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Cost–Benefit Efficiency and Factors for Marketing Channel Choices among Avocado Farmers in Rungwe District, Tanzania

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Abstract

Avocado farming has grown into a significant agricultural industry in Rungwe District, significantly contributing to the local economy. Improving market access for avocado farmers is essential to raising rural incomes and enhancing their standard of living. This paper aims to determine the most efficient avocado marketing channels and analyse the factors affecting marketing channel choices by avocado farmers in the Rungwe District. The study involved 196 smallholder avocado farmers and key informants. Data were collected through interviews, questionnaire surveys, and documentary reviews. Findings showed that the main avocado marketing channels used by farmers in the Rungwe District were categorized into brokers (90.3%) and local traders (9.7%). The local traders' marketing channel was more efficient, with a price spread (per kg) of TZS 400 and a farmer's share in consumers' price of 75%. In comparison, the brokers' marketing channel had a price spread of TZS 1300 and a farmer's share in the consumer's price of 48%, though it had a higher net price received by farmers (TZS 1200) than local traders (TZS 500). Findings from the multiple binary regression analysis indicated that the education level of the household head, farming experience, household size, farm size, access to market information, price, quantity of avocado purchased, mode of payment, and access to extension services had a significant influence on the choice of marketing channel. The findings recommend expanding avocado marketing channels and strengthening avocado farmers' access to market information, extension, and credit services.

Keywords: Avocado, marketing channel, marketing channel efficiency, Rungwe, Tanzania

1. Introduction

Avocado fruit is experiencing a rapidly increasing demand in world markets. Altendorf (2019) classified avocado as the most traded fruit after pineapple, with its contribution estimated to be 25% of the tropical fruits. Developed countries, including the USA, Netherlands, New Zealand, and Australia, are relatively high-cost avocado producers compared to developing countries, whereby avocado farmers have effective marketing channels and receive high farm gate prices (REPOA, 2018). Avocado farmers in developing countries, mainly from Asia and Africa, sell their produce through indirect traditional marketing channels. These channels include local traders, assemblers, wholesalers, and other intermediate marketers such as brokers (Beacom *et al.,* 2021). The main reason for adopting indirect traditional marketing channels is that local markets have lower trading costs than export markets. Farmers in export markets must incur additional marketing costs, such as information search, transportation, packaging, and organization membership fees (Maina *et al.,* 2015, Abebe *et al.,* 2016). Thus, this decreases the number of farmers willing to choose an export marketing chain.

In Rungwe District, like other avocado-producing areas in Tanzania, most of the farmers sell avocados locally in four different

ways: (1) sell the fruits directly to the consumers or end users in the nearby markets; (2) sell the produce to the wholesalers or vendors who come from within the same region or from a more distant region;, (3) sell avocado produce to the wholesalers and vendors through intermediaries; and (4) sell the assumed avocado produce while the fruits are still developing on the trees to wholesalers and vendors through a signed convention (Juma *et al*., 2019; Boniphace *et al*., 2023). Although these avocado marketing channels are well documented, there is still little information on the market players and the flow of avocados from the farmer to the final consumer, which channel is preferred by farmers, the drivers of this preference, and the efficiency of marketing channels. Thus, this study was essential for filling this gap.

Literature confirms that farmers would choose a marketing channel with a high price, low marketing cost, and a high-profit margins (Mehdi *et al*., 2019). Efficient marketing channels ensure high gross margins for farmers (Fadipe *et al.,* 2015). Thus, understanding the characteristics of a marketing channel and the functioning of the markets is crucial for improving product market opportunities and providing appropriate marketing support, hence commercializing the products (Richard, 2017). Most studies on avocados conducted in Rungwe District have mainly focused on production, local trade, and the value chain (REPOA, 2018; URT, 2019; Juma *et al*., 2019), but none is focused on efficiency and determinants of the choice of avocado marketing channels. Thus, this study aimed to provide valuable insights and recommendations to assist farmers, policymakers, and stakeholders in the avocado industry in improving the efficiency of marketing practices and promoting sustainable agricultural development in the region.

2. Materials and Methods

2.1 Location of the study area

The study was conducted in two targeted wards (Kiwira and Kisondela) in the Rungwe District (Figure 1), Mbeya Region. The District council headquarters is situated at Tukuyu Township, about 72 km from Mbeya District along the Uyole Ibanda highway, which passes through Kyela District council enroot to the Republic of Malawi. Rungwe District lies between latitudes $8^0$30’ East and $9^0$30’ South of the equator and longitudes 33^0 and 34^0 East of the Greenwich meridian. According to the 2022 Population and Housing Census, Rungwe District had a population of 273,536. However, this study was conducted in Kiwira and Kisondole wards, with a total population of 36,724 and 10,005 people, respectively. These wards are among the major avocado producers in Rungwe District.

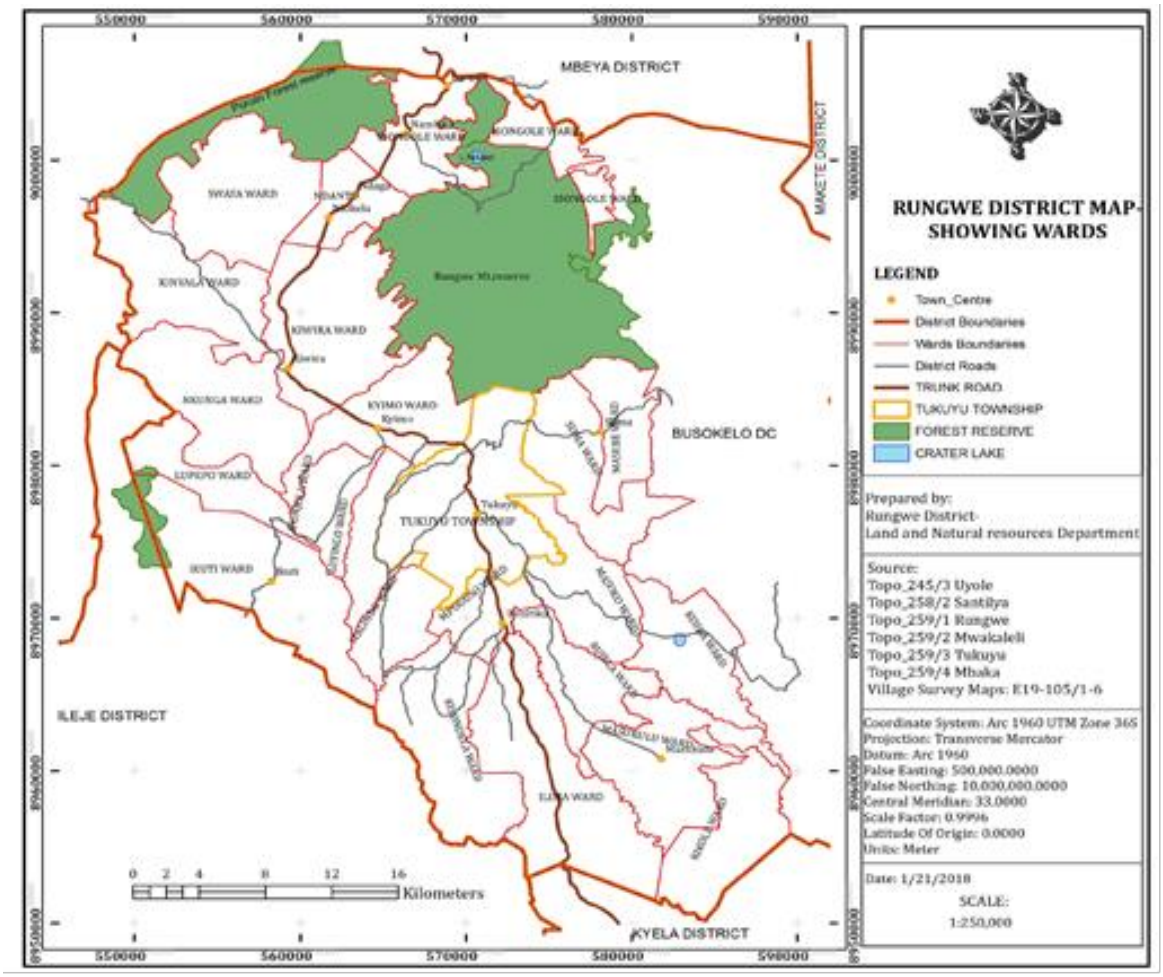

Figure 1: Map of Rungwe District Council: Source: Rungwe District socioeconomic profile, 2022.

2.2 Data collection

The study applied a cross-sectional research design, enabling the qualitative and quantitative data to be collected simultaneously. The study also collected data from avocado farmers participating in avocado marketing in the 2021/2022 farming season. The study used both primary and secondary sources of qualitative and quantitative data. Primary data were obtained using structured questionnaires with open and closed-ended questions. The interview guide was used to collect data from the key informants, such as the District Trade Officer. Secondary data were collected through a documentary review, which included records and reports on avocado production trends, price trends of avocados, main avocado buyers, and revenue generated from avocado production in Rungwe District. In addition, pre-testing of questionnaires was conducted to control validity.

2.3 Analytical Methods

In this study, cost-benefit efficiency, as determined by marketing cost, price, profit, and other socioeconomic variables, was considered to influence farmers' choice of marketing channel. The main avocado marketing channels used by farmers were analysed using descriptive statistics. The efficiency of marketing channels was further analysed based on the marketing efficiency indicators as explained by Acharya and Agarwal (2016) using the following formula:

$$F_s = \frac{F_p}{C_p} \times 100 \ldots\ldots (1)$$

$$P_s = C_p - F_p \ldots\ldots (2)$$

Where, F_p is the farmer's price, C_p is the consumer's price (value of goods purchased), F_s is the farmer's share, and P_s is the price spread between farmers and final consumers.

Data on the factors influencing farmers' choice of avocado marketing channels were analysed through inferential statistics using the Multiple Binary Logistic Regression Model (MBLM), as shown in Table 1, as the dependent variable was assumed to have possible outcomes (binary outcomes, e.g., local traders and brokers). The model can be explained as follows:

$$\ln\left(\frac{P(F_i=1)}{1-P(F_i=1)}\right) = \alpha + \beta_1 + \cdots \beta_{19} \ldots\ldots (3)$$

Where;

- P (Y, =1) =Probability that farmers choose a marketing channel
- Y coded as (1= local traders 0= Brokers)
- α =Regression constant
- $\beta_1 \ldots \beta_{19}$ =Regression coefficients

Table 1: Description of dependent and explanatory variables used in MBLM

Dependent variable		
Variables	**Description**	**Measurement**
Categorical-showing alternative marketing channels through which avocados are sold	Selling avocado to alternative marketing channels	1 = local traders 0 = Brokers
Independent variables		
Variable	**Measurement**	**Expected sign**
Age of household head	Years	+
Gender of the household head	1= Male,0 = Female	+/-
Experience in growing avocado	Years	+
Household annual income	Tanzania shilling (Tsh)	+
Household size	Number of people	+
Farm size	Acres	+
Quantity harvested per acre	Kilograms	+
Distance to the market	Kilometre	-
Access to market information	1 = yes, 0 = No	+
Price of avocado sold per kg	Tanzania Shilling (Tsh)	+
Quantity of avocado purchased in a channel	Kilogram	+
Type of avocado purchased in a channel	0 = Local 1 = commercial	+
Mode of payment for avocado sold	0 = Cash, 1 = Credit	+
Transport cost to the primary market	Tanzania shilling (Tsh)	-
Access to credit by farmers	1 = Yes 0 = No	+
Access to extension services by farmers	1 = Yes 0 = No	+
Contract farming/marketing	1 = Yes 0 = No	+
Membership in farmers groups	1 = Yes 0 = No	+

In addition, the ANOVA analysis was used to determine the significant differences in household socioeconomic characteristics between channel I (brokers) and channel II (local traders) at 10%, 5%, and 1%. Likewise, descriptive statistics were also used to analyse the frequencies and percentages (levels) of socioeconomic characteristics.

3. Results and Discussion

3.1 Descriptive Analysis of Sample Households' Characteristics

The socioeconomic characteristics of the avocado farming households presented in Table 2 indicate that approximately 90.3% of the respondents (177 farmers) sold their avocados to brokers (channel I), and about 9.7% (17 farmers) sold their avocados to local traders (channel II). There were no significant differences between farmer groups for many variables. The significant differences in the mean values existed for the education level, household size, farm size cultivated, and access to market information, which indicates that farmers participating in channel I had significantly greater numbers of household members, more years of school farm size, and more access to marketing information than farmers selling in channel II, whereas for farmers in channel II had significantly more years of farming experience. However, for other variables (age, average produce per acre, gender, membership in farmer groups, household income, and distance to the primary market), no significant differences were found between the groups.

Table 2: Household socioeconomic characteristics

Variable	Channel I (Brokers)	Channel II (Local traders)	Mean Difference (I– II)
Age of household head (Years)	47.03	43.84	3.19
Education of household head (Years)	8.86	8.57	0.29*
Avocado farming experience (years)	4.62	5.15	-0.53*
Household size	1.46	1.26	0.20**
Household off-farm income (Tshs)	330309.60	241052.63	89256.97
Farm size (acres)	1.42	1.02	0.40*
Quantity harvested (kg per acre)	642.18	685.47	-43.29
Distance to the primary market (in km)	0.372	0.368	0.004
Gender of household head (percentage)			
Male	78.0%	73.7%	4.3%
Female	22.0%	26.3%	-4.3%
Access to market information (percentage)			
Have no access	50.3%	100.0%	-49.7%
Have access	49.7%	26.3%	23.4%
Membership in farmers' group (percentage)			
Not a member	91.0%	100%	-9%
A member	9.0%	0%	9.0%

Source: Survey data, 2023 Note: *, **, *** statistically significant at 10, 5 and 1 percent respectively

3.2 Main Marketing Channels for Avocado Farmers in Rungwe District

The main marketing channels used by avocado farmers in the study area were analysed in terms of the market participants and the product flow (Table 3). Marketing channel I entailed the flow of avocados from the smallholder farmers to brokers, then to wholesalers outside the country, mainly in Kenya, who are subcontracted by export companies, and finally to export consumers. In marketing channel II, avocados flow from the smallholder avocado farmers to the local traders. These local traders collect avocados

from farmers in smaller quantities than brokers and then sell them to nearby local retail markets, including Bugoba, Lutete, Kisondela, and Tandale Kiwira. Other avocados are sold to roadside sellers and kiosks. The findings of this study contrast those of Njuguna (2022), who found four main marketing channels (brokers, local traders, direct sales, and farmer marketing organizations) for avocado farmers in Murang'a County, Kenya. This implies a limited market for avocados in the Rungwe District, where farmers depend mainly on brokerage companies who come and buy in large quantities and then sell the produce to wholesalers at a prearranged price.

Table 3: Main avocado marketing channels for avocado farmers in Rungwe District

S/N	Channel	Frequency	Percent (%)
I	Farmer → Brokers → Wholesalers → Export companies → Export consumers	177	90.3
II	Farmer → local traders → (Retail markets, Roadside, Kiosks) → Domestic consumers	19	9.7

Source: Survey data, 2023

3.3 Cost-Benefit Efficiency of Avocado Marketing Channels

3.3.1 Profit analysis of avocado production

The average return realized by rice farmers is presented in Table 4 and Table 5. The net profit margin of the avocado farmers at the farm gate was calculated on an acre basis. Results show that at farm-gate, farmers sold avocados at TZS 75,000 per 150 kg bag on average. The profitability analysis of avocado production shows an average profit of 38.04% for every Tanzania shilling invested. However, farmers selling their produce to brokers at the farm gate received more profit due to price differences.

Table 4: Cost and revenue of avocado production per acre for the 2021/2022 season (at a farm-gate price to local traders)

Item	Value (Tzs.)
Revenue	
Average total output per acre (1 bag = 150 kgs)	7
Average selling price (SP)	75000.00
Gross revenue per acre (TQ*SP) (TR)	525000.00
Cost	
Ploughing	74863.10
Pesticides	75961.29
Spraying pesticides	55951.09
Weeding	49380.49
Fertilisers	176054.21
Fertiliser application	36600.70
Transport	27425.91
Total cost per acre (TC)	499236.78
Total cost per 1 bag of avocados	71319.54
Return at farm level (TR-TC)	25763.22
Return per bag of avocado harvested (farm gate)	3680.46
Return per shilling invested [(TR-TC)/TC)]	0.0516
Marketing cost	
Information search	3555.45
Total marketing cost	3555.45
Total Cost per bag of avocado (Marketing + Production)	6883.70
Selling price	75000.00
Return per bag of avocados	68116.30
Return per 1 kg of avocados	454.12

Note: Seedling and planting costs are amortized.
Source: Authors' calculations

Table 5: Cost and revenue of avocado production per acre for the 2021/2022 season (at a farm-gate price to brokers)

Item	Value (Tzs.)
Revenue	
Average total output per acre (1 trey = 18 kgs)	60
Average selling price (SP)	21600.00
Gross revenue per acre (TQ*SP) (TR)	1296000.00
Cost	
Ploughing	74863.10
Pesticides	75961.29
Spraying pesticides	55951.09
Weeding	49380.49
Fertilisers	176054.21
Fertiliser application	39600.70
Transport	27425.10
Total cost per acre (TC)	499236.78
Total cost per 1 trey of avocados	8320
Return at farm level (TR-TC)	796763.22
Return per trey of avocado harvested (farm gate)	13279.38
Return per shilling invested [(TR-TC)/TC)]	1.5960
Marketing cost	
Information search	1250.75
Total marketing cost	1250.75
Total Cost per trey of avocado (Marketing + Production)	9570.75
Selling price	21600
Return per trey of avocados	12029.25
Return per 1 kg of avocados	668.29

Note: Seedlings and planting costs are amortized. **Source:** Authors' calculations

3.3.2 Price Spread

Regarding price spread, the results in Table 5 show that the highest spread is on channel I. This means the marketing intermediaries are taking advantage of the costs incurred to gain more profit share than channel II. Channel II is the channel with the lower price spread due to fewer intermediaries and local product flow, leading to lower marketing costs. According to Naik and Maurya (2020), the lower the price spread of a marketing channel, the more efficient it is for producers and vice versa.

3.3.3 Farmers' share

Farmers' share is also one of the quantitative measuring tools for assessing marketing efficiency, indicating that the greater the share, the higher the efficiency of the channel from the farmers' point of view. However, in reality, farmers do not care about the portion of the price they receive for the price paid by consumers (Mgale and Yunxian, 2020). Farmers are only oriented towards high or low prices. According to the findings in Table 6, marketing channel II has a higher efficiency value than channel I. The higher farmer share value in channel II reflects the increasing supply chain efficiency. Even though the price paid by final consumers in channel I is more significant than in channel II. In channel I, the price received by the producers is higher than that in channel II simply because it is an export channel. This finding is supported by Njuguna (2022), who ascertained that export channels pay more than local channels.

Table 6: Price spread and farmer's share across marketing channel

Indicator	Channel I	Channel II
Farmer gross selling price (F_P)	1,200	1,200
Net price received by farmers (NP_P)	1,200	500
Retail sale price/consumer's price (C_P)	2,500	1,600
Price spread (P_S)	1,300	400
Gross farmer share (F_S)	48	75

Source: Author's calculations from Survey data, 2023

3.4 Factors Influencing Farmers' Choice of Avocado Marketing Channel

Based on the results in Table 7, it can be said that variables included in the model were good predictors for farmers' choice of avocado marketing channel (Nagelkerke R^2 = 0.836). The wald-chi square test indicated household head years in school, farming experience, farm size, household size, access to market information, price, quantity sold, mode of selling, and access to extension services had a significant influence on the probability of a farmer selecting an avocado marketing channel. However, contrary to many studies (e.g., Kiprop *et al.,* 2020; Mmbando *et al.,* 2016; Maina, 2015), distance and transport cost had no significant influence on the choice of marketing channel because avocado buyers in the Rungwe District (brokers and local traders) purchase avocados directly at the farm area. Therefore, farmers do not incur any transportation costs and do not have to travel to buyers' places. In some circumstances, farmers may be forced to travel to buyers' places and incur transport costs.

Table 7: Multiple binary logistic regression model results for determinants of farmers' choice of avocado marketing channel

Independent variable	B	S. E	Wald	Df	Sig	Exp (B)	95% C.I. for Exp (B)	
							Lower	Upper
Age	-.018	.045	.151	1	.697	.982	.899	1.074
Gender	-2.120	1.723	1.514	1	.218	.120	.004	3.514
Education	-1.126	.498	5.118	1	.024*	.324	.122	.860
Farming experience	1.762	.709	6.169	1	.013*	5.822	1.450	23.380
Household size	-2.354	.871	7.313	1	.007**	.095	.017	.523
Household off-farm income	.000	.000	1.303	1	.254	1.000	1.000	1.000
Farm size	2.597	1.303	3.973	1	.046*	13.423	1.044	17.527
Quantity harvested	.001	.001	.884	1	.347	1.001	.999	1.003
Access market information	-9.270	3.949	5.511	1	.019*	.000	.000	.216
Distance to market	-.809	1.231	.432	1	.511	.445	.040	4.971
Price	-.065	.031	4.403	1	.036*	.937	.882	.996
Transport cost	.014	.459	.001	1	.975	1.014	.412	2.496
Quantity sold	-.013	.005	5.555	1	.018*	.987	.977	.998
Type of avocado purchased	33.162	14018.58	.000	1	.998	.120	.070	.097
Mode of selling	-7.656	3.289	5.420	1	.020*	.000	.000	.298
Access to credit facilities	81.998	12410.84	.000	1	.995	.000	.000	.
Access to extension services	7.073	3.219	4.828	1	.028*	11.628	2.147	6.349
Contractual arrangement	-28.14	943.348	.001	1	.976	.000	.000	.
Group membership	-39.35	14989.65	.000	1	.998	.000	.000	.
Constant	62.105	14018.62	.000	1	.996	000		

R^2 = 0.836; * = Significant at p < 0.05, ** = Significant at p < 0.01; *** = Significant at p < 0.001

The findings indicate that household head education level significantly influenced the selection of a marketing channel (p = 0.024, OR = 0.324, 95% CI). Based on the odds ratio, it can be said that a year's increase in education level decreased the odds ratio of a farmer choosing local traders over brokers by 0.3 times. This implies that an increase in education level increases a farmer's understanding of market dynamics and improves informed decision-making. The findings of this study align with those of Richard (2017) and Njuguna (2022), who found that Kenyan farmers with more years in

school used marketing channels that offered higher prices.

The estimated coefficient for farming experience significantly influenced the choice of a marketing channel (p = 0.013, OR = 5.822, 95% CI). Based on the odds ratio, an increase in farming experience by one year they increased the probability of choosing local traders by 5.822 times. These findings imply that marketing experience directly relates to the farmer's level of bargaining power and marketing network. The long-term relationship made over the years between the farmer and the local traders may have contributed to farmers preferring local traders over selling to brokers. This finding concurs with that of Mana (2015), who showed that farming experience significantly influenced the choice of marketing channels.

The estimates of household size significantly influenced the choice of marketing channel (OR = 0.095, p = 0.007, 95% CI). An increase in one household member decreased the odds ratio of choosing local traders over brokers by 0.095 times. This implies that large households possibly have a much larger workforce to engage in production activity and produce more than households with few members; hence, they prefer using channels that offer bulk purchases, like brokers. These findings align with those of Li and Heerink (2018), who have shown a significant influence of household size on the choice of marketing channel.

Regarding farm size, results show that if farm size increases by 1 acre, the odds ratio of choosing brokers will increase by almost more than 13 times. This implies that large farm sizes increase the amount of avocado output produced; hence, farmers choose to market through brokers because of bulky purchases. Similar findings are in line with Kyaw *et al.* (2018) and Jalata (2021).

Access to market information significantly increased the probability that an avocado farmer would choose a more profitable marketing channel (OR = 1.006, p = 0.019, 95% CI). Based on the odds ratio, having access to market information decreased the odds of choosing local traders over brokers by 1.006 times. These findings are in line with those of Mgale and Yunxian (2020), who highlighted that providing farmers with marketing information (i.e., price, quantity to sell, where to sell, or types of possible contractual arrangements) will give them more bargaining power and reduce their uncertainty when making trade deals with buyers.

The estimated coefficient for price significantly influenced the choice of a marketing channel (OR = 0.036, p = 0.036, 95% CI). An increase in a unit of price would decrease the odds ratio of choosing local traders relative to brokers by 0.036 times. This implies that farmers prefer channels that offer higher prices to increase profitability. These findings concur with those of Bernahu *et al.* (2015), who observed that a one percent increase in the milk price would increase the probability of farmer participation in the traditional channel relative to the other channels.

The quantity of avocados sold significantly influenced the choice of marketing channel (OR = 0.987, p = 0.018, 95% CI). Based on the odds ratio, an increase in 1 kilogram of the quantity purchased decreased the odds ratio of using local traders by 0.987 times. This implies that if the quantity of avocado to be sold is large and a channel guarantees to purchase all or a large portion of it, farmers will prefer to use that particular channel. This finding is in line with Tarekegn *et al.* (2017), who found that the farmers in Ethiopia preferred to sell their honey produced at a cooperative outlet, which was able to buy all of the farmers' honey produced.

The mode of selling avocado fruits was associated with an increased likelihood of choosing a marketing channel (OR = 0.078, p = 0.02, 95% CI). Selling by credit reduced the odds ratio of selecting local traders by 0.078 times relative to cash payments. This implies that farmers prefer using a channel that ensures their bulky produce is sold at once, whether receiving cash on the spot or not, to avoid huge losses of deterioration/decay of produce due to lack of markets. Farmers who

receive their income within a short period are also expected to realize more benefits than those who sell on credit because of the opportunity cost of money. These findings concur with those of Chawaye (2016), who noted that credit sales and delayed payment disincentivized farmers' choice of haricot bean marketing.

Lastly, the number of extension officers visits significantly influenced the choice of marketing channel (OR = 11.65, p = 0.028, 95% CI). An increase in extension contacts by one visit increased the odds ratio of choosing local traders over brokers approximately 12 times. This might have been because agricultural extension agents provide different information and alternatives depending on prevailing activities and situations that impact farmers differently, and they are expected to choose an option that suits them best. The results of this study are broadly consistent with those of Chivm *et al.* (2020), Hayran (2019), and Mgale and Yunxian (2020).

4. Conclusions

Avocado in Rungwe District is mainly produced for sale, and thus, farmers can select a marketing channel based on the comparative advantage of the channels in maximizing their return. This efficiency indicator and multiple binary logistic models were used to assess the cost-benefit efficiency of avocado marketing channels and factors influencing the choice of marketing channels among avocado farmers. The results showed that the probability of choosing brokers was significantly affected by household head education level, household size, farm size, access to market information, price, and quantity purchased. Findings further revealed that sales through local traders had higher efficiency, though less profitable to farmers than brokers. It was also found that selling through brokers was predominant, and most farmers depended on this marketing channel to sell their produce due to limited alternatives.

Based on the findings, the study recommends that: First, the government and other practitioners must assist farmers in finding established markets so they do not rely on fewer market options. This will help them get value for money for their produce. Second, the farmers should be provided education and training to enhance their knowledge and promote information regarding the decision and choice of alternative market channels that provide better prices to increase farmers' income. Third, the role of institutions, in particular producer group organizations, must be strengthened to help farmers improve their performance regarding cultivation techniques (good agricultural practices), post-harvest handling, and avocado marketing. Fourth, there is also a need for an integrated agricultural marketing information system. To develop avocado marketing, improving price information and increasing farmers' awareness of accessing information are necessary. Lastly, farmers should establish networks since they aid in sharing knowledge and strive to improve produce grades as the market requires.

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