

## Sources of Income Inequality among Farm Households in Ethiopia. Using Gini Coefficient Approach

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### Abstract

*The distribution pattern of income over years has been a major concern in the determination of the level of economic growth and development of any country. Household in rural Ethiopia are diversifying activity both within agricultural and non-agricultural sectors. The study intended to analyze sources of income inequality of cash and cereal crops farmers. Data for the study obtained from primary and secondary sources of data. About 164 respondents for cereal crops and 150 cash crops producers sampled for the study. For analysis purposes descriptive statistics, Lorenz curve and Gini coefficient were used for the study. One way ANOVA showed that there is statistical significant difference between cash and cereal crops farmers in terms of income obtained from livestock, off farm income and other farm income. The income obtained from the livestock business and other farm activities were unequally distributed among the cereal crops producers in Ethiopia. On the other hand, income obtained from non-farm activity and livestock business highly contributed for income inequality among the cereal crops producers. The Lorenz curve result showed that income inequality of cash crops producers higher than income inequality of cereal crops farmers. For both cereal and cash crops producer's the study showed that livestock activities is small-scale, mostly free-costs which lacks modern livestock husbandry practice that could result in high productivity and yield easily. Based on the finding of the study, it is suggested that the policy makers targeting to alleviate income inequality should continue to explore options for promoting the farmers involvement in diversified farming and non-farming activity to overcome the income disparity in the country and it should be focused on value-added activities, especially on the lower income group.*

**Key words:** Cereal crops, cash crops, Gini Coefficient, Lorenz curve, Income

### Introduction

The pattern of income distribution has been a concern to economists for a longtime. Specifically, the 1990s witnessed resurgence in theoretical and empirical attention by economists to the distribution of income and wealth. This is because high level of income inequality produces an unfavorable environment for economic growth and development. Previous studies have shown that income inequality has risen in many developing countries over the last two decades (Addison and Cornia, 2001). The widening dimension of poverty has aroused serious humanitarian concerns and fears of political instability. It has therefore become evident that in absence of strong foreign markets, the domestic inter-sectorial linkages and policy environment required for rapid economic growth cannot be provided by policies that result in further concentration of national income in the hands of few proportion of the population (Clarke *et al*, 2003).

A source of income diversification at the individual or household level simply means adding new activities. This can include agricultural, non-agricultural work, work for one's self, or for an employer, home based work or work at other places. Rural livelihood diversification could be described, as the process by which rural households construct an increasingly complex portfolio of activities and assets in order to survive and to improve their standard of living (Ellis, 2000) .As diversification is not an end by itself, it is essential to connect observed patterns of income back to resulting income distribution and poverty. Not all diversification into nonfarm income earning activities offers the same benefits and not all households have equal access to the more lucrative diversification options (Barret *et al.*, 2004).

Households and individuals in rural areas face different constraints on their choice of income-generating activities and because the price and non-price incentives influencing choice are likewise heterogeneous within most populations, observed income diversification patterns can vary markedly between the poor and the rich. This, in turn, determines the likelihood of benefiting from nonfarm employment or activities in Ethiopia (Ashebir and Negussie, 2015). In many less developing countries, policymakers are attracted to the rural nonfarm economy because they hope diversification into rural nonfarm activity will offer poor households a route out of poverty (Barret *et al.*, 2001 and Lanjouw, 2000). However, benefiting from rural nonfarm diversification requires dynamic engines of regional growth, a buoyant economic base in agriculture, tourism or mining which, if sparked, will generate opportunities in the rural nonfarm economy, for rich and poor alike, particularly when initial income increments are distributed broadly enough to yield wide spending increases on local goods and services.

Ethiopia GDP per capita is around USD 110, while life expectancy, educational enrolment, and other indicators of well-being are all extremely low. Agriculture continues to dominate the economy contributing 42% of GDP and accounts for 77% of employment (ATA, 2015). Diversification is a norm rather than an exception. Ethiopia farm households diversify their income sources for at least two motives. The first motive termed as the pull factor in literature is diversification undertaken for accumulation objectives; and the second factor termed as Push factors is diversification undertaken to reduce risk, cope with shocks or respond to diminishing returns in factor use. The two motives of diversification have different implications for income and asset accumulation and inequality in rural areas. While diversification driven by pull factors is usually associated with a rise in income and accumulation of assets for the households thus engaged, the diversification motivated by push factors sometimes extracts a household from poverty, but can be merely a holding pattern (Nega *et al.*, 2014).

Despite the general scarcity of literature on sources of income inequality among the rural families, there is no systematic study done in the Ethiopian context. The available studies in this regard are limited in the focus of their geographical coverage. The purpose of this paper is to provide further evidence regarding the sources of income inequality among the farming households. The study aims to decompose the sources of income inequality in order to pinpoint the contribution of different sources of income-to-income inequality among the cash crops and cereal crop farmers in South West Shewa, West Shewa and Jimma Zone.

## Literature review

According to Prata *et al.* (2014), the 'value of output' from an activity was considered as income from that activity. The concept of income used in the study reckons with income earned both in cash and in kind. Therefore, money values were allocated to receipts of income in kind and household consumption of crops and livestock produced based on prevailing market prices. Values were also computed for houses occupied by their owners. Recognition was made of whether incomes recorded were incomes before or after taxation. The study identified the following sources of income:

- ✓ Non-farm income: includes income realized from non-farm labors, government and private sector employment (full or part time), and profits from non-farm enterprises.
- ✓ Agricultural income: includes net income from all crop production with imputed values from home production and agricultural labors.
- ✓ Transfer income: includes income from relatives within and outside the country, government pension and other gifts received.
- ✓ Livestock income: includes net income from cattle, poultry, sheep, goat pigs and etc.
- ✓ Rental income: includes net income received from ownership of assets

As regional wage rates rise the composition of the rural nonfarm economy changed and returns to labor increase enabling the poor as well as the rich to benefit from regional growth via nonfarm diversification (Barret *et al.*,

2001). Lanjouw (1995) outlined several distributional reasons to focus on the nonfarm sector. Firstly, to the extent that rural industry produces lower quality goods which are more heavily consumed by the poor, good health of this sector has indirect distributional benefits via lowering prices to the poor. Second, the sector fulfills it is a residual source of employment to the poor who, because they are small landholders or are landless, cannot find sustenance in agriculture. Through diversification, it also supplies a way of smoothing income over years and seasons to people who have limited access to other risk coping mechanisms

Ipinnaiye (2001) found that decomposition analysis of income shows that nonfarm income contributes the most to overall income inequality in both the peri-urban and urban areas of Ibadan. In addition, income inequality was higher in peri-urban areas than urban areas. Adebayo (2002) found that in the rural areas in Ibadan metropolis, agricultural income contributes most to the overall income inequality accounting for 91% while rental income makes the least contribution to overall rural income inequality accounting for just 0.17%. In the urban areas, non-farm income makes the largest contribution to overall income inequality accounting for 88% while transfer income reduces urban overall income inequality by 0.13%.

## Methodology

### Description of study area

Ethiopia is a landlocked sovereign country located in the Horn of Africa. Ethiopia is bordered by Eritrea to the north, Sudan to the west, South Sudan to the south-west, Kenya to the south, Somalia to the east and Djibouti to the northeast. Ethiopia is one of the oldest countries in the world and Africa's second-most populous nation. Ethiopia has yielded some of humanity's oldest traces, making the area important in the history of human evolution. Recent studies claim that the vicinity of present-day Addis Ababa was the point from which human beings migrated around the world. Jimma spelled Jima, is the largest city in southwestern Ethiopia. It is a special zone of the Oromia Region and is surrounded by Jimma Zone. It has latitude and longitude of 7°40'N36°50'E. Prior to the 2007 census, Jimma was reorganized administratively as a special Zone. Jimma zone is known by production of cash crops such as coffee etc (CSA, 2016). Southwest Shewa (Afaan Oromo: Shawaa Kibba-lixaa), is one of the zones of the Oromia Region in Ethiopia. West Shewa (Oromo: Shawaa Lixaa/Dhihaa) is one of the zones of the Oromia Region in Ethiopia. West Shewa is bordered on the south by the Southwest Shewa Zone and the Southern Nations, Nationalities and Peoples Region, on the southwest by Jimma, on the west by East Wellega, on the northwest by Horo Gudru Wellega, on the north by the Amhara Region, on the northeast by North Shewa, and on the east by Oromia Special Zone Surrounding Finfinne. Its highest point is Mount Wanchi (3386 meters); other notable peaks include Mount Menagesha and Mount Wachacha. Towns and cities in West Shewa include Ambo. South West Shewa and West Shewa were known by production different cereal crops (CSA, 2016).

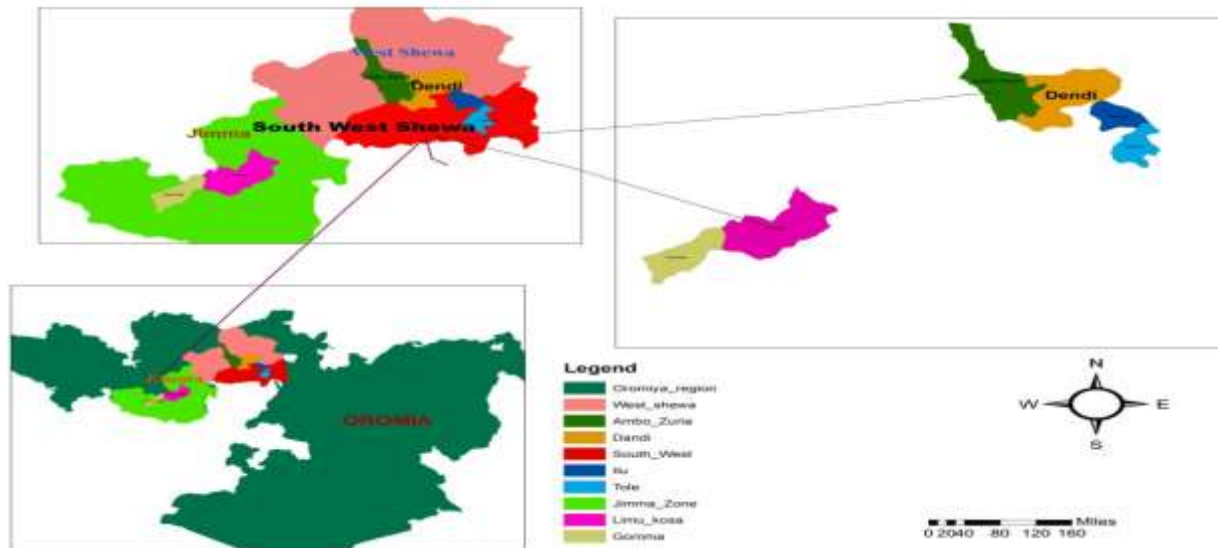


Figure 1: Map of study area.

### Sampling framework

The studies cover three zonal areas in Ethiopia. The three zones considered for study West Shewa, South West Shewa and Jimma zone were selected purposively on their production capacity of cereal crops and cash crops. From Jimma Zone two districts were selected purposively based on production capacity of cash crops specifically coffee two districts were selected namely Limmu Kossa and Gomma districts. Out of the districts, located in West Shewa and South West Shewa four districts selected purposively on their potential to produce cereal crops in zone namely from South West Shewa (Ilu and Tole Districts) and from West Shewa two districts Ambo and Dandi selected purposively. Kebeles for the study from the three zones selected randomly and finally sample of 304 respondents selected proportionally and randomly, as they are convenient for researchers.

### Methods of Data Analysis

Descriptives statistics such as one way ANOVA, Pie chart and Bar graph used to analysis the demographics characteristics of sample respondents. The Gini-coefficient has been used in the past to measure the level of inequalities in many other contexts besides income, including wealth, education, energy consumption, etc. (Jacobson *et al.*, 2007). Inequality decomposition is a standard technique for examining the contributions of inequality of particular characteristics and can be used to assess income recipient characteristics and income package influences (Oyekale, *et al.*, 2006). According to Babatunde (2008), inequality can be conceptualized as the dispersion of a distribution, whether one is considering income, consumption or some other welfare indicators. According to Dillon and Hardaker (1993) Gini coefficient higher than 0.35 indicates higher inequality. Poverty and income inequality are closely related and it has been argued that income inequality is a manifestation as well as strong cause of poverty (UNU/WIDER, 2000). Furthermore, Kolenikov and Shorrocks (2003) found that a high level of poverty in the late 1990s in Russia was due more to the rise in income inequality. As income inequality increase, the incidence of poverty increases. The result of the study is in line with Adejare (1999) and World Bank (2003).

This method of measuring inequality was developed originally by Chen, Tsaur, and Rhai (Chen *et al.*, 1982) and was further developed by Berrebi and Silber (Berrebi and Silber, 1985). Unlike in the case of the “standard” Gini coefficient, the “adjusted” Gini coefficient ( $G^*$ ) corrects the problems associated with the presence of negative observations, which are prevalent in the data that were used, by normalizing the distribution of  $Y$  in a manner so that the upper bound on the Gini coefficient is unity. The formulas for Gini Coefficient were as follows;

$$G^* = \frac{(2/N) \sum_{i=1}^n js_i - \frac{N+1}{N}}{\left[ 1 + (2/N) \sum_{i=1}^m js_i \right] + (1/N) \sum_{i=1}^m s_i \left[ \frac{\sum_{i=1}^m s_i}{s_{m+1}} - (1+2m) \right]}$$

Where

$$s_i = w_i Y_i / N \bar{Y}$$

$$\bar{Y} = \frac{\sum_{i=1}^n w_i Y_i}{N}, N > 0, Y_{i=1} < Y_{i=2} < \dots < Y_{i=n}$$

In this equation and for each of the time periods,  $w_i$  is the survey weight of the  $i^{th}$  household in the state,  $n$  and  $N$  are, respectively, the sample size and the expanded number of farm operator households in the state,  $s_i$  is the corresponding weighted income share of the  $i^{th}$  household in the state,  $Y_i$  is the household's total income (or total wealth) in the state where  $Y_1 \leq \dots \leq Y_n$  with some  $Y_i < 0$ , and  $m$  is the size of the subset of the households whose combined weighted income is zero with  $Y_1 \leq \dots \leq Y_m$ . For computational purposes,  $m$  is determined where the sum of incomes over the first  $m$  households is negative and the first  $m + 1$  household is positive. Prior to implementing the measurement of inequality,  $Y_i$  is divided by the square root of household size in order to allow, without differentiation between adults and children, level of economies of scale (Burkhauser, *et al.*, 1996 and Daly and Royer, 2000). The implication of this equalized notion of  $Y$  is that a household's economic requirements increase less than proportionally with its size; e.g., the needs for a family of four persons are twice as great as of a single person household. If the value of Gini coefficients income elasticity is unity, it indicates neutrality of the income source to inequality, but if its value is greater (less) than unity, then the source is inequality increasing/decreasing (OECD, 2013).

## Result and Discussion

### Descriptives Analysis

Result of the study presented in two separate parts. From the sampled farm household of both cash and cereal crops producers' agriculture has been the principal source of income for farm households, which accounts more than 83.2% of the households, have reported that they obtained income from agriculture, and it makes up 56.2% of the total income on average. The non-farm business activities, with a share of 17.25% in the total income, comprise the second largest income source after agriculture. Table 1 showed that one-way ANOVA between the groups of producers and within the groups of crops produced. In terms of income obtained from other farm sources, off farm income and livestock sources there is statistically significant difference between the cereal crop and cash crop producers at 1% significance level in the study area.

Table 1: One-Way ANOVA analysis between the cash and cereal crops producers

Variables		SS	Df	MS	F	Prob>F
Other farm income	Between groups	71.33	115	0.62	25.01	0.0000
	Within groups	4.66	188	0.025		
Off farm income	Between groups	58.08	96	0.605	6.99	0.0000
	Within groups	17.92	207	0.065		
Livestock income	Between groups	31.87	55	0.594	3.28	0.0000
	Within groups	43.12	244	0.177		
Bartlett's test for equal variances		Chi2(3)	1.4326	Prob>Chi2	0.698	

Source: Own computation from survey result, 2016/17

The cereal crop producers obtained higher income from the non-farm activities when compared with cash crop producers in the study area as shown in the pie chart below. This implies that cereal crops producers involved in more non-farm activity such as vegetable production using irrigation during winter season, involved in livestock and other crops trading during free time or off farm season. On the other hand, the central parts of Ethiopia



where the cereal crops producers were sampled farmers involved highly in non-farm activity as the area is nearest to weather roads than the cash crop producers where they are located far from roads and poor infrastructure when compared with the central parts of Ethiopia.

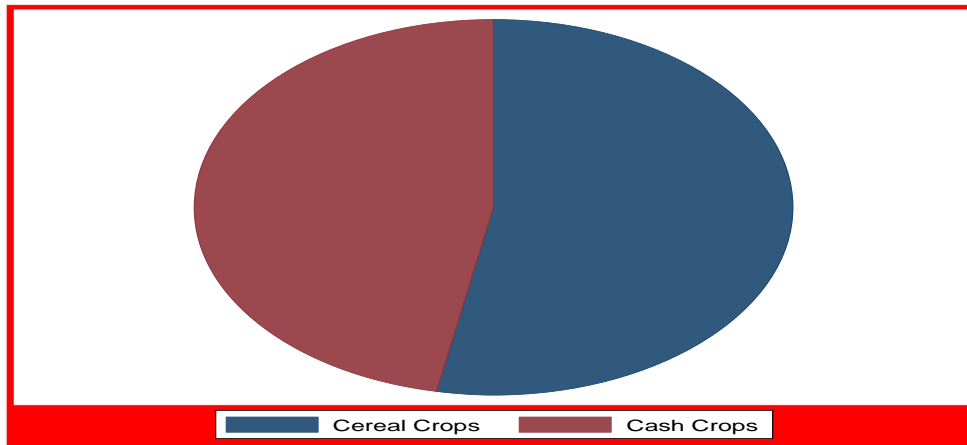


Figure 2: Proportion of livestock income as per types of crops produced  
Source: Generated from field survey data (2016)

As depicted in the Figure 2 the mean of income obtained from other crops was greater than other sources of income such as livestock income and income from off farm activity. The total income from other farm income sources of sample respondents mean was Birr 50,106.27. The average of other farm income of farmers actively participating on cash crops producers is 72,359.19 Birr/year. The major sources of cash income were from the sale of other home cereals, chickpea, grass pea and vegetables in the study area. The average total income from cereal crops income sources of sample respondents was 63,374.91 Birr/year and less than the average cash crops income per year. There was significant difference in the mean annual income between cash crops and cereal crops producers in Ethiopia at 1 % significance level in terms of income obtained from the livestock activities.

The total income from livestock income sources of sample respondents was 1,134,028 Birr/year. The average livestock income of actively participating on cereal market is 7,270.329 Birr/year and less than the other farm income per year. The major sources of cash income were from the sale of livestock, sale of egg, rented oxen and donkeys and sale of milk and milk products. The total income from non-farm income sources of sample respondents was 5,390.09 Birr/year for cereal crops producers in the study area. The average non-farm income of respondents participating in the cash crops production is 6,758.3 Birr/year and exceeds the average of other farm income of the cereal crops 1,280 Birr/year.

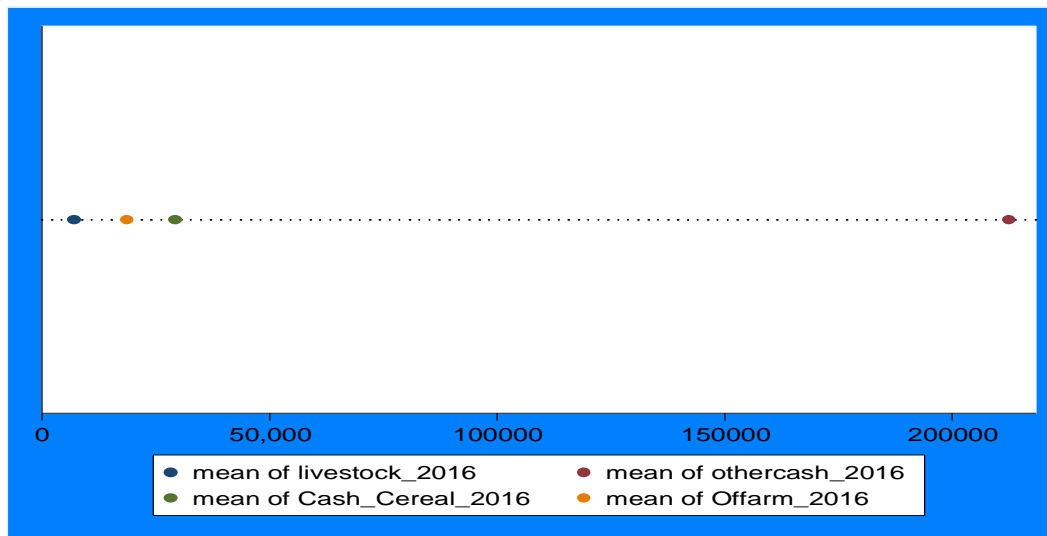


Figure 3: Mean of each sources of income  
Source: Generated from field survey data (2016)

The income earned from non-farm sources is from labor employment, handcrafts, remittance, renting house, trade, salary and pension sometimes. The income generated from off-farm/non-farm activity ranges from 25,687 incomes to a maximum of Birr 2.22 million per household in the study area in 2016/17. It is usual in the study area that farmers used to engage in various income generating activities. This is so because the farmer's production is inadequate to fulfill their demand for consumption expenditure as well as purchase of livestock fed and livestock for farming purposes. Among the non-farm income source remittance is major one for the respondents involved in the production of cash crops.

#### Decomposition of income inequality by sources

The overall total income inequality of cash crops and cereal crops producers included in the sample have Gini coefficient of 0.4023 and 0.3386 respectively this finding is collaborate with the result reported by Demie and Zeray (2015) for other parts of Ethiopia. There is a considerable disparity in the contribution to income inequality among the farm households. Table 2 showed the result of Gini coefficients analysis of the different sources of income inequality of cash crops farmers; the decomposition of the Gini coefficient among the income sources components. When there is a 1% increase in the non-farm sources of income for households, the income inequality among the farmer's increases by 80.67%. This finding is in line with Woldehana (2002) who studied the rural farm/non-farm linkages in northern Ethiopia have found that non-farm income has an unequalizing effect on income distribution due to entry barriers for the poor. Given the entry barriers, wealthy farm households dominate the most lucrative non-farm activities. On the other hand, Reardon *et al.* (2000) pointed out, the assertion that non-farm employment reduces income inequality is based on three empirical assumptions; the income created by such activities is large enough to influence the rural income distribution, non-farm income is unequally distributed and this unequally distributed income source favors the poor". As the income from other farm activity increase by one percent the income inequality of cash crops producer's increases by 77.38 percent that showed, income obtained from other farm activity paramount contribution to income discrepancy among the cash crop producers in the study area.

Table 2: Decomposition of income inequality among cash crops producers

Sources of Income	Sk	Gk	Rk	share	% change
<b>Non-farm income</b>	0.0023	0.8067	0.2810	0.0013	-0.0010
<b>Cash crops income</b>	0.0144	0.4701	0.3746	0.0063	-0.0081
<b>Farm income other than cash</b>	0.0008	0.7738	0.2788	0.0004	-0.0004
<b>Livestock income</b>	0.0004	0.8811	0.3183	0.0003	-0.0001
<b>Total income (Gini)</b>		0.4023			

Source: Own computation from survey result, 2016

An increase in income from livestock income causes the largest increase in the marginal effects, which is 88.11%. The Gini coefficient of income distribution of livestock farmers is the highest. This mean that income is unequally distributed among livestock farmers while it is more unequally distributed among respondents that engaged in mixed farming and least among cereal crop farmers. Social welfare value is derived from the mean income and the Gini coefficient of a particular group of people. The higher the mean income and the lower the Gini coefficient, the higher is the social welfare of the group (Salimonu *et al.*, 2006).

Table 3: Decomposition of income inequality among cereal crops producers

Sources of Income	(Sk)	(Rk)	(Gk)	RkGkSk/Gk	share	% (Change)
<b>Cereal crops income</b>	0.1691	1.000	0.3485	0.0589	0.1740	0.0049
<b>Farm income other than cereal</b>	0.0117	0.0579	0.3170	0.0037	0.0006	-0.0111
<b>Livestock income</b>	0.0028	0.1964	-0.5115	-0.0014	-0.0008	-0.0037
<b>Non-farm income</b>	0.0078	0.3182	0.7459	0.0058	0.0055	-0.0023
<b>Total income (Gini)</b>			0.3386			

Source: Generated from field survey data (2016)

From the Table 3 the corresponding marginal effects for different income sources of households participating in cereal crops production shown. The result showed that a 1 percent increase in livestock income, assuming other sources of income constant, it was reduced the overall income inequality by 51.15 percent for cereal crops farmers in the study area. The income obtained from non-farm activity increases the income inequality by 74.59%, as non-farm income increases by 1 percent for cereal crops farmers. This result is consistent with the finding of Nega *et al.*, (2014) non-farm income is the major inequality-increasing source of income in Northern Ethiopia. Furthermore, Lanjouw and Stern, (1993) and Sen (1994) on the other hand, had reported a strong unequalizing effect of non-farm income on rural income inequality. On the contrast, Lanjouw and Shariff (2002) have found the non-farm income to be neither inequality increasing nor inequality decreasing.

Similarly, income obtained from farm other than cereal crops production, 1 percent increase in other farm income will be increased overall income inequality by 31.7 percent keeping other sources of income constant. In contrast to other source of income 1% increase in the cereal crops farm income, assuming other source of income unchanged, it was result an increase of 34.85 percent of overall income inequality. The reason why cereal crops farm income causing income inequality among farmers may be the factors involvement of farmers in farm activities. This implies that the size of land is most relevant to explain uneven distribution of income from farming activities. The discrepancies in the size of land owned by farmers may be the cause of inequality in farm income and may lead to the overall income inequality of cereal crops farmers.



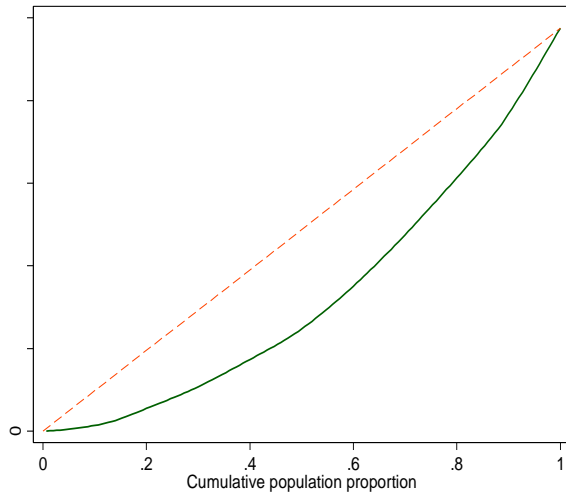


Figure 4: Lorenz Curve for cereal crops farmers  
Source: Generated from field survey data (2016)

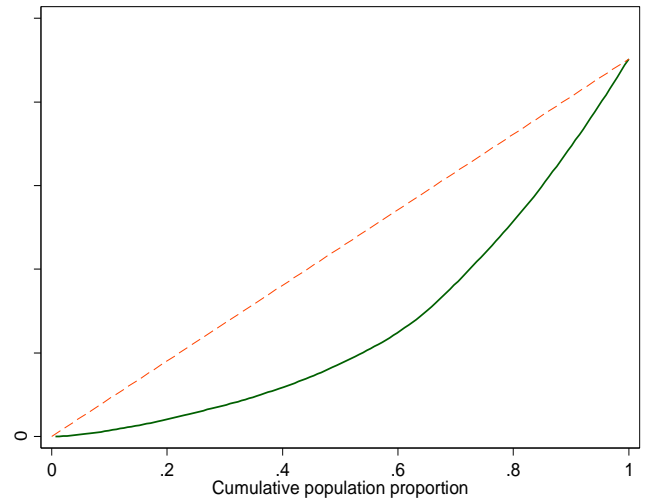


Figure 5: Lorenz Curve for cash crops  
Source: Own computation from survey result, 2016

Using the Lorenz Curve has the advantages that it provides a visual representation of the information wish to consider, in this case the inequality of income of different sources. In a situation where the inequality is severe the further, the curve will deviate away from the line of absolute equality of 45 degree. The fact that the area under the curve is wider than that of the distribution of income before nonfarm income is aggregated in total household earnings is relatively unequal compared to the scenario after nonfarm income is included. Based on the above-depicted Lorenz curve of cereal crops and cash crops it is visible that the income inequality among the cereal crops producers are less than cash crop producer because the Lorenz curve of cash crops more deviated from the 45<sup>0</sup> degree.

### Conclusion and Recommendation

The persistence of income inequality has been a challenging problem. The study examined the sources of income inequality among the cereal crops producers and cash crop producer in Ethiopia. One way ANOVA showed that there is statistically significant difference between cash crops and cereal crops producers in the study area. The mean of income obtained from off farm activity was higher for cereal crops producers than the cash crops producers. The analysis conducted using Gini coefficient showed that annual income mean of cash crops producer were greater than annual income mean of cereal crop producer in the country. Income obtained from the livestock business and other farm activities were unequally distributed among the cereal crops producers in Ethiopia. On the other hand, income obtained from non-farm activity and livestock business highly contributed for income inequality among the cereal crops producers. For both cereal crop and cash crops producers farmer the study suggested that livestock activities is small-scale, mostly free-costs which lacks modern livestock husbandry practice that could result in high productivity and yield easily. The income obtained from other farm sources of income, 1 percent increase in farm income was increased overall income inequality by 31.7 percent keeping other sources of income constant. In contrast to other source of farm income 1% increase in the cereal crops farm income, assuming other source of income unchanged, it was result an increase of 34.85 percent of overall income inequality. The reason why farm income causing income inequality among farmers, may be because of the factors involvement of farmers in farm activities. The Gini coefficient of income distribution of livestock farmers is the highest. Based on the finding of the study, it is recommended that the policy makers targeting to alleviate income inequality should continue to explore options for promoting the involvement of the farmers in diversified farming and non-farming activity to overcome the income disparity in the country.

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