

Sugarcane farming practices and household income levels nexus: A case of Ndhwa Sub-County, Homa Bay County, Kenya

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ABSTRACT

Sugarcane farming is the main economic activity in Ndhwa sub County. While the activity remains an important source of rural livelihoods, there is limited research with regards to the contribution of sugarcane farming to household income. While its contribution to rural incomes is significant, limited empirical evidence exists on how different dimensions of sugarcane production including land allocation, farming practices, labor structures, payment systems, and value chain participation affect household income. Most of the studies have laid emphasis on the levels of sugarcane production and the relationship between sugarcane millers and farmers. This leaves a knowledge gap with regards to livelihood dynamics and sugarcane farming income dynamics. Thus, this study sought to determine the nexus between sugarcane farming practices and household income levels in Ndhwa sub-County. The study was guided by the Agricultural Location Theory by Von Thünen (1826) and the Sustainable Livelihoods Approach (SLA) by DFID (1999). It was based on Cross-sectional descriptive survey design with mixed method approach. The sample size of the study was 418 respondents. Stratified random sampling was used with the seven wards in the sub-County serving as strata. Questionnaires, interview schedule and focus group discussions were the main data collection tools. Data was analysed using descriptive statistics and Chi square tests. The findings indicated that 55.5% of the respondents were cultivating between 1 and 3 acres of sugarcane. Additionally, most of the farmers relied on sugarcane as their main source of livelihood. However, 57% of the respondents cited delays in payment as a major challenge that affects their income levels. This research concluded that most of the farmers in Ndhwa sub County highly depend on sugarcane farming for their livelihood but delayed payments affect their income. The study recommends increased access to agricultural extension services and education to farmers. In addition, the sugar millers should ensure there is a payment structure to improve payment duration to between 30 and 45 days after delivering cane to the millers.

Keywords: Farming Practices, Household Income, Ndhwa Sub-County, Sugarcane Farming

I. INTRODUCTION

Sugarcane farming is one of the most significant agricultural activities in the world due to its central role in sugar production and ethanol manufacturing. It was estimated that the land under sugarcane cultivation was approximately 26 million hectares which produced an estimated 1.87 billion tonnes in 2020 [Food and Agriculture Organization Statistical Database (FAOSTAT, 2022)]. In Brazil, the annual production of sugarcane is estimated to be 752.9 million tonnes annually, positioning it as the global leader in sugarcane production (Taylor & Koo, 2015). However, despite this growth in production, the small scale sugar farmers in the country still experience payment issues that are mainly driven by global fluctuations in sugar prices. Similar challenges have been experienced in India which produces approximately 405.4 million tonnes. Sugarcane farmers face challenges such as high cost of farm inputs, recurrent water shortages and delays in payments from milling companies (Reuters, 2024). In China, Sugarcane production is estimated to be 110 million tonnes. Despite this high production, small scale farmers have to cope with small farm sizes and smallholder producers contend with small land holdings and restricted access to advanced farming technology (Taylor & Koo, 2015).

In South Africa, it is estimated that the sugar industry supports at least 350,000 jobs (Mabeta & Smutka, 2023). The production among small scale farmers is, however, affected by poor infrastructure in the rural areas, climate variability and high cost of labour (IISD, 2023). Chisasa (2019) observed that sugarcane farming in Malawi was a significant source of income among rural households. Despite this important contribution, farmers in the country faced several challenges including limited access to modern technologies, poor infrastructure, limited access

to credit and low market access (Chisasa, 2019). Similarly, Guloba et al. (2026) established a steady growth in sugarcane production in Uganda between the years 2000 and 2020 from 1.5 million tonnes to 5.8 million tonnes, respectively. The increase in production was attributed to increase in land under sugarcane production by almost four times (Guloba et al., 2026). Nevertheless, this growth did not necessarily lead to increase in farmers' income levels.

The sugar sector in Kenya plays an important role in the economy since it has created jobs, promoted development in rural areas and improved food security. The industry has, however, faced several challenges including delays in farmers' payments, poor management in private and state owned sugar companies, competition from cheap sugar imports and conflicts in policy initiatives (Kenya National Bureau of Statistics [KNBS], 2024). With regard to production, the performance of the industry has been fluctuating over the years. For instance, data from KNBS indicated that in 1996 the cane production was approximately 90.86 tonnes per hectare. The production declined to approximately 78.42 tonnes/ha in 1999 and decreased further to 60.52 tonnes per hectare in 2020 (KNBS, 2024). These national dynamics are reflected in Ndhiwa sub-County, located in Homa Bay County, Western Kenya. The establishment of Sukari Industries Limited Company in the sub-county has made sugar farming the leading cash crop in the area. Many farmers in the area have set aside large tracts of land for sugarcane production because of its perceived high income and market availability (Homa Bay County Government, 2023). Sugarcane production cycle takes between 18 and 24 months. This extended period means that farmers take long before realizing income after planting the crop. The sugar millers normally provide farming inputs to farmers on credit and then deduct the costs from farmer's earnings when paying them. This arrangement guarantees inputs to the farmer but significantly leads to reduced farmer net earnings due to increased deductions and delays in payments.

1.1 Research Question

What are the effects of sugarcane farming practices on household income levels in Ndhiwa sub-County, Homabay County, Kenya?

II. LITERATURE REVIEW

2.1 Theoretical Review

This study was grounded in two complementary theoretical frameworks: the Agricultural Location Theory by Von Thünen (1826) and the Sustainable Livelihoods Approach (SLA) by DFID (1999).

2.1.1 Agricultural Location Theory

The Agricultural Location Theory was developed in 1826 by Heinrich von Thünen. The theory states that the location of agricultural activities is influenced by factors such as land rent, the cost of transportation, how far the farm is from the market and how perishable the farm products are (Van Leeuwen, 2010). It is based on the assumption that a farmer will act rationally when selecting the crops to grow. Thus, the farmer will select crops that will give maximum returns in relation to market proximity. This theory was applied in this study to explain how factors such as distance of the farm from the sugar mill, condition of the roads and presence of farm input supply centres influence the decision of households with regard to land utilization and agronomic practices. Additionally, the theory was used in the analysis of the relationship between spatial proximity to the sugar mills and the use of high yielding farming practices.

Moreover, agricultural location theory guided this study to identify spatial variations in household income by pointing out how the size of land, efficient transport and access to markets influence sugarcane farmer's decision making. Farmers living far away from the sugar mill are more likely to incur high production and transport costs. This will eventually reduce their profit margins and lower their income. On the other hand, farms located near sugar mills and input distribution centres will most likely incur less transportation costs which will translate to higher profits. Thus this theory generated insights that enabled the study to understand how geographical factors affect sugarcane farmers' income.

2.1.2 Sustainable Livelihoods Approach (SLA)

The Sustainable Livelihoods Approach (SLA) offers an elaborate structure for comprehending how households in rural areas marshal resources and deal with threats that can derail their well-being. This approach consists of five aspects including social, physical, capital, natural and financial and their interaction with environment, institutions and market conditions to improve household's welfare (DFID, 1999). SLA was instrumental in this study since it enabled the study to analyse how different households organize labour, gender roles and the influence of these aspects to the income realized from sugarcane farming. Additionally, SLA provided the basis for analysis of the impacts of delayed payments, uneven income and farmer's reliance on credit on financial security of households.

(Scoones, 2015; Mdee, 2002).

2.2 Empirical Review

Several global studies have recognized the influence of sugarcane farming practices on household income. de Amorim et al. (2021) established that small scale farmers who cultivated more than 10 hectares of land and used modern farm machinery in Brazil had a 45% chance of earning higher incomes as compared to their counterparts who relied on traditional cultivation methods. Mishra et al. (2022) observed that adoption of early maturing cane by farmers in India increased their profits by 33%. Farmers who continued to grow the traditional cane varieties earned ₹49,800 per acre while those who adopted new varieties increased their earnings to ₹66,200. In Thailand, Marks et al. (2024) found out that farmers who received education and cultivated more than 2 hectares of sugarcane increased their earnings by 27% above the national farm average.

Additionally, Nguyen (2021) observed that training farmers at least three times a year led to 24% increase in sugarcane farmers' income in Vietnam. In Colombia, Beltrán-Tolosa et al. (2022) identified improvement in planting schedules, reduction in production waste and a 19% rise in household income as a result of technical assistance that farmers received from co-operatives. Zulu et al. (2019) noted that adoption of irrigation and mechanization of farms led to 41% increase in farmer's earnings in South Africa. On their part, Dlamini and Masuku (2013) found that cane farmers in Eswatini, were recording low yields because of poor pest management and late weeding. Yakubu et al. (2020) found that farmers cultivated an average of 2.3 hectares of sugarcane. The cost of production was estimated at N33, 224.22 per hectare, while the corresponding revenue was N36, 706.17. Further, Umar & Mohammed (2024) argued that only 28% of farmers in Niger State received agronomic training.

In Uganda, Guloba et al. (2026) demonstrated that adoption of improved farm practices including certified seeds and farm mechanization increased cane yields from 45 to 68 tonnes per hectare. Training and use of fertilizer improve earnings from sugarcane farms in Tanzania by 32% (Nsindagi & Sesabo, 2017). In Ethiopia, Buehren et al. (2017) established that farm size and support given to farmers by extension officers improved farmers income. In Kenya, Ogutu et al. (2020) observed that sugarcane production in Kenya dropped from 105 to 63 tonnes per hectare in the period between 2000 and 2020. This was attributed to poor farming practices such as use of uncertified seedlings and late weeding. Additionally, Mwendwa (2022) found that land subdivision affected crop production in Kenya with average farm sizes in populous areas reducing to 1 acre. Waswa et al. (2012) added that although local milling companies rely on small-scale growers for the vast majority (92%) of their agricultural inputs, this cash crop has fallen short of securing stable livelihoods or nutritional needs for rural farming families. According Yator (2025), farmers could realize upto 35% increase in yields if they receive training on soil management, rationing and spacing.

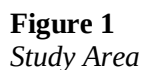
III. METHODOLOGY

3.1 Research Design

This study adopted a cross-sectional descriptive survey design that integrated quantitative and qualitative techniques. The quantitative component utilized structured questionnaires to capture numerical insights on land use, payment timelines, and household income levels. The qualitative component employed Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs).

3.2 Study Area

The research was conducted in Ndhiwa sub-County, located in Homa Bay County in western Kenya. Ndhiwa covers an area of 711 square kilometers, situated between 0.44° South of the Equator and 34.22° East of the Greenwich Meridian, with an altitude ranging between 1,313 and 1,374 meters above sea level (Kenya Institute for Public Policy Research and Analysis (KIPPRA), 2016). According to the Kenya National Bureau of Statistics (2019), the sub-County has a population of 218,136 people with an average household size of 4.64. Administratively, it consists of seven wards: Kwabwai, Kanyamwa Kosewe, Kanyamwa Kologi, Pala, Kabouch North, Kanyikela, and Kanyadoto. Ndhiwa has a bimodal rainfall pattern, with long rains occurring between March and May and short rains between October and December. The average annual rainfall is approximately 1,379 mm, while temperatures range between 20.6°C during cooler months (April–November) and 22.5°C in warmer months (December–March) (Ogenga et al., 2018). The predominant soil type is alluvial sandy loam, which is fertile, well-drained, and well-aerated, ideal for sugarcane farming. Ndhiwa's economy is anchored in agriculture, supplemented by fishing, trade, and tourism. Sugarcane farming involves approximately 33,600 households, making it the dominant cash crop (Homa Bay County Planning Report, 2022). Other crops include maize, cassava, millet, and sunflower. Fishing in Lake Victoria contributes to food security, while trade and transport provide alternative livelihoods.



The target population for this study comprised sugarcane farming households in Ndhiwa sub-County. The number of families practicing sugarcane farming in Ndhiwa sub-County is estimated to be 33,600 (Homa Bay County Planning Report, 2022). The target population also included cooperative managers, agricultural extension officers and representatives from sugarcane processing firms operating in the region.

A stratified random sampling technique was applied. Given that the sub-county comprises seven administrative wards with varying levels of engagement in sugarcane farming, each ward served as a stratum to enable fair and structured representation of the population. For the qualitative component, the study purposively selected participants for two Focus Group Discussions (FGDs) and ten Key Informant Interviews (KIIs). Each FGD included 10 participants, drawn from diverse socio-economic backgrounds; including youth, women, cooperative members, and smallholder farmers, to capture a broad range of perspectives. Key informants included agricultural extension officers, cooperative leaders, local government officials, sugarcane transporters, and representatives from the local sugar mill. The sample size for this study was determined using Krejcie and Morgan's (1970) sample size determination formula (equation 1)

Where N = population size (33,600), P = population proportion (0.5), d = margin of error (0.05), and χ^2 = chi-square value for df=1 at the 0.05 confidence level (3.841). This yielded a minimum sample size of 380 respondents. However, to account for potential non-responses or incomplete data, an additional 10% buffer was included, increasing the total sample size to 418 households.

The proportional allocation of the sample across wards was determined using equation 2:

$$n_i = (N_i/N) \times n \dots \dots \dots \text{equation 2}$$

Where n_i is the number of households sampled from ward i , N_i is the number of sugarcane farming households in that ward, N is the total population (33,600), and n is the total sample size (418). The allocation for each ward is shown in Table 1.

Table 1
Sample Size Allocation

Ward	Sugarcane Farming Households	Sample Allocation	% of Total Population
Kwabwai	5,379	67	16.01%
Kanyamwa Kosewe	4,372	55	13.01%
Kanyamwa Kologi	4,382	55	13.04%
Pala	7,899	98	23.51%
Kabouch North	5,281	66	15.72%
Kanyikela	3,165	39	9.42%
Kanyadoto	3,122	38	9.29%
Total	33,600	418	100%

3.5 Data Collection

This study employed three research instruments including structured questionnaires, key informant interview guides and focus group discussion (FGD) protocols. The structured questionnaire was administered to 418 sugarcane farming households, selected through proportionate stratified random sampling across the seven wards of Ndhiwa sub-County. For the qualitative component, the study conducted 10 Key Informant Interviews (KIIs) with purposively selected stakeholders including agricultural extension officers, cooperative leaders, local government officials, and sugarcane value chain actors. Additionally, the study conducted two Focus Group Discussions (FGDs) involving a total of 20 participants, drawn from diverse socio-economic backgrounds. These FGDs were conducted in two purposively selected wards, one with high sugarcane production intensity and another with lower production levels, to gather comparative insights.

3.6 Data Analysis

Quantitative data from the structured questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics, including means, frequencies and percentages were used to summarize demographic characteristics and responses related to each objective. Inferential statistics, specifically, Chi-square were applied to assess the relationships between sugarcane farming practices and income levels.

3.7 Ethical Considerations

Before commencing fieldwork, ethical clearance was obtained from Mount Kenya University's Ethics Review Committee (ERC). The researcher was also issued with a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). Additionally, the research informed all the participants what the study entailed before collecting data from them. The participants were allowed to decline participating in the study or withdraw from the study at any point. Confidentiality was also upheld during data collection and reporting. The participants were not required to disclose their names or any information that could reveal their identity.

IV. FINDINGS & DISCUSSIONS

4.1 Effect of Sugarcane Farming Practices on Household Income

Sugarcane farming practices form a foundational aspect of household income generation in the study area. Variations in land allocation, farming methods, and access to extension services directly influence financial outcomes.

4.1.1 Land Allocated to Sugarcane Farming and Household Income

The study sought to establish the relationship between land allocated to sugarcane farming and household income. It was established that lower income households (households with an income between KES 5001 and KES 15000 per month) allocated the largest acreage of land to sugarcane farming (Table 2). The respondents in this income bracket observed that their decision to allocate more land to sugarcane farming was influenced by their previous income earnings from sugarcane sales. Additionally, the respondents noted that they were willing to put more land

under sugarcane cultivation if payment schedules become prompt. Similar findings were recorded among respondents earning monthly income of between KES 15,001 and KES 25,000. All respondents in this category also agreed to the statement that increased land allocation leads to better income from sugarcane sales. These findings agree with Muriithi and Matz's (2015) who established that farmers with moderate income mostly reinvest their income from the farm with the aim of increasing production.

Farmers earning below KES 5,000 per month had varied views about land allocation to sugarcane farming. The results indicated that 40.30% of the farmers agreed that they need to allocate more land to sugarcane farming, 40.30% were neutral while 19.50% strongly disagreed to this statement. These findings could be attributed to the fact that such farmers may not have enough finances to invest in huge sugarcane farms. Similar findings were reported by Marinus et al.'s (2023) who found out that farmers with little income were more hesitant to invest their resources in farming. Moreover, International Labour Organisation (ILO) (2020) maintained that better financial incentives were not the only important factor in improving agricultural profitability. Other factors such as prompt payments and small land sizes were also important.

Table 2*Extent of Land Allocated to Sugarcane Farming Disintegrated by Income*

Statement	Household Income	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Allocated land to sugarcane	Below 5,000	19.50%	0.00%	40.30%	40.30%	0.00%
	5,001 - 15,000	0.00%	0.00%	100.00%	0.00%	0.00%
	15,001 - 25,000	0.00%	0.00%	0.00%	0.00%	100.00%
	25,001 - 35,000	0.00%	50.00%	0.00%	50.00%	0.00%
More land improved income	Below 5,000	19.50%	0.00%	0.00%	60.40%	20.10%
	5,001 - 15,000	0.00%	0.00%	0.00%	100.00%	0.00%
	15,001 - 25,000	0.00%	0.00%	0.00%	0.00%	100.00%
	25,001 - 35,000	0.00%	0.00%	50.00%	50.00%	0.00%
Would expand if payments were timely	Below 5,000	0.00%	0.00%	20.10%	60.40%	19.50%
	5,001 - 15,000	0.00%	0.00%	0.00%	0.00%	100.00%
	15,001 - 25,000	0.00%	0.00%	0.00%	0.00%	100.00%
	25,001 - 35,000	0.00%	0.00%	0.00%	50.00%	50.00%
Allocation depends on past income	Below 5,000	19.50%	0.00%	20.10%	60.40%	0.00%
	5,001 - 15,000	0.00%	0.00%	0.00%	100.00%	0.00%
	15,001 - 25,000	0.00%	0.00%	0.00%	100.00%	0.00%
	25,001 - 35,000	0.00%	0.00%	0.00%	50.00%	50.00%
Limited land access limits benefits	Below 5,000	19.50%	0.00%	20.10%	40.30%	20.10%
	5,001 - 15,000	0.00%	0.00%	100.00%	0.00%	0.00%
	15,001 - 25,000	0.00%	0.00%	0.00%	100.00%	0.00%
	25,001 - 35,000	0.00%	0.00%	0.00%	50.00%	50.00%

The study sought to understand how different land allocation sizes for sugarcane farming correlate with monthly household income levels in Ndhiwa sub-County. The cross-tabulation (Table 3) revealed that farmers who cultivate less than one acre of sugarcane earn less than KES 5,000 per month. It is important to note that household income reported in this study encompasses all income sources, including off-farm activities, casual labor, and small business income, in addition to sugarcane earnings. In contrast, those cultivating more than three acres show a notable shift towards higher income brackets, with a significant number earning between KES 25,001 and 35,000 monthly.

Table 3*Cross-tabulation of Land Size under Sugarcane and Household Income*

Land under sugarcane (acres)	Monthly Income: Below 5,000	5,001–15,000	15,001–25,000	25,001–35,000	Total
<1 acre	61	0	0	30	91
1–3 acres	87	45	14	17	163
>3 acres	5	3	8	25	41

These results were statistically validated using the Pearson Chi-Square test (Table 4), which returned a value of $\chi^2 = 79.266$, $df = 6$, and a p -value < 0.05 , indicating a strong and statistically significant relationship between land size allocated to sugarcane and monthly household income.

Table 4

Pearson Chi-Square Test Results

Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	79.266	6	0.001
Likelihood Ratio	106.49	6	0.000
Linear-by-Linear Association	5.639	1	0.017

These findings align with de Amorim et al. (2021) and Mishra et al. (2022), who observed that larger-scale farmers in Brazil and India respectively realized higher returns due to economies of scale, mechanized farming, and better bargaining power. Similarly, Fitawek & Hendriks (2024) noted that farmers engaged in large scale agricultural investments earned higher incomes than those with smaller holdings. However, the study also exposes a stark income disparity: despite sugarcane's status as a cash crop, 61 households growing on less than one acre still earned below KES 5,000 monthly. This supports findings by Moswetsi et al. (2017) who established that smallholder farmers faced challenges such as delayed planting dates, managing use of fertilizers, choice of cultivars, tillage operations and cropping patterns.

4.1.2 Adoption of Improved Agronomic Practices

As shown in Figure 4.2, the strongest agreement was recorded for the statement that improved techniques increased income, with 55.8% agreeing and 22.3% strongly agreeing. Similarly, 44.5% of respondents agreed that they rotate or intercrop to improve fertility, a practice critical for long-term soil health. The use of certified seed cane elicited more divided views; 33.2% agreed while 33.2% strongly disagreed, indicating uneven access or skepticism about its value. These findings reflect the conclusions of Muriithi and Matz (2015), who observed that while adoption of agronomic best practices is increasing, uptake is often limited by access, cost, and extension reach. Similarly, Dhankhar and Patel (2021), highlighted the role of education and advisory services in enhancing agronomic efficiency.

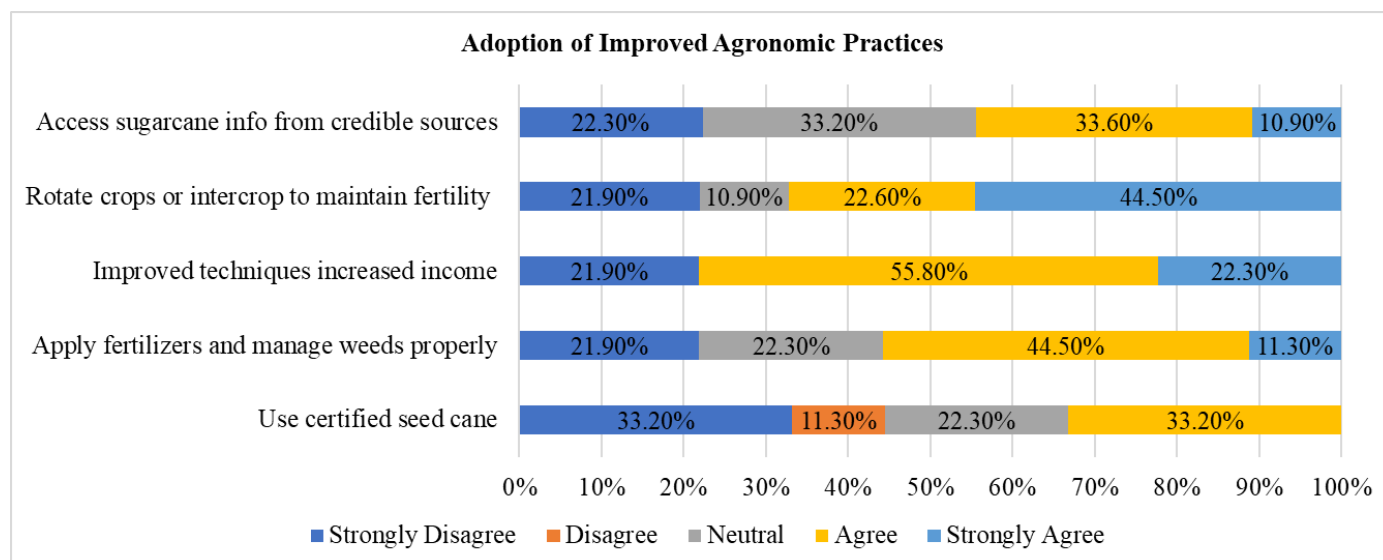


Figure 1

Adoption of Improved Agronomic Practices

The findings reveal a strong positive association between the adoption of improved agronomic practices and household income levels. The results from symmetric measures (Table 5) show a very high Phi and Cramer's V value of 0.867, with an approximate significance of $p < 0.05$, indicating a statistically significant relationship.

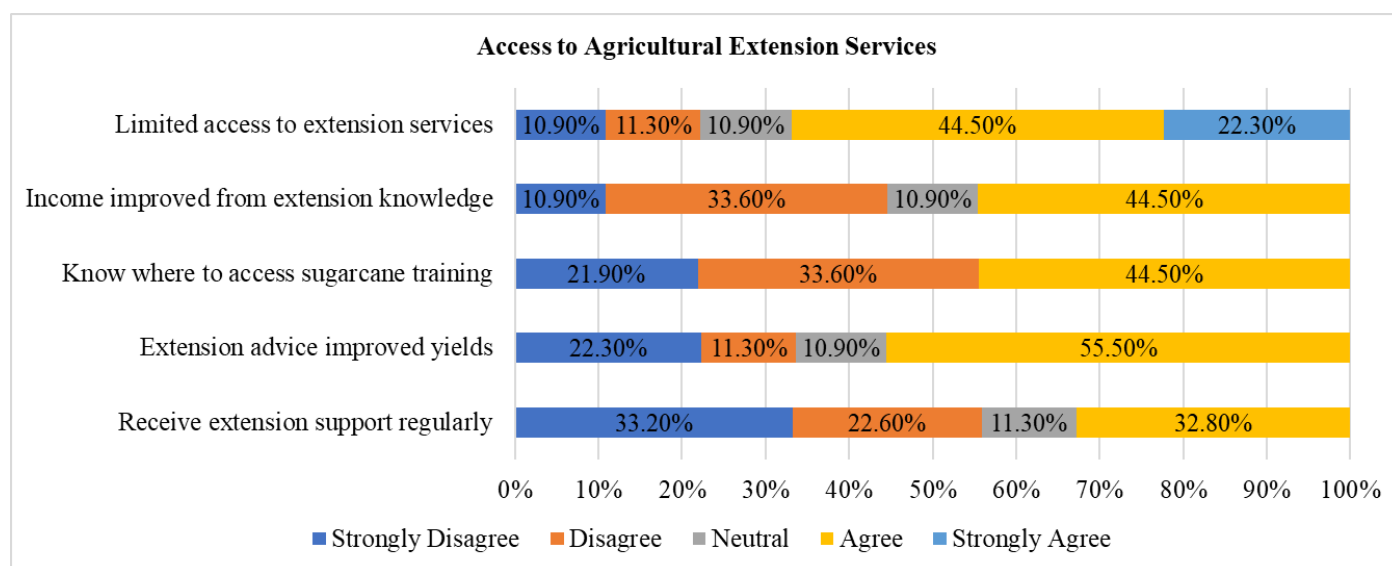
Table 5*Symmetric Measures for the Adoption of Agronomic Practices and Household*

Measure	Value	Approx. Significance
Phi	0.867	0.011
Cramer's V	0.867	0.011
N of Valid Cases	274	—

Farmers who adopted practices such as early planting, timely weeding, certified seed cane, and structured crop rotation were more likely to earn higher incomes than those using conventional or outdated methods. This confirms the empirical literature reviewed earlier, such as the work of Mishra et al. (2022) in India and Marks et al. (2024) in Thailand, which established that improved production methods enhance yield and profitability per acre. These findings are also consistent Ogutu et al. (2020) who found that timely weeding and adoption of high-yielding cane varieties increased household income by 28% per acre. Additionally, Were (2026) reported that farmers in Ndhiwa who implemented water stress management, certified inputs, and crop rotation earned more income per year than those relying on traditional methods.

4.1.3 Access to Agricultural Extension Services

Figure 4.3 shows that 55.5% of respondents agreed that extension advice had improved their yields, while 44.5% agreed that their income had improved through knowledge gained from extension officers. Additionally, 44.5% of farmers agreed they knew where to access sugarcane training. However, only 32.8% agreed they received extension support regularly, with 33.2% strongly disagreeing. This could be attributed to lack of consistency and coverage of extension services. These findings agree with Fischer and Qaim (2012), who emphasized that while farmers often benefit from extension guidance, access remains irregular and underfunded.

**Figure 2***Access to Agricultural Extension Services*

The findings indicate a strong association between regular access to agricultural extension services and higher household income among sugarcane farmers in Ndhiwa sub-County. As seen in Table 6, a significant proportion of farmers without regular extension access earned below KES 5,000 monthly, while those with access demonstrated a more balanced distribution across higher income categories. Specifically, 48 households with access earned between KES 5,001 and 15,000, and 22 earned between KES 15,001 and 25,000, contrasting starkly with the 154 low-income households lacking such support.

Table 6*Cross-tabulation of Access to Extension Services and Household Income*

Access to Extension Services	Monthly Income: Below 5,000	5,001–15,000	15,001–25,000	25,001–35,000	Total
No / Uncertain	154	0	0	30	184
Yes (Regular Access)	10	48	22	10	90

Statistical analysis using the Pearson Chi-Square test (Table 7) confirms a highly significant relationship between extension access and income levels ($\chi^2 = 205.996$, $p < 0.05$), suggesting that extension services play a pivotal role in improving farm productivity and income outcomes. This corroborates findings from Nguyen (2021) in Vietnam and Beltrán-Tolosa et al. (2022) in Colombia, which demonstrated that farmers receiving consistent technical advice achieved notably higher yields and incomes. It also aligns with Ogutu et al. (2020) and Were (2026) who reported that farmers in Homa Bay receiving at least two extension sessions per season recorded increase in farm income compared to their counterparts.

Table 7
Pearson Chi-Square Test Results (Extension Access vs Income)

Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	205.996	3	0.009
Likelihood Ratio	263.754	3	0.000
Linear-by-Linear Association	88.842	1	0.000

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study concludes that the extent of land allocated to sugarcane and the quality of agronomic techniques employed are decisive determinants of household income in Ndhiwa Sub-County. While the majority of farmers cultivated small plots of one to three acres, only a minority accessed or adopted improved agronomic practices, leading to significant disparities in productivity and earnings. Farmers who implemented timely weeding, used certified seed cane, and applied optimal spacing, often supported by extension services, achieved markedly higher incomes. Conversely, those reliant on traditional practices experienced lower yields and unstable revenue streams.

5.2 Recommendations

The study recommends that the county government should expand access to agricultural extension services to train farmers on improved sugarcane farming practices, such as soil management, use of certified seed cane, and modern agronomic techniques to boost productivity and income. Additionally, there should be structured and timely payment systems by sugar millers to ensure that farmers receive payments within a maximum of 30 to 45 days after cane delivery.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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