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Market Performance of Avocado Fruits among Smallholder Farmers in Southern Highlands of Tanzania

Ndabhemeye Mlengera[1*], Adolph Katunzi[1*], Issaya Marijani[2], Billes Nzilano[1], Marco Mng'ong'o[3], Baraka Mvile[1]

[1]Department of Natural Resources Management, Tanzania Agricultural Research Institute (TARI - Uyole), Uyole, Mbeya, Tanzania
[2]Department of Economics and Market Research, Tanzania Agricultural Research Institute (TARI - Kifyulilo), Mufindi, Iringa, Tanzania
[3]College of Agricultural Sciences and Technology, Mbeya University of Science and Technology (MUST), Mbeya, Tanzania
Email: *namulengera@gmail.com, bugaiga@gmail.com

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Abstract

This study was designed to determine factors that influence market performance of avocado fruits among smallholder farmers in Mbeya and Songwe regions. A cross section research design entailing 209 farmers from five (5) districts of two (2) regions and 15 key informants; 5 local service providers (LSP), 5 traders/brokers and 5 district extension officers (DEO) were involved in the study. Random selection procedures were used to select avocado producers and purposive selection procedures were used to select key informants. The study employed survey questionnaires to collect data from avocado farmers and structured interview to collect data from key informants. Collected data were analyzed with an aid of descriptive statistics and linear regression model was used to determine significant factors that determine market prices of avocado fruits among smallholder farmers. The demographic characteristics of avocado farmers showed that; 61.2% of farmers had age between 36 to 59 years old, 84.7% were married, 74.6% had primary education level, average number of 5 members of the family, average 4.3 acres of owned land and 1.8 acres planted with avocado. Moreover, findings showed that 90.9% grew improved avocado varieties. Farm gate (88.5%) was the major market outlet chosen by avocado farmers. Local merchants and processors were the major buyers of the produced avocado. Results from linear regression analysis showed that variety grown ($P < 0.05$), location ($P < 0.05$), farm size ($P < 0.05$) and farmers experience ($P < 0.05$) were factors that statistically influenced market prices for avocado fruits. The study

concluded that despite the remarkable contributions to livelihood of the farmers yet, it is highly fragile on market prices. Therefore, the study recommends the need to establish market systems that will govern avocado fruits marketing for sustainability of the sub-sector.

Keywords

Avocado, Avocado Fruits, Market Performance, Smallholder Farmers

1. Introduction

The changes in food habit and realizations of nutritional benefits of avocado fruits have triggered the increase in global demand. Despite the increase in demand of avocado fruits, empirical data shows that there is a shortage in supply. The avocado crop originated in Latin America and it is highly produced in Mexico which is ranked as the largest avocado producer in the world [1]. But in recent years the crop has been grown in many countries which provides an average avocado production of 6.4 million MT annually [2]. It is estimated that 2.4 million MT of avocado fruits accounted for export trade [3].

In East Africa, Tanzania has good climatic conditions that support cultivation of avocado fruits with annual production of 190,000 MT [4]. The crop is grown in different agro ecologies of Tanzania, mainly in Southern Highlands (SH) covering Mbeya, Songwe, Iringa and Njombe regions; Northern Zone in Moshi and Arusha regions; and Eastern Zone in Morogoro region [5]. The crop is dominated by smallholder farmers who account for 90% of the total productions and 10% from commercial farmers [6]. The crop is attracting more attention with an increase in areas of productions due to the introductions of improved cultivars and increase in demand for exports [7].

Both improved and local varieties are grown in the country but due to the increase in exports demand; Hass and Fuerte (*Persea americana* Mill) varieties are the most grown cultivars considered as commercial varieties [2]. The reason for increased cultivation of these varieties is due to the morphological characteristics of having long shelf life which suits long distance transportations of the fruits [3]. This feature has been helpful in exportations of avocado fruits grown in Tanzania to other countries such as Kenya, South Africa, China and European countries [1].

In Tanzania, avocado is considered as new emerging crop in cross border trade as it got more attention in the year 2009. In 2008 the total production was 7500 MT but in year 2020 the crop cultivations tremendously increased to 190,000 MT which shows an increase in production by more than 250% [4]. Despite the increase in cultivations of the crop in the Tanzania, yet there is a great information dearth on the productions, total consumptions, exports and imports of the crops [5]. The variations in data are linked with weak institutional performance across

avocado value chain [8].

Farmers seem to be the most vulnerable to the effects of poor performance of responsible institute than other actors across avocado value chain [5]. These farmers face various challenges such as pests and diseases outbreak on avocado production, poor infrastructures, high prices of avocado seedlings, limited access credits and low market prices of avocado. These challenges ultimately affect farmers' production and productivity and returns on investment [9]. Poor and lack of essential market infrastructures like cold storages cause inabilities of the farmers to store their harvest and inabilities to maintain freshness of the fruits from the farm to the last consumers [4]. This pushes most of farmers to sell their produces immediate after harvest which in most cases fetches lower prices [10]. Together with low bargaining powers of smallholder farmers and lack of specified markets for the crops, farmers end up with low market margin than other actors in the market like middlemen or brokers [10]. Therefore this study was designed to determine market performance among smallholder avocado farmers in Mbeya and Songwe regions.

Theoretical Review

The study was governed by Rational Choice Theory (RCT) which was firstly put in place by Adam Smith in the year 1776 who is considered as a father of economics. The central idea of the theory is that human beings are rational who would like to maximize returns subject to the limited resources. Therefore given a number of alternatives, an individual will select the best alternatives that gives the highest utility.

The RCT fits in this study in a way that smallholder avocado farmers are rational human beings who are subjected to sets of market alternatives. Under the stipulated market qualities, are subjected to alternatives of whether to sell their produce in the local/village, urban/town or cross border markets. Also the same farmers are subjected in to set of alternatives on whether to market their avocado individually, through middlemen or through Agricultural Marketing Cooperative Societies (AMCOs). The chance of selecting the best alternative depends on the expected utility from the selected choice. In this regards profit margin is considered as a measure of level of satisfactions that farmers gets after sales of avocado fruits. The higher the profit the higher the satisfactions, likewise the lower the profit margin the lower the satisfactions. This choice behavior can be modeled using expected utility. The function that is associated with a choice of the alternative that yield the highest utility is given by;

$$Utility(U) = f(x_1, x_2, x_3, x_4 \cdots x_n)$$

where;

U = Farmer's utility derived from the selected best alternative on where to market avocado fruits.

X_i = Factors considered when selecting the best alternative.

2. Methodology

2.1. Study Area

The study was conducted in Mbeya region which is located at the latitude −8˚29'59.99" S and longitude 33˚00'0.00" E and Songwe region which is located at the latitude 8˚31'25.68"S and longitude 32˚32'14.28"E. The three districts of Mbeya, Rungwe and Busokelo were selected from Mbeya region as well as Mbozi and Ileje districts of Songwe region. The study purposively selected the two regions since are among potential regions for avocado productions in Tanzania and are the areas where KIBOWAVI project was implemented (Figure 1).

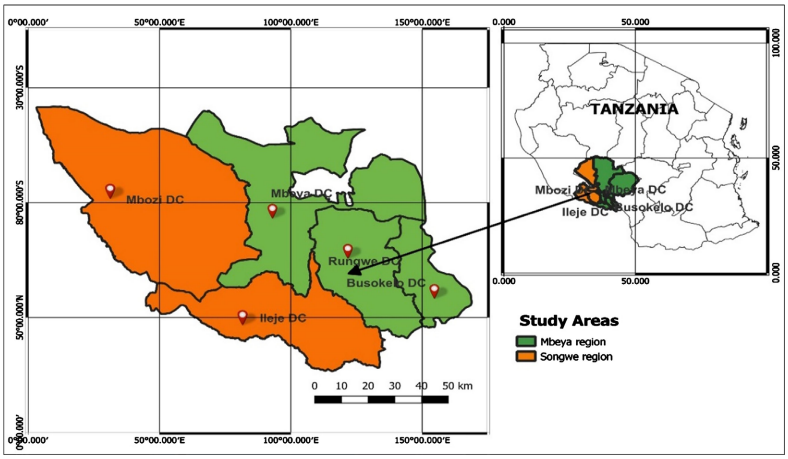


Figure 1. The map of Tanzania showing the study areas.

2.2. Sample Population and Selection Procedures

The study used a multistage sampling procedure which involved the use of purposive selection procedures in selecting regions (Mbeya and Songwe) and five districts (Mbeya, Rungwe, Busokelo, Ileje and Mbozi). The selection of the districts was based on the fact that the selected areas are major producers of avocado fruits in these regions. Then, simple random selection procedure was used to select 209 avocado producing households. Rungwe district accounted for 54% of the study's sample due to high concentrations of avocado farmers and large number of beneficiaries of KIBOWAVI project which supported horticultural farmers. Additionally a total of 15 key informants were selected basing on their basic roles performed on avocado value chains in the study areas (Table 1).

Table 1. Sample distributions in the study areas.

Region	District	Sample	Key Informants
Mbeya	Mbeya	13	3
	Rungwe	112	3
	Busokelo	26	3
Songwe	Mbozi	35	3
	Ileje	23	3
	Total	**209**	**15**

2.3. Data Collection

A field survey was conducted involving random selection procedures to determine 209 households from selected five districts while purposive selection procedures were used to select fifteen (15) key informants 5 LSP, 5 traders/brokers and 5 DEOs. Well-structured questionnaires with both open and closed ended questions were used to collect data from avocado growing farmers. Structured interviews were used to collect data from selected key informants.

2.4. Data Analysis

Collected data were cleaned, coded and analyzed using Statistical Package for Social Science (SPSS Version 25) with an aid of analytical frameworks. Descriptive statistics were used to characterize collected data. On the othehand, the study employed inferential statistics like linear regression model which was used to determine factors that significantly associated with market performance of avocado fruits among smallholder farmers in the study areas. The linear regression model was specified on Equation (1) and model variable descriptions and expected signs shown in Table 2;

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \cdots + \beta_n x_n + \gamma_1 \omega_1 + \gamma_2 \omega_2 + \gamma_3 \omega_3 + \cdots + \gamma_n \omega_n + \varepsilon \quad (1)$$

Table 2. Variable descriptions and expected signs.

	Variable (s)	Type	Measurement	sign
Y.	Avocado fruits selling price	Continuous	TZS per kg	
x_1	Education	Categorical	1 = Primary, 0 = Otherwise	+
x_2	Size of the land cultivated	Continuous	Acres cultivated	±
x_3	Experience in avocado cultivations	Continuous	Years	±
ω_1	Variety grown	Categorical	1 = Improved, 0 = Local	+
ω_2	Sex of household head	Categorical	1 = Male, 0 = Female	±
ω_3	Location of avocado farmer	Categorical	1 = Mbeya, 0 = Songwe	±

Additionally, the study used Gross Margin (GM) to analyze profitability in avocado crop cultivations. The model was specified on Equation (2);

$$\text{Gross Margin} = \text{Total Revenue}(\text{TR}) - \text{Total Variable Costs}(\text{TVC}) \quad (2)$$

Where:

Total Revenue(TR) = Avocado selling Price (P_y) x Quantity of avocado produced (Y).

Total Variable Costs(TVC) = Price of inputs $(P_{\omega i})$ x Quantity of inputs used (ω_i)

$$GM = TR - TVC$$

$$GM = \left[\text{Avocado fruits selling Price } (P_y) \times \text{Quantity of avocado fruits sold } (Y)\right] - \left[\text{Price of inputs}(P_\omega) \times \text{Quantity of inputs used}(\omega)\right]$$

$$Gross\ Margin(GM) = P_y Y - P_{\omega i}\omega_i$$

3. Results and Discussion

3.1. Results

3.1.1. Demographic Characteristics of the Respondents

The findings showed that 88.5% of respondents were male headed households while 7.2% of respondents were female headed households (Table 3). On the other hand, 9.1% of respondents were wives of the heads of the households while 2.4% were husbands of the heads of the households and 0.5% was a male labour working on the farm of household head. The results portray that women involvements in avocado farming is lower than men as was also reported by [1]. But these findings differs with [11] who reported that in United State of America women outnumbers men in avocado productions. Also, differs with what was reported by [12] who showed that in Ethiopia avocado productions is dominated by women as it is grown in homestead giving them high chances to own the crop. Majority of avocado farmers 61.2% had the age between 36 to 39 years, 30.1% had the age between 60 years and above and 8.6% had the age below 35 years. This is an indication that avocado production is highly dominated by elders who own resources needed for investment in avocado productions including fixed assets like land. This was also reported by [13] who showed that the mean age of avocado farmers was 44.71 years. Also, it was found that majority of avocado producers were married (84.7%), widows (9.1%), single (3.3%) and separated (2.9%).

Results suggest that majority of farmers who invest on avocado crop are settled which gives them highest chances of supervising all activities in their fields. Findings showed that 74.7% of avocado farmers had primary education level, 10.5% had secondary education level, 9.1% had informal education level, 3.8% had college education level and 1.9% had university education level. This implies that most of farmers have basic education level which is in line with [14]. Findings showed that the average owned land size for the avocado farmers was 4.3 acres while areas cultivated with avocado was 1.8 acres as was reported by [7].

Table 3. Demographic characteristics of the respondents.

Variables		Gender		Total
		Male	Female	
Position of the respondent to the household	Head	170 (81.3)	15 (7.2)	185 (88.5)
	Wife/Husband	5 (2.4)	19 (9.1)	23 (11.0)
	Farm labour	1 (0.5)	0 (0.0)	1 (0.5)
	Total	**175 (83.7)**	**34 (16.3)**	**209 (100)**
Age	Less than 35 years	15 (7.2)	3 (1.4)	18 (8.6)
	36 to 59	107 (51.2)	21 (10.0)	128 (61.2)
	60 and above	53 (25.4)	10 (4.8)	63 (30.1)
	Total	**175 (83.7)**	**34 (16.3)**	**209 (100)**
Marital status	Single	6 (2.9)	1 (0.5)	7 (3.3)
	Married	160 (76.6)	17 (8.1)	177 (84.7)
	Separated	2 (1.0)	4 (1.9)	6 (2.9)
	Widowed	7 (3.3)	12 (5.7)	19 (9.1)
	Total	**175 (83.7)**	**34 (16.3)**	**209 (100)**

Continued

Education level	None	10 (4.8)	9 (4.3)	19 (9.1)
	Primary	135 (64.6)	21 (10.0)	156 (74.6)
	Secondary	19 (9.1)	3 (1.4)	22 (10.5)
	College	7 (3.3)	1 (0.5)	8 (3.8)
	University	4 (1.9)	0 (0.0)	4 (1.9)
	Total	**175 (83.7)**	**34 (16.3)**	**209 (100)**
Average number of household members		5		
Average owned land size		4.3 acres		
Average land size cultivated avocado		1.8 acres		
Numbers in parenthesis are percentages (%)				

3.1.2. Avocado Varieties Grown

Based on the study findings, 90.9% of avocado farmers grows improved varieties mainly Hass while 6.7% and 2.4% grows local and both improved and local varieties respectively (**Figure 2**). This revealed a rapid transformations on improved avocado varieties especially Hass due to the increase in demand of avocado fruits for exports. Hass variety is highly cultivated due to low gestation periods, and highly demanded for both local and international markets. These findings aligns with [15] and [4] who altogether reported rapid increase in demands of avocado fruits in the cross border trade that has tremendously increased the cultivations of improved cultivars mainly Hass variety.

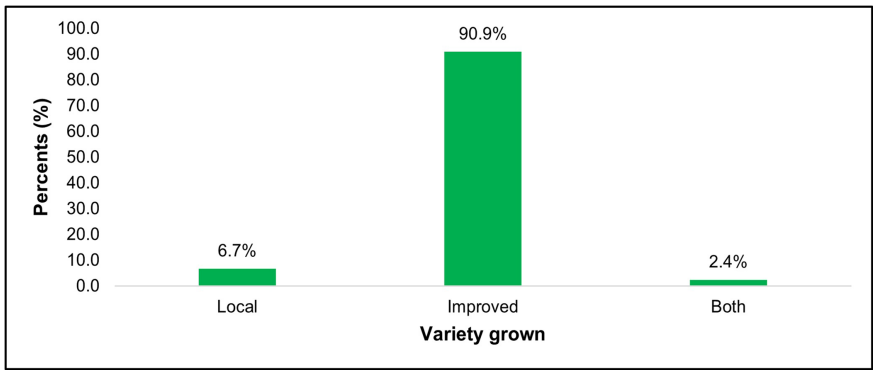


Figure 2. Avocado varieties grown.

3.1.3. Market Availability for Avocado Fruits

The results show that majority of farmers sell their avocado fruits at the farm gate accounting for 88.5% which is an indication that farmers end up with produces shares (**Table 4**). Other market channels used by farmers to market their avocado fruits are; 7.2% sold at village markets, 1.9% sold to the markets outside the village, 0.5% sold direct to the buying and processing factories, 1.4% sold to the neighbors at home and 1.9% sold at the collection centres. These market channels align with [10] who showed that avocado marketing channels differs but majority of farmers sells their produces at the farm gate ending up with relatively low prices.

Table 4. Market for avocado fruits.

Where a farmer market avocado		Districts					Total
		Mbozi	Ileje	Rungwe	Mbeya	Busokelo	
Farm gate	Yes	20 (9.6)	107 (51.2)	20 (9.6)	8 (3.8)	26 (12.4)	185 (88.5)
	No	3 (1.4)	5 (2.4)	3 (1.4)	5 (2.4)	0 (0.0)	24 (11.5)
Total		**35 (16.7)**	**23 (11.0)**	**112 (53.6)**	**13 (6.2)**	**26 (12.4)**	**209 (100.0)**
Village market	Yes	3 (1.4)	2 (1.0)	3 (1.4)	3 (1.4)	0 (0.0)	15 (7.2)
	No	20 (9.6)	110 (52.6)	20 (9.6)	10 (4.8)	26 (12.4)	194 (92.8)
Total		**35 (16.7)**	**23 (11.0)**	**112 (53.6)**	**13 (6.2)**	**26 (12.4)**	**209 (100.0)**
Outside the village	Yes	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.0)	4 (1.9)
	No	23 (11.0)	112 (53.6)	23 (11.0)	13 (6.2)	24 (11.5)	205 (98.1)
Total		**35 (16.7)**	**23 (11.0)**	**112 (53.6)**	**13 (6.2)**	**26 (12.4)**	**209 (100.0)**
Direct to the industry	Yes	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)
	No	23 (11.0)	112 (53.6)	23 (11.0)	13 (6.2)	26 (12.4)	208 (99.5)
Total		**35 (16.7)**	**23 (11.0)**	**112 (53.6)**	**13 (6.2)**	**26 (12.4)**	**209 (100.0)**
At home	Yes	0 (0.0)	2 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.4)
	No	23 (11.0)	110 (52.6)	23 (11.0)	13 (6.2)	26 (12.4)	206 (98.6)
Total		**35 (16.7)**	**23 (11.0)**	**112 (53.6)**	**13 (6.2)**	**26 (12.4)**	**209 (100.0)**
Collection centres	Yes	0 (0.0)	2 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.9)
	No	23 (11.0)	110 (52.6)	23 (11.0)	13 (6.2)	26 (12.4)	205 (98.1)
Total		**35 (16.7)**	**23 (11.0)**	**112 (53.6)**	**13 (6.2)**	**26 (12.4)**	**209 (100.0)**

Numbers in parenthesis are percentages (%).

3.1.4. Main Buyers of Avocado Fruits

Processors were found to dominate avocado market (39.7%) in Rungwe, Mbozi, Ileje and Mbeya districts. Processors buy avocado fruits through local collectors and brokers and farmers groups/ cooperatives. On the other hand, 34.9% of respondents reported that the main buyers are local merchants, 25.4% reported to sell their avocado fruits to middlemen's, 16.8% sells their produce to merchants from other districts or regions, 4.8% sells their avocado fruits to neighbors and 1.9% sells their produce to local collectors (Table 5).

Table 5. Main buyers of avocado fruits.

Main buyers	District					Total
	Mbozi	Ileje	Rungwe	Mbeya	Busokelo	
Neighbors	3 (1.4)	0 (0.0)	2 (1.0)	3 (1.4)	2 (1.0)	10 (4.8)
Middlemen	12 (5.7)	3 (1.4)	29 (13.9)	5 (2.4)	4 (1.9)	53 (25.4)
Local merchants	5 (2.4)	2 (1.0)	46 (22.0)	0 (0.0)	20 (9.6)	73 (34.9)
Merchants from other regions	7 (3.3)	11 (5.3)	13 (6.2)	2 (1.0)	2 (1.0)	35 (16.8)
Local collectors	1 (0.5)	3 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.9)
Processors	8 (3.8)	3 (1.4)	68 (32.5)	4 (1.9)	0 (0.0)	83 (39.7)

Numbers in parentheses are percentages (%).

The diversity of avocado buyers together with lack of well-structured guidelines

and low bargaining power of farmers tend to govern avocado marketing and affect the market performance.

3.1.5. Membership and Service Received from Associations

1) *Avocado farmers' membership to associations*

The study showed that, most of avocado producers comes from Rungwe district if compared to other districts (Figure 3). However, the avocado producers in Mbozi, Rungwe, Ileje, Mbeya and Busokelo districts have divided into two main groups; the first group are members of the farmer groups and those who are not in farmers' groups. Most of the avocado growers 34.9% were member of the association and all from Rungwe district, followed by 18.7% of farmers who are not in farmers' groups. Furthermore, Busokelo and Mbozi districts have the same proportion of farmer groups/associations who produce avocado fruits 10.5%, while others who are not in farmer groups are 6.2% and 2.0% for Mbozi and Busokelo districts respectively. The situation has been different for Ileje district, where the avocado producers who are not in farmer groups/associations were 5.7% and those in farmer groups were 5.3%. In Mbeya district, the proportions of avocado growers were 3.8% and 2.4% for farmer groups/associations and non-members respectively.

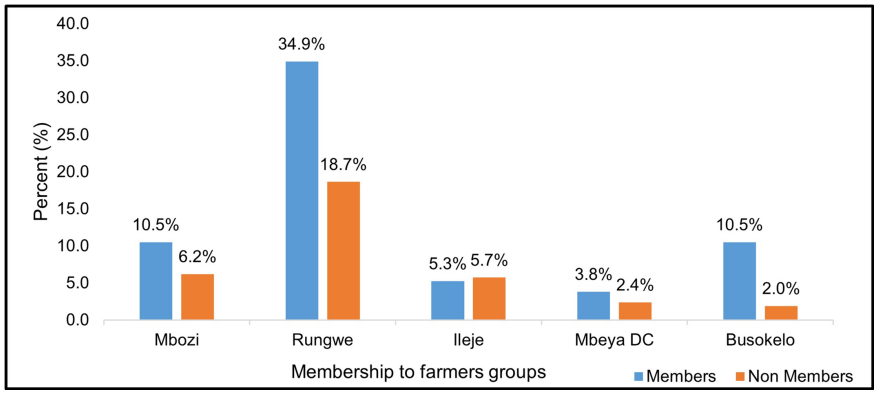


Figure 3. Avocado farmers' membership to association.

2) *Service received from associations*

The findings revealed that, 53.6% of avocado farmers benefit in terms of marketing services from their associations through collection, storage, collective bargaining and marketing information (Table 6). Results showed that, 26.8% of avocado growers benefit in terms of extension advisory services and 1.9% benefits in terms of inputs supply from their associations. The agricultural services offered by avocado farmers associations have been pointed out and marked to reduce the operational costs while increasing profit margin through strengthened bargaining power.

Table 6. Service received from associations.

Service	District					Total
	Mbozi	Rungwe	Ileje	Mbeya	Busokelo	
Inputs	3 (1.4)	1 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	4 (1.9)

Continued

Advisory	16 (7.7)	22 (10.5)	8 (3.8)	8 (3.8)	2 (1.0)	56 (26.8)
Marketing	15 (7.2)	69 (33.0)	4 (1.9)	4 (1.9)	20 (9.6)	112 (53.6)

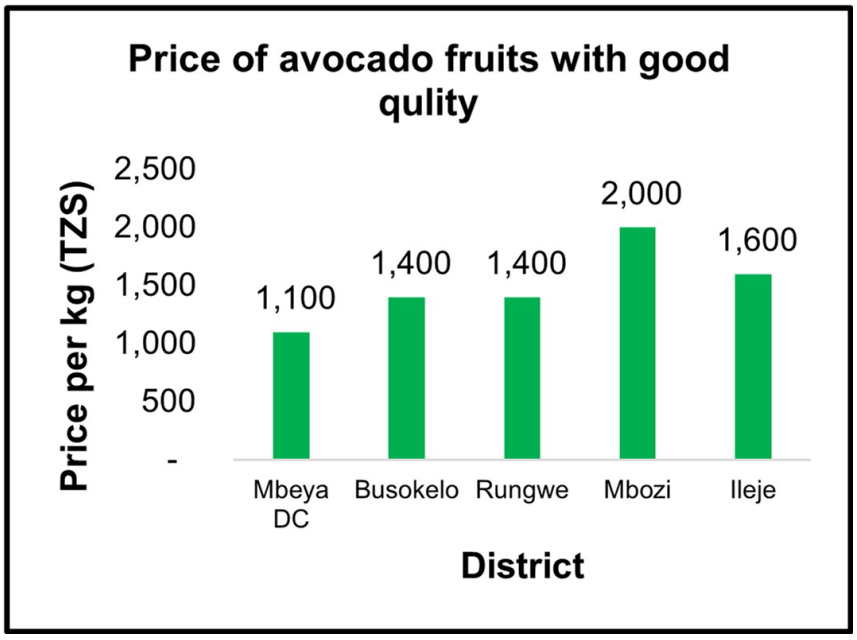
Numbers in parenthesis are percentages (%)

3.1.6. Selling Prices and Profit Margin of Avocado Fruits

1) ***Selling prices***

Despite of the facts that most of smallholder farmers in Tanzania sells their avocado fruits at the lowest price, findings revealed that there was significance difference in prices of avocado fruits among districts. The price of avocado fruits with good quality was observed to range from TZS 1,100 to 2,000 per kg. Mbozi district was found to have the highest market price TZS 2,000 compared to Mbeya district with the lowest price of TZS 1,100. Busokelo and Rungwe had the price of TZS 1,400, while Ileje had the price of TZS 1,600 per kg. The study observed that districts with strong managements of cooperatives significantly sold their avocado fruits at higher prices.

With regard to low quality of avocado fruits, the selling prices was observed to be TZS 500, 400, 300, 500 and 400 per kg in Mbeya, Busokelo, Rungwe, Mbozi and Ileje districts respectively (**Figure 4**). Data showed that there was no great variations in selling prices of rejected avocado fruits across districts. But, unexpectedly the study found that brokers/ middlemen uses advantages of low buying prices for avocado fruits with low quality "Rejects" to raise their profit margin by rejecting avocado fruits with good quality so as to buy them as rejects. Also, inefficiency of farmers' cooperatives and lack of avocado storage facilities led to low prices. Findings showed no significant difference on market price for avocado to members and nonmembers of farmers' cooperatives. But, farmers who are members benefits through reductions of production and marketing costs.



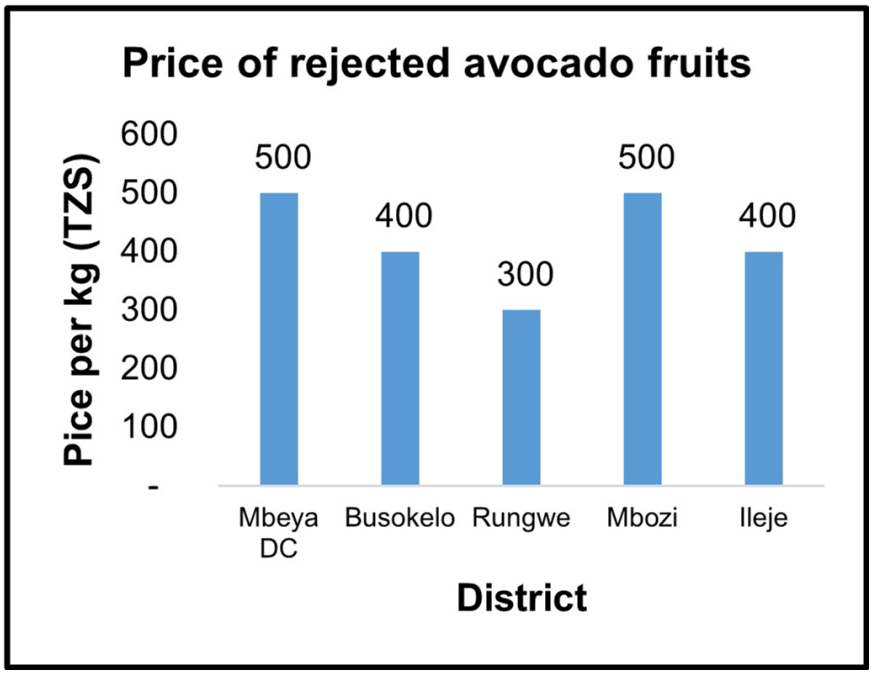


Figure 4. Selling prices of avocado fruits with good quality and rejects.

2) *Profitability of avocado farming*

To understand the market performance of avocado fruits in the study areas, the study used profit margin as a proxy implying that the higher the price and low costs of marketing avocado as recommended by [14]. Gross margin analysis showed that there was a significant differences on profit margin of avocado farming across districts. Mbozi district had the highest gross margin of TZS 1,583,022.4 per acre followed by Mbeya district with gross margin of TZS 1,140,707.7 per acre, Busokelo district with TZS 890,230.8 per acre, Ileje district with TZS 333,400.0 per acre and Rungwe district with the least gross margin of TZS 232,933.3 per acre (Table 7). Low profit margin per acre in Busokelo and Rungwe was attributed by low selling prices and high marketing costs. This is also linked with low number of farmers' memberships in farmers groups/ cooperatives that weakens their bargaining powers which is in line with [6].

Table 7. Gross margin of avocado farming.

Variable/ Districts	Rungwe	Mbeya	Busokelo	Ileje	Mbozi
Average variable cost per acre	597,238.7	224,476.9	404,769.2	337,695.7	430,520.4
Average yield per acre	593.0	1,241.1	925.0	419.4	1,006.8
Average price per kg.	1,400.0	1,100.0	1,400.0	1,600.0	2,000.0
Gross revenue	830,172.0	1,365,184.6	1,295,000.0	671,095.7	2,013,542.9
Gross margin (TZS)	**232,933.3**	**1,140,707.7**	**890,230.8**	**333,400.0**	**1,583,022.4**

3) *Percentage returns on investments*

To understand the rate of returns on investments the study estimated the percentage of returns on investing in avocado productions. With the study's findings

it was observed that percentage rate of returns on investments differed across districts whereby Mbeya district had the highest returns on investment of 508.2%, Mbozi district with 367.7%, Busokelo district with 219.9%, Ileje district with 98.7% and Rungwe district had the lowest returns on investment of 39.0% (Figure 5). Low rate of returns on investments for Rungwe district was due to low selling prices and productivity while the marketing costs were high, the Ileje district had comparative low rate of returns due to high marketing costs.

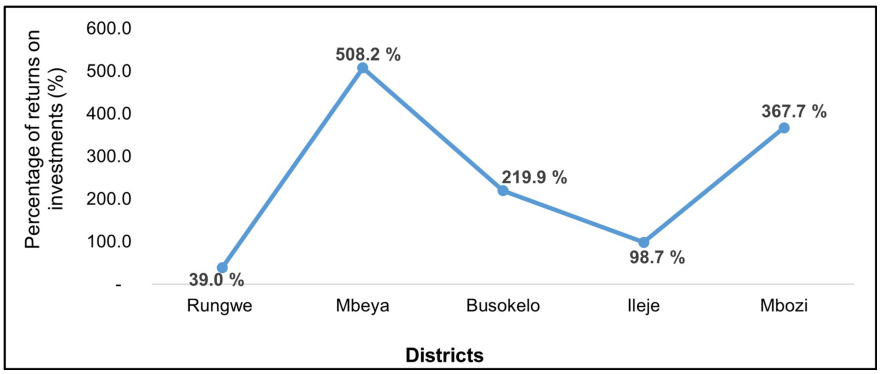


Figure 5. Percentage of returns on investments.

3.1.7. Challenges Facing Farmers in Marketing the Avocado Fruits

The findings showed that 37.3% of farmers faces the challenges of price fluctuations (Table 8). Unstable price in the study areas was caused by lack of institutional support to set and regulate the selling prices of avocado fruits. Therefore, buyers mainly brokers and middlemen takes the advantage by setting lowest buying prices. Unreliable markets of avocado fruits 32.5% was also a challenge that faces farmers in all of the study districts. Avocado is a perennial crop whose trade is conducted seasonally. Therefore, most of avocado grower's faces unreliable market issues when avocado fruits matures but they find no place or buyers. Furthermore, results showed that about 8.1% of avocado growers faces difficulties in grading avocado fruits, the study also showed that 5.3%, 4.3% and 3.8% of avocado farmers faces challenges on delayed payment, high input prices and difficulties in transporting avocado fruits respectively. Although, the study revealed that, 4.8% of avocado growers had no challenges when marketing their avocado fruits.

Table 8. Challenges facing farmers in marketing avocado fruits.

Challenge(s)	District					
	Mbozi	Rungwe	Ileje	Mbeya	Busokelo	Total
Price fluctuations	7 (3.3)	52 (24.9)	4 (1.9)	4 (1.9)	11 (5.3)	78 (37.3)
Unreliable markets	11 (5.3)	36 (17.2)	9 (4.3)	6 (2.9)	6 (2.9)	68 (32.5)
Difficulties on grading	0 (0.0)	11 (5.3)	0 (0.0)	2 (1.0)	4 (1.9)	17 (8.1)
Delay of payments	4 (1.9)	3 (1.4)	4 (1.9)	0 (0.0)	0 (0.0)	11 (5.3)
High input prices	0 (0.0)	4 (1.9)	0 (0.0)	0 (0.0)	5 (2.4)	9 (4.3)
Difficult to transport	4 (1.9)	0 (0.0)	4 (1.9)	0 (0.0)	0 (0.0)	8 (3.8)
Poor harvesting tools	1 (0.5)	1 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.0)

Continued

Unstandardized measurement units	2 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.0)
Low capital	0 (0.0)	1 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)
Pests and diseases infestations	1 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)
No selling calendar	0 (0.0)	1 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)
Avocado rejected due to scars	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)	0 (0.0)	1 (0.5)
No challenge	5 (2.4)	3 (1.4)	1 (0.5)	1 (0.5)	0 (0.0)	10 (4.8)
Total	**5 (16.7)**	**112 (53.6)**	**23 (11.0)**	**13 (6.2)**	**26 (12.4)**	**209 (100)**

Numbers in parenthesis are percentages (%).

3.1.8. Determinant of Avocado Fruits Selling Prices among Smallholder Farmers

The study showed that, when holding other factors constant; farmer's experience in avocado farming was statistical significant predictor of selling prices at $P < 0.05$ (Table 9). This implied that with additional increase in one year of experience in avocado farming increased the selling price by TZS 11.987 per kg. Size of the farm under avocado farming was also found to be a good predictor of avocado selling prices at $P < 0.05$, such that with additional increase in land size by one (1) acre increased selling prices by TZS 25.401 per kg. Location of the farmer was also significant at $P < 0.05$ such that a farmer being in Mbeya district had less chance of getting additional TZS 242.839 per kg than farmers in other locations (Mbozi, Rungwe, Busokelo and Ileje). Also, variety grown by avocado farmers was statistical significant at $P < 0.05$ such that growing local varieties significant reduced market price by TZS 231.380 than improved varieties. Gender of avocado growers and education level were found to be statistical insignificant at $P < 0.05$.

Table 9. Linear regression results.

Model variables	Coefficients		Sig.
	B	Std. Error	
Gender	37.320	73.658	0.613
Education of the farmer	−72.057	62.422	0.250
Variety grown (Local Variety)	−231.380**	108.478	0.034
Years of experience	11.987**	6.104	0.050
Location of a farmer (Mbeya District)	−242.839**	111.557	0.031
Area cultivated	25.401**	11.845	0.033
(Constant)	1414.556	86.570	0.000
Dependent var.	Avocado fruits selling price/kg		
Model level of significance	0.04		

*** $P < 0.01$, ** $P < 0.05$ *and* * $P < 0.1$.

3.2. Discussion

This study was designed to evaluate market performance of the avocado fruits in Mbeya and Songwe regions. The socio economic characteristics of respondents showed that avocado productions in Mbeya and Songwe regions is highly dominated by male which has been reported by other studies as reported by [15]. This is due to the facts that most of the men in these regions are considered as heads of

households who owns basic resources vital for avocado productions. Married farmers seemed to outnumber other marital statuses of avocado farmers. This implies that with regards to the nature of the crop, it needs farmer who have settled to have a close supervision that may help to realize returns on investments. In terms of education levels, results showed that avocado productions doesn't need only literate farmers rather it needs commitments. This was evidenced by high representations of avocado growers with primary education level which is termed as basic education level in the country. Such findings aligns with those reported by [5]. The study found that majority of smallholder farmers grow avocado in small pieces of lands and in some occasions they intercrop with some friendly tree species. Also it was found that some farmers intercrop avocado trees with other crops like banana, coffee and other staple crops like maize and beans. This findings aligns with many studies which reported that avocado productions in Tanzania is highly dominated by smallholder farmers who owns less than five acres.

In the study areas, majority of farmers cultivates improved avocado cultivars/varieties mainly Hass. This is highly linked with the rapid increase in demand of improved avocado fruits for exports as shown by [13]. However, it was noticed that prices of avocado fruits greatly varies across districts despite the facts that the varieties, qualities, and all attributes required by the buyers are the same. Mbozi district showed an outstanding market performance of avocado fruits while Mbeya was the district with the lowest market price, the reason explained to be early maturity before the market is flooded by produce from other areas of the Southern Highlands as was found by [5]. But across districts there were slightly differences in terms of prices between members and non-members for farmers' groups/associations. Low market prices and low productivity were found to be among the reasons for low profitability in avocado farming. Ileje, Rungwe and Busokelo were the districts with the lowest yield per acre while Mbeya was the district with the least market price while farmers in Mbozi districts sold their avocado fruits with the highest prices. Also, results from gross margin analysis showed that, there were differences in level of profit across selected districts. Mbozi district was the one with highest profit margin attributed by high market price. This was due to low average costs and high yield per acre as reported by [7] and [13]. Rungwe district was found to have lowest profit margin compared to all other districts in the study areas.

The findings from linear regression analysis showed that variety grown had significant influence on selling prices. This was due to the fact that the increase in global market demand of avocado fruits has tremendously increased the change from the cultivations of local cultivars to improved cultivars or varieties such as Hass. This aligns with studies by [10] and [16] who showed that production of improved avocado varieties significantly increase the selling prices of avocado fruits in both local and international markets. The experience of a farmer in production of avocado fruits significantly influenced seeing prices which is associated with having the connections with previous buyers and better understandings on

the trends of the avocado selling prices. The experienced farmers were also found to have strong abilities to bargain for harvested avocadoes compared to the new farmers. This is in line with a study by [12] conducted in Ethiopia who reported that farmer experience had higher chances of increasing production and fetching higher prices for avocado fruits. It also aligns with results of a study conducted in Mexico by [17] who reported that farmers experience influences the selection of market channel which significantly influences market prices. Location of the farmer was found to be a significant factor influencing market price associated with socio-economic factors of such location. A farmer who is located far from the market place was found to have low market prices while for the locations which were near to markets had relative higher prices. Additionally, location of avocado farmer differentiated the quality of avocado due to weather factors which also influenced the market prices. This is in line with a study by [18] who showed that a distance from district to the market significantly influences market prices. Moreover, the study found that area under avocado production had significant influence on avocado buyers as they would prefer a farmer who can supply large volume of avocado fruits from a single farm. This reduces costs associated with aggregations of fruits from different and distant farmers. Therefore, farmers with large farm sizes were found to have slightly higher prices than those with small farms as also reported by [19].

4. Conclusions and Recommendations

4.1. Conclusions

Avocado fruits are considered as green gold to smallholder farmers providing income and employment opportunities in Mbeya and Songwe regions. Despite the remarkable contributions to livelihood and food security of the farmers yet it is highly fragile with regard to market prices. The study's findings showed that avocado production is dominated by elderly men who almost half of them produce independently and the other half operates in farmers groups/ cooperatives. The market system of avocado fruits in the study areas is not yet well structured as there are no established market standards and selling prices which may be in favor of avocado producers. Regression analysis signifies that varieties grown, farmer location, farm size and experience are the main factors that influence avocado selling prices among smallholder farmers. This implies that these factors may be taken into account in developing market systems that will govern avocado fruits marketing in the study areas.

4.2. Recommendations

With regards to these findings it is recommended to establish a price floor for avocado that will be useful and profitable to farmers. The study recommends avocado growers to be motivated to join farmer cooperatives in order to increase bargaining power in the study areas. There is also a need to create accessibility of marketing infrastructures like cold storage facilities which may be used to store

avocado fruits during peak harvesting season characterized with low prices and selling fruits during low supply with high prices. Moreover, the study recommends the need to train smallholder avocado farmers on value additions which may help to increase their incomes through increased profit margins.

Research Gap

Due to limited time and financial resources the study didn't explore market performance for other crops. This leaves a gap to be researched on understanding challenges facing other crops produced in the study area and making a comparison with challenges facing marketing avocado.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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