The Contribution of Smallholders' Livelihood Activities on Income

Inequality and Poverty: Case Study from Rural Tanzania

by Gregor Mager and Anja Faße

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Abstract

In most studies at household level in developing countries, the focus so far has been on reducing poverty in the sense of better wellbeing in rural areas, where smallholder farmers are engaged in a wide range of income sources. The recent literature shows that one aspect has so far been neglected: What is the contribution of different income sources on the changes in poverty and income inequality? Can we identify an income source, which reduces poverty while not increasing inequality? The identification of these pro poor income activities is important for future development projects and policy implications. This paper uses a panel dataset with 786 households over 3 years (2014, 2016, and 2018) at the community level, assessing the contribution of different income sources on the changes in income inequality and poverty. The results show that income from non-farm self-employment next to agriculture is the main driver of reducing poverty constantly, while the results on the effects on inequality are mixed. Future research is important to grasp the effect on inequality in more detail assessing its determinants and causal relationship.

Keywords: Income inequality, Poverty, Rural development, Gini coefficient, Tanzania

1. Introduction

The United Nations recognize poverty, growth and inequality as three main areas for the UN´s 2030 Agenda to envisage a world free of poverty and hunger to ensure sustainable economic growth and human well-being (UN 2015). The focus on inequality in relation to poverty reduction is driven through the assumption that high inequality will not only hamper future growth (Thorbeck 2013; Fosu 2017), but it also reduce the conversion of economic growth into poverty reduction (Ravallion 1997, 2005; Fosu 2017).

The number of people who are living in extreme poverty (less than US$1.90 PPP 2011 per person per day) has fallen from 1.9 billion in 1990 to 689 million in 2017 (World Bank 2020). Although poverty has decreased overall worldwide, Sub-Saharan Africa (SSA) accounts for two-thirds of the global extreme poor population half of them are concentrated in five economies: Nigeria (79 million), the Democratic Republic of Congo (60 million), Tanzania (28 million), Ethiopia (26 million), and Madagascar (20 million) (World Bank 2020). Therefore, poverty is and will be a primarily African phenomenon notwithstanding the poverty rate is expected to decline from 41% in 2015 to 23% by 2030 under the most scenarios (Beegle, Christiaensen 2019; World Bank, 2020). Furthermore, most of the poor (83.5%) live in rural areas (World Bank 2018), generating their income mainly from agricultural production (Nerman 2015).

Economic growth is one of the key components for reducing poverty in the long term (Dollar, Kraay 2002; Fosu 2017). However, reducing poverty should not be considered alone. The distribution of growth and thus inequality need to be taken into account. The relationship between economic growth, poverty reduction, and inequality is of particular interest for rural areas, where poverty is widespread (Manero et al. 2020), but the results are mixed. Studies reveal that economic growth is positively correlated to poverty reduction (Fosu 2017; Dollar,

Kraay 2002). Others show that the growth-poverty relation is not consistent and clear (Deininger, Okidi 2003; Brock, Durlauf 2000; Atkinson, Lugo 2010). Moreover, this relationship is very complex and related to inequality (Son 2003). The gap between rich and poor in SSA remains one of the highest worldwide and recent evidence reveals that inequality is a more substantial challenge in SSA than in any other region of the developing world (Bhorat et al. 2017). According to data from the World Bank, the world´s eight most unequal nations (measured by the Gini coefficient) are located in SSA, but the variation of inequality levels and trends among the African nations are large (Cornia 2017). According to the World Bank´s PovcalNET the highest level of inequality are in South Africa (0.63), Botswana (0.61), and Namibia (0.59), while others such as Tanzania (0.38) or Nigeria (0.35) shows relatively low inequality coefficients.

The theoretical foundation of the connection between poverty and inequality was laid down by the Kuznets curve. It assumes an increase in inequality with simultaneous economic growth up to a peak. The reduction in inequality can then be observed as economic growth continues to rise over time (Kuznets 1955). Empirically the results are more complex. Ravallion (2001) reports from 50 developing countries that the annual poverty reduction is larger in countries with a coincident inequality decline. Other studies reveal that economic growth is an initial point for poverty reduction if income inequality can be held constant (Deininger and Squire 1997; Son and Kakwani 2004; Ravallion, 2005; Bourguignon, 2004; Fosu 2015, 2017).

Beside the complex growth-poverty relationship and the relation to changes in inequality, there is a broad common sense that the two main factors determining different rates of poverty reduction at a given rate of economic growth, are the initial level of income inequality and how inequality changes over time. The higher the initial inequality within a country, the fewer poor people will benefit from economic growth and it becomes less pro-poor growth

(Bourguignon 2004 ; Heshmati 2006; Ravallion 2004 ; Balakrishnan et al. 2013; Klasen 2016).

In general, high initial inequality limits the poverty reduction effect of economic growth, while growing inequality fosters poverty directly for a given level of growth (Fosu 2017). However, inequality is not necessarily negative per se, it is able to set incentives for more labor input or risk-taking (Petersen, Schoff 2016) or can increase intergenerational mobility, thereby having a positive impact on the inequality of opportunities (Lefranc et al. 2008).

To sum up, the challenge is to understand the relationship between growth, poverty reduction, and inequality for producing a development strategy that is able to foster pro-poor or inclusive-growth (Bourguignon 2004). To increase the understanding of the relationships between poverty, growth and inequality, it is important to understand the contribution of different income sources on the changes in welfare and inequality (Azevedo et al. 2012; Heshmati 2004). Using the Shapley decomposition approach of Azevedo et al. (2012) it is possible to decompose the changes in income inequality and poverty into the respective income sources to explore the linkages between economic growth from certain income sources with inequality and reduction of poverty. The overall objective of this paper is to identify the income sources of the rural poor, which have the potential to reduce poverty while not increasing inequality in the community, using primary household level data from Tanzania as an example.

Tanzania is a relevant example where the relationship between economic growth, poverty reduction and inequality is becoming particularly interesting. Tanzania recorded a remarkable economic growth and decline in poverty over the last decades (World Bank 2019). However, Tanzania's success is not without limitations. In recent years, poverty incidences have remained relatively high despite more than a decade of strong and stable economic growth as mentioned above (Arndt et. 2016; Mashindano, Maro 2011). A ten percent increase of the

Gross Domestic Product (GDP) per capita results in a reduction of poverty of only 4.5%, which is low compared to other developing countries (World Bank 2019). The inequality (measured with the Gini coefficient) increased from 0.353 in 1991 to 0.405 in 2017 (PovcalNet). The noteworthy progress in poverty reduction in Tanzania has come to an end. After an 11 percentage point drop in poverty between 2007 and 2011, data from 2017 show stagnation at a poverty headcount of 49%, while the GDP is still growing (World Bank 2020). This mismatch between economic growth and poverty reduction can be explained by inequality (Atkinson, Lugo 2010) because the inequality increased from 0.353 in 1991 to 0.405 in 2017 (PovcalNet). Another point that makes Tanzania interesting for research on inequality is the high share of the rural population (73%), where 80% of the population are smallholder farmers (farm size smaller than of 2.2 hectares) (Rapsomanikis 2015). The livelihood of these individuals depends on agricultural production as their main source of income, but diversification of income generating activities is the norm (Barrett et al. 2001). In addition to that, smallholder farmers are characterized by the high vulnerability to exogenous shocks such as droughts, floods, pests, market fluctuations, etc. (Anderson et al. 2016; Mutabazi et al. 2015).

The existing data on inequality in Tanzania is usually restricted to limited rounds of methodologically different household budget surveys and only a few of them include more than two survey rounds, ignoring trends in inequality and poverty (Maliti 2019). Furthermore, the bulk of the literature on inequality and poverty focuses on macroeconomic studies derived from governmental data (Aktinson, Lugo 2010; Fosu 2017; Ferreira, Ravallion 2008; Thorbecke 2015). Only few studies reveal that inequality in farmer groups can be the main driver of total inequality (Cogneau et al. 2007), but the impact of growth on inequality may vary widely across villages over time (Takane, Gono 2017).

In summary, the relationship between economic growth, poverty and income inequality at the community and household level is still an under-researched topic (Ferreira, Ravallion 2008; Silva 2013). It is important to understand the relationship between poverty, inequality and growth more specifically in order to design more effective policy measures supporting robust growth strategies (Berg, Ostry 2011; Ravallion 2001). Furthermore, there is hardly any literature assessing which income components of smallholders (agriculture, off-farm wage employment, non-farm self-employment, or livestock farming) positively promote growth at household level (and thus the reduction of absolute poverty) and how they influence inequality. So the question arises, are there sources of income that have the potential to reduce poverty at the household level and at the same time not increase inequality in the community? This paper aims to contribute to this research gap. A unique household panel dataset from rural Tanzania is used to answer the question of how the livelihood activities of smallholder farmers affect the poverty and inequality level using the Shapley decomposition of changes in welfare and income inequality.

2. Data and Methodology

2.1 Study Area and Data Collection

The United Republic of Tanzania (URT) shows a human development index (HDI) of 0.528 in 2019 and belongs to the least developed countries in East Africa on position 159 out of 189 in the world. Almost half (49.1%) of the population in Tanzania lives under the poverty line of 2011 PPP USD$ 1.90 per day (UNDP 2020). Tanzania´s Gini coefficient of 0.405 in 2017 is below the SSA average of 0.451 (Bhorat et al. 2016, World Bank 2019). Furthermore, the landscape of Tanzania is very diverse, which leads to very different local conditions with respect to

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climate conditions (Rowhani et al. 2011) and infrastructure (Asfaw et al. 2012). This is also appropriate to the study area (Figure 1).
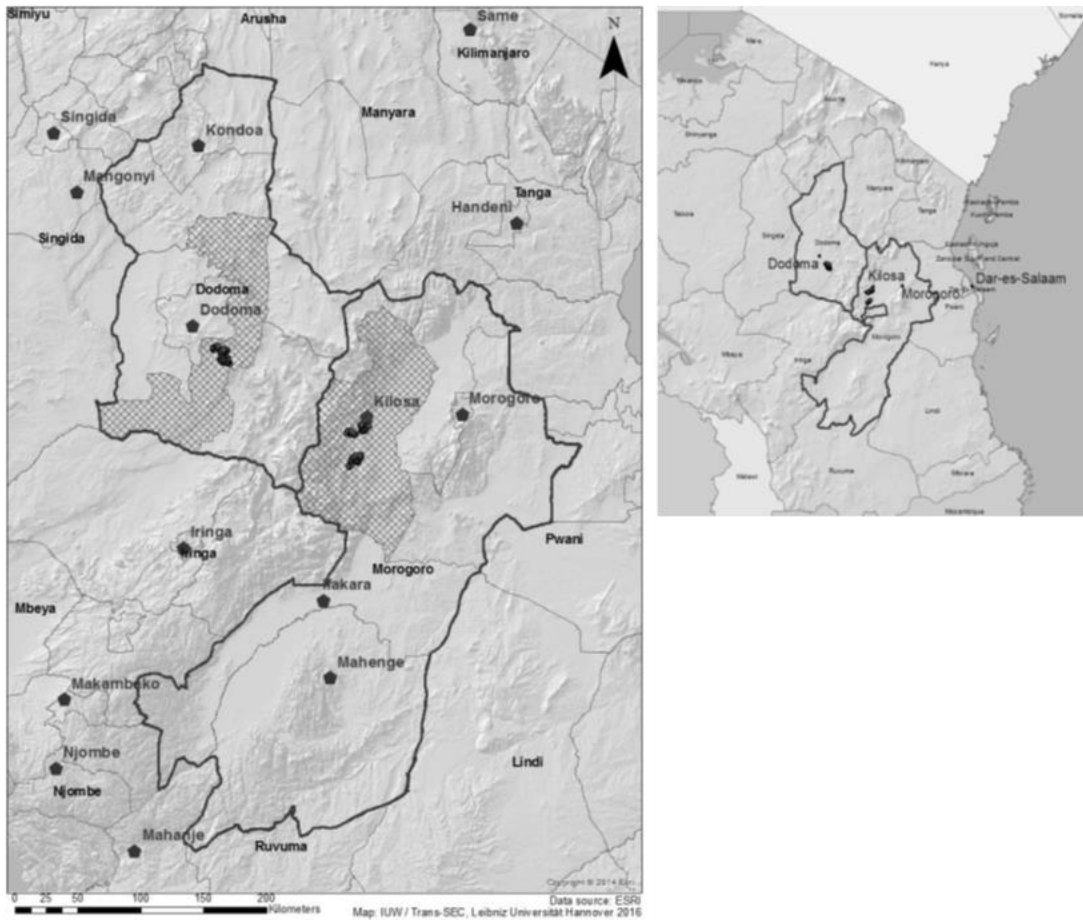

Figure 1: Location of Tanzania and the sample sites. Study sites are located in Kilosa district in Morogoro region and Chamwino district in Dodoma region (dashed area). Source: Own data

The household panel data set used in this paper covers two distinct regions, the Kilosa district in Morogoro region and Chamwino district in Dodoma region. Morogoro characterized by semi humid climate with 600-800 mm annual precipitation and bimodal rain patterns (Graef et al. 2014), which leads to a more diverse agriculture system compared to Dodoma (Mnenwa & Maliti 2010). The crop production is dominated by maize, sorghum, legumes, rice, and horticultural products. Livestock keeping plays a minor role (URT 2007; URT 2015; Mnenwa, Maliti 2010) Furthermore, Morogoro region is closer to the main economic center of Tanzania,

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Dar es Salaam, and to the coast region, which is beneficial for rural farmers due to trading opportunities (Jesse et al. 2020).

Dodoma has a semiarid climate with an annual precipitation rate of 350-500 mm and a unimodal rainfall regime (Mnenwa, Maliti 2010; URT 2015), resulting in a lower agricultural productivity compared to the Morogoro region (URT 2012).

The food system mainly focuses on sorghum, maize, and millet and livestock keeping is widespread. Smallholder farmers in Dodoma are more engaged in livestock keeping compared to Morogoro (URT 2007; Mnenwa, Maliti 2010). Dodoma is characterized by a worse infrastructure compared to Morogoro resulting in a higher isolation of the villages from markets and trading opportunities (Steffens et al. 2020).

The surveys take place in 2013, 2016 and 2018 and covered 786 households interviewed in all three survey rounds. The reference period for each survey refers to the past year. The selection process of the households followed a two-step sampling procedure. In the first step, three villages being representative for the respective district were selected together with local experts (Morogoro, Kilosa district: Changarawe, Ilakala, and Nyali; in Dodoma, Chamwino district: Ilolo, Idifu and Ndebwe) covering 70-80% of the typically farming systems in Tanzania. In the second step, 150 households per village were randomly selected from household lists, proportionally to the village size. So the influence of the various income activities on poverty and inequality could be analyzed, the structured questionnaire included information on all income generating activities as well as consumption, assets and land use.

2.2. Variables of Interests

The portfolio of income generating activities: Income calculation

The household income aggregation was done following the World Bank guidelines and included the following income sources (Johnson et al. 1990): (1) Remittances received from friends and relatives; (2) income from land rent; (3) income from crop production; (4) income from livestock keeping; (5) income from natural resource extraction; (6) income from off-farm wage employment; (7) income from non-farm self-employment; and (8) transfer payments. Income from remittances, land rent, transfer payments accounted for only a very low amount of income, and therefore collapsed to income from "other sources". The final disposable household income was converted from local currency, the Tanzanian Schilling (TZS) to 2011-based purchasing power parity (PPP) United States dollar (US$). The disposable net income was used instead of the gross income because this is the income that households have available to buy goods and services; hence, it is a better measure of living standards than gross income where costs are not reflected (Balestra, Tonkin 2018).

To overcome the problem of negative incomes and the resulting abnormal behavior of the Gini coefficient (Chen et al. 1982), negative values of the respective incomes sources where set to zero before calculating the overall income (OECD 2017; De Battsit et al. 2019; Feng et al. 2006). This only applied to 2.5% of households and does not bias the result (De Battisit et al. 2019). To account for the economies of scale, the adult equivalent scale used by the National Bureau of Statistics of the United Republic of Tanzania and the United Nation Children´s Fund (NBS 2016), which adjusts household's welfare of certain needs based on age and sex of the household member, was used in this paper to increase the comparability of the results.

Measuring Inequality: Gini coefficient

The Gini coefficient, mostly applied for measuring inequality, measures the degree to which a given distribution in a society differs from a perfect equal distribution. It can range from 0 (perfect equality) to 1 (perfect inequality) (Gini 1912; United Nations 2015) and is based on the representation of the Lorenz curve, which plots cumulative income vs. cumulative population. It is calculated as follows:

$$G = cov(y, F(y)) \frac{2}{\bar{y}}$$

where cov is the covariance between the income levels y of and the cumulative distribution of the same income F(y) with the average income of $\bar{y}$.

Shapley decomposition

Azevedo et al. 2012 proposed a non-parametric approach that allows decomposing the changes in welfare and inequality into income sources using the Shapley concept. The Shapley decomposition can be applied to any welfare measure based on the welfare aggregate (disposable income) providing the contribution of each component to the observed change in the indicator (Azevedo et al. 2012).

The measure of inequality θ generated by the function $\phi(.)$ depends on the cumulative density function $F(.)$ in income across the household with respect to the income source y_K. The initial inequality rate is calculated as follows:

$$\theta = \phi(F(Y(y_1, y_2, \dots, y_K)))$$

Following Barros et al. (2006), this method uses the advantage of the additivity property of a welfare aggregate to construct a counterfactual distribution of the welfare aggregate by changing each component at a time to calculate their contribution to the observed changes in poverty and inequality. For instance, assuming the distribution of the welfare aggregate (i.e.

income) for period 0 and period 1 is known and they were calculated using an equation based on their components (i.e. income sources). The counterfactual distribution for period 1 can be calculated by substituting the observed level of a given income source y_K by its observed level for period 0, $\hat{y}_K$, one at a time, until there is a completed change from period 0 to period 1. In the next step, the inequality and poverty measure can be constructed for each counterfactual distribution and those counterfactuals are interpreted as the inequality or poverty level that would have prevailed in the absence of a change in that indicator.

More in detail, to measure the impact of a change in the distribution of income source y_1, $\widehat{\theta_1}$ is computed, where the value for y_1 is substituted by its value in period 0, $\hat{y}_1$:

$$\widehat{\theta_1} = \phi(F(Y(\hat{y}_1, y_2, \dots, y_K)))$$

The resulting effect due to changes in income source *1* is calculated by $\widehat{\theta_1} - \theta$. Similarly, the contribution of each income source to the changes in inequality is measured as follows:

$$\widehat{\theta_K} = \phi(F(Y(\hat{y}_1, \hat{y}_2, \dots, \hat{y}_K))) \qquad \text{Contribution of income source K: } \widehat{\theta_K} - \widehat{\theta_{K-1}}$$

In order to deal with the path-dependency, all potential paths K! were decomposed and the average of the estimates were taken (Shorrocks 2013, Shapley 1953).

The Shapley decomposition is very useful for understanding the driving income sources behind inequality and poverty but is not free of limitations. The decomposition that is claculated by eliminating each factor in succession lacks equilibrium consistency. The results are no longer an economic equilibrium, but rather a result of assuming, ceteris paribus, that it would be possible to change only one factor at time. This would not be a problem if the factors were independent from each other (Azevedo et al. 2013).

Foster-Greer-Thorbeck indicators

The Foster-Greer-Thorbeck indicators (FGT) have become a standard for international evaluations of poverty and the World Bank´s PovalNet and many other countries report them regularly (Foster et al. 2010)based on the following equation:

$$FGT_\alpha = \frac{1}{n}\sum_{i=1}^{q}(\frac{z-y_i}{z})^\alpha,$$

where z is the poverty line, y_i is the ith lowest income (or consumption), n is the total population, q is the number of persons who are poor (those with incomes at or below z), and α ≥ 0 is the "poverty aversion" parameter. If α is low then the FGT metric weights all individuals with income below the poverty line z equally. The higher the value of a gets, the greater the weight place on the poorest individuals and this leads to three different FGT indicators (Foster et al. 1984):

i. $\alpha = 0$, the formula is reduced to $FGT_0 = \frac{q}{n}$, the poverty headcount ratio measuring the proportion of the population that lives below the poverty line in percentage. The FGT_0 is insensitive to differences in the depth and severity of poverty.

ii. $\alpha = 1$, the formula is reduced to $FGT_1 = \frac{1}{n}\sum_{i=1}^{q}(\frac{z-y_i}{z})$, the poverty gap index. FGT_1 measures the depth of poverty. The poverty gap index is the ratio by which the mean income of the poor falls below the poverty line. It provides an indication of the poverty level in percentage between 0 and 100%.

iii. $\alpha = 2$, the formula is $FGT_2 = \frac{1}{n}\sum_{i=1}^{q}(\frac{z-y_i}{z})^2$, the squared poverty gap index. FGT_2 measures the severity of poverty. It weights the poverty gap and gives higher weights on the poorest, indicating a combined measure of poverty and inequality.

3. Results

Poverty and Income Inequality

Table 1 indicates the level of disposable income inequality as well as the incidence, depth and severity of poverty changes from 2014 to 2018. The results show that the poverty headcount fell from 80.53% to 72.53% in Morogoro and in Dodoma from 86.86% to 71.05%, respectively. The poverty gap index and the squared poverty gap index decreased in both regions over time (Morogoro: 48.10% to 37.33%; Dodoma: 34.03% to 22.97%). However, the incidence, depth and severity reduced in both regions over the years but not to the same extent. Dodoma showed higher poverty values in all FGTs in 2014 but the poverty reduction was higher compared to Morogoro leading to lower values in 2018. Regarding inequality, in both regions the values declined from 2014 to 2018 (Morogoro: 0.566 to 0.502; Dodoma: 0.520 to 0.426).

Table 1: Foster-Greer-Thorbeck indicators and the Gini coefficient

Indicator	Morogoro (n=375)			Dodoma (n=411)		
	2014	**2016**	**2018**	**2014**	**2016**	**2018**
FGT(0)	80.53	78.93	72.53	86.86	83.94	71.05
FGT(1)	48.10	45.38	37.33	55.95	49.93	35.06
FGT(2)	34.03	31.24	22.97	40.76	34.34	21.54
Gini coefficient	0.566	0.573	0.502	0.520	0.501	0.426

Source: TransSEC data 2014, 2016, 2018, own calculation. FGT(0) poverty head count ratio (%), FGT(1) poverty gap index (%), FGT(2) squared poverty gap index

Share of the incomes sources on the total income by quintiles

To understand the contribution of the income sources to the changes in inequality and poverty, we evaluate the income generating activities within the overall income quintiles. Figure 2 illustrates the contribution of the income sources on the total income for the first third and fifth quintile.
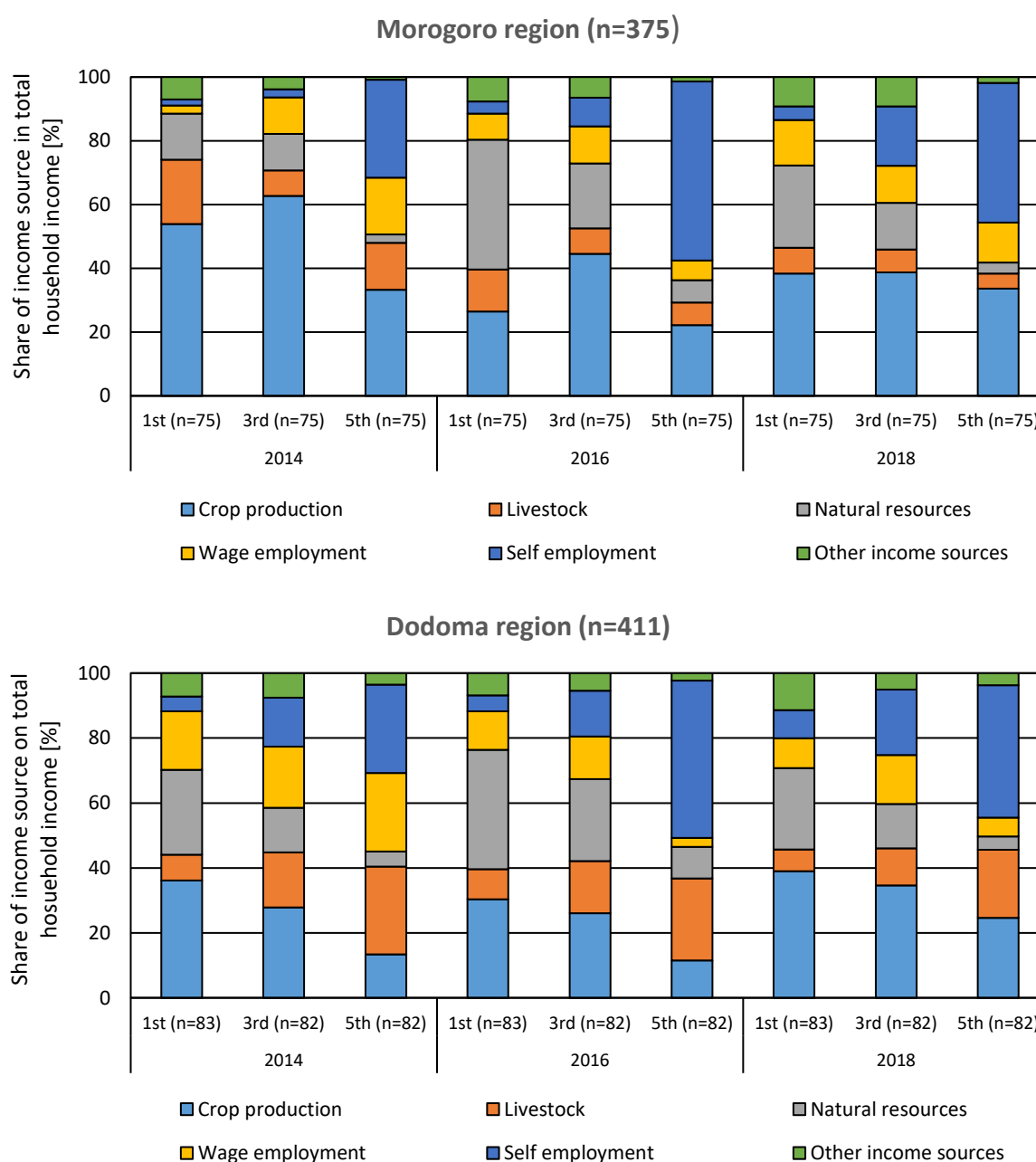

Figure 2: Income from different income sources as a share of total annual household income per adult equivalent (PPP USD 2010) for Morogoro (n=375) and Dodoma (n=411) region by income quintiles

For the most households the main income source is crop production, especially for poor households while it gets less important for the fifth quintile. Furthermore, natural resources are much more important for households in the first quintile where it accounts for almost half of the income compared to household in the upper quintile. Income from non-farm self-employment is particularly important for the high-income households and almost negligible for the poorest. Regional differences can be derived from livestock and wage employment incomes being more important for households in Dodoma than in Morogoro. Interestingly, from 2014 to 2016, we see a tremendous changes in the income patterns of the quintiles. Especially in Morogoro, the shift for the first and third quintile from crop production to natural resource extraction. While crop production is still the main income source for the third quintile, the magnitude is reduced. The households in the fifth quintile were able to increase their income from self-employment to more than half of the overall income. At the same time, income from crop production is becoming less important accounting for 22% of the total income. A reduction in income from crop production can be especially observed for the first and fifth quintiles between 2014 and 2016.

These income patterns also changed from 2016 to 2018. Income from crop production is getting more important again, while natural resource extraction becoming less. Income from self-employment is now the main income sources for the fifth quintiles, even if reduces a bit. The changes between 2014 and 2016 for income from crop production, self-employment and natural resource extraction are following almost the same direction in both regions. This leads to almost equal income patterns within the quintiles in Morogoro and Dodoma in 2018, expected for crop and livestock income for the upper quintiles.

Income sources accounting for the change in disposable income inequality and poverty

In the previous section the share of the different income sources on the total annual household income per adult equivalent were presented. These results are accompanied by an analysis of the contribution of each income source to the change in disposable income inequality (measured by the Gini coefficient) and poverty (measured by the Foster-Greer-Thorbeck indicators) (Table 2).

In Morogoro, the increasing Gini coefficient between 2014 and 2016 is driven by only two income sources, income from crop production and self-employment income. All other income sources have an equalizing effect on the distribution of disposable income. The changes in the Foster-Greer-Thorbeck indicators reveal that all poverty measures were reduced between 2014 and 2016 but the contribution of the income sources differ. Income from crop production and livestock increase poverty by 4.756% and 1.116%. Income from crop production is increasing the poverty headcount by 4.756% and increases the squared poverty gap index by 5.229. Income from self-employment has an unequalizing effect but also contributes most to the reduction of poverty headcount (-3.453%). Income from natural resources reduced the poverty incidence by -2.102 percentage points besides the decline effect on the squared poverty gap index more by -4.112. From 2016 to 2018, all income sources reduced the level of inequality, which leads to equalizing effect on the Gini coefficient by -0.071. Crop production now is not only reducing the inequality but also the poverty within Morogoro, especially for the poorest household in the sample (-3.051). Only income from livestock and natural resources have an increasing effect on the level and severity of poverty. Income from self-employment is still the main driver behind reducing poverty headcount with -3.693 percentage points.

Table 2: Shapley decomposition of the changes in inequality and poverty in disposable annual household income (PPP USD 2011) per adult equivalent by income sources

Morogoro (n=375)	2014 – 2016				2016 – 2018			
Income sources	FGT(0)	FGT(1)	FGT(2)	Gini	FGT(0)	FGT(1)	FGT(2)	Gini
Crop production	4.756	5.533	5.299	0.034	-1.129	-2.514	-3.051	-0.004
Livestock	1.116	0.968	0.847	-0.007	0.444	-0.151	-0.23	-0.009
Natural resources	-2.102	-3.830	-4.112	-0.021	1.373	0.802	0.493	-0.004
Wage employment	-1.329	-1.260	-1.057	-0.032	-2.160	-2.107	-2.226	-0.007
Non-farm self employment	-3.453	-3.007	-2.549	0.042	-3.693	-3.105	-2.419	-0.044
Other income sources	-0.587	-1.124	-1.217	-0.008	-1.236	-0.977	-0.837	-0.004
Total difference	-1.600	-2.721	-2.789	0.007	-6.401	-8.053	-8.270	-0.071

Dodoma (n=411)	2014 – 2016				2016 – 2018			
Income sources	FGT(0)	FGT(1)	FGT(2)	Gini	FGT(0)	FGT(1)	FGT(2)	Gini
Crop production	-0.280	-0.857	-0.820	-0.006	-7.324	-7.968	-6.896	-0.023
Livestock	0.925	0.600	0.298	0.005	-2.721	-1.737	-1.218	-0.011
Natural resources	-2.287	-4.402	-4.808	-0.026	2.186	1.365	0.936	-0.002
Wage employment	3.345	2.983	2.533	-0.016	-1.103	-1.755	-1.357	-0.005
Non-farm self employment	-3.966	-3.703	-3.028	0.030	-3.24	-3.699	-3.092	-0.026
Other income sources	-0.657	-0.642	-0.592	-0.006	-0.693	-1.068	-1.172	-0.007
Total difference	-2.920	-6.022	-6.417	-0.019	-12.895	-14.862	-12.799	-0.074

Income from crop production is increasing the poverty headcount by 4.756% and increases the squared poverty gap index by 5.229. Income from self-employment has an unequalizing effect but also contributes most to the reduction of poverty headcount (-3.453%). Income from natural resources are reducing the poverty incidence by -2.102 percentage points besides the decline effect on the squared poverty gap index more by -4.112. From 2016 to

2018, all income sources have a decreasing effect on the level of inequality, which leads to equalizing effect on the Gini coefficient by -0.071. Crop production now is not only reducing the inequality but also the poverty within Morogoro, especially for the poorest household in the sample (-3.051). Only income from livestock and natural resources have an increasing effect on the level and severity of poverty. Income from self-employment is still the main driver behind reducing poverty headcount with -3.693 percentage points.

The results of the Shapley decomposition in Dodoma differ compared to Morogoro. In the years between 2014 and 2016, the Gini coefficient and poverty decreased. Two income sources had an unequalizing effect of the disposable income in the population, income from livestock and self-employment. Income from wage employment increases poverty the most. Like in Morogoro, income from self-employment has strong positive effect on poverty reduction, not only the percentage of people living below the poverty line but also on the severity (FGT2) of poverty for the poorest. Only income from natural resource extraction has a higher effect on reducing severity of poverty. The strong decrease in all FGT indicators in the years 2016 to 2018 is mainly driven by income from crop production with more than half of the total change. The same income source together with income from self-employment is also responsible for the over half in the reduction of the Gini coefficient. Income from natural resource extraction, which was poverty reducing in the years between 2014 and 2016, has now a poverty increasing character.

To sum up, the two regions differ in the importance of the income sources on poverty reduction and inequality, but these results are also changing over time. It concluded that income from crops production, self-employment, and natural resource extraction has a strong impact on welfare and inequality in both regions, even if the direction in poverty reduction

and inequality are changing between the years. Livestock and income from wage employment plays a more important role in Dodoma in this context.

4. Discussion

Disposable income inequality and poverty

The overall Gini coefficient in our sample varies from 0.566 in Morogoro in the year 2014 to 0.426 in Dodoma in 2018. The Household Budget Survey of National Bureau of Statistics from Tanzania reports for the year 2018 using consumption expenditures a Gini coefficient for rural areas of 0.320 and for Tanzania Mainland of 0.380. The difference in the values can result from two reasons: Tanzania does not report values for rural regions and uses expenditure-based values. The Gini coefficient based on disposable income as used here shows usually higher values and variability than consumption (Hassine, Zeufack 2015). An empirical study by Manero (2017) showed the Gini coefficient for two regions in Tanzania focusing on smallholder farmers ranging from 0.56 to 0.60 using income, and 0.39 to 0.54 using consumption expenditures. Lusambo (2016) focusing on farmers in Morogoro highlighted a Gini coefficient of 0.82.

Regarding the poverty headcount, the values in this study range between 86.86% and 71.05%, whereby the World Bank (2018) reports 49.4% using the poverty line $1.90 a day (2011 PPP). Anderson et al. (2016) analyzing smallholder households in Tanzania calculated a poverty headcount of 85%. Since we wanted to shed light on the relationship of inequality and poverty and their relative changes, the absolute values (although not complete in line with other sources) are not undermining any interpretational power of the results.

The simultaneous decrease in poverty and income inequality shows that the poor are benefiting more from growth than the richer ones, which is a key characteristic of pro-poor

growth (Alinoa 2017). Poverty and income inequality is decreasing in both regions. Dodoma shows a higher reduction of poverty while having a lower initial income inequality. This result supports studies revealing that initial inequality is one key factor converting economic growth into poverty reduction (Ravallion 1997, 2005; Thorbeck, Charumilid 2002; Nel 2006; Bhorat, Naidoo 2017; Fosu 2017). This underscores the misconception that focusing only on economic growth assuming that it will induce also a reduction in poverty can fail if inequality is neglected and high-income households benefit more than the poor.

Household income sources and its relevance

As stated in the results, income from crop production is particularly important (Davis et al. 2010). Agriculture is the main income source especially for poor households, rather than self-employment income (van den Berg, Kumbi 2006), because self-employment requires initial capital to start an own business (Nilsson, Heshmati 2019). Nevertheless, agricultural income is closely related to self-employment activities and can be seen as a necessary precondition (Davis et al. 2017), because high agricultural production implies a higher liquidity, which enables engagement in the non-farm activities (van den Berg, Kumbi 2006).

The poorest households are usually more involved in natural resource extraction (Lopez-Feldman 2014), because it provides several benefits; e.g. a safety net in case of a shortfall in income from other sources or supporting consumption (Angelsen, Wunder 2003). Furthermore, using natural resources usually does not require investments and is free of access restrictions (Baletti, Manda 2015). Livestock is concentrated on the top of the income distribution, supported by Covarrubias et al. (2012), using panel data from rural Tanzania, where income from livestock contributes only 18% to the income of the bottom quintile and 24% to the top quintile. However, the results are mixed, Davis et al. 2007 reveals the other

way around, where livestock´s share of income was highest in the poorest income quintile, promoting the importance for the poor as well. One of the main income source for the top pf the income distribution is self-employment, usually it is restricted to the rich one because initial capital is needed to start own business (Barrett et al. 2001; Ellis, Freeman 2004).

The tremendous changes in the income patterns between 2014 and 2016 can be explained by the effect of "El- Nino" since October 2015 (Mollet, Barelli 2016). Many households in Dodoma and Morogoro region were affected by floods resulting in water-logging of agricultural and pasture land, leading to animal disease and decreasing yields. Many of the affected land areas were totally destructed or reduced the production of crop by up to 41%. Additionally to that, this loss resulted in increasing prices for animal and crops by up to 60% (Mollet, Barelli 2016). Environmental shocks are threaten the livelihoods of poor more than high-income households, forcing them to look for other income alternatives. Evidence shows that weather shocks are associated with decreased yield, food consumption, suffering sales of productive assets resulting in reduction of household´s long-term welfare (Hoddinott 2006; Hoddinott, Kinsey 2001; Gray, Muller 2012; Thiede 2014). Here, natural resources acts like a safety net for poor households engaged in agriculture during periods of stress (Paavola 2008). The choice of a coping activity depends on the intensity with which the household could engage in the activity, as well as the availability of other opportunities (Eriksen et al. 2005). That means a household who is already engaged in self-employment, e.g. running an own shop, is much more easier to increase their afford in this business, while households who are poor and not engaged in self-employment are missing the necessary capital stock to start business (Nilsson, Heshmati 2019; Ellis, Friedman 2004).

From to 2016 to 2018 and with a normalization in the climate conditions, resulting in higher yields, also the income patterns changes. The income from crop production is becoming more

important for the top and bottom 20% of the income distribution, switching back from natural resources and self-employment respectively. It is not surprising if the weather conditions are changing and engagement in crop production is able to generate a sufficient amount of income that the poor households are switching back to crop production instead of the less favored extraction of natural resources. For the households in the upper quintile the shift from self-employment to crop production is not so high meaning the share of crop income is increasing but the self-employment is the main income source. Starting or expanding a business, e.g. running a shop, can become a principle status and will continue after the shock. While a smaller and risky business, e.g. selling cooked products would be typically a complementary coping strategy and will be dropped if shock is overcome (Eriksen et al. 2005). Furthermore, smallholder farmers are enjoy and find great satisfaction in farming, transition away from farming is therefore more by necessity rather than joy (Anderson et al. 2016). Shifting back to farming is therefore a logical follow if crop production is able to ensure a sufficient livelihood. Therefore, it is important to know which self-employment activities are driven by necessity or joy with a direct implication for the inequality level.

These changes in the income patterns has strong implications on the contribution of the different income sources on the changes in the income inequality as well as poverty over time.

Income sources accounting for the change in disposable income inequality and poverty

Income from crop production is the main driver of an increasing poverty incidence, depth and severity in Morogoro due to the fact that the weather shock leads to strong decrease of yields and hence loss of income. The dependence by the poor on crop production is closely related to yields, therefore a loss affects the poor distortional harder than the rich households (Reardon, Taylor 1996), resulting in a poverty support effect. This is particularly evident when

examining the severity of poverty, which emphasize the poorest households in the income distribution. In contrast, the main driver of poverty in Dodoma is livestock and wage employment. The latter is mostly based on simple agricultural activities that tend to be paid less. Livestock is usually taken as long-run insurance in periods of a shortfall in income; especially poor households are selling livestock because of a lack of other opportunities (Reardon, Taylor1996). In contrast to this, income from natural resources and self-employment are decreasing poverty in both regions between 2014 and 2016, assuming the adoption of successful coping activities to overcome the losses resulting by the El Nino effect. The results show that in the study region crop income is reducing the poverty severity more than the incidence of poverty; the opposite effect has income from self-employment. Therefore, crop production is more beneficial for the poorest, while the richer ones are profiting more from self-employment activities, even if the share of self-employment income is decreasing. This can have several reasons, one the one hand, households who are focusing on principle business will continue after recover from shock. On the other hand, households who are focusing on complementary business will drop them after a shock (Reardon, Taylor 1996). The shift away from farming to e.g. non-farm self-employment often necessity driven and not opportunity driven. Most farmers are enjoying farming and find high levels of satisfaction (Anderson et al. 2016), meaning shifting back to what they like, crop production, seems to be a normal behavior, also when there income is reducing.

Although a suitable instrument for reducing poverty, self-employment outside of agriculture increases inequality in both regions. The results of the empirical literature is mixed. Several studies reveal that crop production and self-employment are increasing inequality (Awoyemi, Adeoti 2006; Sharma, Choubey 2016; Gutema 2019), whereby others report an equalizing effect of these both income sources (van den Berg, Kumbi 2006). Self-employment can

decrease inequality if poor households are pushed out of agriculture for example due to an exogenous shock, but if the high-income households are participating more because they have the means to do so, self-employment will increase inequality (van den Berg, Kumbi 2006). The prosperous households are more able to increase or at least to stabilize their income from these sources in case of an exogenous shock.

This raises the question of whether it would be acceptable to accept an increase in inequality in the region while reducing poverty. Specifically, it would mean that self-employment is able to help poor households out of poverty, but the wealthier households are able to increase their income more compared to the poor. Of course, the starting level of both indicators (poverty and inequality) must be taken into account.

5. Conclusion

The main objective of this paper was to describe and assess the contribution of the different income sources on the inequality and poverty of smallholder farmers in rural Tanzania from 2014 to 2018. The results show a reduction of the overall poverty incidence, depth and severity as well as the level of inequality. Dodoma shows a higher reduction in poverty as Morogoro, while having a lower level initial inequality level.

The contribution of the different income sources on poverty reduction and inequality is not consistent over time but indicates an interesting picture. The most important income sources affecting poverty and inequality are income from crop production and non-farm self-employment. The results emphasize that non-farm self-employment increases inequality in one period of time, while decreasing in a further period of time, although a reduction in poverty through these entrepreneurial activities could be shown in both periods. This shows the possibilities that are based on non-farm self-employment. If suitable political and

institutional measures were taken to increase income with a strong pillar on non-farm self-employment next to farming activities while stabilizing or even reducing inequality, this would be a great lever to fuel future growth in developing countries.

Regarding to self-employment income it would be particularly interesting to know why certain households are able to increase their income from this activity while other are not. Self-employment is able to reduce poverty and inequality but only if all households are able to start their own business. Therefore, reducing the entry barriers for farmers starting their own business can decrease poverty and inequality at the same time, another effect is that poor households are not forced any more to extract natural resources maybe in an unsustainable way and hence degrading the natural capital for future generations.

Furthermore, there are two different types of self-employment, principle and complementary, meaning that principle business are able to established themselves as an important source of income while complementary businesses are only done to overcome a temporary shortfall in the overall income. After coping the shock, rich households are reducing their effort in self-employment, showing that they are not focusing only on income generation, rather than satisfaction. Satisfaction is one dimension of entrepreneurship that is neglected in the development context and further research would be necessary.

References

Alinoa, J. (2017). Pro-Poor Growth: Definition, Measurement and Policy Issues. MPRA Paper No. 85397, Munich Personal RePEc Archive.

Anderson, J., Marita, C., Musiime, D. (2016). National Survey and Segmentation of Smallholder Households in Tanzania. Understanding Their Demand for Financial, Agricultural, and Digital Solutions. Working Paper, CGAP.

Angelsen, A., Wunder, S. (2003). Exploring the forest-poverty link: Key concepts, issues and research implications. CIFOR occasional paper 40.

Arndt, C.D., Demery, L., McKay, A., Tarp, F. (2016). Growth and Poverty Reduction in Tanzania. In C. Arndt, A. McKay, & F. Tarp (Eds.), Growth and Poverty in Sub-Saharan Africa. Oxford: Oxford University Press.

Atkinson, A.B. & Lugo, M.A. (2010). Growth, poverty and distribution in Tanzania, IGC (International Growth Centre) Working Paper 10/0831.

Awoyemi, T.T., Adeoti, A. (2006). The decomposition of income inequality by sources of income: the rural Nigerian experience. African Journal of Economic Policy, 11(1), 1-16.

Azevedo, J.P., Sanfelice, V., Nguyen, M.C. (2012). Shapely Decomposition by Components of a Welfare Aggregate. MPRA Paper No. 85584, Munich Personal RePEc Archive.

Azevedo, J.P., Inchauste, G., Olivieri, S., Saavedra, J., Winkler, H. (2013). Is Labor Income Responsible for Poverty Reduction? A Decomposition Approach. Policy Research Working Paper, No. 6414, 38.

Balakrishnan, R., Steinberg, C., Syed, M. (2013). The Elusive Quest for Inclusive Growth: Growth, Poverty, and Inequality in Asia. IMF Working Paper 13/152, International Monetary Fund, Washington.

Balestra, C. & Tonkin, R. (2018). Inequalities in household wealth across OECD countries: Evidence from the OECD Wealth Distribution Database. OECD Statistics Working Papers, No. 2018/01, OECD Publishing, Paris.

Barrett, C.B., Reardon, T., Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. Food Policy 26, 315–331.

Barros, R., Carvalho, M., Franco, S., Mendoisa, R. (2006). Uma Análise das Principais Causas da Queda Recente na Desigualdade de Renda Brasileira. Revista Econômica.,8(1), 117-147.

Beegle, K, & Christiaensen L. (2019). Accelerating Poverty Reduction in Africa. Washington, DC: World Bank.

Berg, A. & Ostry, J. (2011). Inequality and Unsustainable Growth: Two Sides of the Same Coin? IMF Staff Discussion Notes 11/08, International Monetary Fund.

Bhorat, H., Chelwa, G., Naidoo K., Stanwix, B. (2017). Resource dependence and inequality in Africa: Impacts, consequences and potential solutions', in A. Odusola, G. A. Cornia, H. Bhorat, P. Conceição (eds). Income Inequality Trends in sub-Saharan Africa - Divergence, Determinants and Consequences. New York: United Nations Development Programme, 129–152.

Bourguignon, F. (2004): The Poverty-Growth-Inequality Triangle. Washington D.C.: World Bank.

Brock, W.A. & Durlauf S.N. (2000). Growth economics and reality. Working Paper 8041, National Bureau of Economic Research, Cambridge, Massachusetts.

Chen, C.N., Tsaur, T.W., Rhai, T.S. (1982). The Gini coefficient and negative income. Oxford Economic Papers, 34, 473–478.

Cogneau, D., Bossuroy, T., De Vreyer, P., Guénard, C., Hiller, V., Leite, P., Mesplé-Somps, S., Pasquier-Doumer, L., & Torelli, C. (2006). Inequalities and equity in Africa. Working paper DIAL DT 2006/11 and AFD Notes et Documents 31.

Cornia, G.A. (2017). Inequality Levels, Trends and Determinants in sub-Saharan Africa: An overview of main changes since the early 1990s. In A. Odusola, G. A. Cornia,H. Bhorat, P. Conceição (eds). Income Inequality Trends in sub-Saharan Africa - Divergence, Determinants and Consequences. New York: United Nations Development Programme, 129–152

Covarrubias, K., Nsiima, L., Zezza, A. (2012). Livestock and livelihoods in rural Tanzania. A descriptive analysis of the 2009 National Panel Survey. LSMS-ISA, Integrated Surveys on Agriculture.

Davis, B., Winter, P., Carletto, G., Covarrubis, K., Quinones, E.J., Zezza, A., Stamoulis, K., Azzarri, C., Digueseppe, S. (2010). A Cross-Country Comparison of Rural Income Generating Activities. World Development, 38(1), 48-63.

Davis, B., Giuseppe, S., Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. Food Policy, 67, 153-174.

Deininger, K. & Squire, L. (1997). Economic Growth and Income Inequality: Reexamining the Links. Finance & Development, March 1997.

Deininger, K. & Okidi, J. (2003). Growth and Poverty Reduction in Uganda, 1999-2000: Panel Data Evidence. Development Policy Review, 21(4), 481-509.

Dollar, D. & Kraay, A. (2002). Growth is Good for the Poor. Journal of Economic Growth, 7, 195–225.

Ellis, F., Freeman, H.A. (2004). Rural livelihoods and poverty reduction strategies in four African countries. J. Dev. Stud., 40, 1-30.

Eriksen, S.H., Brwon, K., Kelly, P.M. (2005). The dynamics of vulnerability: locating coping strategies in Kenya and Tanzania. The Geographical Journal, 171(4), 287-305.

Feng, S., Burkhauser, R.V., Butler J.S. (2006). Levels and Long-Term Trends in Earnings Inequality, Journal of Business & Economic Statistics, 24(1), 57-62.

Ferreira, F.H.G., Ravallion, M. (2008). Global Poverty and Inequality: A Review of the Evidence. The World Bank Policy Research Working Paper, No. 4623, Washington, DC.

Foster, J., Greer, J., Thorbecke, E. (1984). A class of decomposable poverty measures. Econometrica, 52, 761–776.

Foster, J., Greer, J., Thorbecke, E. (2010). The Foster–Greer–Thorbecke (FGT) poverty measures: 25 years later. The Journal of Economic Inequality, 8(4), 491-524.

Fosu, A.K. (2015) Growth, inequality and poverty in Sub-Saharan Africa: Recent progress in a global context. Oxford Development Studies, 43(1), 44–59.

Fosu, A.K. (2017). Growth, inequality, and poverty reduction in developing countries: Recent global evidence. Research in Economies, 71(2), 306-336.

Gini, C. (1912). Variabilità e Mutuabilità. Contributo allo Studio delle Distribuzioni e delle Relazioni Statistiche. C. Cuppini, Bologna.

Graef, F., Sieber, S., Mutabazi, K., Asch, F., Biesalski, H.K., Bitegeko, J. … Uckert, G. (2014). Framework for participatory food security research in rural food value chains. Global Food Security, 3, 8–15.

Gray, C.L., Muller, V. (2012). Natural disasters and population mobility in Bangladesh. PNAS, 109(16), 6000-6005.

Gutema, G. (2019). Standard Gini Decomposition Results of Income Inequality in Rural Ethiopia. Nilsson, P., Heshmati, A. (eds). Efficiency; Equity and Well-Being in Selected African Countries. Efficiency; Equity and Well-Being in Selected African Countries. Springer, Switzerland, 242-255.

Hassine, N.B., Zeufack, A. (2015). Inequality of Outcomes and Inequality of Opportunity in Tanzania. Policy Research Working Paper, No. 7260. World Bank, Washington, DC.

Heshmati, A. (2004). Growth Inequality and Poverty Relationships. IZA Discussion Paper No. 1334, Institute for the Study of Labor.

Heshmati, A. (2006). The World Distribution of Income and Income Inequality: A Review of the Economics Literature. Journal of World Systems Research, 7(1), 61-107.

Hoddinott, J. (2006). Shocks and their consequences across and within households in Rural Zimbabwe. Journal of Development Studies, 42(2), 301–321.

Hoddinott, J., & Kinsey, B. (2001). Child growth in the time of drought. Oxford Bulletin of Economics and Statistics, 63(4), 409–436.

Klasen, S. (2016). What to do about rising inequality in developing countries?, PEG Net Policy Brief, No. 5/2016, Kiel Institute for the World Economy (IfW), Poverty Reduction, Equity and Growth Network (PEGNet), Kiel

Kuznets, S. (1955). Economic Growth and Income Inequality. American Economic Review, XLV, 1-28

Lefranc, A., Pistolesi, N., Trannoy, A. (2008). Inequality of Opportunities vs. Inequality of Outcomes: Are Western Societies All Alike. Review of Income and Wealth, 54(4), 513 – 46.

Lopez-Feldman, A. (2014). Shocks, Income and Wealth: Do They Affect the Extraction of Natural Resources by Rural Households? World Development, 64, 91-100.

Lusambo, L.P. (2016). Households´ Income Poverty and Inequalities in Tanzania: Analysis of Empirical Evidence of Methodological Challenges. Journal of Ecosystem & Ecography, 6(2), 1-15.

Maliti, E. (2019). Inequality in Education and Wealth in Tanzania: A 25-Year Perspective. Soc Indic Res, 145, 901–921.

Manero, A. (2017). Income inequality within smallholder irrigation schemes in Sub-Saharan Africa. International Journal of Water Resources Development, 33(5), 770-787,

Manero, A., Bjornlund, H., Wheeler, S., Zuo, A., Mdemu, M., Van Rooyen, M., Chilundo, M. (2020). Growth and inequality at the micro scale: an empirical analysis of farm incomes within smallholder irrigation systems in Zimbabwe, Tanzania and Mozambique, International Journal of Water Resources Development, 36, 224-245.

Mashindano, O. & Maro, F. (2011). Growth without poverty reduction in Tanzania: Reasons for the mismatch. Chronic Poverty Research Centre, Working Paper No. 207.

Mnenwa, R., & Maliti, E. (2010). A comparative analysis of poverty incidence in farming systems of Tanzania. Special Paper10/4. Dar es Salaam: Research on Poverty Alleviation (REPOA).

Mollet, M., Barelli, D. (2016). Rapid Agriculture Needs Assessment in response to the "El - Niño" effects in the United Republic of Tanzania. Food and Agriculture Organization of the United Nations, Rome.

Mutabazi, K.D., Sieber, S., Maeda, C., Tscherning, K. (2015). Assessing the determinants of poverty and vulnerability of smallholder farmers in a changing climate: the case of Morogoro region, Tanzania. Reg Environ Change 15, 1243–1258.

National Bureau of Statistics (NBS) (2016). Child Poverty in Tanzania. National Bureau of Statistics and United Nations Children's Fund, Dar es Salaam, Tanzania.

Nel, P. (2006). The Return of Inequality. Third World Quarterly, 27(4), 689-706.

Nerman, F. (2015). Households' Income-Generating Activities and Marginal Returns to Labour in Rural Tanzania. Journal of African Economies, 24(3), 367-389.

OECD (2017). Terms of Reference. OECD Project on the Distribution of Households Income. Income Distribution Database (2017).

Petersen, T. & Schoof, U. (2016). The Impact of Income Inequality on Economic Growth. Future Social Market Economy, Bertelsmann Impulse, Bertelsmann Stfitung, 2016/05.

Paavola, J. (2008). Livelihoods, vulnerability and adaptation to climate change in Morogoro, Tanzania. Environmental Science & Policy, 11(7), 642-654.

Rapsomanikis, G. (2015). The economic lives of smallholder farmers. An analysis based on household data from nine countries. Food and Agriculture Organization of the United Nations (FAO)

Ravallion, M. (1997). Can high-inequality developing countries escape absolute poverty? Economics Letter 56(1), 51-57

Ravallion, M. (2001). Growth, Inequality, and Poverty: Looking Beyond Averages, World Development, 29(11), 1803-1815.

Ravallion, M. (2004). Pro-Poor Growth: A Primer. Policy Research, Working Paper 3242, World Bank, Washington, DC.

Ravallion, M. (2005). Inequality is Bad for the Poor. Policy Research Working Paper, No. 3677. World Bank, Washington, DC.

Ravallion, M. (2008). Global Poverty and Inequality: A Review of the Evidence. Policy Research Working Paper, No. 4623. World Bank, Washington, DC.

Reardon, T., Tayor, J.E. (1996). Agroclimatic shock, income inequality, and poverty: Evidence from Burkina Faso. World Development, 24(5), 901-914.

Shapley, L. (1953). A value for n-person games. In: H. W. Kuhn and A. W. Tucker (eds) Contributions to the Theory of Games, vol. 2. Princeton, NJ: Princeton University Press.

Sharma, S., Choubey, M. (2016). Livelihood Diversification and income distribution among Rural Households of Sikkim: A study. International Journal Advances in Social Sciences, 5(3), 148-154.

Shorrocks, A.F. (2013) Decomposition procedures for distributional analysis: a unified framework based on the Shapley value. Journal of Economic Inequality, 11, 99-126.

Silva, J.A. (2013). Rural Income Inequality in Mozambique: National Dynamics and Local Experiences. The Review of Regional Studies, 43, 23-50.

Son, H. (2003). A new poverty decomposition. Journal of Economic Inequality, 1, 181-187

Son, H. & Kakwani, N. (2004). Economic Growth and Poverty Reduction: Initial Conditions Matter. Working Paper No. 2, United Nations Development Program

Steffens, J., Brüssow, K., Grote U. (2020). A Strategic Approach to Value Chain Upgrading—Adopting Innovations and Their Impacts on Farm Households in Tanzania. Horticulturae, 6(2), 32.

Takane, T., & Gono, H. (2017). Smallholder Livelihood Diversification and Income Inequality in Rural Malawi. Advances in Social Sciences Research Journal, 4(13), 40-53.

Thiede, B. (2014). Rainfall Shocks and Within-Community Wealth Inequality: Evidence from Rural Ethiopia. World Development. 64, 181-193.

Thorbeck, E. (2013). The Interrelationship Linking Growth, Inequality and Poverty in Sub-Saharan Africa. Journal of African Economies, 22(1), 15-48.

Thorbeck, E., Charumilind, C. (2002). Economic Inequality and Its Socioeconomic Impact. World Development, 30(9), 1477-1495.

United Nations (2015). Inequality Measurement. Development Issues No. 2. Development Strategy and Policy Analysis Unit. Development Policy and Analysis Division. Department of Economic and Social Affairs.

URT (United Republic of Tanzania) (2007). National Adaptation Programme of Action (NAPA). Vice President's Office, Division of Environment, Dar es Salaam, Tanzania.

URT (United Republic of Tanzania) (2012). Guidelines for integrating climate change adaptation into national sectoral polices, plans and programmes. Office of the Vice President.

URT (United Republic of Tanzania) (2015.) Government Portal. http://www.tanzania.go.tz/home/pages/225.

Van den Berg, M., Kumbi, G.E. (2006). Poverty and the rural nonfarm economy in Oromia, Ethiopia. Agricultural Economics, 35, 469-475.

World Bank (2018). Poverty and Shared Prosperity 2018: Piecing Together the Poverty Puzzle. Washington, DC: World Bank.

World Bank (2019). Tanzania Mainland Poverty Assessment. Executive Summary. Washington, DC: World Bank.

World Bank (2020). Poverty and Shared Prosperity 2020: Reversals of Fortune. Washington, DC: World Bank.