Determinant Factors Affecting The Allocation Of Farmers' Working Hours In Maize Farming In Gorontalo Regency, Indonesia.

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Abstract
The present work seeks to: (1) examine the influence of household income sources other than maize on the allocation of working hours in maize farming; and (2) analyse the determinant factors that affect the allocation of working hours of farmers in maize farming. This study was conducted in Gorontalo Regency and applied the survey method and relied on questionnaires and interviews to collect data. While the sampling technique uses multistage purposive random sampling, which includes district, village, and farmer household samples selection. The districts comprised Limboto and Telaga Biru, considering both were potential maize-producing areas. In addition, the selected villages, including Tenilo and Tilihuwa Villages, represented the Limboto District, and Modelidu and Dulamayo Utara Villages represented the Telaga Biru District. The sample units totalled 87 respondents, randomly chosen using proportional allocation based on the sample village. The findings indicated that: (1) An increase in income sourced from non-maize farming and outside the agricultural sector would reduce the allocation of working hours for farmers in maize farming; (2) The determinants of land area, age, experience, education, productive labour force, number of family dependents, maize farming income, other non-maize farm income, and non-agricultural income simultaneously have a significant effect on the allocation of farmers' working hours on farming maize. Partially, the factors that have a significant effect are land area, age, maize farming experience, maize farming income, and non-maize farming income, while other factors have no significant effect

Keywords: Allocation, working hours, farmer and maize

Introduction

Farm households in developed and developing countries continue to adjust to a wide range of changes, including changes in external economic conditions in agricultural and nonagricultural markets, environmental forces that influence farm and nonfarm decisions, and social structures and norms, as well as policy (Findeis, 2002). Although forces that affect the farm household-firm unit vary widely across countries and regions, the subjective equilibrium theory of the farm household provides a unified theoretical framework for analyzing the expected adjustments that farm households make in response to change (Nakajima, 1986).

All economic activities start from the household, although the household is the smallest economic actor, it is the most important economic actor. Households in economic activities are owners of production factors including labor, capital, expertise, land, and others. Production activities carried out by households are to provide factors of production needed by other economic actors by obtaining compensation (Taylor and Adelman, 2003). This also applies to corn farmers, all productive activities were carried out by corn farmers and their families which are a phenomenon of the household economy. Corn farmer household economic activities include production, distribution and consumption activities. The production activities carried out

by corn farming households are to provide production factors needed by other economic actors in return for compensation. In corn farming activities, farmers allocate the potential of their workforce to manage their farming. In addition, farmers will also allocate their potential time for other activities outside of corn farming. This is done to increase household income in an effort to meet the needs of food, clothing and shelter. According to Akib et al. (2018), the allocation of working hours for farmers is the outpouring of working hours by farmers and families into productive activities that include both major agricultural and other activities.

Maize is an important commodity for Gorontalo Regency; this is consistent with the Gorontalo Provincial Government's strategy, which has designated maize as a major commodity in accelerating economic growth through the Maize Agropolitan Program since 2002. Gorontalo Regency, being the largest region in Gorontalo Province, is a prospective maize-producing area, hence several policies have been established to assist the growth of this commodity on and off the farm. Maize's importance to the inhabitants of Gorontalo Regency makes it an intriguing commodity to analyze in various ways, one of which is the determining factor that influences the allocation of working hours. The study's objectives are as follows: 1) to investigate the impact of non-maize farmer family income sources on the allocation of working hours in maize farming; and 2) to investigate the determining elements that influence farmers' allocation of working hours in maize farming.

2. Methods

This study examines the working hours of farmers in maize farming in Gorontalo Regency. A survey with questionnaire data collection instruments and interviews is employed as the research method, with data is primary data sourced from maize farmers. The sampling technique used was multistage purposive random sampling, comprising sub-districts and progressing to farmer households. Limboto and Telaga Biru sub-districts were chosen on purpose as sub-district samples. This decision was made because these two sub-districts had the potential to produce maize. Based on the same criteria, four villages were purposefully chosen: Tenilo and Tilihuwa Villages from the Limboto District, and Modelidu and Dulamayo Utara Villages from the Telaga Biru District. The sample unit of farmers consisted of 87 respondents who were chosen at random using a proportional allocation based on the sample village using the following formula:

$$ni = \frac{Ni}{N} \text{ x n}$$

Details:

ni : sample size in village i ;

Ni : the total population of the village area i;

N : total population of the sample area (315 farmers)

n : number of sample units (87 farmers).

The data analysis of this study refers to the research objectives, which are The analytical steps for the effect of income sources on the allocation of working hours in maize farming are as follows:

2.1 Farm household income

$$\text{PRtp} = \text{PUj} + \text{PLUj} + \text{PLP}$$

Explanation:

PRtp : Farm household income

PUj : Income earned by maize farming

PLUj : Income earned from non-maize farming

PLP : Income earned from non-agricultural sector

2.2 Maize Farming Income

$$\pi = PT - BT$$

Explanation:

Π :Income from maize farming

PT : Total income from maize farming

BT : total cost of maize farming.

The total income of maize farming is the result of multiplying the production of maize with the selling price of its production using the formula:

$$TR = Pj \; x \; Qj$$
$$BT = BT + BTT$$

Explanation:
Pj : Maize price
Qj : Total production of maize
BT : Fixed costs
BTT : Variable cost

The aggregation of all working hours of farmers and their families in maize farming throughout one growing season is referred to as the allocation of working hours. Measurement of working time allocation uses labor conversion according to Yang (1995) in Salim, et al (2019) with the following criteria:
1 man : 1 men's workday
1 woman : 0.7 men's workdays
1 child : 0.5 man's workday
1 cattle : 2 days of men's workday

2.3 The determinant factors that affect the allocation of working hours of farmers in maize farming

Multiple linear regression statistical analysis with the SPSS data processing tool was utilized to investigate the determining elements that impact farmers' working hours on maize farming. The model of multiple linear regression is:

$$Y = \beta 0 + \beta 1\,X1 + \beta 2\,X2 + \beta 3X3 + \beta 4\,X4 + \beta 5X5 + \beta 6\,X6 + \beta 7\,X7 + \beta 8\,X8 + \beta 9X9 + \varepsilon i$$

Explanation:
Y : Allocation of farmer working hours on maize farming (HOK)
X1 : Maize cultivated area (ha)
X2 : Farmer age (year)
X3 : Maize farming experience (year)
X4 : Education (year)
X5 : Total productive labor (person)
X6 : Number of family dependents (person)
X7 : Maize farming income (Rp)
X8 : Non-maize farming income (Rp)
X9 : Non-agricultural income (Rp)
β0 : Constant
β1.....β9 : Regression coefficient
ε i : Standard deviation

3. Results And Discussion

3.1 Description of Determinant Factors

This study's determinant factors are land area, age, experience, education, productive labor, and family load and income. Table 1 explains each of these elements. In maize farming, one of the criteria that determine the distribution of working hours for farmers is land acreage. The larger the maize farming area, the greater the allocation of labor hours spent on this cultivation. The average area of maize grown by farmers in Gorontalo District is 1.38 ha, whereas, in Limboto District, the amount of farmers' land is 1.72 ha, which is larger than the 1.15 ha cultivated by maize farmers in Telaga Biru District. According to this comparison, farmers in Limboto District should devote more of their working hours than farmers in Telaga Biru District.

Table 1. Description of Indicators of Determinant Factors that Affect the Allocation of Working Hours for Maize Farming in Gorontalo Regency

No	Indicator	District/Regency area					
		Limboto		Telaga Biru		Gorontalo	
		Average	sd	Average	sd	Average	sd
1	Number of Respondents (person)	(35)		(52)		(87)	

2	Land area (ha)	1.72	1.78	1.15	0.73	1.38	1.28
3	Age (years)	40.23	13.12	44.33	11.01	42.68	11.59
4	Experience (years)	15.11	8.38	13.90	7.25	14.39	7.72
5	Education (years)	6.97	2.88	6.25	3.44	6.54	3.23
6	Productive Labor (person)	2.57	1.07	2.29	0.74	2.40	0.88
7	Family Dependents (person)	4.06	1.26	3.94	1.18	3.99	1.18

Source: Processed data (2022)

Another indicator as a determinant factor that is included in the model of allocating labor in corn farming is age. Age is an important factor affecting the allocation of working time for corn farmers because age is an important factor in the decision to work. Age has a positive effect on free time for corn farmers (Adesiina and Baidu-Forson, 1995). The farmer's age is connected to his productivity in managing his land and doing other useful tasks. Farmers in their productive age range are physically stronger than farmers in their non-productive age range. According to the BPS and WHO, the productive age range is 15-64 years, with under 15 years and above 64 years classified as non-productive. According to Table 1, the average age of Gorontalo District maize growers is 42.68 years. The average age of farmers in Telaga Biru District is 44.33 years, which is older than the average age of farmers in Limboto District, which is 40.23 years. All of these age ranges are productive, therefore, if farmers' time is devoted to maize farming activities, it will be able to promote maize farming production.

Farmers' farming experience is one of the characteristics projected to impact the allocation of working hours for maize farmers. Farmers' maize farming experience demonstrates the period of farmers while pursuing maize farming as a source of livelihood in acquiring income for farmers' survival. According to the study's findings, maize farmers in Gorontalo District have an average experience of 14.39 years, whereas Limboto District has an average experience of 15.11 years, and Telaga Biru District has an average experience of 13.90 years. This data indicates that farmers have sufficient expertise in cultivating maize.

Another factor that is expected to influence working hours allocation in maize farming is the farmer's formal education level. Farmers' education is tied to their intellectual talents, thus it will affect the allocation of working hours they have for major activities and productive side activities. Farmer households with more educated members can manage time because educated members are able to apply modern agricultural production technologies by working on time, especially improving crop varieties. This is consistent with the literature that education creates a favorable mental attitude for acceptance of new practices especially information-intensive and management-intensive practices (Waller et al, 1998; Caswell et al, 2001). The degree of formal education of farmers is assessed in this study based on the most recent education obtained. According to the findings, the formal education level of maize farmers in Gorontalo District is 6.54 years. According to the accomplishment sub-district, the formal education score of farmers in Limboto District was higher, namely 6.97 years, compared to 6.25 years in Telaga Biru District. This occurrence implies that the average formal education level of Gorontalo District maize farmers in elementary school.

The amount of productive labour held by farmer families is another element that is hypothesized to influence the allocation of working hours for farmers in maize farming. A member of the farmer's family who is of working age, that is, between the ages of 15 and 64, is considered productive labour. The greater the number of productive-age household members owned by farmers and engaged in maize farming activities, the greater the allocation of working hours. According to

the findings, the average productive labor possessed by farmer families is 2.40 persons, with 2.57 people in the Limboto District and 2.29 people in the Telaga Biru District. Farmers may use this productive labour to manage their farming operations.

One of the factors that are expected to impact the allocation of working hours for maize producers is the number of family dependents. The number of dependents shows the number of family members who must be paid for clothes, food, and other necessities by the head of the home. The dependents of the family in this research include the children, wife, and other families that reside in the same house. The presence of dependents can assist in work on maize farming, influencing the distribution of farmer household working hours on maize farming. According to the study's findings, the overall burden of maize farmers in Gorontalo District is 3.99 individuals, with specifics per district ranging from 4.06 in Limboto District to 3.94 in Telaga Biru District. This shows that maize farmers' labour potential is large enough to be used in farming.

3.2 Allocation of Working hours and Farmer Household Income

This study's allocation of working hours indicates the number of working days given to maize farming by farmers. The assumption is that one working day is eight hours long, with six working days weekly. Table 2 describes the distribution of working hours for maize farmers.

Table 2. Allocation of Working Hours for Farmers in Maize Farming in Gorontalo District Based on Sample Area (in Working Days per year)

No	Region		Number of respondents	Working Hours Allocation	
	Subdistrict	Village		Average	Standard Deviation
1	Limboto	Tenilo	11	182,1	81.0
		Tilihuwa	24	229.9	168.6
Limboto average			*35*	*214.89*	*147.23*
2	Telaga Biru	Modelidu	28	147.4	74.5
		Dulamayo Utara	24	171.1	86.4
Telaga Biru Average			*52*	*158.33*	*79.s49*
Gorontalo Regency			**87**	**181.08**	**114.09**

Source: Processed data (2022)

Based on findings, farmers' actions in maize farming are undertaken 1-2 times yearly. This condition is very reliant on the season and the quality of the farmland. According to the data above, farmers spend an average of 181 HOK yearly on maize farming. According to the area of the village/sub-district, Tilihuwa Village has the maximum amount of working hours allocations among the sample villages, namely 229.9 HOK per year, while Modelidu Village has the lowest, 147.4 HOK per year. Limboto District has a greater allocation of working hours, namely 214.89 HOK each year, whereas Telaga Biru District has 158.33. Based on these data, it can be stated that maize farmers in Tilihuwa Village, Limboto District, are more engaged than those in other sample villages since maize farming consumes the majority of their available working hours.

Corn farmers in an effort to fulfill their daily needs do not only rely on their household income from their main job, namely corn farming, but also from other sources of income. Income from others, among others, is to utilize free time from farming activities for productive activities. The productive activity in question is an activity that provides income for corn farming households (Akudugu, et al., 2012). In

this study, maize farmers' income is classified into three categories: income from maize farming, income from non-maize farming, and income from non-agricultural. Table 3 shows the household income of maize farmers in the Gorontalo District.

Table 3 Household Income of Maize Farmers in Gorontalo Regency by Source per year

No	Region		Maize Farmer Household Income (thousands rupiah)			
	District	Village	Maize Farming	Non-maize Farming	Non-Agricultural Sector	Amount
1	Limboto	Tenilo	10.660	3.455	9.080	23.195
		Tilihuwa	19.880	7.435	9.660	36.975
Limboto Average			16.985	6.185	9.480	32.650
2	Telaga Biru	Modelidu	8.445	6.970	7.010	22.425
		Dulamayo Utara	9.490	3.800	2.470	15.760
Telaga Biru Average			8.930	5.505	4.915	*19.350*
Gorontalo Regency			**12.170**	**5.780**	**6.750**	**24.700**

Source: Processed data (2022)

According to the table above, the annual household income of maize farmers in Gorontalo Regency is IDR 24.7 million. The contributions of each source of income are as follows: 49.3% from maize farming, 23.4% from non-maize farming, and 27.3% from non-agriculture sector. The data obtained from the sample area shows that the contribution of maize farming to farmer household income ranges from 37.7% to 60.2%; in all sample areas, farmers have a higher source of income from maize farming than other sources of income in the economy. This proves that if farmers allocate most of their potential working time in corn farming, it will have an impact on increasing the income earned from corn farming. According to Ommani (2011) working time for corn farmers is the time allocated for corn farming activities which include land management, planting, fertilizing, pest and disease control, maintenance, harvesting and post-harvesting. From this study it can be seen that the high percentage of income earned from activities outside of corn farming will lead to reduced work time allocation in corn farming.

3.3 Statistic analysis

The statistical analysis used to examine the determinant factors that effects the farmers' allocation of working hours is multiple regression. The analysis results consist of a regression model, simultaneous test, and partial test.

3.3.1 Multiple Regression Models

Multiple regression analysis is aimed to reveal the regression model of the determinant factors that affect farmers' allocation of working hours in maize farming. The results of the farmer's working hours allocation model in maize farming (Y) with the independent variable (X), respectively land area (X_1), age (X_2), experience (X_3), education (X_4), productive labor (X_5), number of family dependents (X_6), maize farming income (X_7), other non-maize farming income (X_8), income outside the agricultural sector (X_9), are as follows:

$$\begin{aligned} Y = {} & 76.251 + 47.321\,X1 - 1.012\,X2 \\ & + 3.083\,X3 + 0.494X4 \\ & + 4.953\,X5 + 1.363\,X6 \\ & + 2{,}366{,}000\,X7 \\ & - 1{,}459{,}000\,X8 - 39{,}400{,}000\,X9 + \varepsilon i \end{aligned}$$

The model shown above indicates that there are six variables with a positive sign, meaning that a rise in the value of this variable will increase the number of working hours allocated to maize producers. These factors are land area (X_1), experience (X_3), education (X_4), number of productive workers (X_5), family dependents (X_6), and maize farming income (X_7). The

other three variables, such as age (X_2), other non-maize farming income (X_8), and income outside the agricultural sector (X_9), have a negative effect on the time allocation of farmer work on maize farming.

This indication means that the higher the farmer's age, the lower the working hours allocated for maize farming. Due to their physical constraints, farmers who are getting older would spend less time engaged in maize farming activities. Additionally, non-maize farm income and non-agricultural income also have a negative sign, indicating that the greater the income from these two sources, the less time allocated to maize farming will be reduced. This occurs as a result of the farmer's working hours not being divided equally between maize farming and other productive activities to increase the farmer's household income. This circumstance leads to a decline in the allocation of farmers' working hours for maize farming activities if the income earned from the non-maize farm and non-agricultural income increases. This is in line with Becker's assertion in Baruwadi (2006) that a rise in non-work income will result in a greater demand for leisure time and a decrease in working hours. The non-labor income is related to the primary occupation, which in this case is maize farming. Thus an increase in income in non-maize farming reduces working hours in maize farming.

According to a study by Baruwadi et al (2019), a total of 35.20% of leisure time possessed by maize farmers in Gorontalo Province is not utilized for productive tasks.

3.2.1 Simultaneous Test

After obtaining the working hours allocation model for maize farmers, it is required to test the significance of the determinant factors that simultaneously affect the independent variables on the working hours allocation. The SPSS processing results for simultaneous tests are shown in the table below.

Table 4 Simultaneous Test Results for Determinant Factors Affecting Farmer Household Work Time Allocation in Maize Farming

Source of Variation	Sum of Squares	Free Degrees	Average Sum of Squares	F_{hit}	$F_{0.05}$	P_{value}
Regression	1064845.06	9	118316.118	134.9*)		0.000
Residue	67509.38	77	876,745			
Amount	1132354.44	86				
R	0.970					
R Square	0.940					

Source: Processed data (2022)

Based on the table above, the F_{count} = 134.9 with P $_{Value}$ = 0.000 means $F_{count} > F_{0.05}$. Thus, based on the criteria, the variables of land area, age, experience, education, productive labor, number of family dependents, maize farming income, other non-maize farm income, and income of non-agricultural are simultaneously had a significant effect on the allocation of working hours of farmers in maize farming. The multiple correlation coefficient values are obtained R = 0.970, and also obtained the coefficient of determination of R^2 = 9s0.40, indicating that the combined effect of the independent variables in the working hours allocation model for maize farming is 90.40 percent, while 9.60 percent is due to other factors not included in the model.

3.2.2 Partial Test

The purpose of the partial test is to determine the effect of the individual determinant factors that affect the time allocation of maize producers. Table 5 displays the result by SPSS data processing.

Based on the t_{count} and P_{value} results, as well as the value of $t_{0,05} = 1.96$, it can be shown that the independent variables that partially have a significant effect on the allocation of working hours for maize farmers are: land area, age, education, maize farming income and other farming income in outside of maize, while other variables partially have no significant effect, namely education, the number of productive workers, the number of family dependents and non-agricultural income

On the other hand, sources of household income from outside the maize farming and agricultural sector are negative, indicating that the greater the income earned outside the maize farming, the less time will be allocated to maize farming.

Table 5 Analysis Results of Regression Coefficient, Standard Deviation, Test Statistics, and P Value Factors Affecting Farmer Household Work Time Allocation in Maize Farming

Variable	Coefficient Regression	Standard Deviation	t_{count}	P_{Value}
Constant	76,251	19,907	3,830	.000
Land Area (X_1)	47,321	11,895	3,979*)	.000
Age (X_2)	-1,012	.384	-2,634*)	010
Maize farming experience (X_3)	3,083	.632	4,876*)	.000
Education (X_4)	.494	1040	.475	.636
Total productive labor force (X_5)	4,953	5,792	.855	.395
Number of family dependents (X_6)	1,363	3,495	.390	.698
Maize farming income(X_7)	2.366E-6	.000	2,588*)	012
Non-maize farming income (X_8)	-1.459E-6	.000	-2,228*)	.029
Non-farm income (X_9)	-3.941E-7	.000	-.830	.409

Note: Significant level □ = 0.05 = 1.960 **) Significant*

Further, partially, the t_{count} and P_{Value} result indicate that: land area, age, maize farming experience, number of productive workers, and maize farming income have a significant influence on the allocation of farm household working hours in maize farming, while education, number of dependent families, farming income excluding maize and income outside the agricultural sector does not have a significant effect on the allocation of farmer household working hours in maize farming.

4. Conclusion

Based on the findings and discussion, it can be concluded that:

1. Maize farmers' working hours allocation will be reduced as income from sources other than maize production and the agricultural industry rises.
2. The determinants factors, such as land area, age, experience, maize farming income, and other non-maize farm income, significantly affect farmers' allocation of working hours in maize farming. While other factors, including education, productive labor force, number of dependent families, and income outside the agricultural sector, have no significant effect.

RECOMMENDATIONS

1. Policy recommendations that can be taken by the government as an effort to reduce the level of price volatility are to increase local shallot production, set a basic price, and implement a low-cost market.
2. It is necessary to conduct more in-depth research on the factors that influence the volatility of shallot prices in Gorontalo Province which focuses on policies that should be taken by the government in dealing with volatility problems, especially those related to the agricultural commodities.

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