skaalsveen *et al*., 2020; Sutherland & Marchand, 2021; Tumwebaze *et al*., 2024).

Indeed, poor access to vital information is a challenge for many Sub-Saharan Africa farmers. According to Tumwebaze *et al*. (2024), agriculture is a knowledge driven industry with knowledge being a significant factor of production. It is a venture filled with risks which necessitates making rational decisions to cushion the impacts of factors such as climate change and pests. Knowledge management scholars recognize agricultural knowledge as a resource key to regional and national development, which boosts productivity in farming communities and agribusiness (Tolinggi *et al*., 2023). For this transformation to take place, access to scientific knowledge, information, and research is vital and improving this access requires understanding how both formal and informal knowledge sharing contributes to effective dissemination of agricultural information.

In Kenya, coconut palms (*Cocos nucifera*) are mainly grown in Kwale, Kilifi, Mombasa, Lamu, Tana River, and Taita-Taveta counties (Mbugua *et al.*, 2022). They are cultivated on several agro-ecological zones along the coast and play a significant role in the region and national economy. There are about 4.4 million coconut plants in the Kenyan coast which yield an average of 1.5 tonnes of nut per hectare (Koitumet, 2023). More than 80% of coastal households depend on the crop and its by-products directly or indirectly for their livelihood (Oyoo, 2021). Additionally, coconut tree parts are also used for commercial and food purposes; thus, the plant is mostly referred to as "the tree of life". Coconut production accounts for about 1.5% of Kenya's agricultural Gross Domestic Product (GDP) and 0.4% of the country's overall GDP (Oyoo, 2021). However, Kenya trails other African nations in advancing technology necessary for diversifying and utilizing coconut products, which reduces the crop's economic impact (Mbugua *et al.*, 2022).

LITERATURE REVIEW

The study was guided by Social Learning Theory. Social Learning Theory (SLT) was developed by Albert Bandura in 1960s to promote understanding of how people learn through observation, imitation and changing behaviours, attitudes and connecting to others emotionally (Li *et al.*, 2023). According to the theory, learning occurs in a social context and is influenced by role models, punishment and reinforcement. The theory is important as it explains learning beyond direct experience (Rumjaun & Narod, 2020). Accordingly, the theory goes beyond behaviourism to include observational learning, thus making it more comprehensive. The theory also is important as it puts into account cognitive processes. It recognizes the fact that attention, retention, reproduction and motivation play an important role in learning (Li *et al.*, 2023). The theory is also important as far as training is concerned to shape behaviours. The theory, however, has been criticized for ignoring biological influences on learning and behaviour. The theory is also limited as it is difficult to measure observational learning as it cannot be quantified (Rumjaun & Narod, 2020). The theory also depends much on availability of role models and social context which may not be ideal.

In India, Maon *et al.* (2024) examined the challenges and opportunities in coconut production. The study employed descriptive research design where 153 participants were studied. According to the study, coconut farming presents numerous opportunities and challenges and calls for effective sharing of information to enable farmers have a good understanding of coconut production. Developing learning programs for the farmers can help a lot to ensure that farmers are well-informed about farming practices. The programs provide opportunity to

coconut farmers to seek answers to questions that may have been hindering them from producing effectively and efficient. The study, however, brings out conceptual gap as it has failed to provide a clear link between training programs and coconut farming.

In Nigeria, Obianefo *et al*. (2023) examined planting and resilience of coconut farming. The study employed cross-sectional study approach where 384 respondents were studied. The study found out that training of farmers through extension and training programs is important to enable them to know appropriate planting techniques, which is important to improve their resilience in coconut farming. Extension and training programs give farmers good time to learn new techniques and how they can be applied to improve production. Extension and training programs can help also to promote engagement with the government which in the long run help to ensure that farmers get the assistance that they need to succeed in coconut farming. The study, however, brings out contextual gap as it was done in the context of Nigeria which differs significantly from Kenya.

In Kenya, Atapattu and Nuwarapaksha (2025) examined best practices in coconut farming. The study employed systematic review approach to understand the best practices in coconut farming and how they can be disseminated to farmers. According to the study, learning the best practices such as application of the fertilizer is important. Organizing extension and training programs to ensure that farmers are well-educated about the best practices is important. Use of extension and training programs is important as it provides effective interaction with the farmers. The study, however, has failed to study extension and training programs but instead focused more on the best practices consequently out conceptual gap.

RESEARCH METHODOLOGY

The study adopted a mixed-method approach utilizing both qualitative and quantitative methods to determine how knowledge sharing impacts on coconut production. The study in particular adopted descriptive survey design where structured questionnaires were used together with interviews. The target population for the study was 162,648 coconut farmers in Kilifi County (Ministry of Agriculture & Livestock Development, 2025). The study also targeted other stakeholders that agricultural extension officers, coconut processers, government through National and county coconut development, and research institutions via head of KALRO Kilifi for interview to get qualitative findings. The unit of observation of the study was coconut farmers and agricultural extension officers. The study made use of the purposive sampling technique. The sample size is the number of individuals or items that were used to gather data

about the target population (Andrade, 2020). Sample size of 399 coconut farmers in Kilifi County was calculated using Slovin's Formula (Slovin, 1960).

The sample size, therefore, was 399 coconut farmers in Kilifi County. In selecting the sample size of the study, stratified random sampling approach was employed. Specifically, the stratified random sampling was employed concurrently with simple random sampling to select a representative and unbiased sample population to the study. Structured questionnaires were used to collect data. Questionnaires were distributed to coconut farmers in Kilifi County and respondents given time to fill them out and collect them after the agreed time. Both face-to-face and telephone interviews which included open-ended questions. 1 agricultural extension officer per sub county was interviewed to get a good understanding of different aspects of interest. Thus, 7 extension officers from the 7 sub counties in Kilifi County were interviewed. Statistical Package for Social Science (SPSS) version 29 was used to do data analysis. Descriptive and regression analysis was done to enable the study to better understand the characteristics of the variables and the relationship between the dependent and independent variables. Frequency tables, percentages, and means were used to present the findings.

RESULTS

This section presents the findings of the study. It is structured to cover the demographic patters of respondents, their perceptions and views of various aspects, and finally a statistical examination of the underlying relationships.

Demographic Information

The demographic information in the study included gender of the respondents, highest level of education, the number of years of growing coconut as well as the age bracket of the respondents. The demographic analysis is presented in the subsequent sections.

Table 1: Demographic Information of the Respondents

Category	Frequency	Percent
Male	97	66.2
Female	190	33.8
Total	**287**	**100**
Certificate	75	26.1
Diploma	85	29.6
Undergraduate	43	15
Post Undergraduate	5	1.7

Others	79	27.5
Total	**287**	**100**
Less than 3	29	10.1
4 to 6	73	25.4
7 to 10	89	31
More than 10	96	33.4
Total	**287**	**100**
25 and below	7	2.4
26 to 29	40	13.9
30 to 35	51	17.8
36 to 39	50	17.4
40 to 44	42	14.6
45 and above	97	33.8
Total	**287**	**100**

From the results, 66.2% of the respondents were male whereas 33.8% were female. This is an indication that majority of the coconut farmers contacted in the study were male. 29.6% of the respondents had diploma as their highest education level, 26.1% certificate level, 15% under graduate, 1.7% post undergraduate while 27.5% of the respondents recorded other levels of education. As can be noted, 33.4% of those contacted in the study had been engaged in coconut farming for more than 10 years, 31% for between 7 and 10 years, 25.4% between 4 and 6 years while 10.1% had been growing coconut for less than 3 years. It can be observed that 33.8% of the respondents were aged above 45 years, 14.6% aged between 40 and 44 years, 17.4% aged between 36 and 39 years, 17.8% between 30 and 35 years, 13.9% aged between 26 and 29 years while 2.4% were aged below 25 years.

Descriptive Statistics of Variables in the Study

To describe a distribution of the scores of measurements using indices or statistics, the study employed descriptive statistics to summarize the responses using percentages, mean and standard deviation.

Table 2: Descriptive Results for Extension and Training Knowledge Sharing Programs

	SD	D	N	A	SA		S
							Dev
	%	%	%	%	%	M	
I attend extension and training programs on coconut farming regularly.	10.1%	9.4%	9.1%	41.8%	29.6%	3.71	1.26
Structure and content of coconut farming extension and training programs motivate me to complete training	10.5%	9.1%	11.8%	38.0%	30.7%	3.69	1.28
Extension and training programs have influenced my coconut farming practices positively.	10.1%	9.1%	8.7%	43.2%	28.9%	3.72	1.25
I apply knowledge and skills acquired from the extension and training programs to improve coconut production.	8.4%	11.1%	8.0%	40.1%	32.4%	3.77	1.25
The extension and training sessions are well-organized and are delivered effectively	10.5%	9.1%	7.7%	41.8%	31.0%	3.74	1.28
Trainers of extension programs are knowledgeable and provide useful insights that are important to improve coconut farming.	10.1%	9.4%	9.8%	40.8%	30.0%	3.71	1.27

The statement on whether the respondents attend extension and training programs on coconut farming regularly received responses as follows; 41.8% of the respondents were in agreement, 9.1% were neutral while 29.6% were in concurrence strongly with a mean of 3.71 and standard deviation of 1.26. With a mean and standard deviation of 3.69 and 1.28, 38% of the respondents were in agreement that structure and content of coconut farming extension and training programs motivate me to complete training, 30.7% were strongly in tandem while 11.8% were

neutral. In addition, 28.9% were strongly in agreement that extension and training programs have influenced their coconut farming practices positively, 8.7% were neutral while 43.2% were in tandem with a mean of 3.72 and 1.25. The responses for the question, I apply knowledge and skills acquired from the extension and training programs to improve coconut production were as follows; 8% of the respondents were neutral, 40.1% being in agreement while 32.4% in tandem strongly with a mean of 3.77 and standard deviation of 1.25. Additionally, 31% of the respondents were in concurrence that the extension and training sessions are well-organized and are delivered effectively with a mean of 3.74 and standard deviation of 1.28, 7.7% were neutral while 41.8% were in agreement. Finally, with a mean of 3.71 and standard deviation of 1.27, 30% of the respondents were tandem strongly that trainers of extension programs are knowledgeable and provide useful insights that are important to improve coconut farming, 40.8% in agreement while 9.8% were neutral.

Correlation Analysis

Correlation analysis is significant in determining the correlation among the variables in the study. The analysis is used to determine the strength and direction of correlation among the variables under review.

Table 3: Correlation Test Results

		Coconut Farming	Extension and Training Knowledge Sharing Programs
Coconut Farming	Pearson Correlation	1	.557**
	Sig. (2-tailed)		0.000
Extension and Training Knowledge Sharing Programs	Pearson Correlation	.557**	1
	Sig. (2-tailed)	0.000	

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

The correlation between extension and training knowledge sharing programs and coconut farming in Kilifi County was positive and statistically significant (0.557, $p = 0.000 < 0.05$).

Regression Analysis

Regression analysis is used to determine the relationship between extension and training knowledge sharing programs and coconut farming in Kilifi County, Kenya.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.557a	0.31	0.308	0.90299

Simple linear regression analysis was conducted to determine the relationship between extension and training programs and coconut farming in Kilifi County, Kenya. From the regression results, extension and training programs gives an explanation of 31% of the total changes in the coconut farming in Kilifi County, Kenya. An R Square of 0.31 supports this. The results further indicate a strong positive correlation between extension and training programs and coconut farming in Kilifi County, Kenya.

Table 5: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	104.432	1	104.432	128.075	.000b
	Residual	232.388	285	0.815		
	Total	336.82	286			

The significance of the model was tested using a two-tail approach. From the results, the overall model was statistically significant (0.000<0.05). The results posit that extension and training programs is an important component in coconut farming in Kilifi County. An estimated F value of 128.075, which is greater than the critical F value ($F_{1, 285}$) supports the results of this study.

Table 6: Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.634	0.188		8.679	0.000
Extension and Training Programs	0.577	0.051	0.557	11.317	0.000

The coefficient of extension and training knowledge sharing programs was positive and statistically significant (β =0.577, p =0.000<0.05). Thus, a unit improvement in extension and

training knowledge sharing programs results in 0.577 unit improvement in coconut farming in Kilifi County. Hence, extension and training knowledge sharing programs determine s significantly coconut farming in Kilifi County. Extension and training knowledge sharing programs are important in coconut productions as they help to equip farmers with modern agricultural practices and techniques and enable them to have knowledge of the market (Tolinggi *et al.*, 2023). Extension and training knowledge sharing programs are mostly organized by non-governmental organizations, government agencies and cooperatives and are intended to provide hands-on training in various areas such as disease and pest control, sustainable farming practices and efficient farming techniques. Extension and training knowledge sharing programs can enable farms to increase crop yield and improve the quality of the produce (Maon *et al.*, 2024). It also enables farmers to understand and make good use of the opportunities.

Extension and training knowledge sharing programs also help a lot to foster farmer collaboration, exchange of knowledge and policy advocacy (Tolinggi *et al.*, 2023). It brings stakeholders that include; farmers, researchers and policymakers which is important to create important network that can drive innovation, funding and market expansion. The training also helps farmers to adapt to changing climatic conditions and become resilience (Maon *et al.*, 2024). This is important in promoting food security and sustainable agriculture. Extension and training knowledge sharing programs also ensure that coconut farmers receive up-to-date information that is important to improve productivity and ensure long-term sustainability.

Maon *et al.* (2024) pointed out coconut farming presents numerous opportunities and challenges and calls for effective sharing of information to enable farmers have a good understanding of coconut production. Developing learning programs for the farmers can help a lot to ensure that farmers are well-informed about farming practices. The programs provide opportunity to coconut farmers to seek answers to questions that may have been hindering them from producing effectively and efficient.

Obianefo *et al.* (2023) found out that training of farmers through extension and training knowledge sharing programs is important to enable them to know appropriate planting techniques, which is important to improve their resilience in coconut farming. Extension and training knowledge sharing programs give farmers good time to learn new techniques and how they can be applied to improve production. Extension and training knowledge sharing programs can help also to promote engagement with the government which in the long run help to ensure that farmers get the assistance that they need to succeed in coconut farming.

Atapattu and Nuwarapaksha (2025) pointed out that learning the best practices such as application of the fertilizer is important. Organizing extension and training knowledge sharing programs to ensure that farmers are well-educated about the best practices is important. Use of extension and training knowledge sharing programs are important as it provides effective interaction with the farmers.

CONCLUSION

The study concludes that extension and training knowledge sharing programs have a positive and statistically significant with coconut farming. Thus, a unit improvement in extension and training knowledge sharing programs results in in significant units improvement in coconut farming in Kilifi County. Hence, extension and training knowledge sharing programs determine s significantly coconut farming in Kilifi County. Therefore, the study rejected the null hypothesis; extension and training knowledge sharing programs have no effect on coconut farming in Kilifi County, Kenya and concluded that extension and training knowledge sharing programs determine s significantly coconut farming in Kilifi County. Extension and training knowledge sharing programs are important in coconut productions as they help to equip farmers with modern agricultural practices and techniques and enable them to have knowledge of the market. Extension and training knowledge sharing programs can enable farms to increase crop yield and improve the quality of the produce. It also enables farmers to understand and make good use of the opportunities. Sharing of knowledge through mentorships and trainings is, therefore, important. It helps farmers to deal with risks and improve production.

The implementation of extension and training knowledge sharing programs is significant in enhancing productivity and income generation for the coconut farmers. Through these programs, farmers gain access to improved agronomic practices, pest and disease management techniques, and post-harvest handling methods, which collectively improve yield quality and quantity. The programs also facilitate the adoption of modern technologies, diversification into value-added coconut products, and market linkage development, thereby boosting profitability. Moreover, such programs strengthen farmers' capacity for climate resilience and sustainable resource management, contributing to rural economic growth and food security in Kilifi County.

RECOMMENDATIONS

The study recommends that there should be regular workshops, demonstration plots, mobile-based advisory services and collaboration with research institutions, farmers can access expert guidance tailored to local conditions. This structured approach not only enhances productivity and quality but also supports value addition, diversification of coconut products and stronger linkages to markets, thereby improving incomes and livelihoods while promoting sustainable coconut farming systems.

Policymakers should strengthen and institutionalize diverse knowledge-sharing approaches among coconut farmers in Kilifi County by supporting farmer-to-farmer networks, enhancing extension and training services, promoting mentorship programs and leveraging digital platforms for wider reach. Integrating these approaches through cooperatives and partnerships with research institutions, NGOs, and private sector actors can ensure that farmers access timely, practical and context-specific information on improved farming practices, value addition and market opportunities.

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