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AGRIBUSINESS-BASED RICE FARMING: EFFORTS TO INCREASE PRODUCTION AND INCOME OF RURAL FARMERS

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Abstract

Agribusiness is an agricultural business with a business character where farmers as business actors and as part of rural communities consistently strive to achieve sustainable commercial and financial added value. The research aims to analyze the factors that influence production and income and examine the agribusiness system in lowland rice farming in Palolo District, Sigi Regency using descriptive analysis and multiple linear regression. The research results show that land area, seeds, fertilizer, pesticides, labor, and farmer's origin simultaneously influence lowland rice production. Meanwhile, the amount of production, land costs, seed costs, fertilizer costs, pesticide costs, labor costs, and farmer origin simultaneously influence the income of lowland rice farming. Rice marketing in Palolo District, Sigi Regency involves four marketing institutions through 6 patterns, namely; a) Farmer-Collecting Trader-Wholesale Trader-Consumer; b) Farmer-Collecting Trader-Wholesale Trader-Retailer-Consumer; c) Farmer- Collecting Trader-Intermediary Trader-Retailer-Consumer; d) Farmer-Intermediary Trader-Wholesale Trader-Retailer-Consumer; e) Farmer- Intermediary Trader-Retailer-Consumer and, f) Farmer-Retailer-Consumer

Keywords: Lowland Rice, Production, Income, Marketing.

1. INTRODUCTION

The agricultural sector has an important role in national economic development. Development in the agricultural sector is not only to meet the food needs of the population but is also the main source of income for the population, especially farmers, and is a contributor to national income and the largest absorber of labour in rural areas [1]. Apart from being a contributor to the Gross Domestic Product (GDP) of approximately 16%, the agricultural sector also contributes around 70-80% of food, especially rice which is needed by the community, absorbs Labour (around 49.3%), encourages the emergence of business opportunities for other sectors (supplier of materials for non-agricultural industries) and also earns foreign exchange from export proceeds [2]. The agricultural sector is a sector that contributes quite a lot to GDP, although its role is decreasing because growth in the non-agricultural sector is currently relatively faster. It is hoped that the management and utilization of agricultural products can be carried out in a more planned manner with optimum utilization and can be enjoyed by the entire population of Indonesia.

The main target of agricultural development today is to increase agricultural production and farmer income. In general, agricultural development aims to create a resilient, advanced and efficient agriculture characterized by increasing the welfare of farmers, encouraging the growth of related sectors and the national economic sector [3]. However, currently, the contribution of the agricultural sector to both labour absorption

and GDP tends to decline and saturate (leveling off). The decline in the contribution of the agricultural sector in the narrow sense refers to changes in the national economy which was originally dominated by primary agricultural products and has shifted to other sectors [4]. The revitalization of the agricultural sector includes three main things, namely increasing food security, developing agribusiness, and improving farmer welfare.

Food crop farming, especially lowland rice farming, has strategic value, as a producer of rice which is the staple food for the Indonesian population. In order to support food self-sufficiency, especially rice, the government is making various efforts, including increasing assistance in implementing technology packages, providing production facilities, land cultivation and rice planting movements, harvest and post-harvest handling and marketing [5]. The agricultural sector plays an important role as an instrument in efforts to increase the income of rural farmers and reduce economic disparities [6]. Apart from that, lowland rice farming is quite prospective and promising with quite high land potential. In line with the increase in Indonesia's population every year, the need for rice availability is increasing [7]. Therefore, efforts will always be made to increase lowland rice production and productivity nationally so that there is a balance between rice availability and population.

2. METHODOLOGY

Research sampling was carried out using a simple random method (simple random sampling) to provide unlimited equal opportunities for each element of the population to be selected as a sample. Simple random sampling is a process of selecting an example from all sample units, where each sample unit in the sample frame has an equal chance of being selected [8]. The sample will be generalized to the population. The larger the sample size, the smaller the chance of generalization error to the population, and vice versa. The minimum sample size is 30 people because the sample distribution formed approaches the normal distribution assumption when the sample size reaches 30 people.

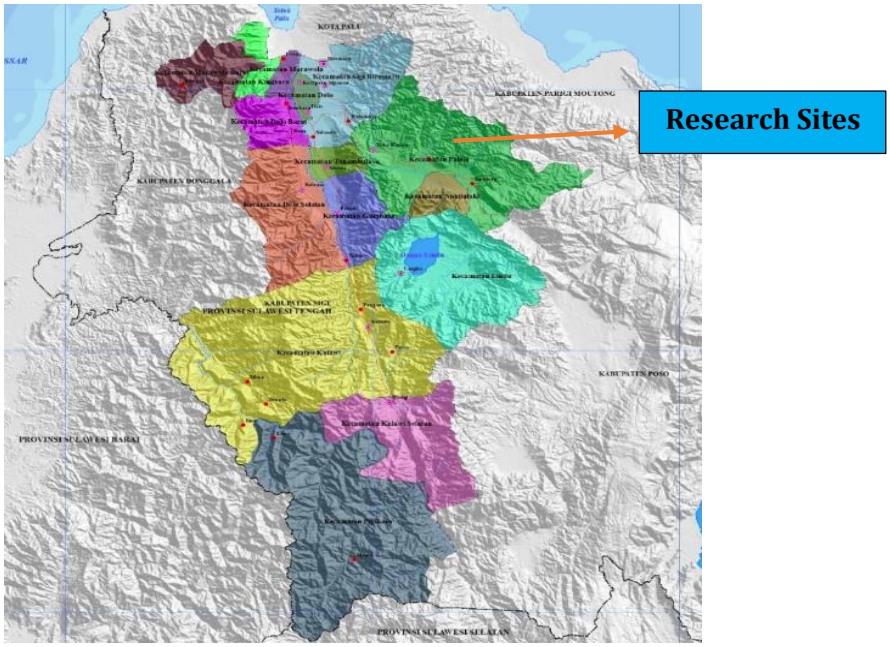

Figure 1: Map of Research Location

2.1 Production and Income Analysis

This research uses multiple regression analysis in logarithmic form. The model used is the Cobb-Douglas production function, which aims to analyze whether there is a relationship between lowland rice production as the dependent variable and production input as the factors that influence it In general [9], it can be described as follows:

$$Y = b0 \sum_{I=1}^{n} XI^{bi} * \mu$$

2.1.1 Production Equation

The linear, logarithmic function is converted into a mathematical equation as follows:

LnY = Lnbo + b1 LnX1 + b2 LnX2 + b3LnX3 + b4 LnX4 + b5 LnX5 + b6 LnX6 + b7LnD + e

Where:

Y = Rice production

Bo = Intercept

b1- b6 = regression coefficient (quantity to be estimated)

X1 = Farming land area (ha).

X2 = Seeds used (kg/ha).

X3 = Urea fertilizer used (kg/ha).

X4 = Phonska fertilizer used (kg/ha).

X5 = Pesticide used (Liter/ha).

X6 = Labor (HOK).

D = Labor (0: Local, 1: Migrants)

e = Error

2.1.2 Income Equation

The linear logarithmic function is converted into a mathematical equation as follows:

LnY = Lnbo + b1 LnX1 + b2 LnX2 + b3LnX3 + b4 LnX4 + b5 LnX5 + b6 LnX6 + b7LnD + e

Where:

Y = Farming income

bo = Intercept

b1- b6 = regression coefficient (quantity to be estimated)

X1 = cost of farming land area (Rp/ha)

X2 = cost of seeds (Rp)

X3 = cost of Urea fertilizer (Rp)

X4 = cost of Phonska fertilizer (Rp)

X5 = cost of pesticides (Rp)

X6 = labor wages (HOK)

D = Labor (0: Local, 1: Immigrant)

e = Error

2.2 Classical Assumptions

The use of multiple linear regression must meet basic assumptions in order to produce a linear estimator. These basic assumptions are known as classic linear regression assumptions [10] , namely:

1) Homoscedasticity, meaning that the variance of the independent variable is constant for each particular value of the other independent variable or the residual variation is the same for all observations.
2) Non-autocorrelation, meaning that there is no influence of the variables in the model over time or there is no correlation between the random errors.
3) Non-multicollinearity, meaning that there is no near-perfect relationship between one independent variable and another in the regression model.
4) The error distribution is normal.
5) The average population error value in the stochastic model is equal to zero.
6) The independent variable has a constant value each time the experiment is carried out repeatedly (nonstochastic variable).

2.3 Statistical Testing

A statistical test is first carried out on the estimation results, to see the accuracy of the regression function in estimating the actual value, measured from the goodness of fit. The assessment is carried out by looking at the t statistical value, the F statistical value, and the coefficient of determination.

2.3.1 Coefficient of Determination (R2)

The coefficient of determination (R2) is used to determine the extent of accuracy or suitability of the regression line formed in representing groups of observational data. The coefficient of determination describes the part of the total variation that can be explained by the model [11]. The greater the R2 value (closer to 1), the better the accuracy is said to be, with the following mathematical equation:

$$R^2 = \frac{\text{JK regression}}{\text{JK total correlated}}$$

Where:

Value $0 \leq R2 \leq 1$

$R^2 = 0$, meaning there is no relationship between X and Y, or the regression model formed is not appropriate for predicting Y.

$R^2 = 1$, the regression line formed can predict Y perfectly.

2.3.2 F–Test.

The F-test shows whether all independent variables included in the model have a joint influence on the dependent variable. The explanatory variables simultaneously influence significantly or insignificantly the dependent variable [12].

Statistically, the F-test formula is as follows:

$$\text{F count} = \frac{R^2/(k-1)}{(1-R^2)/(n-k)}$$

If F count > F table at a rejection level of 5% and a certain level of confidence or significance probability value is smaller than 0.05, then H0 is rejected, which means that the independent variables jointly influence the dependent variable.

2.3.3 T–Test.

Basically, the t-test shows how far an individual explanatory variable influences the dependent variable. The independent variable influences the dependent variable significantly or insignificantly [13]. In statistics, it can be searched using the formula:

$$\text{F count} = \frac{\beta i}{\text{Se}\ (\beta i)}$$

Where:

T = the value sought

Bi = regression coefficient and

Se = standard error of the regression coefficient.

If t count > t table at a rejection level of 5% or the significance probability value is smaller than 0.05 (5% real level) then H0 is rejected, in other words the independent variable has a significant effect on the dependent variable.

3. RESULTS AND DISCUSSION

3.1 Farming Variables

3.1.1 Cost

Farming production costs incurred by farmers are IDR 17,474,074.07/farmer (IDR 17,922,127.26/ha.). These costs consist of fixed costs (taxes and land rent) and variable costs (seeds, fertilizer, pesticides and labor).

3.1.2 Production

The amount of production produced by farmers was 4,147.01 kg/farmer (4,253.34 kg/ha). The lowest amount of farmer production was 2,000 kg and the highest was 6,000 kg. The categories of production levels produced by respondent farmers are shown in Table 1 below:

Table 1: Lowland Rice Farming Production Levels in Palolo District

Production Level (kg)	Quantity (person)	Persentage (%)
2.000 - 3.000	12	13,33
>3.000 - 4.000	38	42,22
>4.000 - 5.000	26	28,89
>5.000 - 6.000	14	15,56
Amount	90	100,00

Source: Processed primary data, 2024.

Based on Table 1, the highest amount of farmer production is in the production interval >3,000 - 4,000 kg as many as 38 farmers (42.22%), followed by the production interval >4,000 - 5,000 kg as many as 26 farmers (28.89%), and the production interval >5,000

- 6,000 kg as many as 14 farmers (15.56%), and the lowest in the production interval 2,000 - 3,000 kg as many as 12 farmers (13.33%).

3.1.3 Revenue

Farmers' income is obtained from the multiplication of production quantity and production price/kg. The average amount received by farmers is IDR 41,470,085.47/farmer (IDR 42,533,420.99/ha). The lowest amount of farmer income is IDR 20,000,000 and the highest is IDR 60,000,000/farmer.

3.1.4 Income

Income is the net result received by farmers after deducting all costs incurred in the production process. The average amount of income received by farmers is IDR 23,996,011.40/farmer (IDR 24,611,293.74/ha). The lowest amount of farmer income was IDR 11,387,500.00 and the highest was IDR 30,214,500.00/farmer.

3.2 The Influence of Land Area, Seeds, Fertilizers, Pesticides, Labor, and Farmers' Area of Origin on Rice Farming Production

The results of multiple regression analysis of the Cobb Douglas model show the anova values of the factors that influence lowland rice production in Palolo District in Table 2 below.

Table 2: Anova of factors influencing lowland rice farming production

Source of Diversity	db	Sum of Squares	Middle Square	F-count	Sig
Regression	6	6,908	1,151	453,28	0,000
Residual	83	0,211	0,003		
Total	89	7,119			

Source: SPSS Analysis Results, 2024.

Table 2 shows F-count = 453.28 with Sig 0.000 < 0.01 (α = 1%) proving that it rejects hypothesis 0, meaning that the independent variables are land area, seeds, fertilizer, pesticides, labor and the farmer's area of origin simultaneously affect lowland rice production. To show the influence of each independent variable on the dependent variable, t test is used. Meanwhile, the adjusted determinant coefficient (R2) of 0.968 shows that variation in lowland rice production can be explained by the independent variables land area, seeds, fertilizer, pesticides, labor, and farmer's area of origin by 96.80%, while 3.20% is explained by Other factors that are not included in the model include climate factors, etc., as shown in Table 3 below.

Table 3: Estimated Results of Cobb Douglas Production Function Parameters in Lowland Rice Farming

Variable	Coefficient	Standard Error	t-count	Sig
Intercept	4,465			
Land area	0,633	0,099	6,386	0,000
Seed	0,534	0,051	10,452	0,000
Fertilizer	0,732	0,043	16,849	0,000
Pesticide	-0,091	0,052	-1,752	0,083
Labor	1,196	0,085	14,068	0,000
Farmer's area of origin	0,038	0,014	2,784	0,007
Adjusted determinant coefficient (R^2)	0,968			

Source: SPSS Analysis Results, 2024.

3.2.1 Land Area

The land area has a positive and significant effect on lowland rice production in Palolo District, where t-count = 6.386 with Sig 0.000 < 0.01 (α 1%) through a two-way test. The regression coefficient (production elasticity) is 0.633, indicating that for every 1% increase in land area, lowland rice production can increase by 0.633% assuming other factors are held constant. This is because every increase in land area will increase the population of paddy fields and vice versa. Furthermore, increasing the population of rice fields will increase the amount of production per unit area. This statement is supported by studies that have been carried out which show that the larger the land managed by lowland rice farmers, the more production they will obtain will also increase. Thus, the area of wetland rice harvest has a positive and significant effect on lowland rice production [14]. Land area is an important production factor for lowland rice production, with a large land area, farmers have a greater opportunity to produce high lowland rice production and vice versa.

3.2.2 Seeds

Seeds have a positive and significant effect on lowland rice production in Palolo District, where t-count = 10.452 with Sig 0.000 < 0.01 (α 1%) through a two-way test. The regression coefficient (production elasticity) is 0.534, indicating that for every 1% additional seed, it can increase lowland rice production by 0.534% assuming other factors are held constant. This is because every additional seed will increase the population of lowland rice so production will also increase. This statement is supported by studies that have been carried out which state that seeds have significant value in increasing lowland rice production, every increase in the use of seeds will provide an increase in lowland rice production [15]. Apart from the number of seeds, seed quality also influences increasing lowland rice production. The seeds used by lowland rice farmers in Palolo District are seeds produced by farmers themselves or uncertified seeds, even though lowland rice production will increase if farmers use labeled or certified seeds.

3.2.3 Fertilizer

Fertilizer has a positive and significant effect on lowland rice production in Palolo District, where t-count = 16.849 with Sig 0.000 < 0.01 (α 1%) two-way test. The regression coefficient (production elasticity) of 0.732 means that for every 1% addition of fertilizer, lowland rice production can increase by 0.732%, assuming other factors are considered constant. This is because every addition of fertilizer to agricultural land will increase the nutrients Nitrogen, Phosphate and Potassium in the soil which are really needed by lowland rice plants. This statement is in accordance with studies that have been carried out which show that the role of NPK fertilizer is being able to contribute macronutrients which are very necessary for the growth and production of lowland rice plants [16]. Compound NPK fertilizer can contribute the nutrients N, P, and K, which are the main macronutrients in supporting the growth and production of lowland rice plants.

NPK fertilizer has a very significant effect on the number of productive tillers, the number of grains per panicle, the percentage of filled grains per panicle and the percentage of empty grains per panicle [17]. This happens because NPK fertilizer can provide macronutrients in fairly balanced amounts for plant growth and development. The addition of nitrogen elements to Urea fertilizer is an important variable that can increase lowland rice production. Meanwhile, the nutrient P is able to stimulate root

formation and increase the number of seedlings and functions to accelerate flowering and fruit ripening [18]. The nutrient K functions as a catalyst in the formation of proteins, cell division and carbohydrates, regulates the activities of various mineral elements, increases the growth of meristem tissue, regulates stomata movement, strengthens the uprightness of stems so that plants do not easily collapse, activates enzymes both directly and indirectly, makes plants more resistant to pests and diseases, and helps root development [19].

3.2.4 Pesticides

Pesticides have a negative and insignificant effect on lowland rice production in Palolo District. Sigi Regency, Central Sulawesi Province. This indicates that the use of pesticides has been excessive or not in accordance with the level of pest or disease attack. This statement is supported by previous studies which stated that pesticides do not have a positive and significant effect on lowland rice production [20]. Lowland rice production has actually decreased due to several factors such as the use of pesticides that are not appropriate to the dosage or level and type of pest and disease attacks. In fact, the fertility of paddy fields in Palolo District has been degraded by the repeated use of pesticides and not in accordance with the required dosage, besides that the residue produced with pesticides becomes chemicals that are toxic to organisms living in the soil which affect soil fertility. Most farmers still use pesticides routinely at doses that are not recommended. This farmer's decision causes several losses such as the high cost of pest control, the ineffectiveness of the pesticides used, and the possibility of other effects such as resistance, residue, and environmental pollution which can pollute the environment and damage the balance of the ecosystem at large which in the end will have an indirect impact on the sustainability of human life.

3.2.5 Labor

Labor has a positive and significant effect on lowland rice production in Palolo District, where t-count = 14.068 with Sig 0.000 < 0.01 (α 1%) through a two-way test. The regression coefficient (production elasticity) of 1.196 indicates that for every 1% increase in labor, lowland rice production can increase by 1.196% assuming other factors are held constant. This is because every additional workforce on agricultural land will cause existing activities in rice farming to be completed more efficiently and effectively. This statement is in accordance with previous studies which stated that labor is a determining element, especially for lowland rice farming. Lack of labor will result in delayed planting, which will affect plant growth, productivity, and product quality so that the results obtained by farmers are not optimal [21]. Labor is an important component of production because labor functions as a driving factor for other input variables. Without labor, other factors of production will not work.

3.2.6 The Farmer's Area of Origin

The farmer's area of origin has a positive and significant effect on lowland rice production in Palolo District, where it = 2.748 with Sig 0.007 < 0.01 (α 1%) through a two-way test. The regression coefficient of 0.038 shows that on average, migrant farmers have lowland rice production that is 0.038 (3.8%) higher than local farmers. This is because migrant farmers are more enthusiastic and have the spirit and work ethic to live a more advanced life because they are in overseas areas and cannot pin their hopes on anyone except hard work. This statement is in accordance with previous studies which state that spirit is transformed into typical behaviour such as

hard work, discipline, thoroughness, perseverance, integrity, rationality, and responsibility, as a form of belief, commitment, and appreciation for a particular work paradigm. In this way, migrant farmers have a more positive, creative, and productive work spirit [22]. Work ethic is an individual's attitude and behavior that fully supports the work being done so that it is easier to accept innovation and technology in order to improve their welfare.

3.3 The Influence of Land Size, Seeds, Fertilizers, Pesticides, Labor and Farmers' Area of Origin on Rice Farming Income

The results of multiple regression analysis of the Cobb-Douglas model show the anova values of the factors that influence lowland rice production in Palolo District in Table 4 below:

Table 4: Anova of factors influencing lowland rice farming income

Source of Diversity	db	Sum of Squares	Middle Square	F-count	Sig
Regresi	7	3,044	0,435	27.946,743	0,000
Residual	83	0,001	0,000		
Total	90	3,046			

Source: SPSS Analysis Results, 2024.

Table 4 shows F-count = 27,946.743 with Sig 0.000 < 0.010 (α = 1%) proving to reject the null hypothesis, meaning that the independent variables are production amount, land area costs, seed costs, fertilizer costs, pesticide costs, labor costs, and the origin of farmers simultaneously influences the income of lowland rice farming. To determine the effect of each independent variable on the dependent variable, the t test is used. Meanwhile, the adjusted determinant coefficient (R^2) of 0.999 shows that variations in lowland rice production can be explained by the independent variables of production amount, land area costs, seed costs, fertilizer costs, pesticide costs, labor costs, and the farmer's area of origin by 99.99%. , while 0.01% is explained by other factors not included in the model. The influence of each independent variable on lowland rice farming income is shown in Table 5 below.

Table 5: Estimated Results of Cobb Douglas Income Function Parameters in Rice Farming

Variable Coefficient	Coefficient	Standard Error	t-count	Sig
Intercept	25,194			
Production quantity	1,408	0,006	239,238	0,000
Land area costs	-0,975	0,565	-1,727	0,088
Seed costs	-0,024	0,004	-6,736	0,000
Fertilizer costs	-0,023	0,004	-5,360	0,000
Pesticide costs	-0,024	0,004	-6,038	0,000
Labor costs	-0,292	0,007	-40,215	0,000
Farmer's area of origin	0,001	0,001	0,876	0,384
Adjusted determinant coefficient (R^2)		0,999		

Source: SPSS Analysis Results, 2024.

3.3.1 Production Amount

The amount of production has a positive and significant effect on the income of lowland rice farming in Palolo District, where t-count = 239.238 with Sig 0.000 < 0.01 (α 1%) through a two-way test. The regression coefficient (income elasticity) of 1.408 means that for every 1% increase in the amount of production, it can increase rice farming

income by 1.408%, assuming other factors are considered constant. This is because every increase in the amount of production will increase the amount of revenue from lowland rice farming provided that the production price per unit does not decrease. This statement is in accordance with previous studies which stated that production results have a significant effect and are positively related to the level of income from rice farming. The increase in rice farming income is influenced by the amount of production and the selling price per unit which will affect the revenue [23]. Apart from that, rice farming income is also influenced by the large production costs incurred by farmers.

3.3.2 Land Costs

Land costs have a negative and significant effect on lowland rice farming income in Palolo District, where t-count = -1.727 with Sig 0.088 < 0.10 (α 10%) through a two-way test. The regression coefficient (income elasticity) = -0.975 shows that for every 1% increase in land costs, lowland rice farming income can be reduced by 0.975% assuming other factors are held constant. This is because every additional land cost will increase the total production costs of lowland rice farming, thereby reducing revenues which will result in a decrease in the amount of income from lowland rice farming. This statement is supported by a previous study which stated that if the amount of costs incurred increases, it will cause a decrease in the amount of income from rice farming [24]. Land rental costs are one of the costs that contribute to increasing production costs and reducing income from rice farming.

3.3.3 Land Costs

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3.3.4 Seed Costs

Seed costs have a negative and significant effect on lowland rice farming income in Palolo District, where t-count = -6.736 with Sig 0.000 < 0.01 (α 1%) through a two-way test. The regression coefficient (income elasticity) = -0.024 shows that for every 1% increase in seed costs, it can reduce lowland rice farming income by 0.024% assuming other factors are held constant. This statement is in accordance with previous studies which stated that if seed costs are increased, farmers' income will decrease [26]. This is because every additional cost of seeds will increase the total production costs of lowland rice farming so that the farmer's income decreases.

3.3.5 Fertilizer Costs

Fertilizer costs have a negative and significant effect on lowland rice farming income in Palolo District, where t-count = -5.360 with Sig 0.000 < 0.01 (α 1%) through a two-way test. The regression coefficient (income elasticity) = -0.023 shows that for every

1% increase in fertilizer costs, lowland rice farming income can be reduced by 0.023%, assuming other factors are held constant. This statement is in accordance with previous studies which stated that any additional fertilizer costs will increase the total production costs of lowland rice farming, thereby reducing farmers' income [27]. This is different from other statements which explain that fertilization will increase production as well as the income of lowland rice farmers. Increasing the production and income of lowland rice farmers will increase farmers' income even though the costs incurred due to the use of fertilizer are relatively high.

3.3.6 Pesticide Costs

Pesticide costs have a negative and significant effect on rice farming income in Palolo District, where t-count = -6.038 with Sig 0.000 < 0.01 (α 1%), using a two-way test. Regression coefficient (income elasticity) = -0.024, indicating that for every 1% increase in pesticide costs, lowland rice farming income can be reduced by 0.024%, assuming other factors are held constant. This statement is in accordance with studies that have been carried out which state that the greater production costs incurred will reduce the income of lowland rice farming if it is not offset by a significant increase in production [28]. The decline in lowland rice farmers' income occurred due to various types of pesticides used by farmers. This is because rice plants are attacked by various kinds of pests and diseases which can reduce production yields.

3.3.7 Labor costs

Labor costs have a negative and significant effect on rice farming income in Palolo District, where t-count = -40.215 with Sig 0.000 < 0.01 (α 1%) through a two-way test. Regression coefficient (income elasticity) = -0.292, indicating that for every 1% increase in labor costs, it can reduce lowland rice farming income by 0.292%, assuming other factors are considered constant. This statement is supported by previous studies which state that labor costs have no effect on rice farmers' income, because the direction of the relationship between labor costs and income is inversely proportional, where if there is an increase in labor costs it will reduce the farmer's income [29]. This is because every additional labor cost will increase the total production costs of lowland rice farming.

3.3.8 Farmer's Area of Origin

The farmer's area of origin has a positive and non-significant effect on rice farming income in Palolo District, where t-count = 0.876 with Sig 0.384 > 0.01 (α 1%) through a two-way test. The coefficient of 0.876 shows that there is no difference between local farmers and migrant farmers in the income of rice farming in Palolo District. This happens because the price level received by local farmers is the same as the price level received by migrant farmers, so the farmer's area of origin has no influence on the income of rice farming in Palolo District.

3.4 Agribusiness System

3.4.1 Upstream Agribusiness Subsystem.

The upstream agribusiness subsystem of lowland rice farming in Palolo District does not yet fully support the lowland rice farming agribusiness system. Farmers still have relatively limited access to production factors related to fertilizers, pesticides, and seeds. Even though we get subsidized fertilizer from the government, sometimes it is difficult for farmers to get fertilizer when it is needed farmers [30]. The process of

distributing the fertilizer needed by farmers still often experiences obstacles due to the invisible hand that carries out speculation, as a result not only is fertilizer difficult for farmers to obtain but the price is also relatively expensive. So farmers buy fertilizer no longer according to their needs but based on their financial capabilities. The seeds used by farmers are seeds obtained from their own farming results or from other farmers in the surrounding area. The seeds used are not certified seeds, so there is no guarantee of optimal production. This happens because it is difficult to get certified seeds and the price is much more expensive than seeds prepared by yourself. The role of agricultural extension workers in trying to convince farmers to use certified seeds has not received a good response from farmers. Apart from that, pesticides used to control weeds, pests, and diseases purchased from agricultural shops sold in the capital city of Palolo District are more expensive than those sold in Palu City. However, purchasing seeds in Palu City will result in wasted time and additional costs. In addition, you will be burdened with additional time and transportation costs to Palu City. Because of this, farmers prefer to buy pesticides at agricultural shops near where they live or in the sub-district capital.

3.4.2 Production/Farming Agribusiness Subsystem.

The agribusiness subsystem of rice farming in Palolo District is managed according to the knowledge and experience of farmers. Production factors such as seeds, fertilizers, pesticides, and labor are used according to experience and availability when needed [31]. This can be seen from the use of uncertified seeds, the use of fertilizers and pesticides that do not comply with recommended doses, as well as the outpouring of labor, most of which involves family labor.

3.4.3 Downstream Agribusiness Subsystem.

The downstream agribusiness subsystem of rice farming in Palolo District is related to the distribution or marketing of rice until it reaches consumers and is related to aspects of marketing channels, marketing institutions, and marketing margins.

3.4.4 Marketing

Marketing is part of the downstream agribusiness subsystem in the agribusiness system. Marketing plays an important role in channeling farmers' production results to consumers and determining the amount of farmers' income [32]. Lowland rice farmers in Palolo District market their farming products (in the form of rice) to traders as intermediaries to reach consumers. Farmers do not market their farming products directly to consumers, considering time and energy.

3.4.5 Marketing channel

Marketing channels are the paths through which goods or services are distributed from producers to consumers. The process that goods or services go through from the producer to the consumer generally goes through a long path to reach the consumer, involving many components and marketing institutions. The results of rice farming in Palolo District are sold in the form of rice through various marketing channels. Rice marketing channels in Palolo District go through various channels, farmers to collectors, farmers to intermediary traders, and farmers to retailers. Lowland rice farmers market rice through intermediary marketing institutions, namely traders so that their agricultural products reach consumers, there are no direct sales to consumers. This is in accordance with previous studies which state that traders usually act as intermediaries in the delivery of goods/services from producers to consumers in the

formation of marketing channels which are a series of intermediary institutions that are interconnected in the distribution of goods to consumers [33]. Rice marketing channels in Palolo District can be seen in Table 6.

Table 6: Rice Marketing in Palolo District

No.	Status	Purchased	Purchase Price (Rp/Kg)	Sold To	Sales Price (Rp/Kg))
1.	Intermediary Trader	Collector Trader	10.400	Retailer	11.000
2.	Wholesalers	Collector Trader	10.400	Retailer	11.000
		Intermediary Trader	10.600	Consumer	12.500
3.	Intermediary Trader	Farmer	10.000	Wholesalers	10.600
4.	Retailer	Intermediary Trader	11.000	Consumer	12.500
5.	Collector Trader	Farmer	10.000	Intermediary Trader	10.400
6.	Wholesalers	Intermediary Trader	10.600	Retailer	11.000
				Consumer	12.500
7.	Collector Trader	Farmer	10.000	Wholesalers	10.600
8.	Retailer Intermediary	Farmer	10.000	Consumer	11.500
9.	Trader	Farmer	10.000	Wholesalers	10.600

Source: Primary Data After Processing, 2024.

Based on Table 6, it can be seen that the marketing channels in lowland rice farming in Palolo District involve several marketing institutions, namely farmers, collectors, intermediary traders, wholesalers, retailers, and reach consumers through several patterns, namely:

1) Farmers-Traders Collectors-Wholesale Traders-Consumers

In this first marketing channel pattern, farmers sell their farming products in the form of rice to collecting traders, collecting traders to wholesalers, and then from wholesalers to consumers. Wholesalers, apart from being distributors, also carry out activities as retailers to consumers by setting the same price as the price of rice at retailers. Wholesalers sell directly to consumers or double as retailers with the consideration that these wholesalers can earn income from retail sales as income for daily needs.

2) Farmers-Traders Collectors-Wholesale Traders-Retailers-Consumers

This second pattern marketing channel involves more marketing institutions compared to the first pattern marketing channel so the channel is longer with more marketing activities.

3) Farmers-Traders Collectors-Intermediary Traders-Retailers-Consumers.

In the third marketing channel, this pattern is almost the same as the second marketing channel, the difference is that the third marketing channel does not involve large traders but intermediary traders.

4) Farmers-Intermediary Traders-Wholesale Traders-Retailers-Consumers.

In the fourth marketing channel, the pattern is the same as the second and third marketing channels, namely involving three marketing institutions, but the type of

marketing institution involved is different from the second and third marketing channels.

5) Farmers-Middle Traders-Retailers-Consumers.

In this fifth marketing channel pattern, the number of marketing institutions involved is the same as in the first marketing channel but differs in terms of the types of marketing institutions involved.

6) Farmers-Retailers-Consumers.

This sixth pattern marketing channel is the shortest marketing channel of the six rice marketing channels in Palolo District because it only involves one marketing institution, namely retailers. Retailers buy rice from farmers as producers and then sell it to consumers. Retailers who buy directly from farmers in Palolo District are traders who sell to consumers at markets in Palolo District and its surroundings, who move every day.

3.4.6 Marketing Institute

Distribution of agricultural products from producers to final consumers through interrelated marketing institutions. Marketing of rice farming products in Palolo District in the form of rice involves marketing institutions, including collecting traders, intermediary traders, wholesalers, and retailers with the following characteristics:

a. Collecting traders consist of mill owners who act as collecting traders by buying rice from farmers and then selling it to intermediary traders and wholesalers in Palu City.
b. Intermediary traders are traders who buy rice from farmers or/ and from collectors to sell to wholesalers and retailers. Intermediary traders are domiciled in the Palolo sub-district and Palu City.
c. Wholesalers are traders who sell to retailers as well as to consumers. Wholesalers are domiciled in Palu City, located at Masomba Market and Manonda Market.
d. Retailers are traders who buy rice from farmers, collectors, intermediaries, and wholesalers to sell to consumers. There are retailers who are domiciled in Palolo District, Palu City, and surrounding areas.

3.4.7 Marketing Margin

Marketing margin is the difference between the price at the farmer level and the price at the consumer level. The price differences that occur are caused by the costs of the marketing functions carried out in the marketing channels and the profits taken as compensation for the marketing functions carried out. The marketing margin for rice in Palolo District is IDR 2,500/kg or IDR 125,000/50 kg (1 sack) in the first to fifth marketing channels. Meanwhile, the marketing margin in the sixth marketing channel is IDR 1,500/kg or IDR 75,000/50 kg (1 sack). The difference in marketing margins is caused by the first to fifth pattern marketing channels involving more marketing institutions, causing greater marketing costs compared to the sixth pattern marketing channel. Marketing margin will affect the price received by producers and also the price received by final consumers. The elements included in the marketing margin that needs to be taken into account by every marketing institution are operational costs, depreciation and profits [34]. Therefore, it is necessary to determine the sales price by each marketing institution so as not to suffer losses.

4. CONCLUSIONS

Based on the results of the discussion, the following conclusions can be drawn:

1. The independent variables of land area, seeds, fertilizer, pesticides, labor, and the farmer's area of origin simultaneously influence lowland rice production in Palolo District. Every 1% increase in the land area will increase production by 0.633%, every 1% addition of seeds will increase production by 0.534%, every 1% addition of fertilizer will increase production by 0.732%, every 1% addition of pesticides will reduce production by 0.091, and every 1% increase in labor will increase production by 1.196% assuming other factors are held constant.
2. The independent variables are production quantity, land area costs, seed costs, fertilizer costs, pesticide costs, labor costs, and the farmer's area of origin simultaneously influence the income of lowland rice farming in Palolo District. Every 1% increase in production volume will increase farming income by 1.408%, every 1% increase in land costs will reduce farming income by 0.975%, every 1% increase in seed costs will reduce lowland rice farming income by 0.024%, every additional cost 1% fertilizer will reduce farming income by 0.023%, every 1% increase in pesticide costs will reduce farming income by 0.024%, and every 1% increase in labor costs will reduce farming income by 0.292%, assuming other factors are held constant.
3. The farmer's area of origin has a positive and significant effect on lowland rice production in Palolo District. Migrant farmers have lowland rice production that is 0.038 (3.8%) higher than local farmers. The farmer's area of origin has a positive and non-significant effect, but there is no difference between local farmers and migrant farmers on rice farming income in Palolo District.
4. Rice marketing in Palolo District involves four marketing institutions (collecting traders, wholesalers, intermediary traders, and retail traders), with the pattern: a) Farmer-Collecting Trader-Wholesale Trader-Consumer; b) Farmer-Collecting Trader-Wholesale Trader- Retailer-Consumer; c) Farmer- Collecting Trader-Intermediary Trader-Retailer-Consumer; d) Farmer-Intermediary Trader-Wholesale Trader-Retailer-Consumer; e) Farmer- Intermediary Trader-Retailer-Consumer and, f) Farmer-Retailer-Consumer. Meanwhile, the marketing margin for rice in the first to fifth pattern marketing channels is IDR 2,500/kg or IDR 125,000/50 kg (1 sack), the marketing margin in the sixth pattern marketing channel is IDR 1,500/kg or IDR 75,000/50 kg (1 sack).

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