Analysis of lowland rice farmers' income using star systems in Gorontalo Province

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Analysis of lowland rice farmers' income using star systems in Gorontalo Province

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Abstract

This research focuses on

- identifying the star system tradition in lowland farming in Gorontalo Province and
- Analyzing the lowland rice farmers' income using star systems. This research was carried out in April-June 2022. The data were primary and secondary. The method was descriptive-quantitative, using an income data analysis and an independent sample t-test.

The results demonstrated that:

- the Gorontalo society complied with the 4-star system tradition, i.e., Totokiya, Tadata, Otoluwo, and Maluo and
- farmers using star systems earned IDR8,595,476.00/farmer on average or IDR23,082,143.00/Ha on average at a revenue cost of IDR12,926,000.00/farmer or IDR23,082,143.00/Ha and a total cost of IDR4,330,524.00/farmer or IDR7,733,078.00/Ha. As exhibited by the independent sample t-test result, there was a significant difference in income between farmers using star systems and those using non-star systems in Gorontalo Province?

Keywords: Lowland Rice; Income; Star System; Gorontalo Province

1. Introduction

Indonesia has cultural and traditional multiplicities still implemented by the society, especially those living in rural areas, until today. Traditions and cultures guide, encourage, and supervise the attitudes, behaviors, and actions of society in regulating many different social institutions.

Culture is changing in tandem with changes in the life of society (Bakker in Purwasito, 2003). The changes emanate from new experiences, new knowledge, and new technology and oblige society to adapt to new ways of life and situations. Associated with cultural changes and development, the roles of mass media, education, and tourism are significant, particularly in the globalization era. One of the provinces in Indonesia famed for their cultures is Gorontalo.

Gorontalo Province cultivates a distinctive ethnicity and culture. The Gorontalo society is famous for its tradition and culture. Badrudin (2014) defines a society as a cultural creature. It links to the definition of culture as a measurement of human life and behavior. It is reflected through the reality that has long been crystalized through a saying, "*Aadati hula-hula'a to sara'a, sara'a hula-hula'a to kitabullah*" (Eng. Cultures comply with sharia, and sharia complies with the Holy Koran).

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Each community/big family (*pohala'a*) in Gorontalo maintains different cultures and habits. It breeds Gorontalo to have a diverse array of local wisdom. Among local wisdom practiced today are choosing the best day for holding ceremonies, e.g., marriage, circumcision, building houses, seedling, or farming.

Farming development aims to ramp up agricultural product results and quality, broaden job opportunities, augment farmer income and living standards, support industrial activities, and elevate foreign exchange (Soekartawi, 2006:63).

Farming is a specific production process based on plant and animal growth processes (Mosher, 2011:19). Production activities in farming are business parts, in which cost and revenue are critical.

Gorontalo Province area is 12,435km^2 or 0.63% of the total area of Indonesia. Gorontalo Province is composed of five districts (Bualemo, Gorontalo, Pohuwato, Bone Bolango, and Gorontalo Utara) and one city (Gorontalo) (Statistics Indonesia in Gorontalo Province, 2018).

Farming areas in Gorontalo have declined, from 345,685Ha in 2016 to 34,764Ha in 2017. The farming areas with irrigation are 27,660Ha. Areas harvested for lowland and highland rice in Gorontalo in 2015 were 59,668Ha. It decreased from 62,690Ha (Statistics Indonesia in Gorontalo Province, 2018).

The Gorontalo society uses the farming area in Gorontalo provinces to fulfilling their living needs. The society complies with guidance for deciding the day to have the best farming. They refer to the lunar calendar system, through which the months are divided into 12: (1) *Muharram*, (2) *Safar*, (3) *Rabi'ul Awal*, (4) *Rabi'ul Akhir*, (5) *Jumadil Awal*, (6) *Jumadil Akhir*, (7) *Rajab*, (8) *Sya'ban*, (9) *Ramadhan*, (10) *Syawwal*, (11) Dzulqaidah, and (12) *Dzulhijjah*. The day determination refers to the concepts of Lowanga and Kalisuwa. Lowanga literally means unlucky days, but many describe it as empty days/the day when you earn nothing.

Farming implementation outside the months mentioned above is performed by the non-Gorontalo society. The calendar system engenders the terms of marriage season, planting season, or the season for holding a certain customary rite. And yet, the local wisdom is poorly documented. The reason is that the oral cultural tradition is more developing in the Gorontalo society, bringing on local wisdom retained only from mouth to mouth from generation to generation.

Building on the background, we focus on identifying the star system tradition in Gorontalo Province and the income levels from lowland rice farming using a star system.

2. Methods

2.1. Research Area and Time

The research areas were two subdistricts in Gorontalo Province, namely Telaga (Bulota Village) and Mootilango (Paris Village). The area determination was performed purposively. That is, it was grounded on specific considerations referring to the research objectives. The research time was April-June 2022.

2.2. Research Type

The research type was descriptive using a quantitative approach to examine the relationship between two or more causal variables, test the theory, analyze data, and test the hypothesis using statistics.

2.3. Data Type and Source

The data used were both primary and secondary. The first type of data was directly collected from the first hand, such respondents through questionnaires, focus groups, panel groups, or informants through interviews.

The latter was collected from available resources, e.g., relevant books, literature, the Internet, previous studies, and from institutions supporting this research, e.g., Statistics Indonesia, Agricultural Office, and local BPTPH (Nurdin & Hartati, 2019:172).

2.4. Data Collection Technique

Four data collection techniques used in this research were:

2.4.1. Interview

We carried out an in-depth interview, an effective data collection method that allowed us to disclose what was hidden in individuals' minds in the past, present, and future.

2.4.2. Observation

The observation was collecting data by observing the research object directly. Through observation, we could identify a range of incidents, events, or conditions breaking out in society. This technique was applicable to not only visible phenomena but also the listened ones.

2.4.3. Research Diary

The research diary was collecting data by recording the information needed and relevant to the research from relevant data sources. The results of this technique were called field notes. Field notes were written notes concerning what was listened to, observed, experienced, and thought. Qualitative researchers wrote such notes to collect data and make relevant reflections.

2.4.4. Documentation

Documentation was collecting data by observing charts, organizational structures, graphs, archives, pictures, and so forth.

2.4.5. Data Analysis Technique

Data were analyzed on the grounds of the research problems.

2.4.6. Cost Analysis

The rice farming investigated used a combine harvester and power thresher. The fixed and variable costs in farming were observed and analyzed using the following equation.

$$TC = TFC + TVC$$

Description:

TC = Total cost
TFC = Total fixed cost
TVC = Total variable cost

Revenue Analysis

We used the following formula to examine the total revenue/harvest season earned by farmers.

$$TR = P \times Q$$

Description

TR = Total revenue
P = Output rice IDR/kg
Q = Production quantity

Income Analysis

We used the following formula to identify farmer income levels.

$$Pd = TR - TC$$

Description

Pd = Farming income
TR = Total revenue
TC = Total cost

Comparative Analysis

A statistical t-test was conducted to compare farming using combine harvesters and that using power threshers. The t-test we used was the independent sample t-test. The test was undertaken to compare two mean groups of two different samples (independent).

The formula of the independent t-test used in this research was:

$$t = \frac{x_1 - x_2}{\sqrt{\frac{n_1 - 1.S_1^{\,2} + n_2 - 1.S_1^{\,2}}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Description

T = A differential test of two means
x_1 = The average income of farmers using star systems
x_2 = The average income of farmers using non-star systems
n_1 = The number of farmers as samples using star systems
n_2 = The number of farmers as samples using non-star systems
$S_1^{\,2}$ = Variance of the income of farmers using star systems
$S_2^{\,2}$ = Variance of the income of farmers using non-star systems

3. Results and discussion

3.1. Star System

By the time the Gorontalo society was about to plant rice, they invited a panggoba, a star system expert, to visit their fields and determine the best day to plant. The star configurations were visible to the naked eye when the sky was clear. The four-star configuration, called the Poliyama Wopato Configuration, was composed of Totokiya, Tadata, Otuluwa, and Maluo.

3.2. Lowland Rice Farming Cost Analysis

A farming or production cost was all costs or capital spent by farmers during a production process and measured in IDR (Hamid, 2016:41). To determine a production cost, farming costs were divided into two, namely a fixed cost and a variable cost.

Table 1 Fixed Cost

Type of Fixed Cost	Star System		Non-Star System	
	Average/ Farmer	Average/ Ha	Average/ Farmer	Average/ Ha
Land tax	112,000	200,000	290,000	200,000
Equipment depreciation	76,009	135,731	314,013	216,651
Family labor	237,014	423,240	336,229	231,882
Total	425,024	758,971	940,242	648,443

Source: Processed primary data, 2022

A fixed cost was not determined by the production volume, e.g., equipment depreciation and land tax. The detailed data are exhibited in Table 1.

The fixed costs in this research encompassed land tax, equipment depreciation, and family labor costs. According to Table 1, the total average fixed cost of farmers using star systems was IDR425,024.00/farmer and/or IDR758,971.00/Ha. The total average fixed cost of farmers using non-star systems was IDR940, 242.00/farmer and/or IDR648, 443.00/Ha.

The average land tax cost of farmers using star systems in Gorontalo Province (Bulota Village) was IDR112,000.00/farmer or IDR200,000.00/Ha. The average land tax cost of farmers using non-star systems in Gorontalo Province (Paris Village) was IDR290, 000.00/farmer and/or IDR648.443.00/Ha. The average equipment depreciation cost of farmers using star systems was IDR76, 009.00/farmer and/or IDR135, 731.00/Ha. The average equipment depreciation cost of farmers using non-star systems was IDR314, 013.00/farmer and/or IDR216, 561.00/Ha. The equipment included in the equipment depreciation cost was made up of a hoe, sickle, machete, and tank/sprayer used during lowland rice growing season.

The other fixed cost was sourced from family labor costs used during the seedling, fertilizing 1 and 2, and insect and disease control processes. The average family labor cost of farmers using star systems was IDR237, 014.00/farmer and/or IDR423, 240.00/Ha. The average family labor cost of farmers using non-star systems was IDR336, 229.00/farmer and/or IDR231, 882.00/Ha.

Table 2 Variable Cost

Type of Variable Cost	Star System		Non-Star System	
	Average/ Ha	Average/ Farmer	Average/ Ha	Average/ Farmer
Seed	163,000	291,071	450,000	310,345
Fertilizer	695,800	1,242,500	1,791,900	1,235,793
Pesticide	236,200	421,786	402,500	277,586
Hired labor	2,810,500	5,018,750	7,826,500	5,397,586
Total	3.905,500	6,974,107	10,470,900	7,221,310

Source: Processed primary data, 2022

As indicated in Table 2, farmers using star systems spent variable costs on seeds (IDR163,000.00/farmer or IDR291,071.00/Ha), fertilizers (IDR695,800.00/farmers or IDR1,242,500.00/Ha), pesticides (IDR236,000.00/farmers or IDR421,786.00/Ha), and hired labor (IDR2,810,500.00/farmer or IDR 5,018,750.00/Ha). Farmers using non-star systems spent variable costs on seeds (IDR450,000.00/farmer or IDR310,345.00/Ha), fertilizers (IDR1,791,900.00/farmer or IDR1,235,793.00/Ha), pesticides (IDR402,500.00/farmer or IDR277,586.00/Ha), and hired labor (IDR7,826,500.00/farmer or IDR 5,397,586.00/Ha.

A difference in the total average variable cost was noticeable. Farmers using star systems spent fewer costs (IDR3,905,500.00/farmer) than farmers using non-star systems (IDR10,470,900.00/farmer). The cause was that during harvesting activity processes, farmers using non-star systems required more laborers compared to farmers using star systems. Additionally, farmers using star systems were contingent on traditional systems, e.g., attributed to seeds and pesticides to eradicate insects and diseases. Accordingly, the total average variable cost spent by lowland rice farmers using star systems was lower than farmers using non-star systems.

Table 3 Total Farming Cost

Cost	Star System		Non-Star System	
	Average/ Farmer	Average/ Ha	Average/ Farmer	Average/ Ha
Fixed cost	425,024	758,971	940,242	648,443
Variable cost	3,905,500	6,974,107	10,470,900	7,221,310
Total	4,330,524	7,733,078	11,411,142	7,869,753

Source: Processed data, 2022

Predicated on Table 3, the average fixed cost spent by farmers using star systems per growing season was IDR425,024.00/farmer or IDR758,971.00/Ha. The average fixed cost spent by farmers using non-star systems per growing season was IDR940, 242.00/farmer or IDR648, 443.00/Ha. The total variable cost spent by farmers using star systems was IDR3, 905,500.00/farmer and/or IDR6, 974,107.00/Ha. The total variable cost spent by farmers using non-star systems was IDR10, 470,900.00/farmer and/or IDR7, 221,310.00/Ha.

The average production cost spent by farmers using star systems was IDR4, 330,524.00/farmer and/or IDR7, 733,078.00/Ha. The total production cost spent by farmers using non-star systems was IDR11, 411,142.00/farmer and/or IDR7, 869,753.00/Ha. As conveyed by a farmer respondent, farmers using star systems spent less as the systems used enabled them to save money more efficiently than non-star systems. Farmers could simultaneously determine and predict the best time to plant and eradicate insects and diseases, cutting farming costs.

Table 4 Revenue

Revenue	Production (Kg)	Average/Farmer	Average/Ha
Star system	1,293	12,926,000	23,082,143
Non-star system	2,516	25,156,000	17,348,966

Source: Primary data processed, 2022

As demonstrated in Table 4, farmers using star systems earned a total lowland rice farming revenue of IDR12,926,000.00/farmer within one harvest season or IDR23,082,143.00/Ha. Farmers using non-star systems earned a total lowland rice farming revenue of IDR25, 156, 00.00/farmer or IDR17, 348,966.00/Ha in one harvest season.

Farmers using non-star systems earned higher lowland rice production than farmers using star systems. However, using a land area of 1 Ha on average, farmers using star systems earned higher production revenue relative to farmers using non-star systems.

Table 5 Lowland Rice Farming Income

Description	Star System		Non-Star System	
	Average/ Farmer	Average/ Ha	Average/ Farmer	Average/ Ha
Revenue	12,926,000	23,082,143	25,156,000	17,348,966
Total cost	4,330,524	7,733,078	11,411,142	7,869,753
Income	8,595,476	15,349,065	13,744,858	9,479,212

From Table 5, farmers using star systems earned a net income of IDR8, 595,476.00/farmer or IDR15, 349,065.00/Ha. Farmers using non-star systems earned a net income of IDR13, 744,858.00/farmer or IDR9, 479,212.00/Ha. The net income was acquired by calculating the difference between revenue and the total production cost of lowland rice farming.

In addition, farmers using star systems earned less than farmers using non-star systems. Among the reasons was the difference in revenue and total costs between farmers. The income difference was affected by farming production results. Farmers using star systems came with lower production results than farmers using non-star systems. Besides, costs also impacted levels of income earned by farmers using star and non-star systems.

And yet, between lowland rice farmers using star systems and those using non-star systems, the first earned higher than the latter. It was demonstrated between farmer respondents with a land area of 1 Ha on average using star systems and those using non-star systems.

It was on pace with Pontoh (2019), that farmers could benefit from star systems as they could determine the best time to start seedling, planting, and harvesting. Star systems could make them prevent their lowland rice from being attacked by insects and diseases and thereby averting potential losses.

3.3. Comparison Test Result

To investigate whether the income of farmers using star systems and that of farmers using non-star systems were different, a differential analysis was carried out using an independent sample t-test. Before conducting the independent sample t-test, we performed a classical assumption test, comprising normality and homogeneity tests.

3.4. Normality Test

A normality test was undertaken to find the certainty of data distribution towards the data concerned, whether or not they were normally distributed (Farizi, 2018:25). Our normality test was carried out using the One Sample Kolmogorov Smirnoff hypothesis test, acquiring a sig. (p) value of 0.200. Because the probability value > 0.05 (0.200 > 0.05), our research data were normally distributed.

3.5. Homogeneity Test

A homogeneity test aimed to observe if the score variance (variance between sample groups) measured was the same or different (Field, 2009:133). We used Levene's test as the homogeneity test and acquired a significance value of 0.102, higher than 0.05 (0.102 > 0.05). That is, our data were collected from populations with the same or homogenous variance.

3.6. T-Test

Building on the income analysis results, we performed an income comparison analysis using the statistic t-test. In using the test, we aimed to probe whether or not the difference in income between lowland rice farmers using star systems and those using non-star systems was significant. The t-test used was the independent sample t-test. The independent sample t-test was used to compare two mean groups from two different (independent) samples.

Grounded on the independent sample t-test, the t-count was 3,336, higher than the t-table of 2,100 (3,336 > 2.100), and a Sig. (2-tailed) value was 0.004, smaller than $\alpha = 0.05$ (0.004 < 0.05). That being so, Ha was accepted, and Ho was rejected. Therefore, a significant difference existed between the income earned by farmers using star systems and that earned by those non-star systems.

4. Conclusion

On the grounds of the results, the following conclusions were drawn.

- The star configurations used by farmers (panggoba) to start lowland rice farming were visible to the naked eye in the clear sky. The-4-star configuration, referred to as the Poliyama Wopato Configuration, consisted of Totokiya, Tadata, Otuluwa, and Maluo.
- Farmers using star systems earned IDR8,595,476.00/farmer or IDR15,349,065.00/Ha on average at revenue of IDR12,926,000.00/farmer or IDR23,082,143/Ha and a total cost of IDR4,330,524.00/farmer or IDR7,733,078.00/Ha. Predicated on the independent sample t-test, a significant difference in income between farmers using star systems and those using non-star systems in Gorontalo Province existed.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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