



Banana Value Chain Factors and Marketing Channels: A Case Study of Meru, Embu and Tharaka-Nithi Counties in Kenya

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This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Banana is a tropical crop grown in most developing countries, where it is commercialized by smallholder farmers. Banana is a major source of income, improved food security and possess great potential for value addition and export. Kenya is the largest producer of banana in East Africa,

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where it is a major source of food and income for smallholders. However, despite all these benefits, little is reported about its value chain factors and marketing channels in Kenya. Apparently, there are many restricting constraints in terms of banana supply and marketing management. Therefore, this study mapped socio-economic factors in the banana value chain and identified marketing channels in one banana-rich region, comprising Meru, Embu, and Tharaka-Nithi in Kenya. The study employed a cross-sectional survey design and multi-stage sampling of 384 respondents, comprising farmers, traders, and middlemen. A structured questionnaire was administered to respondents to collect primary data, which was subjected to descriptive and econometric analyses. The study found that majority of the farmers were small-scale, who used family labour (60%) and had limited access to credit and extension services. Middlemen were the dominant actors in marketing channels, compared to direct marketing. Farming experience and land allocated to banana were significant predictors with $P=0.030$ and 0.040 , respectively in Tharaka-Nithi, and $P=0.030$ and 0.014 , respectively in Embu. In Meru, land allocated to banana, type of labour, farming experience and education level were significant predictors with $P=0.012$, 0.009 , 0.059 and 0.080 , respectively. Most farmers did not have a specific buyer of their bananas and hence were prone to exploitation by middlemen. Also few farmers got information on marketing channels. These findings provide insights into challenges faced by small-scale banana farmers in the region and recommends enactment of policies that support farmer access to credit, extension services, and direct marketing channels. Sustained sensitization of farmers on value chain requirements should instill the right marketing channel to adopt and consistently use.

Keywords: Mapping actors; marketing channels; small-scale farmers; value chain.

1. INTRODUCTION

Banana is one of the most valuable cash fruit crops and agricultural commodity traded with economic significance and unlimited supply chain path in the world (Gebre et al., 2020). Additionally, it is a major source of income especially for households living in rural areas (Voorra et al., 2020). In the global market, banana is the leading fruit crop both in value and volume traded (Woldu et al., 2015). According to Food and Agriculture Organization Statistical Division (FAOSTAT) (2019), banana production and export data showed that India has the potential of producing the largest amount. However, Ecuador is the leading banana exporter. The European Union and United States are among the leading banana importers in the world that mainly uptake Cavendish variety due to its suitability to international trade and resilience to the effects of global travel compared to other varieties (FAO, 2018; Kenya National Bureau of Statistics, 2019; Okoko et al., 2019).

Banana production and trading can be done sustainably across the world with suitable management. The movement from the production point to retail point must be carefully managed to ensure that quality and safety of the banana is well maintained (Kema and Drenth, 2018). In East Africa at the production level, there are challenges faced due to various banana disease outbreaks and most farmers

have old banana plantations which result in declining yield, poor market integration and weak extension services (European Commission, 2020). An improved value chain is one that is able to maintain its competitive advantage irrespective of the changes in climatic conditions and actors within the value chain, from producers to retailers, and harness strategies jointly to sustain supply to consumers and society (Lim-Camacho et al., 2016). The best business model often enhances earnings to smallholder farmers. A business model entails designed activities that enable the link of smallholder farmers to value chain players and other market players along the chain (Kimble, 2015; Omondi et al., 2015).

Banana producers experience low information flow especially on prices, which renders them most vulnerable to intermediaries along the value chain. Marketing problems are contributed mainly by uncertainty about consumer trends and preferences, and poor marketing infrastructure (Tinzaara et al., 2018). Smallholder banana farmers are more vulnerable due to the high perishability and absence of capacity to store or add value to bananas, hence reducing their bargaining power (Bihunirwa et al., 2012). The major underlying drivers to improved efficiency along the value chain include institutions, technology and market sectors which lead to improved competitiveness, inclusivity, sustainability and access to finance (Yang et al., 2022).

Where:

M_{ik} is a vector of marketing channel of i th farmer, X_i is a vector of marketing channel characteristics, β_k are parameters to be estimated and ϵ_{is} is the error term assumed to be normally distributed with or around a mean.

3. RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of Respondents

The study found that majority of the farmers were females represented by 63% of the respondents (Table 1). Family labour was mostly used, followed by casual labour and permanent employees, corresponding to 60%, 16% and 1%, respectively, in banana farming. Middlemen (37.7%) were the dominant actors in the marketing channels, followed by direct marketing of the banana produce.

3.2 Banana Value Chain Factors and Marketing Channels in Meru

The results of variables in the model are shown in Table 2. The overall data showed that farming experience, type of labour used and land allocated to banana farming were statistically significant at 1%, 5% and 10% significance levels and had a positive influence on banana marketing through organized commodity group,

as compared to marketing by themselves in Meru County.

The level of education was statistically significant at $P=0.05$ and had a negative influence on marketing through organized commodity group, as well as marketing through middlemen as compared to marketing themselves. In addition, the data showed that land allocated to banana was statistically significant at 5% significance level and had a positive influence on marketing through middlemen as compared to marketing by themselves.

The type of labour used had a positive impact on banana production outcomes. The coefficient of 0.3216 indicated that farmers who used hired labour tended to have higher banana production outcomes than those who relied solely on family labour. This finding is consistent with previous research that has shown hired labour can increase productivity and efficiency on smallholder farms (Nzuma et al., 2020).

The land allocated to banana had a positive impact on production outcomes. The coefficient of 0.7288 suggested that farmers who allocated more land to banana production tended to have higher production outcomes. This finding is in line with previous studies that have shown that land allocation is a critical factor in determining smallholder agricultural productivity (Kassie et al., 2017).

Table 1. The socio-economic characteristics of the respondents

Characteristic	Category	Embu	Meru	Tharaka-Nithi	Total
Gender of the respondent:	Male	49.0(70)	29.8(48)	33.7(69)	36.7(187)
	Female	51.0(73)	70.2(113)	66.3(136)	63.3(322)
	Total	100.0(143)	100.0(161)	100.0(205)	100.0(509)
Type of labour	Casual labour	23.1(33)	14.9(24)	12.7(26)	16.3(83)
	Family labour	40.6(58)	69.6(112)	67.3(138)	60.5(308)
	Permanent employees		1.9(3)	2.0(4)	1.4(7)
	Both family and casual labour	31.5(45)	13.0(21)	14.1(29)	18.7(95)
	Both permanent and casual labour	1.4(2)	0.6(1)	1.5(3)	1.2(6)
	Both permanent and family labour	0.7(1)		1.0(2)	0.6(3)
	Family, permanent, and casual labour	2.8(4)		1.5(3)	1.4(7)
Marketing channels used in banana marketing	Total	100.0(143)	100.0(161)	100.0(205)	100.0(509)
	Organized groups	34.3(49)	28.0(45)	19.5(40)	26.3(134)
	Middlemen	34.3(49)	46.6(75)	33.2(68)	37.7(192)
	Direct marketing	31.5(45)	25.5(41)	47.3(97)	36.0(183)
	Total	100.0(143)	100.0(161)	100.0(205)	100.0(509)

The variable of level of education appeared to have a negative impact on banana production outcomes. The coefficient of -0.1445 suggested that farmers with higher levels of education tended to have lower banana marketing tendency through organised groups. This finding concurred that education is an important factor in promoting agricultural productivity (UNESCO, 2016). It is possible that highly educated farmers may prioritize other economic options in banana marketing other than through organised groups.

The level of education of farmers had a significant negative effect on the likelihood of using middlemen to market bananas ($\beta = -0.143$, $P=.056$). This finding is consistent with previous studies that have found education to be a significant predictor of farmers' marketing behaviour (Ouma et al., 2007). Farmers with higher levels of education are market-oriented and able to access and utilize market information, which may reduce their reliance on middlemen in marketing their bananas.

The land allocated to banana had a positive and significant effect on the likelihood of using middlemen to sell bananas ($\beta = 0.529$, $P=.052$). This finding is consistent with the notion that farmers with larger landholdings are likely to produce more bananas and may require the services of middlemen to access larger markets.

The share of banana sold had a negative effect on the likelihood of using middlemen, although the effect was not statistically significant ($\beta = -0.203$, $P=.259$). This finding is not consistent with previous studies that found a positive relationship between the proportion of the crop sold and the use of middlemen (Ouma et al., 2007).

Overall, the results suggest that farmers who have lower levels of education and larger landholdings are more likely to use middlemen to sell their bananas. This highlights the importance of education and market information in reducing farmers' reliance on middlemen and improving their bargaining power in the market.

3.3 Banana Value Chain Factors and Marketing Channels in Tharaka-Nithi

The logistic regression results for Tharaka-Nithi showed that farming experience in years ($P=.030$) and land allocated to banana ($P=0.040$) had a significant positive effect on farmers' participation in organized commodity groups. This indicates that farmers with more experience and larger land allocated to banana farming are more likely to participate in organized commodity groups. However, gender, level of education, type of labour used, share of banana sold, and contribution of banana to farm income did not have a significant effect on farmers' participation in organized commodity groups in this county (Table 3).

Table 2. Factors influencing the choice of banana marketing channels in meru

Variable	β	Std. Err.	z	P> z	[95% Conf. Interval]	
Marketing through organized commodity group						
Gender of the respondent	0.3630	0.2533	1.43	.152	-0.1334	0.8595
Level of education	-0.1445	0.0827	-1.75	.080**	-0.3065	0.0174
Farming experience in years	0.1995	0.1056	1.89	.059**	-0.0076	0.4066
Type of labour used	0.3216	0.1230	2.61	.009***	.0805	0.5627
Land allocated to banana	0.7288	0.291	2.5	.012*	0.1585	1.299
Share of banana sold	-0.2144	0.1988	-1.08	.281	-0.6042	0.175
Contribution to farm income	-0.0602	0.1272	-0.47	.636	-0.3094	0.189
Constant	-1.299	0.9340	-1.39	.164	-3.13	0.531
Marketing through middlemen						
Gender of the respondent	0.147	0.225	0.65	.514	-0.294	0.588
Level of education	-0.143	0.075	-1.91	.056**	-0.290	0.0037
Farming experience in years	-0.056	0.097	-0.57	.560	-0.247	0.135
Type of labour used	0.101	0.122	0.83	.405	-0.137	0.34
Land allocated to banana	0.529	0.272	1.95	.052**	-0.004	1.062
Share of banana sold	-0.203	0.180	-1.13	.259	-0.555	0.150
Contribution to farm income	0.075	0.115	0.65	.518	-0.152	0.30
Constant	0.189	0.846	0.22	.823	-1.47	1.85
Marketing themselves (Base outcome)						

Note: *** $P<0.01$, ** $P<0.05$, * $P<0.10 = 1\%$, 5% and 10% significance levels, respectively.

Table 3. Factors influencing the choice of banana marketing channels in tharaka-nithi

Variable	β	Std. Err.	z	P> z	[95% Conf. Interval]	
Marketing through organized commodity group						
Gender of the respondent	0.162	0.433	0.37	.708	-0.0686	1.011
Level of education	0.064	0.137	0.47	.637	-0.204	0.333
Farming experience in years	0.373	0.172	2.18	.030**	0.037	0.71
Type of labour used	0.246	0.191	1.29	.197	-0.128	0.621
Land allocated to banana	1.356	0.659	2.05	.040**	0.062	2.650
Share of banana sold	-0.25	0.303	-0.83	.408	-0.843	2.65
Contribution of banana to farm income	-0.155	0.222	-0.7	.483	-0.591	0.278
Constant	-2.52	1.526	-1.65	.098	-5.514	0.468
Marketing through middlemen						
Gender of the respondent	-0.195	0.35	0.56	.577	-0.881	0.491
Level of education	-0.174	0.114	-1.52	.128	-0.3972	0.05
Farming experience in years	-0.0411	0.136	-0.30	.760	-0.308	0.226
Type of labour used	0.096	0.18	0.53	.593	-0.256	0.44
Land allocated to banana	0.038	0.712	0.05	.958	-1.372	1.449
Share of banana sold	-0.311	0.241	-1.29	.190	-0.78	0.162
Contribution of banana to farm income	-0.004	0.178	-0.02	.981	-0.354	0.345
Constant	1.16	1.24	0.93	.352	-1.28	3.60
Marketing themselves (Base outcome)						

Note: *** $P < 0.01$, ** $P < 0.05$, * $P < 0.10 = 1\%$, 5% and 10% significance levels, respectively.

The finding that farming experience and land allocated to banana farming had a significant positive effect on participation in organized commodity groups for marketing is consistent with previous findings (Gamba et al., 2016; Kibiego and Verteramo, 2016). The authors argued that experienced farmers with larger land allocation have a better understanding of the benefits of organized commodity groups, including access to markets, credit, and training.

The non-significant effect of gender on participation in organized commodity groups is in line with the findings of Kibiego and Verteramo (2016) that gender did not have a significant effect on participation in cooperatives in Kenya. However, other studies have found that gender plays a crucial role in farmers' participation in organized commodity groups, with women often facing more significant barriers (Mugunieri et al., 2018).

For the middlemen in Tharaka-Nithi County, it was observed that none of the variables assessed was statistically significant at the 5% significance level, except level of banana farming experience and share of bananas sold. The coefficient for farming experience was positive and statistically significant, indicating that as the years of experience in banana farming increases, middlemen are more likely to participate in

banana marketing through organized commodity groups. On the other hand, the coefficient for share of banana sold was negative, but not statistically significant, suggesting that the percentage of bananas sold by middlemen did not significantly influence their participation in organized commodity groups.

Overall, the results suggest that policymakers and development practitioners should prioritize supporting experienced farmers with larger land allocation to promote participation in organized commodity groups. However, it is essential to address the barriers faced by women and other marginalized groups to ensure that they benefit from opportunities provided by organized commodity groups. Also the results for middlemen in Tharaka-Nithi County suggest that factors other than individual characteristics and farm-level variables may be influencing their decision to participate in banana marketing through organized commodity groups.

3.4 Banana Value Chain Factors and Marketing Channels in Embu

Table 4 shows the results of a regression analysis conducted to examine the factors that influence banana production and marketing among farmers in Embu County. The results showed that several factors have a significant influence on banana production and marketing

through organized commodity groups and middlemen.

Farming experience had a significant positive effect on banana production and marketing through organized commodity groups ($\beta=0.447$, $P=.030$), but not through middlemen ($\beta=0.148$, $P=.469$). This suggests that farmers who have been in the banana production business for longer periods are more likely to engage in organized commodity groups and benefit from collective marketing. This finding is consistent with the study by Mburu and Otieno (2017) which found that farmers with more experience are more likely to participate in farmer organizations and access to better markets.

The type of labour used had a significant positive effect on banana production and marketing through organized commodity groups ($\beta=0.500$, $P=.014$), but not through middlemen ($\beta=0.148$, $P=.469$). This suggests that farmers who use hired labour are more likely to participate in organized commodity groups and collective marketing. This finding is consistent with that of Tembo and Sitko (2015) who found that farmers using hired labour were likely to have surplus production and benefit from collective marketing channels.

Land allocated to farming had no significant effect on banana production and marketing

through organized commodity groups ($\beta=0.498$, $P=.337$) and only a marginal effect on marketing through middlemen ($\beta=0.6$, $P=.213$). This suggests that land size does not necessarily determine participation in organized commodity groups or middlemen marketing. This finding is consistent with the study by Mather and Cunguara (2015) which found that land size does not necessarily determine participation in collective marketing.

The contribution of banana to farm income had no significant effect on banana production and marketing through organized commodity groups ($\beta=0.628$, $P=.269$) or middlemen ($\beta=0.005$, $P=.984$). This suggests that farmers who earn more from banana are not necessarily more likely to participate in organized commodity group or middlemen marketing. This finding contradicts that by Davis et al. (2012) which showed that farmers who earn more from a crop are likely to participate in collective marketing channels.

Overall, the results show that farming experience and the use of hired labour are important factors that influence participation in organized commodity groups and collective marketing. These findings highlight the potential benefits of collective marketing for smallholder farmers and the importance of policy interventions to promote participation in organized commodity groups.

Table 4. Factors influencing the choice of banana marketing channels in embu

Variable	β	Std. Err.	z	P> z	[95% Conf. Interval]	
Marketing through organized commodity group						
Gender of the respondent	0.550	0.468	1.18	.238	-0.365	1.47
Level of education	-0.220	0.155	-1.42	.156	-0.524	0.084
Farming experience in years	0.447	0.207	2.16	.030**	0.042	0.852
Type of labour used	0.500	0.204	2.45	.014*	0.100	0.900
Land allocated to banana	0.498	0.518	0.96	.337	-0.519	1.512
Share of banana sold	0.628	0.568	1.11	.269	-0.486	1.74
Contribution of banana to farm income	0.628	0.568	1.11	.269	-0.486	1.742
Constant	-3.78	1.99	-1.89	.058	-7.700	0.135
Marketing through middlemen						
Gender of the respondent	0.418	0.450	0.93	.353	-0.465	1.300
Level of education	-0.075	0.150	-0.50	.616	-0.370	0.210
Farming experience in years	0.148	0.200	0.72	.469	-0.252	0.548
Type of labour used	0.147	0.214	0.69	.469	-0.252	0.547
Land allocated to banana	0.600	0.480	1.25	.213	-0.342	1.536
Share of banana sold	0.814	0.541	1.51	.132	-0.245	1.870
Contribution of banana to farm income	0.005	0.248	0.02	.984	-0.485	0.495
Constant	-2.80	1.95	-1.44	.151	-6.61	1.02
Marketing themselves (Base outcome)						

Note: *** $P<0.01$, ** $P<0.05$, * $P<0.10$ = 1%, 5% and 10% significance levels, respectively.

4. CONCLUSION AND RECOMMENDATIONS

The results provide valuable insights into the factors that influence banana marketing channels in the region. In the three counties, farming experience, the type of labour used, and the land allocated to banana farming had a significant positive effect on marketing channels of bananas. The results also revealed that factors such as gender and education do not have a significant impact on banana marketing channels. Also the results provide a strong foundation for promoting and enhancing the banana value chain in the region, which has the potential to improve the livelihoods of farmers and contribute to the economic development of the region. Overall, the findings suggest that promoting banana marketing channels in the region requires a focus on enhancing farming experience and providing adequate labour-support to farmers. Furthermore, there is a need to develop policies and programmes that increase land access and allocation to banana farming. These measures can help to improve banana income for farmers, as well as economic well-being of the region.

These findings recommend the government and other stakeholders to support the formation and strengthening of organized commodity groups and cooperatives among banana farmers in the counties. These groups could help to improve and facilitate collective bargaining for better banana prices and market infrastructure, including storage and processing facilities, road network to reduce transportation costs and improve access to markets. This study recommends increased investment in agricultural research to develop new marketing options. This could include pick your own, farm-gate, contract and niche marketing. It further recommends training of banana farmers on the best marketing strategies by developing training programmes that could be delivered through local cooperative offices, farmer field schools, and mobile advisory services to ensure accessibility to all farmers. The recommendations highlighted above will require the collaboration of all stakeholders, including the government, private sector, development partners, and farmers themselves, to achieve the desired impact on banana marketing channels in Meru, Tharaka-Nithi and Embu Counties in Kenya.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that no generative AI technologies such as large language models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT

The participants were notified of the objective of the study, the information given would be kept confidential and used only for research, and that they were free to opt out of the study at any juncture. They then gave consent to participate in the study.

ETHICAL APPROVAL

Permission for this study was obtained from the Kenyan National Commission for Science and Technology. Permission was also granted by the respective county Commissioners for the three counties of Meru, Tharaka-Nithi and Embu in Kenya.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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