Gender Analysis of Income Distribution among Rural Households: The Case of Sodo Zuria Woreda, Wolaita Zone, SNNPR

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Abstract:
This study intended to compute level of income distribution among male headed and female headed households and identify major determinants of income among male headed and female headed households. This study used data and information collected from of 154 households, of which 94 male headed and 60 female headed. A multistage sampling technique was used to select the households. The study employs Gini coefficient to estimate income distribution; and multiple linear and Quantiles regression to identify determinants of income level among female-headed households and male-headed households. The key finding of the study is that gender was Significant at 1% probability level and had a positive influence on income. The result of this study reveal that income was more evenly distributed among the male headed households than the female-headed counterparts and participation of female headed households in crop production was less than male headed households. The results also show that annual income of maleheaded households was higher by 25.4% than the income of female headed households. Extension visit, technology and off farm income significantly and positively influenced income of the female-headed households. The findings of this study entail that policy makers should develop the extension system that increases number of extension visits to female headed farmers. Efforts should be made to empower and initiate female headed households through various programs that improve their technology uptake and build their confidence to involve in other business activities and intensify their income. It is also suggested that the issue of rural financial service receive greater attention by government and service providing financial institutions.

Key words: Female-headed households, income distribution, male-headed households, Soddo-Zuria

INTRODUCTION
Most of developing country rural households depend on agriculture as their main source of income and food. In Ethiopia, over 85% of the population live in the rural areas and depend on subsistence agriculture and generate income from agriculture (Elizabeth, 2011). About 48% of the agricultural labor force is driven from female family members (FAO, 2011). According to the World Development Indicators of 2006, Ethiopia is one of the least developing countries in the world, with a per capita Gross National Income (GNI) of 110.00 USD (CSA, 2009). In the SNNPR; agriculture is also the backbone of the regional economy; contributing for about 73% of the regional GDP and more than 90% of the total employment (BOFED, 2005). In addition to the main reproductive and domestic roles they are ought to play, in study area rural women’ productive role comes from their involvement in direct crop production, livestock rearing, home management activities and marketing of agricultural products and off-farm activities. Generally, women contribute greatly to food security at household and at national levels. So, improving women producers’ income implies a multidimensional contribution to the overall growth of the country.

In Sodo Zuria, considerable gender differences exist in the agriculture tasks performed by men and women on the farm and household levels. A lots of role-played by women farmer in agriculture, however, very few of them own or control productive resources (Opio, 2003). Such resources are land, credit, technical services, market outlets, and information and education level. They have not received equitable decision making rights with men farmer. Such limited accesses to productive resource and decision making power to women farmers for agricultural production creates income inequality between men and women farmers.

1.2 Statement of the problem
Notwithstanding women’s contribution to food security, women farmers are commonly underestimated and ignored in income generating activities and trade negotiations processes. They have experienced few concrete benefits and in several cases have even been adversely affected in their living and improvement conditions as result of the implementation of some policies. In fact, there is a general idea among policy makers, politicians, trade officials and negotiators that trade liberalization will reduce poverty equally for men headed farmers and women headed farmers but in reality it not true. The problem of low agricultural productivity and inequality in income distribution exists among male headed and female headed rural HHs. It is also believed that market access will help to increase income and improve the conditions of men headed farmers and women headed farmers equally but women headed households not easily get market access.

In the study area there is still no research conducted on income distribution among rural female headed and male headed households. Therefore this study is aimed at analyzing the socioeconomic characteristics of rural male and female headed
households of Sodo Zuria Woreda. To determine various activities performed by male-headed and female headed households in agricultural activities; analyze the level of income distribution between the male and female headed farmers; and to determine the factors of income between male headed and female headed households.

1.3 Objective

The general objective of this study was to conduct gender analysis of income distribution among rural households where as the specific objectives are:

- To examine gender roles in crop production among rural households.
- To determine level of income distribution between male headed and female headed households.
- To identify the major determinants of income among male headed and female headed households.

DATA AND METHODOLOGY

Description of the Study Area

Sodo Zuria Woreda is located in Wolaita Zone of South Nation and Nationality People Regional State 330 km to the south of Addis Ababa. The Woreda covered an area of 46,006 hectare and have 31 kebeles with total population of 178,890 of which 97,699 are females (CSA, 2007). Sodo Zuria Woreda is bounded in the East and North East by Damot Woye and Damot Galle Woredas, in the South by Humbo and Offa Woredas, in the West by Kindo Koisha, in the Northeast and Southwest by Boloso Sorie and Offa Woredas respectively.

3.2 Data source and data requirements

This study used both primary and secondary data. Unit of analysis for the study was crop producing households in the enset based farming system. The secondary data on the target areas demography and socio-economic data was collected from the Woreda Agricultural Development Offices and Women, Children and Youth affair offices was held to obtain general information on the income distribution among female headed and male headed the role in crop production among male headed and female headed rural households.

Methods of data collection

Data collection was conducted with formal interviews of the randomly selected male headed and female headed households using the pre-tested structured questionnaires. Discussion with the key informants such as Woredas crop production and agricultural marketing experts and Women, Children and Youth affair offices was held to obtain general information on the income distribution among female headed and male headed the role in crop production among male headed and female headed rural households.

Methods of data analysis

Both descriptive statistics and econometric model were used for analyzing the data from the survey

Descriptive statistics

Descriptive analysis such as ratios, percentages, frequency distribution, means, ranges and standard deviations were utilized to examine and describe the socio-economic characteristics of male and female headed households engaged agriculture production and the roles of gender in crop production.

Econometric Analysis

Estimation of income level among male-headed and female-headed households

We used multiple (OLS) and quantile regression methods to estimate the effects of independent variables on household’s annual income for rural male headed and female headed households. The standard model is based on the human capital earnings function developed Mincer in 1998. OLS equation for estimation of income level as below:

\[ \ln INC_i = \beta_1 + \beta_2 \text{Gender} + \beta_3 \text{EDU} + \beta_4 \text{Technology} + \beta_5 \text{Age} + \beta_6 \text{HHsize} + \beta_7 \text{FM SIZE} + \beta_8 \text{CREDIT} + \beta_9 \text{OFFFARMIN} + \varepsilon_i \]

Where:
\[ \ln INC_i, \text{the dependent variable, is the natural logarithm of the annual income for MHHs and FHHs observation i, and Xi is the vector of independent variables, } \beta \text{ is coefficient (} \beta_1 \text{ the vector of unidentified parameters which will be estimated using OLS method, and } \varepsilon_i \text{ is a random error term. } \varepsilon_i \text{ is assumed to satisfy the common properties of zero mean and constant variance (Su and Heshmati, 2013)).} \]

OLS is a method of estimating conditional mean functions by minimizing sums of squared residuals. Similarly, in conditional quantile regression we use an optimization of a piecewise linear objective function of residuals. Equation under conditional quantile regression was:

\[ Q_t(\ln INC_i(Y)) = \beta_1 + \beta_2 \text{Gender} + \beta_3 \text{EDU} + \beta_4 \text{Technology} + \beta_5 \text{Age} + \beta_6 \text{HHsize} + \beta_7 \text{FM SIZE} + \beta_8 \text{CREDIT} + \beta_9 \text{OFFFARMIN} + \varepsilon_i \]

Where \( Q_t \ln INC \) is estimate the Mincerian income model at \( t \)-th quantile (\( Q_t \)) of the distribution of the dependent variable(Y) conditional on the value ofX. \( \beta_i \) is explanatory variables.

\[ \beta \text{ is the estimated parameter for each explanatory variable correspondingly } \]

\[ X_1 = \text{Gender} \]

\[ X_2 = \text{Education (EDU)} \]

\[ X_3 = \text{Extension agent visit (EXTEN)} \]
RESULTS AND DISCUSSIONS

In this chapter, the results of the study are presented and discussed in detail to address the objectives of the research. The household characteristics include household size, age, education, extension visit, farm size, access to credit, off farm income, gender, and use of technology which are hypothesized to influence the level and distribution of income within and between the MHHs and FHHs.

Multiple linear regression and quantile regression analysis were used to analyze the effects of different household characteristics on the level of household income. Since the Multiple linear regressions establish only the average relationship between the different household characteristics and household income based on the conditional mean function, it does not provide the full picture of the relationship. It will not be helpful to understand the relationship at different points in the conditional distribution of the household income. The quantile regression will, however, allow us to achieve the objective of establishing the relationship between the different household characteristics at the median or other quantile (e.g., 25th, 75th percentile) of the household income. Both methods were applied to identify the determinants of the level and distribution of income between FHHs and MHHs in the study area. In addition to the OLS and quantile regression, the Gini coefficient and General Entropy of Thiel's indices of inequality were used for the analysis of income inequality within and between FHHs and MHHs.

**Roles of gender in Crop Production**

Gender roles refer to the rights, responsibilities, expectations, and relationships associated with men and women. Gender division of labor among farming communities of study area has been common. Both men and women have been playing a significant role in the crop production. This result was consistent with the findings of Adunga (2012).

| Variable | FHHs Mean | Std. Dev. | Min | Max | MHHs Mean | Std. Dev. | Min | Max |
|----------|-----------|-----------|-----|-----|-----------|-----------|-----|-----|
| Planting | 2.77      | 3.032964  | 0   | 12  | 10.04     | 1         | 1   | 59  |
| Weeding  | 4.85      | 5.249132  | 0   | 30  | 11.95     | 13.83     | 1   | 84  |
| Harvesting| 4.68      | 6.043603  | 1   | 45  | 9.5       | 11.14     | 0   | 89  |

The result from data shows that, for total sampled respondent’s average labor forces that participated in crop production were 40.72 mandays per year. Disaggregated by gender, average labor force participation in all crop production among the MHHs and FHHs were 28 mandays and 13 mandays per year, respectively. As a survey result indicates in table 16 above the average force for planting, weeding and harvesting for female farmers were 2.77, 4.85 and 4.68 respectively and the average force for planting, weeding and harvesting for male farmers were 13.97, 11.95 and 9.5 respectively. So, from results we concluded that male farmers engaged more in crop production than female farmers.

**4.3 Econometric Result**

**4.3.1 Interaction of Variables by Gender, Multicollinearity test and Heteroskedasticity test**

In order to see if the effects of the independent variables on income vary by gender, a standard linear regression was run for both the MHHs and FHHs separately. The coefficients of the independent variables were compared using t-statistics. Results showed that there were no statistically significant differences in the magnitude of the coefficients of the independent variables between the two regression equations for most of the variables except for two variables, access to extension and access to credit. This implies that only credit and extension have varying effects on income depending on gender. The other variables included in the model have the same effect on income, regardless of the gender of the household head.
4.3.1.2 Multicollinearity test

Standard test of multicollinearity was applied to clear and structure the data before conducting any formal regression analysis. The VIF (variance inflation factor) indicates how much the variance of the coefficient estimate is being inflated by multicollinearity. A VIF near to one suggests that there is no multicollinearity, while a VIF near 10 might cause concern and shows a serious multicollinearity effect. This means a commonly given rule of thumb is that VIFs of 10 or higher (or equivalently, tolerances of 0.10 or less) may be reason for concern. Multicollinearity starts becoming a concern when the VIF is over 2.5 and the tolerance is under 0.40. As it is shown in Table 18 the independent variables had no serious multicollinearity among each other. All the variables had a VIF near to one indicating there was no serious multicollinearity effect on the model.

4.3.1.3 Heteroscedasticity test

In addition to multicollinearity test, heteroscedasticity test was also conducted. Results of the heteroscedasticity test revealed that the null hypothesis of constant variance (heteroskedasticity) was not rejected at the chosen significance level showing that there was constant variance for all the explanatory variables.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

| Variables       | Coefficient | Sd.error | Coefficient | Sd.error | t-value |
|-----------------|-------------|----------|-------------|----------|---------|
| Household age   | 0.0099531   | 0.082489 | -0.0103386  | 0.0055149| 0.00    |
| Education       | 0.0375216   | 0.0243821| 0.0264649   | 0.0324267| 0.07    |
| Household size  | -0.0318876  | 0.0547344| 0.0313201   | 0.060979 | 0.60    |
| Farm size       | 0.2040082   | 0.1490133| -0.0320441  | 0.219376 | 0.01    |
| Credit access   | -0.4458128  | 0.177733 | -0.0320441  | 0.219376 | 2.45*   |
| Technology access| 0.8314035  | 0.3143274| 0.8288021   | 0.190959 | 0.00    |
| Extension       | 0.0708555   | 0.1878671| 0.5493841   | 0.178834 | 3.40**  |
| Off farm income | 0.9021924   | 0.171135 | 0.5934769   | 0.234075 | 0.00    |
| -cons           | 8.618187    | 0.5472955| 7.672628    | 0.494853 | 0.00    |

Table 18- OLS estimation results of interaction of variables by gender

Table 20- Quantile regression for MHHs, FHHs and total sampled households

| ln Income | MHHs(94) | FHHs(60) | Total(154) |
|-----------|----------|----------|------------|
| q25       |          |          |            |
| Household age | -.0013861  | -0.10    | -0.016406  | -1.81*    | -0.0147518  | -2.24** |
| Gender    |          |          |            |
| Education | .0457545  | 1.76*    | -0.01343   | -0.20     | 0.0324075   | 0.97    |
| Household size | -0.0810132 | -0.97   | -0.01957   | -0.21     | -0.0369994  | -0.50   |
| Farm size | .220585   | 0.73     | .4675306   | 1.31      | .3511218    | 1.76*   |
| Credit access| -.2458507 | -0.97   | .0307642   | 0.08      | .1092388    | 0.18    |
| Gender credit| -.2458507 | -0.97   | .0307642   | 0.08      | .1092388    | 0.18    |
| Technology access| .6585   | 0.74     | .62699     | 2.17**    | .5876177    | 2.11**  |
| Extension  | .2902676  | 0.70     | .3606693   | 0.93      | .129664     | 0.61    |
| Gender extension| .8035961 | 2.43***  | .434572    | 1.52      | .7780575    | 3.23*** |
| Off farm income q50 | 0.9021924 | 0.171135 | 0.5934769 | 0.234075 | 0.00 |
| Household age | -.0060965 | -0.75   | -.01416    | -1.88*    | -.0107672   | -1.95** |
With regard to farm size, the coefficient of farm size increased from 25th quantile to median and positively and significantly associated with income distribution in the total sample. It is also positively and significantly associated with the income of the MHHs at median of the income distribution. But it was not significantly associated with income at 25th quantile and 75th income distribution for MHHs. When the farm size of the MHHs increases by one unit, the income of the MHHs increased by 0.27 percent at mean income distribution level. The finding reveals that farm size benefits the MHHs and total sampled at median level income distribution and total sampled at lowest income level.

As for access to technology, the coefficient of technology is positively and significantly related to income in the case of the FHHs. The corresponding coefficient is 62.7% at 25th quantile and it increases to 80.8% at the 75th quantile which also reveals that increasing use of technology increases income for the total sample of households and FHHs significantly.

When it comes to off-farm income, it was positively and significantly associated at 25th, 50th and 75th quantiles in the MHHs. It was not significantly related to income for FHHs at 25th quantile income distribution but positively and significantly related at the median and 75th quantile. This implies that off-farm income benefits MHHs in the all level and did not benefit poorer but benefited the households at median level and the richest FHHs.

Access to credit did not significantly affect annual income of FHHs and the total sampled households in the OLS regression but results of the quantile regression revealed that it significantly affected the 75th quantile of the income distribution total sampled households at 5% significance level. This shows that access to credit was not important to poorer households and FHHs and benefits the richest households in study area.

### 4.3.2 Income inequality measurement among male headed and female headed HHs

Table 21, 22 and 23 shows that the Gini coefficient of total income for the total sample is 0.43. The FHHs and MHHs have Gini coefficient of 0.48 and 0.39, respectively. This implies that income inequality was higher among the FHHs than among the MHHs. In other words, income is relatively evenly distributed among the MHHs than among the FHHs.

#### 4.3.2.1 Lorenz Curve for FHHs and MHHs

The Gini coefficient can be graphically represented by different areas of the Lorenz curve. Figure 5 below displays the Lorenz curves by gender. When the Lorenz curve is near to the perfect line of equality there is low Gini coefficient and when Lorenz curve is far from line of perfect there is high Gini coefficient. In the figure below MHH’s Lorenz curve was near to the perfect line than that of the FHHs, indicating that income was evenly distributed among male headed household than female headed households.

| Gender | Education | Household size | Farm size | Credit access | Gender credit | Technology access | Extension | Gender extension | Off farm income | Q75 Household age | -cons |
|--------|-----------|----------------|----------|---------------|---------------|------------------|-----------|------------------|-----------------|------------------|-------|
|        | 0.0270152 | -0.0525745     | 0.2778633| -0.3665       | -0.3665       | 0.552331        | 0.0705362| -0.9667111      | 0.9972916      | -0.035689       | 1.312589 |
|        | 0.00280868| -0.0128017     | 0.3671438| 0.1875582     | 0.6813895     | 0.4231327       | 0.48      | 0.5515661       | 0.5574265      | -0.0055185      | 2.92*** |
|        | 0.04       | -0.19          | 1.58     | 0.60          | 2.19**        | 1.33             | 1.09      | 2.42**          | 2.17**         | -0.31           | 2.15** |
|        | 1.62       | -0.99          | 1.47     | -0.542875     | 3.22 ***       | 1.83             | 1.60      | 5.29***         | -0.49          | 6.93***         |

Source result of data
Income was decomposed by its sources to assess the contribution of each income source to overall income inequality. Gini coefficient was decomposed to identify how much of the overall income inequality is due to any particular source of income and this can be used to determine whether inequality in an income source serves to increase or decrease overall income inequality.

### Table 21: Gini Decomposition by Income Source for total sample

| Source          | Share in total income Sk | Gini Coefficient for income source Gk | Gini Correlation with total income rankings Rk | Share of the overall income inequality | Impact of a 1% Change in income source on inequality |
|-----------------|--------------------------|--------------------------------------|-----------------------------------------------|----------------------------------------|-----------------------------------------------------|
| Crop income     | 0.512                    | 0.490                                | 0.728                                         | 0.420                                  | -0.092                                              |
| Livestock income| 0.111                    | 0.824                                | 0.662                                         | 0.140                                  | 0.028                                               |
| Off farm income | 0.377                    | 0.687                                | 0.740                                         | 0.441                                  | 0.064                                               |
| Total income    |                          |                                      |                                               |                                        |                                                     |
|                 |                          |                                      |                                               |                                        | 0.435                                               |

Results in Table 21 show that crop income accounts the largest share of the annual income, accounting for 51.2% followed by non-farm income that contributed 37.7% of annual income and livestock income that contributed the remaining 11.1% for total sampled household. A 1% rise in income from crop production decrease income inequality by 0.092% for total sampled household. A 1% rises in income from livestock and off farm income increase income inequality by 0.028% and 0.064%, respectively.

### Table 22: Gini Decomposition by Income Source for FHHs

| Source          | Share in total income Sk | Gini Coefficient for income source Gk | Gini Correlation with total income rankings Rk | Share of the overall income inequality | Impact of a 1% Change in income source on inequality |
|-----------------|--------------------------|--------------------------------------|-----------------------------------------------|----------------------------------------|-----------------------------------------------------|
| Crop income     | 0.509                    | 0.510                                | 0.841                                         | 0.448                                  | -0.060                                              |
| Livestock income| 0.110                    | 0.813                                | 0.711                                         | 0.130                                  | 0.021                                               |
| Off farm income | 0.381                    | 0.682                                | 0.788                                         | 0.421                                  | 0.040                                               |
| Total income    |                          |                                      |                                               |                                        |                                                     |
The share of crop income was the largest among both the FHHs (50.9%) and MHHs (51.3%) followed by off farm income and livestock that contributed 38.1% and 11% for FHHs and 37.4% and 11.2% for MHHs, respectively see Table 22 and 23. This is due to high Rk, which is the correlation of a household’s rank in the distribution of each income to their rank in total income. A high Rk coefficient suggests that a household’s rank in the distribution of the source income is strongly correlated with that household’s rank in the distribution of total income.

| Source          | Share in total income | Gini Coefficient for income source Gk | Gini Correlation with total income rankings Rk | Share of the overall income inequality | Impact of a 1% Change in income source on inequality |
|-----------------|-----------------------|---------------------------------------|-----------------------------------------------|----------------------------------------|--------------------------------------------------|
| crop income     | 0.513                 | 0.475                                 | 0.639                                         | 0.393                                  | -0.121                                           |
| Livestock income| 0.112                 | 0.830                                 | 0.638                                         | 0.149                                  | 0.037                                            |
| Off farm income | 0.374                 | 0.684                                 | 0.710                                         | 0.458                                  | 0.084                                            |
| Total income    | 0.397                 |                                       |                                               |                                       |                                                  |

Results from above Table the decomposition by income source showed that crop income decreases income inequality while non-farm and livestock increase inequality. A 1% rise in income from crop production decrease income inequality by 0.06% and 0.121% for FHHs and MHHs, respectively. In contrast, a1% rise in income from off-farm source would increase income inequality by 0.04% and 0.084 % for FHHs and MHHs, respectively. For FHHs, off farm income significantly affects annual income compared to the case with the MHHs. Livestock income was almost equally affecting total income for MHHs and FHHs. A 1% rise income from livestock production increases income inequality by 0.037% and 0.027%, respectively for MHHs and FHHs.

4.3.4Decomposition of income inequality by factor (sub group)

In addition to decomposition by income source, I have implemented income inequality decomposition by factors such as age, education, farm size and others. Since the Gini coefficient is not perfectly decomposable, I have used Thiel’s general entropy of indices –GE (0) and GE (1). Results are presented in Table below.

Accordingly Okatch (2003),it is widely known that an income inequality exist between FHHs and MHHs. Most of MHHs active in accessto technology and market information that made them to have more income than FHHs. However, most of FHHs are correlated with domestic works which was not paid high.

From Table 25 below it can be observed that male headed households had an income share of 61% and female headed households had income share was 38%. The inequality indices for female headed household were greater than male headed households. The Gini coefficient for female headed households has greater than male headed households; means income was easily distributed in male headed household than female headed households. All indices also indicate that inequality within the groups is a greater problem than inequality experienced between the groups. This leads that there was female headed households more inequality contribute than male headed households.

Education level is one of the most important social statuses in the community. Thiel’s indices of inequality indicate that inequality is more widespread in the group with no formal education for both the MHHs and FHHs. The Gini coefficient is also higher for the groups with no formal education than for the other groups. Further, inequality within the groups is greater than inequality experienced between the groups. The group with no formal education contributes the highest amount of inequality to the total inequality. This result similar with the studies by Mankiw et al (1992) using Slow’s model finds a negative relationship between education and inequality.

Decomposition by age indicates that inequality is maximum in the groups where household heads are older than 64 years old. The Gini coefficient for this group is 0.47 compared to 0.46 for the group of 45-64 years old and 0.38 for those with below 45 years old. This shows that inequality was the highest for oldest household groups. The age group of above 64 years is the highest inequality contributor to the total inequality.
Table 24 - Thiel Index Decomposition by demographic factors

By gender

|                | Population share | Mean | Income share | GE(0) | GE(1) | Gini |
|----------------|------------------|------|--------------|-------|-------|------|
| FHHs           | 0.389            | 9292 | 0.386        | 0.43  | 0.43  | 0.48 |
| MHHs           | 0.610            | 9400 | 0.613        | 0.30  | 0.27  | 0.39 |
| Within groups  |                  |      |              |       |       |      |
|                |                  |      |              |       |       |      |
| Between groups |                  |      |              | 0.00002 | 0.00002 |      |

By education

|                | Population share | Mean | Income share | GE(0) | GE(1) | Gini |
|----------------|------------------|------|--------------|-------|-------|------|
| Illiterate     | 0.47             | 8596 | 0.435        | 0.436 | 0.38  | 0.47 |
| Primary        | 0.40             | 9433 | 0.406        | 0.256 | 0.25  | 0.38 |
| Secondary and above | 0.12 | 12043 | 0.159 | 0.308 | 0.34  | 0.43 |
| Within group   |                  |      |              | 0.35  | 0.32  |      |
| Between group  |                  |      |              | 0.005 | 0.006 |      |

By age

|                | Population share | Mean | Income share | GE(0) | GE(1) | Gini |
|----------------|------------------|------|--------------|-------|-------|------|
| <45            | 0.48             | 9297 | 0.48         | 0.25  | 0.26  | 0.38 |
| 45-64          | 0.39             | 10051| 0.42         | 0.44  | 0.39  | 0.46 |
| >64            | 0.116            | 7264 | 0.090        | 0.447 | 0.39  | 0.47 |
| Within group   |                  |      |              | 0.35  | 0.32  |      |
| Between group  |                  |      |              | 0.0045 | 0.004 |      |

Inequality decomposition by household size in Table 25 below, households of size greater than 5 members have higher inequality than otherwise. The Gini coefficient for households with a household size greater than five was 0.44 and for those with a household size of less than five was 0.41. Therefore, household who have house member greater than 5 contributes high inequality for total inequality. In addition, inequality experienced within the groups is greater than that experienced between.

Table 25 - Thiel Index Decomposition by household size

|                | Population share | Mean | Income share | GE(0) | GE(1) | Gini |
|----------------|------------------|------|--------------|-------|-------|------|
| <5(average)    | 0.312            | 7222 | 0.24         | 0.34  | 0.27  | 0.41 |
| >5             | 0.68831          | 10325| 0.76         | 0.3368| 0.33  | 0.44 |
| Within group   |                  |      |              | 0.340 | 0.319 |      |
| Between group  |                  |      |              | 0.013 | 0.012 |      |

In Table 26 below Thiel index decomposition by farm size in hectare of the household indicates that inequality is higher for households with farm size greater than 0.5 hectare. The Gini coefficient was also high for the households having greater than 0.5 hectares. This shows farm size greater than 0.5 hectares highest inequality contributor to total inequality. There was higher inequality within groups than between groups.

Table 26 - Thiel Index Decomposition by farm size in hectare

|                | Population share | Mean | Income share | GE(0) | GE(1) | Gini |
|----------------|------------------|------|--------------|-------|-------|------|
| <0.5           | 0.68             | 8449 | 0.61         | 0.29  | 0.28  | 0.40 |
| >0.5           | 0.39             | 11306| 0.38         | 0.44  | 0.37  | 0.46 |
| Within group   |                  |      |              | 0.34  | 0.32  |      |
| Between group  |                  |      |              | 0.0095 | 0.0090 |      |

With regard to access to technology in Table below 26, the Gini coefficient is 0.42 for households who have access to technology and 0.35 for those with no access to technology. This shows that households who access to technology is more contribute inequality for total inequality.
Access to agricultural extension services has direct influence on the production and incomes of the farmers. The higher access to the extension service, the more likely that farmers adopt new technology and innovation that increase income of the households. Decomposing total inequality by extension visit in Table 27 below shows that there was high Thiel index of inequality among households have no access to extension visit than those who have access to extension. This shows that households who have no access to extension contribute high inequality.

### Table 27 Thiel Index Decomposition by credit, extension visit and off farm access

| By credit | Population share | Mean | Income share | GE(0) | GE(1) | Gini |
|-----------|------------------|------|--------------|-------|-------|------|
| No        | 0.266            | 5205 | 0.148        | 0.312 | 0.249 | 0.38 |
| Yes       | 0.733            | 10865| 0.85         | 0.305 | 0.298 | 0.41 |
| Within group | 0.046      |      | 0.307        | 0.29  |       |      |
| Between group | 0.0053     |      | 0.0052       |       |       |      |

### Table 26 Thiel Index Decomposition by technology

| Thiel Index Decomposition | Population share | Mean | Income share | GE(0) | GE(1) | Gini |
|---------------------------|------------------|------|--------------|-------|-------|------|
| No                        | 0.123            | 4316 | 0.059        | 0.329 | 0.220 | 0.35 |
| Yes                       | 0.87013          | 10110| 0.94         | 0.32  | 0.31  | 0.42 |
| Within group              | 0.32             |      |              | 0.30  |       |      |
| Between group             | 0.033            |      |              | 0.026 |       |      |

CONCLUSIONS
This study analysed the gender differential in the level and distribution of income of rural households in Sodo Zuria Woreda of the SNNPR. It also identified the major determinants of the variation in both the level and distribution of income. Both linear and quantile regressions were applied to the study data that came from 154 households, of whom 94 MHHs and 60 FHHs who were selected using a multistage sampling technique. Quantile regression was used to capture the non-uniform effects of independent variables at different quantile of the income distribution. The level of income inequality was measured using Gini coefficient. Thiel’s General Entropy indices of inequality were also applied in the case of the decomposition of the total inequality by factor.

This study applied decomposition analysis using Thiel general entropies to examine the impact of different sources of income and factors to explain the variation in income inequality. The sources of income for MHHs and FHHs were crop income, non-farm income and livestock income. As the community in the study area is predominantly an agricultural community, crop income plays a dominant role as an income source followed by non-farm income and livestock. With respect to inequality, non-farm income and livestock income represent an inequality increasing source of income while crop income represents an inequality decreasing source. Results also indicate that inequality within the groups was greater than inequality between the groups.

5.3 RECOMMENDATIONS
In the analysis of the role of gender in crop production, the major finding was that there was large inequality in crop roles among MHHs and FHHs. This suggests that the Woreda women, children and youth office together with woreda Agriculture offices should mobilize and initiate FHHs to participate more in crop production. This could be done, on the one hand, by putting in place a system of incentives in the form of inputs and improved agricultural production and processing technologies. On the other hand, men should also be encouraged to share in domestic tasks by putting in place initiatives and incentives that entice men to work more in the house. Further, effective gender sensitization programmes may be required. This could be done through non-formal educational activities.
agricultural extension, meetings and mainstreaming gender issues in school curricula at all levels. In addition, informal educational activities organized for rural farmers should take note of the heavy domestic workload of females. These activities should also be scheduled at appropriate times to enable many FHHs to participate in crop production and marketing. Improving participation of women farmers in various areas of extension programmes is the best option for empowering farm women for better production that increase income. Therefore, it is recommended that the Woreda agriculture office should be organize and conduct training programmes based on women’s need, in a manner that women are encouraged to attend, taking into consideration timing, duration, location and language; in any training organized for farmers

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