

INEQUALITY AND INCOME STRUCTURE: A CASE STUDY ON MAIZE FARMER HOUSEHOLD IN GORONTALO REGENCY

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ABSTRACT

The present work aims to investigate 1) the inequality and income structure of maize farmers' households; and 2) the contribution of maize farming to the household income of the farmer. Furthermore, this research was conducted in Gorontalo Regency for four months. It relied on the survey method, in which the data were collected from questionnaires and interviews. The data consisted of primary data from 132 maize farmers randomly selected from each area using the proportional allocation method. All data were analyzed using the quantitative descriptive method, Gini coefficient, and z-test for proportions. According to the results, moderate inequality was caused if the household income was from maize farming and other farming. The inequality would be categorized high if the non-farming income was included in the calculation. Based on the income structure, this inequality was likely to occur since the non-farming income contributed significantly to the percentage of the total income of high-income farmers. Maize farming income was significant to the farmers' household income, meaning that farmers relied on maize farming as their primary income source.

Keywords: Farmer household; Income structure; Inequality; Maize.

INTRODUCTION

Gorontalo Regency is one of the regencies with the largest population in the 2010 Census, which accounted for 34.22% of the total population in Gorontalo province. Of this percentage, 29.02% worked in the farming sector. Therefore, the Regency made maize farming one of its priority programs to boost the economic condition. Gorontalo Regency has 73,881 ha of maize plantation areas, the largest crop cultivation area compared to other food crops. Another factor underpinning the advancement of maize farming is that maize has supported farmers and their families for generations, making maize the primary trade commodity.

Such a condition also draws the attention of the municipal and regional government, as seen in *Program Agropolitan Jagung*, which was established not long after the inauguration of the province of Gorontalo (Baruwadi *et al.*, 2013). The program was also implemented in Gorontalo Regency. It led to a rise in the production and income of maize farmers as the government did not set the basic price of maize in the market that kept the price intact during harvesting seasons.

Despite such advantages, maize farmers do not heavily rely on maize crops for earnings as maize is, by nature, a seasonal plant. Instead, they run other businesses to strengthen their household economy. One notable example is cultivating other food crops or working in non-farming sectors. However, not all farmers can accommodate such works, resulting in inequality in their household income structure. The purpose of

this research is to investigate: 1) inequality and income structure of maize farmers' households and 2) the contribution of maize farming to the household income of the farmer

METHOD

This research relied on the survey method and was conducted in Gorontalo Regency for four months. Its object was the household income of maize farmers. All primary data from the maize farmers were retrieved from questionnaires and interviews. The present work relied on multistage purposive random sampling. In this method, the sample or farmers living in districts and villages that produce maize the most were selected purposively. The farmer households were selected randomly according to the Slovin criteria for the total sample unit. Limboto and Tabongo Districts were sampling sites, with two villages, namely Tilihuwa and Tenilo, and Tabongo Barat and Tabongo Timur, respectively. As many as 132 households were selected from each area using the proportional allocation method. All data were analyzed using the quantitative descriptive method, Gini coefficient, and z-test for proportions.

1. Inequality of maize farmer household income

The inequality of maize farmer household income was examined using the Gini coefficient (GC) below (Saleh, 1978):

$$GC = 1 - \sum_i^k f_i (y_i^* + (y_{i-1}))$$

where:

- y_i^* = the cumulative proportion of the total household income of maize farmers to a specific number (i)
 f_i = proportion of corn farmer households in a specific class (i),
 k = total class.

The GC value varies from 0 (perfect equality) to 1 (perfect inequality). Todaro (2011) proposes the measurement of inequality as follows:

- (1) $0.20 < GC < 0.35$: low inequality
 (2) $0.35 < GC < 0.5$: moderate inequality
 (3) $GC > 0.50$: extreme inequality

2. Income structure of maize farmers

Income structure was analyzed based on the farming with a profit-loss approach (Soekartawi, 2011; Baruwadi, 2021), and statistics analysis. In addition, descriptive statistical analysis is used to describe income inequality in farmer households.

3. The contribution of farmer income from maize farming

The contribution of farmer household income was analyzed using a Z-test with the following formula (Riduwan, 2009):

$$Z = \frac{\frac{x}{n} - \pi_o}{\sqrt{\pi_o \frac{(1 - \pi_o)}{n}}}$$

where:

- Z = test statistics
 x = Number of farmers with maize farming income higher than other income
 π_o = Proportion of population limit = 0.50
 n = Number of farmer samples

If $Z_{count} < Z_{list}$, the contribution of maize farming to the household income is less than other income. However, if $Z_{count} > Z_{list}$, it means that the contribution of maize farming to the household income is higher than other income (Yusuf *et al.*, 2019).

RESULTS AND DISCUSSION

Farmer Characteristics

The farmer sample varies in characteristics, which involve demographic and socio-economic dimensions. These traits are able to differ the attitude of each farmer in a particular situation. In the present work, the characteristics involve several aspects: age, area of arable land, experience in corn farming, highest education level, and the number of dependents in the family.

Table 1. Maize Farmer Household Characteristics in Gorontalo Regency

No.	Indicator	Area					
		District				Regency	
		Limboto		Tabongo		Gorontalo	
		Average	Std. Deviation	Average	Std. Deviation	Average	Std. Deviation
1.	Sample size	(69)		(63)		(132)	
2.	Age	36.38	6.31	45.08	11.75	40.37	8.82
3.	Land Area	1.25	0.65	1.08	0.34	1.17	0.50
4.	Work Experience	6.93	4.48	21.43	8.73	14.18	6.61
5.	Elementary School Graduates	75.36		73.01		74.19	
6.	Dependents	6.93	4.48	3.40	1.25	3.94	2.89

Source: Research Data (2022)

Table 1 shows that the average age of maize farmers in Gorontalo Regency is 40.37 years. Farmers in Limboto District are younger than those living in Tabongo District. These data confirm that the farmers in Gorontalo Regency are in their productive ages, in line with Law on Manpower No. 13 of 2003, stating that the productive age ranges from 15 to 64 years. Farmers in this age group are physically strong, enabling them to develop their maize farms that positively contribute to their household earnings.

On average, maize farmers in Gorontalo Regency cultivate 1.17 ha of farming area, whereas farmers in Limboto District (1.25 ha) have wider plantations than those in Tabongo District (1.08 ha). Land areas correlate with the harvest. The wider the land, the greater the potential of the farmers to increase their yield. In other words, Limboto District has more harvest potential than the Tabongo district.

In terms of the year of experience, most maize farmers in Gorontalo Regency have been in the agriculture sector for 14.18 years. Farmers in Tabongo District have worked longer (21.43 years) than those in Limboto District (6.93 years). Experienced maize farmers are emotionally attached to their farming activities, and thus they spend more time managing their land than those with less experience in farming. Furthermore, seasoned farmers find it easy to incorporate technologies in managing their agriculture rather than young farmers, culminating in better decision-making skills. These arguments become one of the contributing variables to maize farmers' household income.

For the educational background variable, the present study finds that the majority of farmers are elementary school graduates (74.19%). This finding confirms that human resources in maize farming are categorized as low, resonating with common issues among farmers in Indonesia. The poor educational background hinders farmers

from accepting innovation in maize farming. Moving on to the dependents variable, farmers in Gorontalo Regency have 3.94 dependent family members on average. Farmers in Limboto District have 6.93 dependent family members, while farmers in Tabongo District have 3.40 dependent family members. A high dependent rate is significant to the low average household income rate.

Inequality and Income Structure

1. Household Income Sources

Inequality and household income structure of maize farmers are identifiable from the total household income of the farmers, which is the calculation of maize farming income, non-maize farming income, and non-agriculture income. Table 2 shows the household income of maize farmers in Gorontalo Regency.

It shows that the annual income is 19.037 million rupiahs, which is the sum of maize farming income at 15.051 million, 0.0324 of non-maize farming income, and 1.662 million of non-agriculture revenue. The household income of farmers in the Tabongo District is higher than those in the Limboto district. The reason underpinning this condition is the variable of age and experience of Tabongo District farmers that surpass farmers in the latter area, despite farmers in Tabongo District having smaller land areas. Such finding concludes that maize farming in Tabongo is more productive than Limboto district.

Table 2. Maize Farmer Household Income in Gorontalo Regency
(in thousand rupiah)

No.	Area		Household Income (rupiah/year)			Total
	District	Village	Maize Farming	Non-maize Farming	Non-agriculture Business	
1.	Limboto	Tilihuwa	12,023	154	556	12,733
		Tenilo	7,286	533	360	8,178
	Average in Limboto			10,101	308	477
2.	Tabongo	Tabongo Barat	20,924	1,910	2,163	24,996
		Tabongo Timur	21,115	287	6,425	27,803
	Average in Tabongo			21,066	699	5,342
Average in Gorontalo Regency			15,051	324	1,662	17,037

Source: Research Data (2022)

2. Inequality of Income Structure of Maize Farmers

The Gini ratio was employed to measure the inequality of household income of maize farmers. This ratio shows the overall and comprehensive disparities in income. The value of the Gini ratio ranges from 0 to 1. Income distribution is considered perfect if the Gini coefficient is close to 0, and, on the one hand, the income distribution is not perfect if the ratio is close to 1. Results of the Gini ratio calculation on the household income of maize farmers are provided in Table 3.

The Gini coefficient of household income is measured at 0.48; this coefficient refers to income from maize farming activities. Referring to the criteria proposed by Todaro (2011), the coefficient falls under medium inequality. Moving on to the Gini coefficient at the district level, the coefficients of Limboto District and Tabongo District are 0.61 (high inequality) and 0.35 (low inequality), respectively. Such a finding confirms that maize farming highly depends on some aspects of the agricultural land. Topography and land fertility are central to maize productivity, leading to different production rates and income. The Gini coefficient of other commodities are 0.32 and 0.28 for palm (Pakpahan *et al.*, 2021); 0.42 for red onion (Ivanni *et al.*, 2017); and 0.44 for soybean (Moervitasari *et al.*, 2018).

Table 3. Inequality of Household Income of Maize Farmers
(in percentage and thousand rupiah)

No.	Area	Maize Farming Income		Non-maize Farming		Maize Farming + Non-maize Farming Income + Non-farming income	
		Gini	Average	Gini	Average	Gini	Average
1.	Limboto	0.61	10,101	0.53	10,406	0.60	10,883
2.	Tabongo	0.35	21,066	0.30	21,765	0.59	27,107
Regency		0.48	15,051	0.42	15,375	0.60	17,037

Source: Research Data (2022)

The Gini coefficient of household income from maize and non-maize farming is 0.42, which is also moderate inequality. However, the coefficient is lower than the income from maize farming businesses. Therefore, maize farmers who cultivate other crops are less prone to low income; this situation applies to farmers in Limboto and Tabongo Districts (although the coefficient does not significantly change the category in these districts). Equal opportunities among maize farmers in looking for extra earnings from cultivating non-maize crops are the reason behind the decline in the above coefficient. As a result, the income ratio is well-distributed.

Incorporating non-agriculture income into income from maize farming and non-maize farming, interestingly, causes a rise in the inequality ratio as shown in the Gini coefficient of maize farmers in Gorontalo (the sum of maize, non-maize, and non-agriculture) at 0.60, severe inequality. This condition also occurs at the district level (in Limboto and Tabongo). In other words, earnings from the non-agriculture sector are the factor of inequality among farmers' earnings. Non-agriculture businesses that require specific skills (while farmers have limited skills and poor education background, hindering them from making extra money) contribute to the situation previously mentioned. This situation differs from the report seen in Baruwadi (2006) and Akib *et al.* (2018) that in coconut and maize farming, non-coconut and non-maize income, and non-agriculture income reduce the income inequality. Meanwhile, Sungkar *et al.* (2015) and Nurahman *et al.* (2021) research corresponds to the present study's finding that the rise in the minimum wage in Indonesia will only magnify the income gap.

3. Income Structure

Investigating the income structure of maize farmers in Gorontalo Regency aims to reveal the sum of earnings of farmers categorized into five groups or quantiles (Q) according to their income. Q₁ is the low-income group, and the high-income group is Q₅. The household income of maize farmers is seen in Table 4.

Table 4 reveals that farmers who depend on a single business, i.e., maize farming, only earn 7% of the overall income. On the other hand, farmers in the highest group make 35.75% of the overall income. Based on the district level, the percentage of the income of farmers in the highest group is 42.5% of the overall income, thus indicating a significant gap compared to other quantiles. Q₂ to Q₅ farmers in Tabongo District have relatively similar income percentages, confirming that the income structure is well-distributed.

According to Table 4, the household income with no significant changes refers to the sum of maize and non-maize farming income. The total revenue of Q₁ did not experience any changes and remained at 7%, while Q₂ saw a slight increase in the income percentage by 0.60%. The fall in the income percentage of Q₃, Q₄, and Q₅ ranges from 0.15% to 0.35%. From the table, it can be seen that the situation at the district and regency levels is the same. An additional income source from non-maize farming does not lead to a significant rise or fall in the household income of each farmer group.

Table 4. Maize Farmer Household Income Structure in Gorontalo Regency (in percentage)

Description	Percentage of Income (out of the sum or overall income)				
	First 20% Group (Q ₁)	Second 20% Group (Q ₂)	Third 20% Group (Q ₃)	Fourth 20% Group (Q ₄)	Fifth 20% Group (Q ₅)
Household income (maize-farming only)					
Limboto	5.00	11.50	18.00	23.00	42.50
Tabongo	9.00	18.00	22.00	22.00	29.00
Regency	7.00	14.75	20.00	22.50	35.75
Household income (maize farming and non-maize farming)					
Limboto	5.00	12.70	18.60	22.90	40.80
Tabongo	9.00	18.00	21.00	22.00	30.00
Regency	7.00	15.35	19.8	22.45	35.40
Household income (maize farming + non-maize farming + non-agriculture business)					
Limboto	5.00	12.00	17.00	23.00	43.00
Tabongo	7.00	13.00	15.40	19.20	45.40
Regency	6.00	11.50	16.00	21.60	44.20

Source: Research Data (2022)

If income from non-agriculture businesses is incorporated into the household income, there would be a rise in the percentage of total income at 8.8% in the highest group. Meanwhile, the low group experienced a change ranging from 0.85% to 3.85%. Such findings clarify that the increase in the income from non-agriculture businesses culminates in a rise in the income percentage of high-income farmers, including at the district level. These data later indicate that high-income farmers have higher chances of making money from non-agriculture sectors.

Income Contribution

The income contribution is from the significance of maize farming to the total household income of farmers. Investigating the importance of income contribution aims to get an overview of farmers' household income dependency on maize farming. This finding can be seen from the contribution of each income source to the household income; please see Table 5 below.

Table 5. Contribution of Each Income Source to Maize Farmer Household Income in Gorontalo Regency (in percent)

Num ber	Area		Household Income (%)			Total
	District	Village	Maize Farming	Non-maize Farming	Non-agriculture Business	
1.	Limboto	Tilihuwa	94.42	1.21	4.37	100.00
		Tenilo	89.09	6.52	4.40	100.00
	Average in Limboto		92.80	2.83	4.37	100.00
2.	Tabongo	Tabongo Barat	83.71	7.64	8.65	100.00
		Tabongo Timur	75.96	1.03	23.11	100.00
	Average in Tabongo		77.71	2.58	19.71	100.00
Average in Gorontalo Regency			88.34	1.90	9.76	100.00

Source: Research Data (2022)

Table 5 shows that maize farming contributes to 85% of the total household income of maize farmers in Gorontalo Regency, and the remaining 9.76% refers to the

significance of the non-agriculture revenue. Meanwhile, the non-maize income contributes to 1.90% of the total household income. Moving on to the District data, maize farming contributes to 92.80% and 77.71% of farmers' household income in Limboto District and Tabongo district, respectively. This finding is considerably different from the data of maize farmers in Ciamis Regency, where maize and non-maize farming contributes to 62.03% of the household income. In comparison, 37.93% refers to the contribution of the non-agriculture sector.

Table 6. Result of Statistical Analysis of Income Contribution from Maize Farming on Farmer's Household Income in Gorontalo Regency

No.	Area		Number of respondents	Average Income				Z-count
	District	Village		Maize Farming (000)		Other Income (000)		
				Value	Std. Deviation	Value	Std. Deviation	
1.	Limboto	Tilihuwa	41	8.535	4.128	709	1.980	6.10^{*)}
		Tenilo	28	6.144	2.524	892	2.187	5.75^{*)}
	Average in Limboto		69	7.565	3.735	784	2,053	8.70^{*)}
2.	Tabongo	Tabongo Barat	16	11.770	4.039	4.072	7.628	3.44^{*)}
		Tabongo Timur	47	12.056	4.448	6.712	13.836	4.57^{*)}
	Average in Tabongo		63	11.983	4.318	6.041	12.548	5.83^{*)}
Average in Regency			132	9.700	4.170	1.986	6.927	9.58^{*)}

Source: Research Data (2022)

Note: ^{*)} Significant at $\alpha = 0.05$

Statistically, farmers' dependence on maize farming as a source of household income is identified using the Z-test proportion statistical analysis. This test examines the significance of maize farming income to household income. In this case, the proportion covers two categories: the number of farmers whose household income from maize farming businesses surpasses other income. Another category is the farmers whose other income is greater than the income from maize farming. The limit proportion used for this test is 50 percent ($\pi_0 = 0.50$). The results are depicted in Table 6.

Table 6 shows the results of the Z test statistic that the Z_{count} of each observation area is more excellent than Z_{list} at a significant level = 0.05: $Z_{0.05} = 1.96$. Based on this comparison, the income obtained from maize farming significantly contributes to farmers' household income.

CONCLUSION

According to the research results, moderate inequality was caused if the household income was from maize farming and other farming. The inequality would be categorized high if the non-farming income was included in the calculation. Based on the income structure, this inequality had a high probability rate as the non-farming income contributed significantly to the percentage of the total income of high-income farmers. Maize farming income was significant to the farmers' household income, indicating farmers' dependency on maize farming as their primary income source.

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