

Contribution of Orange Production to Household Income of Smallholder Farmers in Muheza District, Tanzania

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ABSTRACT

This study aimed at assessing the contribution of orange production to household income of smallholder farmers in Muheza District. Data collected using structured questionnaires administered to a random sample of 135 households composed of equal sub-samples from three wards. Both descriptive and inferential statistics (Pearson Product Moment Correlation) were used to analyze processed data. Results indicate that average orange yield was 12,875 kg/ha with the maximum of 24,500kg/ha and the minimum of 487 kg/ha. The average annual income earned from orange production was TZS 3,840,229 and contributed to 35% to total annual household income among orange producers. Furthermore, the results revealed that annual household income significantly correlated with income from orange production ($r = 0.9431$, $P = 0.000$), livestock ($r = 0.199$, $P = 0.021$), other crops ($r = 0.245$, $P = 0.009$) and income from salaries/wages ($r = 0.455$, $P = 0.0000$) while income from petty business was not significant ($r = 0.053$, $P = 0.543$). The study concludes that orange yield in kilogram was significantly correlated with the farm size in hectare. The yield of oranges has been decreasing per hectare probably due to the fact that orange trees are too old that cannot produce more oranges per hectare, decline in soil fertility caused by continuous cultivation without replenishment of soil with fertilizers and inadequate application of insecticides/pesticides among farmers. Also, annual household income significantly correlated with income from orange production. Consequently, the study recommends that strategies to increase orange production in the area should emphasize on optimal application of agricultural inputs including fertilizers, pesticide and insecticide. Efforts should also be made to encourage the farmers' plant new trees to replace the ones that are old with lower yields.

Keywords: Household income, citrus production, non-farm income, orange

1.0 INTRODUCTION

Citrus fruits are widely cultivated in tropical as well as subtropical African countries. While fresh fruit for the market produced preferably in subtropical climates (e.g. South Africa) and Mediterranean climates (e.g. Tunisia, Egypt, Morocco, Libya), citrus for juice is predominant in tropical climates because of the possibility for higher sugar content. The most important species of citrus fruits are sweet oranges (*Citrus sinensis*), limes (*C. aurantifolia*), grapefruits (*C. paradisi*), lemons (*C. limon*) and mandarins (*C. reticulata*), often called tangerines (FiBI, 2011). Due to its importance orange constitutes the bulk of the global citrus fruit production (Yusuf and Adekunle, 2007). The UNCTAD (2007) reported that orange is rich in vitamin C, A, B and phosphorus as

well as a good source of fiber. Normally, orange consumed fresh or in the form of juice, jam, squash and syrup. Moreover, oranges are also fat free, sodium free and cholesterol free.

World production of oranges has experienced continuous growth in the last decades of the 20th century. Nevertheless, the rise in orange 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 Adekunle, 2007).

Agriculture in Tanzania is the major source of livelihood especially among rural communities accounting to almost 70% of population (World Bank, 2017). Economically; agriculture contributes to 29.1% of total GDP of the country (URT, 2016). Interestingly, Tanzania is the leading producer of orange (426.8 thousand tonnes) in East Africa, followed by Kenya which produced 114.4 thousand tonnes (FAO, 2017) and this crop grown in all regions of Tanzania though in different proportions. According URT (2017) orange production is among the permanent (perennial) crops grown in Tanzania and it accounts for 2.5 percent (34,085 ha) from the total planted area of permanent crops. However, only 21,375 ha harvested leading to the yield of 9,839 tonnes, where Mainland contributed 5,321 tons (54 percent) and Zanzibar 4,518 tons (46 percent). In Tanzania Mainland, two regions of Tanga and Pwani provide 90% of the total area planted with oranges. In addition, Tanga is having the largest planted area 26,230 ha (82 percent) and Pwani 2,592 ha (8 percent), whereas Mtwara was next with 1173 ha (4 percent) while Simiyu had the lowest planted area recorded of 1 ha. Furthermore, Tanga is the leading region in orange production in Mainland with 3,731 tonnes (70 percent) followed by Pwani (880 tonnes; 17 percent). Conversely, Kagera recorded the lowest production of 3 tonnes (URT, 2017).

Historically in Tanzania, orange trees planted in Muheza District of Tanga Region in early 1900's by Anglican missionaries at Magila mission and then spread in the neighbourhood with rapid expansion to other village such as Potwe (Potwe ward), Semungano (Kilulu ward) and Tanga town. However, effective propagation of oranges started during the period 1930 to 1940, through the nursery run by Mlingano Sisal research station. Plants of different varieties and other citrus species produced by the station through vegetative propagation were distributed to farmers free of charge (Mbiha and Maerere, 2003). According to URT (2013), agriculture is the dominant preoccupation of Muheza District inhabitants. The importance of this sector reflected by the fact that; 80% of the economically active population of Muheza District depend on agriculture (URT, 2013). Generally, orange is largely significant crop in Muheza District in Tanga region Tanzania particularly in improving rural farmer' income (Makorere and Mbiha, 2012).

Despite the availability of markets for oranges in Tanzania, still farmers' livelihood not improved as expected (Lazaro, 2010). This could be mainly due to partial existence of market inefficiency and other related factors. For instance, in Kenya large quantities of oranges exported from Tanzania, especially from Tanga Region to feed some Kenya industries. However, the fruit traders in that market complained of making loss in terms of financial investment in buying and selling fruits of which some of them end up in the dumps (Lazaro, 2010).

Most of Tanzanian farmers engaging with horticulture are smallholders (URT, 2004) who to large extent include oranges production in their farms especially in North-Eastern corridor (Tanga, Kilimanjaro, Arusha, and Manyara regions) and Mwanza and Ruvuma Regions. Thus, the

significance of sub sector (i.e. Orange farming) in both poverty reduction and economic growth justify a special attention (URT, 2012). Despite the favourable conditions for citrus fruit in Tanzania, farmers still fail to take advantage of it and exceptionally limited value addition takes place hence the main outlet for citrus being the fresh market. This to large extent affects the overall income earned by orange farmers.

Both rural farm income and non-farm income are important sources of total household income in the majority of rural communities in developing countries like Tanzania. According, Davis et al. (2010), income classified into seven categories: (1) crop production; (2) livestock production; (3) agricultural wage employment, (4) non-agricultural wage employment; (5) non-agricultural self-employment; (6) transfer; and (7) other. Furthermore, the seven income categories aggregated into higher level groupings depending on the type of analysis. One grouping distinguishes between agricultural (i.e. crop, livestock, and agricultural wage income) and non-agricultural activities (i.e. non-agricultural wage, non-agricultural self-employment, transfer, and other income), and in a second, crop and livestock income referred to as on-farm activities, non-agricultural wage and self-employment income as non-farm activities, and agricultural wage employment, transfer, and other income are left as separate categories.

Income shares can be analyzed as the mean of income shares or as the share of mean income (Davis *et al.*, 2017). In the first instance, income shares calculated for each household, and then the mean of the household shares of each income category. In the second case, income shares calculated as the share of a given source of income over a given group of households. Since the household is our basic unit of analysis, this study adopted the mean share in order to ascertain contribution of each category accordingly.

In Tanzania several studies have been conducted previously on this sub sector for instance, Makorere (2014) conducted a study to explore factors affecting development of citrus industry in Tanzania looking at empirical evidence from Muheza district. In his study he found that, there were the greatest constraint related to availability and affordability of orange inputs and seedling supplies. Input supplies include such things as pest control products and machinery for cultivation of the fields. While agro seedling supplies include such things as improved (budded) seedling trees supply. Also, Lugendo (2012) conducted study on the orange value chain analysis while Mbiha and Maerere (2003) studied problems and potentials of marketing of orange produced in Muheza. Additionally, MMA (2008) conducted a quick scan on citrus for local and regional markets in Tanzania as well as Makorere and Mbiha (2012) studied determinants of orange famers' income in Muheza district. However, there is scant evidence of scientifically documented reports on how oranges contribute to farmers' income at household level. Thus, the objectives of this study were to determine demographic characteristics of oranges' farmers, quantify area under oranges production, oranges' yield and determining contribution of oranges production to the household income in three selected wards of Muheza district.

2.0 METHODOLOGY

The study was conducted in Muheza District in Tanga Region specifically at Kwafungo, Mtindiro and Songa Wards. Location wise, Muheza District is in the northern eastern part of Tanga region;

it lies at 5° 00' 00" latitudes South of equator and longitudes 38° 55' 00" East of Greenwich. This study used cross-sectional research design. The study used more than one method of data collection so as to avoid bias and unreliability of data. Structural interview and unstructured interview was used to collect data from the respondents engaged in orange production. Also, observation and focus group discussions were used to obtain other relevant data deemed important to accomplish study's objectives. In addition, documentary review was undertaken to collect secondary data. Probability sampling through systematic random sampling was used to get a sample of 135 orange farmers (heads of household), i.e.45 from each ward. The list of orange farmers from each ward was used to get required respondents. Non probability sampling was used to get four key informants from three wards. Three agriculture extension officers one from each ward and agriculture officer from the district level, were interviewed in order to obtain pertinent data relating to the study's objectives.

In order to get meaningful information from collected data, descriptive statistical analysis were employed based on frequency, percentage and mean. Additionally, Pearson Product Moment Correlation was used to test the strengths of relationship between independent and dependent variables. In this study the dependent variables was the total annual household income which correlated with independent variables income from orange production and income from other sources such as income from livestock, income from business, income from salary/ wages and income from other cash crops.

3.0 RESULTS AND DISCUSSION

3.1 Demographic Characteristics of Respondents

The mean age of the respondent was 48.1 years while the minimum and maximum ages were 20 years and 79 years, respectively. Results in Table 1 indicate that majority (32.6%) of respondents aged between 41- 50 years, with few (6.7%) who aged between 18- 30 years. However, the findings show that majority (83%) of respondents in the study area are the mainly active labour force since they fall in the group of 20-60 years. This indicates that most of the population in general are still vastly active and can afford to carry out various productive activities. As the human being become older, they lose working energy thus contributing less in production (Ajuye, 2010). In addition, the age groups below 16 and above 64 years considered to be under high dependency age structure which is economically less in terms of productivity. Mandara (1998) considered economically productive age from 16-64 years. The age of an individual can affect productivity because the ability to carry out the daily economic activities, both farming and non-farming, will decrease with age. Moreover, age is an important demographic variable and is the primary basis of demographic classification in vital statistics, censuses, and surveys (NBS, 2005).

Findings in Table 1 show that men as heads of households accounted for about 83.7% of the orange producers in the study area. This is higher by 7.7% than what reported by Makorere (2014). The observed high percent of male farmers could probably due to the fact that in most poor to average income families, in Tanzania, men are in-charge of most family activities dealing with monetary transactions while women supposed to take care of their homes and children. Also

for male headed household, it is uncommon to interview a female unless if the male is not around.

Results also, revealed that most (89%) of the respondents were married and few (11%) falls in the group of single, separated, widow and divorced. This is in consistent with the findings of Siriwardana and Jayawardena (2014) who reported that 87.3% of farmers married among paddy farmers in Sri Lanka. The findings from this study imply that most households have satisfactory labour force to engage in various economic activities including orange farming (This relates to household size). With regard to the education levels of respondents, results from Table 1 also show that majority (74.1%) of respondents had primary education and few (25.9%) had at least secondary education and non formal education. However, these findings do not concur with Makorere (2014) who reported that farmers who had primary school education were 84.2%. This situation of having majority of farmers having low level of education could act as a barrier to adoption of improved agriculture technology and modern methods of agricultural production and marketing. The level of education remain as an important factor in coping with poverty and particularly coping with risk and uncertainties related to agricultural production. Farmers' education generally tends to enhance production among food crops farmers, apparently resulting from their efficiency in using new production technologies (Ani, 2006).

Table 1: Demographic characteristics of respondents (n =135)

Variable	Frequency	Percentage (%)
Age		
18– 30	9	6.7
31- 40	29	21.5
41 – 50	44	32.6
51 – 60	30	22.2
Above 60	23	17.0
Sex		
Male	113	83.7
Female	22	16.3
Marital Status		
Married	120	88.9
Single	6	4.4
Widow	3	2.2
Divorced	3	2.2
Separated	3	2.2
Education Level		
Non formal	12	8.9
Primary	100	74.1
Secondary	21	15.6
College and above	2	1.5

3.2 Farm Size under Orange Production

The farm size under orange production is among factors contributing to the yield of orange. Findings in Table 2 reveal that 38.5 % of the respondents are farmers having farm size ranged from 0.5 to 2ha. Also, 40.7% and 20.7% farmers has 2.1 to 5 ha and 5.1 ha and above,

respectively. The average farm size under orange production is 4.5 ha with the maximum of 15 ha and the minimum of 0.5ha. These findings are more or less the same as the ones obtained by Makorere (2014); who reported that 73% of farmers had farm size of 0.4 to 6 ha. However, the same author reported that 23% and 4% of farmers had farm size between 2.2 to 6ha and 6.2 ha and above, respectively. Nevertheless, the mean acreage in this study is higher than that of MMA (2008).

3.3 Orange Yield

Table 3 below portray that 21.5% of respondents produced orange between 4,001 - 6,000kg/ha with very few (4.4%) who produced below 2,000kg/ha of oranges. Also, findings shows that average orange yield is 12,875kg/ha with the maximum of 24,500kg/ha and the minimum of 487kg/ha. This mean yield concurs with MMA (2008). Quantity of orange produced per ha in the study area differs from one respondent to another probably due to farming practices and productivity of land.

Table 2: Farm size under orange production

Orange farm size (ha)	Frequency	Percent
0.5- 2	52	38.5
2.1- 5	55	40.7
5.1- and above	28	20.7
Total	135	100.0

The observed lower yield per hectare among farms might probably due to the fact that they contain orange trees which are too old to be able to produce more oranges per hectare and also a decline in soil fertility caused by continuous cultivation without replenishment of soil nutrients. Moreover, through focus group discussions and key informants' interviews, study found that most farmers use inadequate amounts of insecticides/ pesticides; consequently production is affected. Higher yields from this study observed from farmers having plenty of young trees and those using optimal farm inputs. Additionally, through focus discussions farmers' reported to have very minimal contacts with extension officers probably due to inadequate number of staff as supported by ward and district agricultural extension officers. On the other hand, these findings are contrary to those reported by Kavoi and Tschirley (2004) who revealed that in Kenya, citrus orange yields during the peak season of the year between 1992 and 2001 averaged 3,238 - 4,452kg/ha. Furthermore, it is also contrary to the report of Pole *et al.* (2006) who reported that total harvest per farmer per season ranged from 250 to 24,000kg/ha, with an average of 4,000kg/ha of fruit per season.

Table 3: Distribution of orange yield

Orange yield (kg/ha)	Frequency	Percentage
Mean		
12,875	135	
Yield categories		
< 2,000	6	4.4
2,001- 4,000	23	17.0
4,001 - 6,000	29	21.5
6,001- 8,000	24	17.8
8,001- 10,000	14	10.4
10,001-12,000	13	9.6
12,001-14,000	12	8.9
> 14,000	14	10.4
Total	135	100.0

3.3.1 Trend of Orange Production in Muheza District

Findings from the available reports (URT, 2008; URT, 2010), revealed that orange production from year 2004 to 2010 increased from 61,020 tonnes to 79,830 tonnes. This is an increase of 18,360 tonnes from 2004 to 2010. This is probably due to increase in number of farmers and acreage under orange production coupled with adoption of best agricultural practices among farmers. Also, the rise in orange production is probably mainly due to good weather (rainfall) and an increase in citrus trees bearing citrus fruits. Table 4 shows the level of citrus fruit production since 2004 to 2010.

Table 4: Trend of Orange Production in Muheza District

Year	Production (Tonnes)	Source
2004	61,020	URT (2008)
2005	63,000	URT (2008)
2006	67,250	URT (2010)
2007	68,500	URT (2010)
2008	69,500	URT (2010)
2009	70,500	URT (2010)
2010	79,380	URT (2010)

3.4 Income from Orange Production

The findings in Table 5 revealed that average annual income from orange production is TZS 3,840,229. Also, findings showed that the majority(37.8%) of the respondents having the annual income below TZS 2,000,000 and very few (0.7%) having annual income between TZS 10,000,001 to TZS 12,000,000 and 4.4% of the respondents had annual income above TZS 12,000,000. The mean income obtained from this study is higher compared with that reported by URT (2015) which is TZS 2,652,512. Furthermore, the report by URT (2015) classified income earned from oranges by farmers in Tanga region into four categories. These categories are as follows: - very poor (TZS 1,427,000 - 1,827,000), poor (TZS 2,120 - 2,560,000), middle (TZS

2,727,000 – 3,127,000) and better off (4,273,000 – 4,673,000). Therefore, in connection to findings in Table 5, it portrays that most farmers in study area falls in income categories of better off and middle.

3.5 Other Sources of Household Income among Orange Producers

All other incomes which do not fall under orange production grouped under other sources of income. In this study, salaries/wages considered to include income from both public and private sectors. On the other hand, petty business as a source of income encompassing all benefits accruing from different types of business owned by the household such as shops and kiosks, salon or restaurants. Findings in Table 6 shows the average income earned from other sources apart from orange production. Furthermore, findings revealed that income from salaries/wages constituted the highest share (TZS 3,469,600) followed by petty business (TZS 1,297,381), income from livestock production (TZS 1,173,281) and finally other crops (TZS 1,158,988).

Table 5: Income from orange production

Income from orange (TZS)	Frequency	Percentage
Mean		
3,840,229		
Income categories		
< 2,000,000	51	37.8
2,000,000 – 4,000,000	40	29.6
4,000,001 – 6,000,000	22	16.3
6,000,001 – 8,000,000	13	9.6
8,000,001 – 10,000,000	2	1.5
10,000,001 >	7	5.1
Total	135	100

Table 6: Average annual income earned from other sources apart from orange production

Source of income	N	Minimum	Maximum	Mean
Livestock production	44	60,000	10,800,000	1,173,281
Salaries/wages	15	400,000	7,680,000	3,469,600
Other crops	89	72,000	7,200,000	1,158,988
Petty business	22	200,000	4,800,000	1,297,381

3.6 Contribution Various Sources of Income to the Household Income

Figure 1 shows the contribution of various sources to the household income per year. Income from orange production contributed 35% to the total household income while income from salary/wages, petty business, livestock production and other crops contributed 32%, 12%, 11% and 10%, respectively. These findings are contrary with URT (2015) which reported that in average oranges contributed about 47% of annual household income. Also, URT (2015) reported that income from oranges contributed 37%, 41%, 50% and 72% for very poor, poor, middle and better off households, respectively in Tanga region. Additionally, URT (2015) stated that while poorer and some middle households forced to accept the purchase price offered by middlemen in

exchange for credit prior to harvest (around TZS 16 per orange throughout the year), better off households can wait and sell their oranges on more favourable terms post-harvest. Moreover by providing their own transport to markets or working with local brokers, wealthier farmers receive close to TZS 20 or more per orange, the higher price point increasing the value of this crop for the better off farmers. Furthermore, findings depicts that agricultural income contribute to 56% of total household income. This concurs with Davis *et al.* (2017); they reported that all the countries from Sub-Saharan Africa in the sample earn at least 55 percent of their income from agricultural sources. Conversely, Angelsen *et al.* (2014) in their global study reported that in Africa farm income (i.e. from crops and livestock farming) contribute 43.9% of total household income. Additionally, they reported that wage and business contributes 10.7% and 10.6 %, respectively. Furthermore, in this study findings revealed that shares of income from crop production and non-farm activities in total household income are 45% and 34%, respectively (Fig 1). However, these are higher than that of BIRTHAL *et al.* (2014) who reported that crop production and non-farm activities accounts 41.1% and 24.4% of total household income in India, respectively.

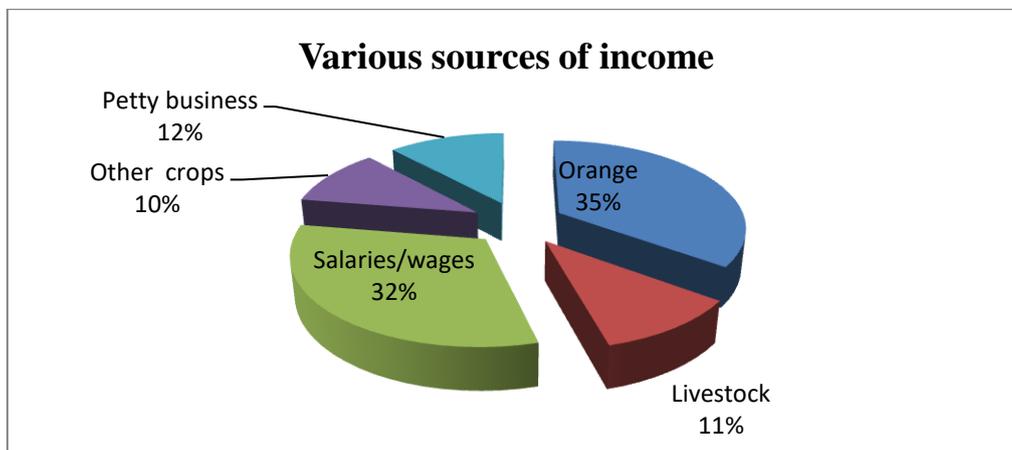


Figure 1: Contribution of various sources of income to total household income

3.7 Relationship between Total Household Income and Income from Other Sources

Table 7 depict result of relationships between the total household income of the respondents as a dependent variable and household income from various sources (orange production, livestock, employment, other crops and business) as independent variables. The results revealed that annual household income was significantly correlated with income from orange production ($r = 0.9431$, $P = 0.0000$), livestock ($r = 0.1988$, $P = 0.0208$), other crops ($r = 0.2451$, $P = 0.0095$) and income from salaries/wages ($r = 0.4552$, $P = 0.0000$). But income from petty business was not significant ($r = 0.0528$, $P = 0.5430$). In India, Brithal *et al.* (2014) found that non-farm income positively correlated with total income, while income from wages, livestock and crop production were negatively correlated with total household income.

Table 7: Results of the Pearson's Correlation Analysis

Source of income	Correlation Coefficient
Orange production	0.9431***
Livestock production	0.1988*
Salaries/ wages	0.4552***
Other crops	0.2451**
Petty businesses	0.0528

*** Significant at $P < 0.001$, ** significant at $P < 0.01$, * Significant at $P < 0.05$

4.0 CONCLUSION AND RECOMMENDATIONS

The study concludes that income from orange production has mostly contributed to annual household income compare to other sources such as livestock production, other cash crops, salary/ wages and business. Furthermore, annual household income was significantly correlated with income from orange production, salaries/wages, livestock production and other crops.

The study therefore makes the following recommendations;

- Since orange production contributed significantly in household income, there is a need for the government and others stakeholders to put down strategies to increase orange production in the area. This can be done by emphasizing the optimal application of agricultural inputs including fertilizers, pesticide and insecticide.
- Also, efforts should be made to encourage the farmers' plant new trees to replace the ones that are old and cannot produce much and those that are dead.
- Government should employ more extension officers and provide them with adequate working facilities. This will enable efficient transfer of technologies in relation to orange production and hence will reduce the tendency of poor farming practices and will probably increase production levels; consequently, led to higher income earned from oranges production to most farmers.

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