The Role of Avocado Production and Trade in Major Producing Districts, Tanzania: Income Inequality Decomposition Approach

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Abstract

This paper investigates whether the production of avocado for the export trade is an income inequality decreasing source of livelihood of producers in Tanzania or not using the evidence from the Hai and Rungwe districts. Data were collected using a semi-structured questionnaire from avocado producers in the study areas. The Gini decomposition technique was employed to analyse the nature and source of income inequality amongst the avocado producers in the study areas. The results of the analysis showed that, on average 34% of the total household income was derived from production of avocados for export. The Gini decomposition analysis revealed an income inequality index of 0.748 for the pooled sample. The Gini index for avocado production was 0.537. The study also showed that avocado production for export trade was the increasing source of income inequality in the study areas with a relative concentration of 0.794 and 0.9944 in gini decomposition and coefficient of variation respectively. Gini decomposition and coefficient of variation reveal salary to be the most inequality-increasing source of income in the study areas. The production of avocados for exportation provides not only additional income but also improves the living standards of smallholder farmers, and it narrows their income gaps. We recommend the promotion and scaling up of the production of avocados as one of the key economic activities that would help tackle the problem of income inequality in rural areas suitable for the production of Hass avocadoes for export in the country.

Keywords

Avocado, Tanzania, Exportation Trade, Income Inequality,

Gini Decomposition, Cofficient of Variation

1. Introduction

Measuring income inequality is important for policy issues as they have undesirable effects on economic development (OECD, 2015). Higher income inequality results in lower aggregate demand as higher income people have lower propensity to consume than lower income groups (Saini & Kaur, 2022). The lower-income households find it difficult to remain healthy and hoard physical and human capital which, in turn, affects growth (Galor & Omer, 2004) and they find it difficult to live good life (Silber, 2020).

Nevertheless, income inequality is considered the best visible manifestation of living standards within society. It prevails within a society in different ways, especially in the distribution of the economy, like the way in which the wealth, payment, and income are divided among its population (Rani & Furrer, 2016). Empirical studies show that economic growth varies inversely with the poverty rate, but when income inequality increases, poverty increases too, causing political instability (Pieters, 2010). Excessive income inequality can erode social cohesion, lead to political polarization, and lower economic growth. It hurts economic growth in the long run (Alesina & Perotti, 1996; Keefer & Knack, 2002; Young, 2019; Aboyade, 1978; Fajana, 1985; Deininger & Squire 1996; Rossana & Hoeven, 2001). As a result, reducing poverty and income inequality has become a popular public policy among development agencies and exploring its nature and causes has attracted the attention of many economic growth scholars (Rao, 1969; Fei et al., 1978; Pyatt et al., 1980; Lerman & Yitzhaki, 1985).

It should be noted here that absolute poverty and excessive inequality, make households and individuals find it challenging to choose income-generating activities because all the prices and non-incentives always influence the choice and diversification of activities (Muriithi & Kabubo, 2022). However, as argued elsewhere in the literature income diversification is not a means to an end. It is therefore imperative to realise and observe the nature and all the patterns of an income inequality resulting from income distribution and their impact on the living standards of people. It is also important to note that supporting the eradication of poverty and income inequality often offers different benefits because it is not always possible that each individual or household will have an equal chance to access the more lucrative diversification options (Reardon et al., 2006; Galor & Zera, 1993).

As much as agriculture continues to be the main source of livelihood of the rural poor in most developing countries addressing the issues of poverty and income inequality remains important.

In Tanzania for example, agriculture, though dominated by smallholder farmers, is considered the backbone of the country's economy (URT, 2021) and a main driver of economic growth, contributing nearly a third of the GDP or USD

13.9 billion and 65% of raw materials for the industry (Suleiman, 2018). According to the UN's World Food Program (WFP, 2012) and the World Bank (World Bank, 2015) agriculture in Tanzania provides over 30% of all exports, serves as livelihood to over 65% of the population and accounts for about 75% of the incomes of rural households.

Avocado is one of the horticultural crops grown in the country and has recently emerged as one of the most exported fruits in the country, followed by mango (REPOA, 2018). With good management of the Africado and Rungwe Avocado Company (RAC) in the Kilimanjaro and Mbeya regions respectively, the production of avocado for export looks like a promising economic activity in these regions, particularly in Hai and Rungwe Districts respectively (Juma et al., 2019; Mwakalinga, 2014) and it stands as a better undertaking for smallholder farmers in these areas to enormously from avocados. Africado and Rungwe avocado companies in these areas have supported over 6000 smallholder avocado growers by providing them with seedling inputs, advice, and transport of the avocados from their farms, and purchasing the avocado fruits for export (Juma et al., 2019).

While the production of avocados for exportation seems an economically promising enterprise, little is known about its role in poverty and income inequality reduction, especially in the study areas (Hai and Rungwe Districts in Tanzania). This understanding is important to inform policies and make plausible decisions and interventions to combat poverty and income inequality among smallholder farmers, at least in the context of avocado-producing areas in the country. To the best of our understanding, most of the previous studies on avocado production have acknowledged that the crop is emerging as a trade crop from the horticulture industry (e.g. Juma et al., 2019; Mwakalinga, 2014; Radha & Mathew, 2007). Many have also investigated the reasons for the increasing demand and consumption of avocado fruits (Kelly, undated; Hancock, 2017; Shahbandeh, 2018). However, the role of avocado production in poverty and income inequality reduction has remained unresearched, at least amongst the agrarian farming systems in developing countries, like Tanzania. Based on this understanding, we conducted a study in Hai and Rungwe Districts in Tanzania to investigate the potential of avocado farming as an income inequality-reducing source of income in these districts.

2. Theoretical and Empirical Review

In the Oxford Dictionary of Economics, inequality is defined as "the differences in the distribution of financial stocks or flows among economic agents." It is important to distinguish between wealth inequality and income inequality. The former, wealth inequality, refers to the distribution of the stock of wealth, whereas the latter, income inequality, refers to the distribution of the flow of income (Black et al., 2012). Inequality is broadly defined as the unequal rewards or opportunities for different individuals within a group or a society (Dabla-Norris

et al., 2015). History shows that the concentration of wealth in the hands of the already wealthy majority can influence social unrest (Acemoglu & Robinson, 2001). Explaining the classical theory of income inequality, Stiglitz (1969), argued that there is a positive correlation between inequality and economic growth.

Our study on the role of avocado production in reducing poverty and income inequality is founded on two main economic theories namely; the "economic man" theory and the "wealth distribution" theory. On the one hand, the "economic man" theory is a fundamental principle of economics that states that individuals are rational and always act in their best interests. In other words, people make financial decisions based on what they believe will result in the most significant benefit for them. On the other hand, this theory asserts that "it is the market organization which compels its participants to seek material self-gain" (i.e. everyone must sell something of market value to acquire the material means of existence (Dalton, 1961). According to Dalton (1961), the "economic man" is therefore a succinct expression of the necessity for each atomistic unit in an impersonal, market exchange system to acquire his or her livelihood through market sale. In economics, the "wealth distribution" theory refers to the systematic attempt to account for the sharing of income among the owners of the factors of production—land, labour, and capital (Pen et al., 2016). Thus, in the context of avocado production, as an emerging opportunity for smallholder farmers in Tanzania, It was, therefore, important to study how the costs of these factors and the size of their return (i.e. rent, wages, and profits) were spread throughout the production horizon to inform decision making.

In addition, it was important to investigate whether avocado production was an income inequality-decreasing or increasing source of income because increasing income inequality may lower human capital by diminishing the livelihood of human beings and causing financial instability (Shaw & McKay, 1969; Fishman & Simhon, 2002; Kumhof & Ranciére, 2010). Thus, understanding the nature and causes of income inequalities in rural areas has continued to be one of the key areas of research, though the vast literature does not provide a unified consensus, especially regarding the relationship between, either farm or non-farm income generating activities, and income inequality.

For example, Kadigi (2021) investigate the nature and determinants of income inequality in the agroforestry systems of Uluguru Mountains in Tanzania. He used the cross-sectional research design and calculated the income percentile shares, Gini coefficients and the coefficient of variation (CV), to pinpoint the nature of income inequality in the study area. He analysed the determinants of income inequality using the step by step multiple linear model and found crop production to be the main source of income in the study area but, the earnings from crops and timber were decreasing income-inequality amongst the smallholder farmers. Similarly, the study by Babatunde (2008) in Nigeria showed that farm income decreased income inequality while non-farm income increases in-

come inequality.

However, the study by Demie and Zeray (2015) in eastern Ethiopiafound farm income to be inequality-increasing and non-farm income decreased income inequality. Equally important, the study by Awoyemi and Adeoti (2004) in Nigeria also found agriculture to account for the largest share of the total inequality, followed by wage income sources and self-employment contributes the least.

In a more or less neutral conclusion, Davis et al. (2007) argue that both farm and no-farm income generating activities may decrease or increase rural income inequality depending on the existing circumstances. They further add that in land-rich and labour-poor situations (such as parts of Africa), for instance, agricultural income is inequality reducing and rural non-farm income inequality increasing, while in land-poor and labour-rich situations (e.g. parts of Latin America or Asia), agricultural income is inequality-increasing and rural non-farm income inequality decreasing (Adams, 2001).

But what causes inequalities? Many things but scholars like Stiglitz (1969) attribute it to an upsurge of aggregate savings and investment which in turn leads to the promotion of economic growth and increased inequality. In fact, there are also many scholars who consistently show that rural non-farm may, in fact, increase income inequality (Elbers & Lanjouw, 2001; Adams, 2001; Burgess, 1997; Reardon & Taylor, 1996; Collier et al., 1986).

More important perhaps, in the context of rural economies in developing countries is the diversification of income sources which is considered as an effective way to enhance household well-being (Kadigi, 2022; Kadigi et al., 2022). In this discouse, both farm and non-farm income-generating activities, combined together, play an important role in the welfare and livelihood of individual rural farmers, especially so in terms of combating absolute poverty (Sultana et al., 2015; Iraoya & Isinika 2022; Haggblade et al., 2002).

In our study, we used the Gini decomposition and Gini index to estimate the share of each income in total income inequality. These metrics are widely used in poverty and income inequality studies and illustrations. Shao (2021) for example, illustrates how to use a matrix structure of the Gini index in a setting of multiple source income and decomposing income inequality using several data sets, including a sample of European aggregated income reporting in 2014. Shao (2021) also employed the Gini index and Gini decomposition methods to identify the impact of various income sources on the income inequality.

Their results revealed that income inequality of forestry-reliant households was primarily affected by both forest and non-forest income and Income quintiles. In Indonesia, Wicaksono et al. (2017) used a regression-based inequality decomposition approach to determine the main sources of inequality. They used three waves of household survey data which represented the data for the years 2000, 2007, and 2014 and they found education, wealth, and the employment sectors to be the main determinants of income inequality.

In Vietnam, Tuyen (2016) analyzed the sources of income inequality among ethnic minorities in the Northwest region which was the poorest and highest inequality region in the country. Using an analysis of Gini decomposition by income source, He found that while agricultural income, especially crop income, significantly decreased income inequality, off-farm income sources (wage and non-farm self-employment incomes) were found to increase inequality. He attributed this to agricultural income being more equally distributed and the main income source for most poor households. Off-farm income sources were more unequally distributed and disproportionately toward the better-off. His findings supported the assertion that income diversification in non-farm activities results in either greater inequality if opportunities for these activities are skewed toward the better-off or less inequality if such opportunities are accessible to the poorer part of the population.

3. Methodology

3.1. Data Collection, Sampling Procedure, and Sample Size

This paper is based on data gathered from a sample of 120 smallholder farmers in Tanzania who produced avocados for exportation. The study applied a multistage sampling method comprising four main stages. The first stage entailed the purposeful sampling of two regions in the country that produced Hass avocado for exportation (i.e. Kilimanjaro and Mbeya). The second stage involved the selection of districts (one district from each region) which were chosen based on three main criteria namely the quantity of Hass avocado produced; the number of out-growers engaged in the production of the crop; and the existence of companies that buy Hass avocado from out-growers and export it overseas. The third stage entailed a random selection of sample wards based on their importance in producing avocados for exports (Hass avocado). The fourth and last stage involved randomly selection of smallholder avocado producers in selected wards (three wards in Hai district, and four wards in Rungwe district were chosen).

The determination of sample size (S) for the study took into consideration the proportions of avocado producers in the study districts, including resource availability such as the time which was available for the accomplishment of the study (Chander, 2017). In total, 120 smallholders were selected (48 in Hai and 72 in Rungwe district) understanding that, in any case, a minimum of 30 respondents in each district was reasonable to make statistical inferences from the study (Altunışık et al. 2004).

Primary data were collected through interviews using a semi-structured questionnaire administered to all the sample avocado producers with the help of the Android application GeoODK. Smallholder avocado producers were asked about all of their sources of income in the household, investment costs, operating costs, and the revenue or gross income earned from each source.

3.2. Data Analysis

Data were analysed using SPSS V 25 software packages and Microsoft Excel. The analysis involved mainly descriptive statistics, including the average investment and operating costs, and the mean household income from each source of income. In addition, the Gini decomposition and coefficient of variation were used to assess whether avocado production and other household income sources were inequality decreasing or not.

3.2.1. Gini Decomposition

The decomposition of the Gini coefficient by income sources was suggested early by Rao (1969), followed by the contributions of (Fei et al., 1978; Pyatt et al., 1980; Lerman & Yitzhaki, 1985). The objective of the decomposition is to explain total income inequality in terms of the underlying income sources (Senadza, 2011; Balde et al., 2014). Thus, the contribution of an income source to absolute income inequality has been of particular interest in the decomposition (Birthal et al., 2014).

1) Share of income source to the total income

Assuming S_k is the income share to the total income or the ratio of the sample mean of income from source k, then, the mean household income can be expressed as in Equation (1).

$$\mu_1 = \frac{\mu_k}{\mu} \tag{1}$$

where; μ denotes the mean household income, and μ_k is the sample mean of income from source k.

2) Gini coefficient of income source

The Gini coefficient is then expressed as in Equation (2).

$$G_k = \frac{2Cov\left[Y_k, F(Y)\right]}{\mu} \tag{2}$$

where; μ, as previously defined, denotes the mean household income of the sample, and $F(Y)$ is the cumulative distribution of total household income in the model.

3) Gini coefficient of the total income

The Gini coefficient of the total income can be calculated using Equation (3).

$$G = \sum_{k=1}^{k} R_k G_k S_k \tag{3}$$

where; S_k, as previously defined, is the share of source k of income in total group income, G_k is the Gini coefficient measuring the inequality distribution of income component k within the group, and R_k is the Gini correlation of income source k.

4) Gini correlation

Gini correlation (R) has properties similar to Pearson's correlation: its value ranges between −1 and +1 but will take on more extreme values than Pearson's. A monotonically increasing (decreasing) function will yield a +1 (−1) value. Thus, R will equal 1 (−1) when an income source is the total income's increasing (decreasing) function. When the income source is constant, R equals 0, implying

that the source's share of Gini is 0. The Gini correlation between income component k and total income can therefore be expressed as in Equation (4).

$$R_k = \frac{Cov\left[Y_k, F(Y)\right]}{Cov\left[Y_k, F(Y_k)\right]} \tag{4}$$

5) The relative concentration of income source to the overall inequality

The relative concentration of income source to overall inequality is also called the Pseudo Gini coefficient and can be expressed as in Equation (5).

$$g_k = \frac{G_k R_k}{G} \tag{5}$$

where; G_k is the Gini coefficient of income source k, R_k is the correlation coefficient of income source k, and G is the Gini coefficient of total income.

6) Relative marginal percentage change in income source upon overall inequality

The relative marginal percentage change in income upon overall inequality can be calculated using the formula expressed in Equation (6), which gives the effect of an increase of 1% of income source k, to the overall inequality. The importance of examining marginal effects has also been stressed by Jurkatis and Strehl (2014). They also argues that policymakers can affect income sources only at the margin and, therefore, it is more important to know how marginal changes in income sources affect total income inequality than just to understand the proportional contributions of income sources. Reviewing decompositions of different inequality indices by income sources, Kimhi (2011) argues that marginal effects are more robust across decompositions of other inequality indices than proportional contributions.

$$\frac{\partial_G / \partial \sigma_k}{G} = \frac{S_k G_k R_k}{G} - S_k \tag{6}$$

where; S_k, G_k, k, R_k and G areas defined previously.

7) The inequality weight factor

The inequality weight factor of the income source, W_k, is expressed as the summation of the product of the pseudo-Gini coefficient of income source k and the share of the income k as in Equation (7) The total inequality weight factor of all sources of income is 1% or 100%.

$$W_k = \sum_{k=1}^{k} S_k g_k \tag{7}$$

where; g_k, as defined previously, is the relative concentration of income source to overall inequality or the Pseudo Gini coefficient.

3.2.2. Coefficient of Variation

The coefficient of variation is widely used as a measure of income inequality since it measures the variability relative to means and independent of the level of income and compares diversity between different sources of income (Agresti & Agresti, 1978). The coefficient of variation decomposes total household income

into major categories of income. Corresponding to the coefficient of variation the formulae presented in Equation (8) and Equation (9) are applied.

$$\sum w_i c_1 = w_1 = \frac{\mu_i}{\mu} \tag{8}$$

where $w_i c_1$ is the inequality weight factor of the i-th source of income in overall inequality, μ_i is the mean income of the i-th source, c_i is the relative concentration of the i-thsource to overall inequality, ρ_i is the correlation coefficient between the i-th source and the total income and σ is the is the covariance involving the i-th income source.

$$c_i = \rho_i \left[\frac{\sigma_i / \mu_i}{\sigma / \mu} \right] \tag{9}$$

4. Results and Discussion

4.1. Household Income Distribution

Table 1 summarizes the contribution of various sources of household income in the study areas. Avocado production contributed 34.04% to the total revenue, and poultry keeping contributed only 2.17% to the total income. Poultry keeping is more diverse than the others because of the slightest standard deviation of 360 563.62 because the study had the smallest number of respondents who generated income through poultry keeping.

Avocado production for the exportation trade was the main source of income for all smallholder farmers who engaged in production of avocado for the exportation trade followed by business. The contribution of income from cattle, goat and sheep keeping was the lowest averaging only 2.7% of the total household income. The contributions of income from poultry, as well as cattle, goat and sheep keeping were the lowest, averaging only at about TZS 137,125 and

Table 1. Household total income per source for the pooled sample ($n = 120$).

Source of income	n	Mean	STD	Percent share
Avocados	120	2,167,980	3,906,699	34.40
Piggery	20	237,279	613,715	3.77
Cattle, Goats and sheep	24	173,085	508,602	2.74
Cereal and legumes	39	416,625	1,446,335	6.61
Poultry	23	137,125	360,564	2.17
Horticulture (excluding avocado)	47	357,667	571,781	5.68
Salary	29	1,407,168	5,012,558	21.08
Business	61	983,509	1,686,975	14.70
Remittance	29	567,009	1,378,618	8.85
Total				**100**

TZS 173,085, respectively.

4.2. Income Inequality by Gini Decomposition and Coefficient of Variation

The results of the analysis of income inequality using the Coefficient of variation (CV) for the pooled sample are presented in Table 2. Avocado production for exportation increased inequality to overall sources of income with a relative concentration close to one (i.e. $c = 0.994444$). Furthermore the results in gini decomposition show the avocado production is not the most increasing source of income inequlity with ($g_k = 0.794$) which is approximated closely to one.

Poultry, as well as cattle, goat, and sheep keeping, were the most inequality-decreasing sources of income to the total household income with a relative concentration of less than one i.e. $c = -0.22611$) and (i.e. $c = -0.00343$) respecively. The results support the claim of George et al. (2018) that the production of avocados can support and boost the livelihood of smallholder avocado producers. The results also reveal salary is the most income disparity with high relative conceetration (i.e. $c = 2.307805$), this claim supported by Zambia (2017) where wage income revealed to be the primary contributor in income inequality compared to other sources of income.

Table 2. Income inequality by coefficient of variation.

Source of Income	μ	$w_1 = \frac{\mu_k}{\mu}$	$corr(\rho) = correl(y_1\ y)$	$Sdev(\sigma)$	$c_i = \rho_i * \frac{\sigma_i/\mu_i}{\sigma/\mu}$	$w_1 c_1$
Avocado	2,167,980	0.340401	0.607483	3,906,699	0.994444	0.33851
Piggery	237279.2	0.037256	0.108064	613714.6	0.25391	0.00946
Cattle, Goats & Sheep	173084.8	0.027177	−0.00129	508601.8	−0.00343	−9.3E−05
Cereal and legumes	416,625	0.065416	0.154135	1,446,335	0.48609	0.031798
Poultry keeping	137,125	0.02153	−0.09466	360563.7	−0.22611	−0.00487
Horticulture (excluding avocados)	357666.7	0.056158	0.201119	571781.4	0.292076	0.016403
Salary	1,407,168	0.220944	0.713171	5,012,558	2.307805	0.509895
Business	983508.8	0.154424	0.346287	1,686,975	0.539582	0.083324
Remittance	567009.3	0.089028	0.124291	1,378,618	0.274528	0.024441
Total	6,368,899	1	1	7,010,883	1	1

μ, μ_k = Mean income of the i-th source of income; $w_1 = \mu_k/\mu$ = the ratio of the mean income from i-th source to the total mean income; $corr(\rho)$ = Correlation coefficient of the i-th source of income to the total income; $Sdev(\sigma)$ = Covariance in-

volving thei-th source of income; c_i = the relative concentration of thei-th source of income in overall inequality; $w_1 c_1$ = the factor inequality weight of the i-th source of income in overall inequality (Table 3).

Table 3. Results of income inequality by Gini decomposition.

Source of Income	$w_1 = \frac{\mu_k}{\mu}$	$\frac{2Cov[Y_k, F(Y)]}{\mu}$	$\frac{Cov[Y_k, F(Y)]}{Cov[Y_k, F(Y_k)]}$	$S_k G_k R_k$	$\mu_k g_k$	$g_k = \frac{G_k R_k}{G}$	$\frac{S_k G_k R_k}{G} - S_k$
Avocado	0.344	0.537	1.105	0.202	0.270	0.794	−0.070
Piggery	0.0376	1.000	0.897	0.034	0.046	1.229	0.009
Cattle, goat & sheeps	0.0274	0.922	1.015	0.025	0.034	1.252	0.007
Cereal and legumes	0.0661	0.687	1.249	0.056	0.075	1.147	0.010
Poultry	0.0218	0.984	0.939	0.020	0.027	1.237	0.005
Horticulture (excluding avocado)	0.0568	0.789	0.845	0.037	0.050	0.891	−0.006
Salary	0.2108	0.804	1.103	0.196	0.262	1.186	0.041
Business	0.1467	0.640	1.000	0.099	0.132	0.856	−0.022
Remittance	0.0885	0.891	0.981	0.078	0.104	1.169	0.015
Total	**1**	**0.748**			**1**		

The Gini coefficient for the total net revenue was 0.748, a value within the range obtained by many developing countries, especially Ghana and Nigeria. The General Gini coefficient was higher than the Gini coefficients of various income components because none of the households derived income from each source of income. The Gini coefficient of 0.748 for the study areas was relatively higher than that of Tanzania as a whole (0.595). It should be noted here that a higher Gini coefficient would indicate greater inequality, with high-income individuals receiving much larger percentages of the total income of the reference population (avocado producers in this case). These results support can be compared with the evidence findings of Demie and Zeray (2015), who show that the income inequality index in rural areas of Eastern Ethiopia was 0.31 with farm income as a whole accounting for as high as 82%, while nonfarm income accounting for only 19% of total inequality in the region. The research also showed that while non-farm income was inequality-decreasing, farm income was inequality-increasing in the study area.

Moreover, our research results show that avocado production for exportation contributed 34.40% to the total household income, which can be considered as a relatively high contribution to the total household income was more equally distributed ($G_k = 0.537$) than any of the other income sources in the study areas. Our results were however contrary to the finding of Demie and Zeray (2015) who found that income from perennial crops was un-equally distributed. However, our results support the findings of George et al. (2018) who showed that income

from avocado production standardise household income and support livelihood. This implies that smallholder avocado producers earn good revenue from avocado production.

Furthermore, the Gini decomposition results at source of elasticity to the total income suggest that a 10% increase in income from avocado production would lead to a decrease of 0.07 in income inequality (i.e. $\frac{\partial_G/\partial\sigma_k}{G} = 0.7$). This closely supports the findings of Tura and Aseefa (2017), which showed that a unit increase in farm income, would lower the Gini income inequality by 0.0111. Thus, the key implication from our findings is that the increase in avocado production would result in more standardisation of income inequality from avocado production and thus contribute more to poverty reduction.

5. Conclusion and Recommendation

The increase in income inequality and poverty continues to be the most challenging economic problem facing developing countries. In this paper, the data from the Hai and Rungwe districts in Tanzania were used to ascertain whether avocado production for the export market was an income-inequality decreasing source of income for smallholder farmers or not. The results showed that avocados contributed the largest share of income to total household earnings. Our analysis of income inequality resulted in an overall Gini coefficient of 0.748 suggesting that avocado production was an income inequality-decreasing source of income and that the expansion of avocado production would significantly reduce income inequality.

Thus, we underscore the need for promoting and supporting avocado production for the export market in the country, especially in areas where the conditions for growing the crop are suitable. Apart from being an income-inequality source of income, we found the crop to be the major source of income for smallholder producers in the study areas. To enhance their productivity, farmers need more support from the government and other development partners through targeted efforts such as the distribution of improved seedlings, provision of low-interest loans to enable more production, and strengthening of both vertical and horizontal integration in the value chain to enable smallholder farmers and other players in the value chain access more lucrative markets for their avocados.

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Conflicts of Interest

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

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