

# Determinants of Profitability in Orange Production Under Smallholder Farming in Muheza District, Tanzania

Hija W. Mwatawala<sup>1\*</sup> and Ramadhani J. Kidolo<sup>2</sup>

<sup>1</sup>Institute of Rural Development Planning  
P. O Box 138 Dodoma, Tanzania

<sup>2</sup>Muheza District Council  
P. O. Box 20, Muheza, Tanzania

\*Corresponding author: Email: hmwatawala@irdp.ac.tz

## ABSTRACT

*This study aimed at assessing determinants of profitability in orange production among smallholder farmers in Muheza district. Data collected from 97 randomly selected farmers through structured interview and unstructured interview. Other methods used were observation and documentary review. Both descriptive and inferential statistics were used to analyze collected data. The profitability from orange estimated using the farm enterprise budget analysis. A multiple linear regression based on Ordinary Least Square (OLS) estimation approach employed to test relationships between variables whereby the gross margin per acre used as a proxy for orange profitability. The average gross margin per acre was TZS 1,754,990. Size of orange farm, education level, quantity of orange produced, price of oranges and access to the market information significantly ( $p < 0.05$ ) influenced the profitability of orange farming. Cost of production was also significant at  $p < 0.05$  but displayed a negative relationship to the profitability. The study concluded that orange production in the study area is a highly profitable enterprise. Furthermore, the study concluded that there are positive and significant relationships between farm size, access to market information, quantity of orange produced, price of orange and education level of the respondents and profitability while there was a significant but negative relationship between cost of production and profitability. The study recommends that there is a need for policy-makers and Government to make appropriate and good policy which would create conducive environment for investor to make investment of small scale industry which could make juice from oranges, this will create a permanent market chain from the orange growers to the final consumers. Consequently, profitability will increase due to readily available market. Moreover, improvement in extension services and formation of farmers groups may lead to high yield and good bargaining power for market price.*

**Keywords:** *Citrus, Determinants, Gross Margin, Smallholders*

## 1.0 INTRODUCTION

For quite long agriculture has been contributing significantly to the development of Tanzania's economy by providing the necessary raw materials required by agro-based industries that form the most important support of the manufacturing sector. From recent data, it contributes about 30 percent of GDP and employing 67 percent of the labor force, with women contributing more than 70 percent of the labor (USAID, 2018). Orange is one of the most important fruit crop grown all over the world. It belongs to citrus species which constitute the most important specie of the *rutaceae* family. Orange constitutes the bulk of the global citrus fruit production (Yusuf and Salau,

2007). The UNCTAD (2007) reported that citrus fruits are rich in Vitamin C or ascorbic acid and folic acid, as well as a good source of fiber. They are fat free, sodium free and cholesterol free. Orange fruit is one of the most important crops in Muheza district of Tanga region in Tanzania particularly in improving rural farmer' income (Makorere and Mbiha, 2012). Orange species are native to eastern Asia and were introduced by Arab traders into the Mediterranean region. They were brought later to tropical Africa by either Arab traders or Portuguese navigators (Mbiha and Maerere, 2003). It is believed that Anglican Missionaries introduced the first oranges to Tanzania (Muheza District) in the early 1900s. After finding oranges to be well adapted to Tanzania's climatic conditions, other suitable areas for orange production were identified and trees distributed by the missionaries and some sisal estates. Soon after, individual farmers also started distributing plant material among each other.

World production of citrus fruit has experienced continuous growth in the last decades of the 20<sup>th</sup> century. The rise in citrus production is mainly due to the increase in cultivation areas and the change in consumer preferences towards more health and convenience food consumption and the rising incomes (Yusuf and Salau, 2007). East Africa's major orange production areas are Tanga on Tanzania's Northeast coast, Kilifi and Kwale districts surrounding Mombasa on Kenya's coast and Soroti and Mubende districts in Eastern and mid-western Uganda (USAID, 2013). Tanzania is known for its quality production of Delta Valencia and Washington navel varieties and its year-round production. These varieties, which were introduced by donor projects in selected areas, are now spread out over a wide growing area (USAID, 2013). Recent report by FAO (2017) has indicated that Tanzania is the leading producer of oranges in East Africa by producing 465,608 tonnes in 2016 followed by Kenya (85,233 tonnes). By having more fruit processing industries in Kenya compared to Tanzania, hence the demand exceeds supply. As a result, Kenya relies heavily on imports from Tanzania. Oranges' thick skin means that they are easier to ship and can withstand the poor packing conditions that persist in the region – typically oranges are loaded loose into trucks. Their durability makes them less risky than other more fragile horticulture crops and therefore more appealing to traders (Makorere and Mbiha, 2012).

Majority of Tanzanian farmers are smallholder farmers cultivating horticulture (URT, 2004). Thus, the importance of agriculture in both poverty reduction and economic growth deserves a special attention (URT, 2012). Despite orange production being among the important horticultural fruits, but still development of this sector has not improved in Tanzania (MMA, 2008). There are limiting factors that endanger the development of this sector (URT, 2011). For example, in Muheza district, it is estimated that about 32,000 tons of citrus fruits produced each year go bad after harvesting in rural area (Lugendo, 2012). Although, Eaton *et al.* (2007) link this postharvest losses with "high dependence on spot markets contracts" which are dominated by "weak institutional structures". Marketing is fundamental for the success of vegetable farmers and therefore, farmers rely on good infrastructure, appropriate transportation facilities, improved technology and communication links to effectively market their products. Market participation becomes more profitable if farmers are able to minimize transaction costs and produce goods or services at a lower opportunity cost (Porter, 1985).

In Muheza district, the common marketing practice is for the trader to purchase the fruits while still on the trees (Mbiha *et al.*, 2004). Traders used to buy oranges at the farm-gate leaving the farmers with very minimal margins. Lack of infrastructures that could be used to process orange juice and hence improve income of a farmer also seems to be a limiting factor to smallholder farmers to access lucrative markets. Another setback is the fact that most oranges farms were not connected to good feeder roads (DAI PESA, 2003). Thus, this paper intended to assess the profitability of oranges production among smallholder farmers in Muheza district.

## 2.0 METHODOLOGY

This study was conducted in Muheza district in Tanga region specifically at Kwafungo, Mtindiro and Songa wards. Muheza district is in the northern eastern part of Tanga region; it lies between latitudes 5.0° and 5.4° South of equator and longitudes 39.0° East of Greenwich. Muheza district has an area of 1,974 km<sup>2</sup>, whereby land area covers 1,961 km<sup>2</sup> and area covered by the ocean is 13 km<sup>2</sup> along the coast. The study used more than one method of data collection so as to avoid bias and unreliability of data. Both structured and unstructured interviews were conducted in order to collect data from the respondents who engaged in orange production. Other methods were observation and documentary review (for secondary data). Stratified random sampling was used to get a sample of 135 orange famers, 45 from each ward. However, only 97 farmers were included in the analysis due to fact that others failed to give out important data which deemed to be crucial for intended analysis. The study employed non probability sampling technique to obtain key informants who are knowledgeable and experienced in order to get extra information concerning the orange production.

Statistical Package for Social Science (SPSS) version 20 was used to analyze collected data. The analysis was based on both descriptive (means) and inferential statistics. Ordinary Least Square (OLS) regression used to analyse determinants of orange profitability. Multiple regression was preferred to simple regression analysis due to the fact that, first it almost inevitably offers a fuller explanation of the dependent variables, since very few phenomena are products of single cause. Second, the effect of a particular independent variable made more certain for the possibility of distorting influences from other independent variables is removed. The coefficient of determination (R<sup>2</sup>) was used to assess the goodness of fit of multiple regression equations. Coefficient of determination tells how much variation in the dependent variable explained by a set of independent variables. Gross margin per acre was used as a proxy indicator for orange profitability.

The adopted regression model was specified as:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e_i$$

Where:

$Y_i$  = Profitability of orange farming, measured by gross margin per acre

$\beta_0$  = constant

$\beta_1... \beta_8$  = estimated coefficients of the explanatory variables

$X_i$  = Explanatory variables

$e_i$  = Error term

The description of the explanatory variables and their expected relationships with the dependent variable are presented in Table 1.

**Table 2: Description of the independent variables used in the profitability model**

Variables	Coding System	Category	Expected Sign
X <sub>1</sub> = Age of the farmer	Number of years	Continuous	+/-
X <sub>2</sub> = Sex of the farmer	1 if male, and 0 if female	Dummy	-/ +
X <sub>3</sub> = Education of the farmer	Number of years in school	Continuous	+
X <sub>4</sub> = Size of Orange farm	Number of acres	Continuous	+
X <sub>5</sub> = Quantity of orange produced	Number of orange produced	Continuous	+
X <sub>6</sub> = Price of orange	TZS/kg	Continuous	+
X <sub>7</sub> = Access to the market information	1 if access, otherwise 0	Dummy	+
X <sub>8</sub> = Cost of production	TZS	Continuous	-

NB: TZS= Tanzanian shilling

The profitability from orange was estimated using the farm enterprise budget analysis. Farm enterprise budgets represent estimates of income, costs and profits associated with the production of agricultural products (George and Jayson, 1994). Among various uses which such analysis can provide, farm budgets was used to estimate benefits and costs for major changes in production practices to evaluate the efficiency of the farm enterprises. The information in an enterprise budget can be organized in different ways, but it typically includes sections on gross income, variable costs, fixed costs, and net income above selected costs (Lessey *et al.*, 2004).

Prices play an important role in economic analysis. Normally market prices was used, although there may be differences in prices right after harvest and the prices received after farmers have stored their produce, especially for non perishable products.

Farm enterprise budget analysis used the following formula:

$$NI = TR - TC$$

$$TC = TFC + TVC$$

$$ROVC = TR - TVC$$

Profitability  $\equiv$  Gross margin per acre = ROVC/Acre

Where:

NI = Net Income

TR = Total revenue from the orange (quantity of orange produced/acre x Price of the orange).

TVC = Total Variable costs (Inputs, operations and labour costs)

ROVC = Revenue over variable costs (profit)  $\equiv$  Gross Margin.

TFC = Fixed costs (depreciation, taxes, interest on investment, land charges, salaried labour etc).

The fixed cost component of the total cost of production was assumed to be negligible.

### 3.0 RESULTS AND DISCUSSION

#### 3.1 Profitability Analysis

Gross margins per acre used as a proxy for profitability as it measures relative profitability. Gross Margin (GM) is measured as the difference between the Gross Returns (GR) and the Total Variable Cost (TVC). The fixed cost component of the total cost of production assumed to be negligible. The Gross Returns (GR) was the total output multiplied by the unit price of orange. The total variable cost involved those costs that were varied more or less in direct proportion to the level of production. The profitability analysis is presented in Table 2. The average gross margin per acre of TZS 1,754,990 obtained from deducting all variable costs of production from the average revenue from sales of oranges. Mean yield of oranges per acre per year was 7,020 kg and average price per kg was TZS 374.5 which led to total revenue of TZS 2,628,990. Also, total variable cost was TZS 874,000. These include cost of labour for weeding which is an average of TZS 120,000 per year, pruning an average of TZS 100,000 per year per acre, purchasing of insecticide which is average of TZS 150,000 per year per acre, hiring labour for spraying insecticide an average of TZS 140,000 per year per acre and the cost of harvesting/transport which is TZS 364,000 per year per acre. Gross margin was approximately the same as Net Return per acre since the fixed cost is assumed to be negligible. Additionally, fixed cost like planting of tree seedling are normally done once at a time before farmer generating profit and most of orange tree are very old that means, they were planted in more than 6 to 10 years ago. Consequently, cost of hiring land was not available. This shows that orange farming is generally profitable in the study area, since the gross margin was more than twice as compared to the total cost incurred by the respondents. Therefore, greater effort in orange production will enhance the income of the respondents which in other hand will lead to improvement of their livelihoods.

**Table 2: Profitability analysis**

Item	Quantity (kg, litre)	Price (TZS)	Amount (TZS)
<b>A. Revenue</b>			
Sales of oranges	7,020	374.5	2,628,990
<b>B. Variable Costs</b>			
Weeding		60,000 x 2 per season	120,000
Pruning		50,000 x 2 per season	100,000
Acquisition of insecticide	5 litres	30,000 x 5	150,000
Applying insecticide		70,000 x 2 per season	140,000
Harvesting/transport		182,000 x 2 per season	364,000
Total Variable Costs			874,000
<b>Gross Margin (A- B)</b>			<b>1,754,990</b>

#### 3.2 Analysis of Determinants of Profitability of Orange Farming

A multiple linear regression analysis was used to examine determinants of profitability in orange farming. Result in Table 3 indicates independent variables included in the model were very good

predictors of profitability in orange farming. Consequently, 83.7% of the variations in profitability of orange farming was explained by variations in the explanatory variables included in the model. Additionally, results indicate that explanatory variables included in the model collectively had a significant influence on the profitability of orange farming ( $F = 118, p < 0.001$ ).

The predictor variables age and sex did not significantly ( $p > 0.05$ ) influenced profitability of orange farming in the study area. Meanwhile size of orange farm significantly ( $p < 0.05$ ) influenced profitability. The results suggest that an increase in land under orange production by one unit would result in a TZS 1425.5 increase in profitability. Also education level of the respondents significantly ( $p < 0.05$ ) affected profitability. The results indicate that with an additional year of education, profitability would increase by TZS 2143.7. This finding agrees with Xaba (2013) who conducted his study in Swaziland. According to Nwaru (2004) education helped to unlock the natural talents and inherent enterprising qualities of the plantain farmers in Nigeria.

Also, price of orange significantly ( $P < 0.001$ ) influenced profitability in orange production. It had a coefficient of 16,635 implying that a unit increase in price of orange would probably lead to increase in profitability by TZS 16,635. According to Eman and Gebremedhin (2007), less developed rural economies and smallholder farmers find it difficult to participate in commercial formal markets due to factors such as scarcity of nearby markets to absorb their produce, low produce prices, multitude of middlemen, unavailability of marketing institutions to facilitate legal contract and coordination among farmers.

In addition, findings depict that access to market information was significant at  $p < 0.001$  and the coefficient is 137,685 implying that, as the access to market information increases then profitability would increase by TZS 137,685. These findings concur with Makhura (2001). Also Porter (1985) portrayed that marketing is vital for the success of farmers and therefore, farmers rely on reliable infrastructure, appropriate transportation facilities, better technology and communication links to effectively market their products. Market participation becomes more profitable if farmers are able to minimize transaction costs and produce goods or services at a lower opportunity cost (Porter, 1985).

Moreover, findings revealed that quantity of orange produced significantly ( $p < 0.05$ ) influenced profitability in orange production with coefficient of 749, implying that a unit increase in quantity produced will increase the profitability by TZS 749. Furthermore, cost of production significantly ( $p < 0.05$ ) influenced profitability of orange farming and with coefficient of  $-0.45$ ; which imply that as the cost of production increase by TZS 1 then the profitability would decrease by TZS 0.45. Similarly, Hettige and Senanayake (1992) and Kodithuwakku (2000) ascertain that most of the smallholder farmers in Swaziland come across high production and transaction costs, consequently impaired sustainability of their livelihood.

**Table 4: Regression estimates of predictors of orange profitability**

Independent variable	B	Std. Error	Sig.
(Constant)	-2,386,121.1	62,871.6	0.000***
Age of farmer	-327.3	872.3	0.3540

Independent variable	B	Std. Error	Sig.
Sex	69,876.4	32,015.5	0.5210
Education Level	2,143.7	451.4	0.0311*
Size of orange farm	1,425.5	576.4	0.0274*
Quantity of oranges produced	749.3	497.3	0.0141*
Price of orange	16,635.2	815.2	0.000***
Access to market information	137,685.1	24,215.1	0.000***
Cost of production	-.045	0.013	0.0130*

R<sup>2</sup> = 0.828, F- value = 118, p < 0.001; \* Significant at p < 0.05, \*\*\* = Significant at p < 0.001

#### 4.0 CONCLUSION AND RECOMMENDATIONS

Result of gross margin and profitability analysis from the study reveals that orange production in the study area is a highly profitable enterprise. In addition, results showed that variables such as size of orange farm, education, quantity of orange produced, price of oranges and access to market information were significant and shows positively influence to the profitability of orange farming. Conversely, cost of production significantly influenced profitability but displayed a negative relationship with it.

The study therefore makes the following recommendations:-

- Since orange production has been revealed to be highly profitable to orange farmers, it is recommended that government through agricultural extension officers from village up to district levels to provide more technical assistance to farmers through workshops and trainings. Consequently, orange production will improve which lead to increase in orange profitability in the study area.
- There is a need for policy-makers and Government to make appropriate and good policy which would create conducive environment for investors to establish a number of agro-processing industries which can take a large amount of oranges produced in the study area, consequently this will create a permanent market chain from the orange growers to the final consumers. Moreover, this will assist in reducing a substantial amount of oranges which are perished few days after being harvested.
- Furthermore, in order to increase profitability, farmers should form production clusters to improve their market intelligence. This could be achieved through the formation of producer groups or cooperatives.

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