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Intensity of Rice Field Land Utilization for Rice and Watermelon Crops (Case Study: Paya Itik Village, Galang District, Deli Serdang Regency)

Kenal P. Hutapea[1], Ragnar Oktavianus Sitorus[2], Trinitianti Purba[3]
[1,2,3]Faculty of Agriculture, Universitas Methodist Indonesia, Medan, Indonesia

Author Corresponding email : hutapeaken@gmail.com

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Abstract
This study aims to (1) determine the intensity of rice field land use for rice and watermelon plants and (2) determine the income of farmers in rice and watermelon farming in Paya Itik Village, Galang District, Deli Serdang Regency. The population of this study consisted of farmers who planted rice and watermelon on one piece of land alternately in Paya Itik Village. The sample of this study was 50 rice and watermelon farmers alternately. Data collection used primary data methods with direct interviews with farmers to calculate the intensity of rice field land use for rice and watermelon plants. Data analysis used qualitative descriptive analysis. The results showed that the intensity of land for the first rice plant was 25%, watermelon was 8.33%, and the second rice was 25% with a land area of 18.58 Ha. This is done because farmers use land to increase production during the planting season. The income of rice farmers in the first planting season was Rp. 5,819,699.444/year, watermelon plants Rp. The income obtained was 8,365,888.3/year, and in the second planting season of rice plants, it was Rp—6,293,452.46/year.

Keywords— : Production Costs, Rice Field Intensity, Rice Field Utilization, And Farmer Income.

Introduction

Utilizing natural resources is one of the human efforts to meet the needs of life. Many of its utilizations are directly or indirectly related to agricultural resources that can be used to support the growth of the Indonesian agricultural economy. Indonesia can focus its efforts in the agricultural sector to meet domestic and foreign needs so that there will be no food crisis cases.(Habib, 2021; Sari & Hariyanto, 2019). One of the efforts to increase farmers' income is by seeking commodities with high economic value and enormous market potential, both domestic and foreign. One of the commodities that is entirely developed is horticulture.(Harisman, 2017; Suryadi et al., 2020).

The availability of land for horticultural agriculture still needs to be higher than that of other agricultural land. If seen from the potential in the future, horticultural products are up-and-coming to be developed. Horticultural development can be done by utilizing the availability of land, which is realized through intensification activities. On the other hand, Indonesia has several diverse land types, such as rice fields, dry land, swamp land, peat land, lowland land, and tidal land.(Nasikh et al., 2023; Ningtyas & Santosa, 2019; Sari & Hariyanto, 2019).

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Rice fields have a strategic function because they are the leading food provider for the community.(Siregar & Oktaviana, 2020). Rice fields must be utilized as much as possible to improve the standard of living and welfare of farmers. This type of diversity has the opportunity to be developed into Horticulture. The potential of this resource must be managed well to be utilized in the development of horticulture as an alternative to increasing income.(Susanti & Afrila, 2017) (Ningtyas & Santosa, 2019; Sari & Hariyanto, 2019).

In rice fields, the cultivated plants are generally rice, although sometimes replaced with other plants such as secondary crops, horticulture, and other annual plants on land with a rice-rice planting pattern, there is a decrease in soil fertility due to the transportation of organic matter without returning it to the soil. Rotation of rice crops with annual crops in rice fields can help improve the soil and increase soil organic matter. One of the plants suitable for being used as an intercropping plant in the same land is watermelon, with a short planting age of 60-75 days(Arif et al., 2022) (Jamilah & Sarifuddin, 2013).

Watermelon (Citrullus vulgaris) is a type of fruit that is very popular among many Indonesians because of its sweet taste and high water content.(Astawan, 2009; Dia Septiani, 2019). Its hard skin is dark green or light green with lines surrounding the skin's surface, and the juicy flesh is red and yellow. Watermelon has a unique attraction because the fruit is large and contains a large amount of water, approximately 92%(Jamilah & Sarifuddin, 2013).

One way to increase watermelon yields is with proper cultivation techniques, such as fertilizing watermelon plants appropriately to maximize production. In watermelon plants, the N element is the primary nutrient for growth and is generally very necessary for the vegetative growth of plants, namely stems, leaves, and roots. Data on the area, production, and productivity of rice harvested in North Sumatra are as follows:

Harvested Area and Rice ProductivityDeli Serdang Regency in 2015

No	Subdistrict	Harvest area(Ha)	Production(Ton)	Productivity(Kw/Ha)
1	Merry Mountain	809.00	835.00	3995.00
2	STM Hulu	555.00	543.00	3685.00
3	Sibolangit	1098.00	1432.00	4440.00
4	New Kutalim	2187.00	2418.00	12884.00
5	Stone fountain	1122.00	1301.00	6513.00
6	My name is Rambe	1224.00	1748.00	9397.00
7	Blue-blue	1849.00	2072.00	10654.00
8	STM Downstream	1710.00	2245.00	11698.00
9	Ancient building	176.00	248.00	692.00
10	**Galang**	**1996.00**	**2162.00**	**11627.00**
11	Cape Morawa	4889.00	4997.00	28331.00
12	The spear	1028.00	1239.00	10658.00
13	Old Deli	14.00	21.00	111.00
14	Sunggal	5059.00	5234.00	29982.00
	Total	**35618.00**	**38839.00**	**213120.00**

(Source: BPS Deli Serdang)

Table 1 It is known that in Deli Serdang Regency, the highest rice production is in Seberang Perak District, which produces 12,344.00 tons. Galang District has a production of 2,162.00 tons, a harvest area of 1,996.00, and a productivity of 11,627.00 Kw/ha. The center of rice production in Galang District is in Paya Itik Village. Data on the area and productivity of watermelon harvested in North Sumatra are as follows:

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Watermelon harvest area and production in Deli Serdang district in 2015

No	Subdistrict	Harvested area (Ha)	Productivity(tons)
1	New Kutalim	5.00	1040.00
2	Blue-blue	6.00	2000.00
3	Galang	30.00	2490.00
4	Cape Morawa	23.00	1169.00
5	Sunggal	25.00	4480.00
6	Silver drapery	91.00	14336.00
7	Labuhan Deli	25.00	2940.00
8	Please forgive me, sir	165.00	51000,00
9	Quiz bar	3.00	780.00
10	Pumpkin Beach	5.00	2900.00
11	Banyan	66.00	250.00
12	Pakam Basin	18.00	240.00
	Total	**462.00**	**83625.00**

(Source: BPS Deli Serdang)

The highest production in Deli Serdang Regency is in Percutsei Tuan District, which produces 51,000.00 tons. Meanwhile, Galang District produces 2,490.00 tons of land and 30.00 ha of land.

One of the rice-watermelon production sites in the Deli Serdang district is Paya Itik Village. The problems often faced are the poor utilization of land after the rice harvest and the high production costs, so researchers are interested in conducting research entitled "Intensity of Rice Field Utilization of Watermelon Plants" in Paya Itik Village, Galang District, Deli Serdang Regency. The reason researchers chose the title is that by implementing the Intensity of Land Utilization system, the people in the village are prosperous.

Literature Review

1. Land Intensity

In agriculture, land intensity is expressed as the area of agricultural land utilized by a Farming Business with low, medium, and high input intensity as a percentage of the total. The land intensity of a Farming Business can be defined as the input level used by the Farming Business per unit of production factor (generally land). Land is classified into intensity categories based on the estimated volume of input per hectare(Shinta, 2001).

2. RotationPlant

Crop Rotation is a plant cultivation system that involves rotating crops or planting more than one type of plant at different times. It has been known for a long time in agriculture and is often recommended for several types of plant cultivation.

Crop Rotation has many advantages. It is highly recommended in some organic plant cultivation systems. Some advantages of crop rotation are reducing the intensity of pest or disease attacks, increasing soil fertility, and forming a stable micro-ecosystem. In addition, several types of commodities, especially vegetables, can meet market demand in the agribusiness world.(Suprihatin & Amirrullah, 2018).

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There are several functions of crop rotation, namely:

Crop rotation can increase soil fertility. Some plants have a greedy nutrient nature, and some can provide soil nutrient availability. In addition, the type of plant that is greedy for nutrients is tubers, while the type of plant that provides nutrients is legumes—crop rotation is a Fulfillment of Market Needs and Demands. Of course, we can produce various commodity variants with crop rotation in 1 plot of planting area(Sulistyarso et al., 2022). This crop rotation is usually done in a village in the Galang sub-district, namely Paya Itik Village, Galang sub-district, Deli Serdang district. Crop rotation is done three times a year with rice-watermelon rice plants, aiming to provide time for nutrient repair in the soil(Suwantoro, 2008).

3. Income

Increasing rice production can be done by agricultural intensification, and important cultivation activities in agricultural intensification are land processing or land area (Pretty & Bharucha, 2014). However, to maximize agricultural productivity, it is necessary to use facilities to allow for maximum productivity, with the support of existing technology, to maximize agricultural yields (Khan et al., 2021).

Farming income can be divided into two meanings: gross income, which is the income obtained by farmers in farming for one Year, which can be calculated from the results of sales or exchange of production results valued in rupiah based on the price per unit weight at the time of harvesting, and net income, which is the total amount of income obtained by farmers in one Year minus production costs during the production process. Production costs include actual labor costs and real costs of production facilities (Hilton & Platt, 2020).

The area of agricultural land control is critical in the production process of farming and agricultural businesses. For example, narrow land selection or control is less efficient farming than broader land. The narrower the land, the less efficient the farming business is unless it is carried out in an orderly and sound administration and with the right technology (Hilton & Platt, 2020; Shaner, 2019).

Research Method

This research was conducted in this farming business located in the Galang sub-district, Deli Serdang district. Objective considerations are due to land use, including implementing this crop rotation in the Deli Serdang district. The population in this study were farmers who cultivated rice and watermelon farming businesses according to the planting season in one Year in the Galang sub-district, Deli Serdang district. The selected sample of farmers was 50, determined purposively from the number of farmers in the area. The data used in this study are two data: the first is primary data, where data is obtained from interviews with rice farmers using a list of questions (questionnaires) that have been prepared in advance, and the second is secondary, where it is obtained from related agencies including the Central Statistics Agency (BPS), and literature studies related to this study. The Data Analysis Method calculates the intensity of rice field utilization for watermelon plants and sees farmer income against land use treatment can be analyzed using the cropping pattern formula.

Cropping intensity index

$$IIP = \frac{\sum_{i=1}^{n} (bi \times ti)}{A \times 12} \times 100\%$$

Information:

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bi = plant area
ti = age of the plant
A = land area
12 = 12 months

A cropping pattern is a system of crop rotation on one land. The arrangement of cropping patterns is intended to obtain optimal results based on the land's carrying capacity and maintain the sustainability of agricultural land and water resources to be used sustainably. To analyze the income obtained from rice and watermelon farming using the income and profit formula. The following calculation formula for income can be calculated using the following formula.

$TR = P \times Q$

Information :

TR: total revenue (Rp/period)

P: Production quantity (Kg/period)

Q: Production price (Rp/Period)

Results and Discussion

1. CharacteristicsSample

a. Rice Farmers

Rice is a food crop in the form of grass in clumps. History shows rice cultivation in Zhejiang (China) began in 3,000 BC. Fossils of rice grains and paddy were found in Hastinapur, Uttar Pradesh, India, around 100-800 BC. In addition to China and India, some areas of origin of rice are Northern Bangladesh, Burma, Thailand, Laos, and Vietnam(Astriah et al., 2017)

Soil acidity varies from 4.0 to 8.0. Lowland rice is planted in heavy clay soil with a hard layer 30 cm below the soil surface. Requires fertile mud soil with a thickness of 18-22 cm (Media Tani Online, 2023). Soil acidity between pH 4.0-7.0. In lowland rice, flooding will change the planting pH to neutral (7.0). Calcareous soil with a pH of 8.1-8.2 does not damage rice plants. Because it experiences flooding, rice fields have a reduction layer that does not contain oxygen, and the pH of the rice field soil is usually close to neutral. Special soil processing is required to obtain qualified rice field soil. Plants can grow in areas ranging from lowlands to highlands(Astriah et al., 2017)

b. Watermelon Farmers

Watermelon is very identical to summer or dry-season fruit in some countries. The high water content and sweet taste make watermelon very refreshing when the air is boiling. Watermelon plants are tropical plants(Antika & Arnama, 2023).

Watermelon plants are widely cultivated worldwide, primarily to consume the fruit. Watermelon flesh is generally red, with many tiny black seeds in the center. However, modern watermelon cultivars have other variations, such as yellow flesh or seedless watermelons.

Watermelon is a type of climbing plant. A large area of land is needed to plant for cultivation purposes. In addition to providing sufficient nutrients regularly, watermelon plants require direct sunlight exposure to grow well. Watermelon plants have tendrils. The leaves of watermelon plants are large, have a rough texture, and have hairs. The shape of watermelon leaves is pinnate, and the older the leaf texture becomes, the more complex and rougher it becomes.(Antika & Arnama, 2023).

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The cultivated type of watermelon can grow to a diameter of 60 cm. The Indians began cultivating watermelons in the Mississippi Valley and Florida. Seedless watermelons were first discovered in 1939 by a Japanese scientist. This hybrid is rare, especially when compared to regular seeded watermelons because this type is not resistant to disease. Seedless watermelons have become more prevalent in the 21st century. This is evidenced by their sales increasing 85% of total watermelon sales in the United States in 2014.(Antika & Arnama, 2023).

c. Utilization of Rice Fields

Indonesia has a fixed agricultural land area, and its enormous population growth will cause the availability of agricultural land to become smaller. If this continues, there will be an imbalance between the population working as farmers in an area and the existing agricultural land area. As a result, population pressure on agricultural land will increase, or in other words, the area will no longer be able to meet the food needs of its population. Therefore, the region must meet this by utilizing and increasing the potential of existing resources, primarily agricultural land.

Continuous flooding in rice fields will disrupt the biological and chemical balance of the soil—suspicion of the emergence of phenomena indicating soil degradation, especially in rice fields. Aerobic and anaerobic alternation in rice fields effectively controls the biological and non-biological balance so that rice fields become healthy and remain productive. Crop rotation is essential because farmers develop various commodities according to market demand. Crop rotation between rice and horticulture is a wise alternative to maintaining productivity, land fertility, and the economy of farmers. The study results showed that rice crop rotation with horticulture can improve the structure of rice field soil.(Suprihatin & Amirrullah, 2018).

d. CharacteristicsSample

The socio-economic characteristics of the study's sample population include age, education level, number of family members, and length of rice and watermelon farming. This can be seen in Table 1 below:

a. Sample Characteristics by Gender

Table 1Characteristics of Rice and Watermelon Farmer Samples in Paya Itik Village

No.	Gender	Amount	Presentation
1	Man	18	18%
2	Woman	32	32%
	Amount	**50**	**50%**

(source: Processed data)

Table 1 shows 55 farmer samples grouped by gender. Males comprise 18% of the sample, and females comprise 32%.

2. Land Intensity

Agricultural land is land intended for agricultural activities. One of the agricultural lands widely available in Indonesia, for example, Java Island, is rice fields. This type of agriculture requires water puddles in its processing. Therefore, rice fields must have a flat surface to hold the puddles, usually limited by embankments.

Agricultural land is a land that is intended for agricultural activities. One of the

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agricultural lands widely available in Indonesia, for example, Java Island, is rice fields; this rice field is a type of agriculture that, in its processing, requires water puddles. Therefore, rice fields must have a flat surface to hold the puddles, usually limited by embankments.(Dinaryanti & Atmanti, 2014).The level of allocation and land capacity to produce good agricultural products with the best possible agricultural land management can be seen in Table 2 below:

Table 2. Average Intensity of Land Use in 1 Year

No	Type plant	Area of rice-watermelon land-rice (Ha)	Rice field intensity-watermelon-rice(Ha)
1	Paddy	18.58	25%
2	Watermelon	18.58	16.66%
3	Paddy	18.58	25%
	Total	**18.58**	**76.66%**

(source: processed data)

Table 2 shows the magnitude of the land capacity of sample farmers 1 to 50 in producing for 1 year with a total area of sample farmers' land of 18.58 Ha; it can be seen that the land capacity in producing rice in the first planting season is 25%, the land capacity in producing watermelon looks optimal with 16.66% where this figure is half of the capacity of the main crop, namely rice and the land capacity in the third planting season is still the same as the percentage of the first planting season of 25%. Therefore, this activity can increase rice production and improve soil nutrients for each planting season. Table 3 shows the amount of land intensity in Rice and Watermelon plants as follows:

Table 3 Average Total Land Intensity in One Year

No.	Plant type(Year)	Total land area (Ha)	land intensity amount (%)
1	Paddy 1 & 2	37.16	50%
2	Watermelon	18.58	16.66%
	Total	**18.58**	**76.66%**

(Source: processed data)

Table 3 shows the total intensity of each commodity in one Year, where rice is 50% and watermelon is 16.66%. This means that the land use of sample farmers 1 to 50 in each planting season is effective with full land utilization every Year.

It can be concluded that hypothesis **(1) States that implementing the Intensity System for Utilizing Paddy Fields for Rice and Watermelon plants increases production results, which is acceptable.**

3. Production Costs in Rice and Watermelon Farming

Costs incurred during the production process. This includes Fixed Costs and Variable Costs involved in production. The value of fixed costs is fixed up to a certain point. However, the value of variable costs changes depending on the goods produced.

Production costs are the costs incurred when producing something. There are fixed costs and variable costs in the production process.

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1. CostStill

Production-related costs are costs incurred during the production process. Fixed costs and variable costs are both part of production. Although the value of variable costs varies with the volume of goods produced, the value of fixed costs remains mostly constant. Fixed expenses are types of expenses that can be predicted or constant (Fixed).

a. Equipment Depreciation Cost

Depreciation Cost is determined by dividing the price by the useful life of the equipment. It is used to calculate the cost of equipment maintenance during production. Table 4 shows this.

Table 4Average total cost of depreciation of rice-watermelon-rice farming equipment

No.	Tool name	Paddy 1 (Rp)	Watermelon (Rp)	Rice 2(Rp)
1	Tractor	622964.3	415309.5	622964.29
2	Spray	4395,83333	2930,55556	4395,83333
3	Hoe	16754,72	2211169,8148	19498,1019
4	Sickle	845,7143	563,809524	845,7143
	Amount	**1,470,340**	**980,197.3**	**1,514,467.54**

(Source: processed data)

Table 4 shows several tools used in the rice and watermelon farming process. The depreciation cost of rice tools for the first planting period was Rp1,470,340, watermelon Rp980,197.3, and rice for the second planting period was Rp1,514,467.54. This value is obtained from the sum of the tools' depreciation divided by three and multiplied by each age of the plant by farmers who do not utilize their land.

2. Variable Costs

Input and support costs are variable costs associated with rice cultivation. Variable costs greatly influence all production costs.

a. Production Facilities

Seeds, fertilizers, and pesticides are the means of production in rice farming, which ensure the sustainability of the ongoing farming business. Table 5 below shows details of the costs and several means of production.

Table 5 Average cost of production facilities per farmer in 1 year

No.	Production Facilities	Paddy 1 (Rp)	Watermelon (Rp)	Paddy 2 (Rp)
1	Seeds	227100	321600	237300
2	Fertilizer	1067080	386320	1096300
3	pesticide	890080	838540	838540
	Amount	**2,184,260**	**1,546,460**	**2,172,140**

(Source: processed data)

Table 5 shows that each farmer uses several means of production. The highest average

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price for fertilizer is Rp. One million sixty-seven thousand eighty for the first planting of rice in one Year, Rp. 386,320 for watermelon Per Year, and Rp.1,096,300 for the second rice planting period. This is because of the increasing fertilizer price and the reduction in government-subsidized fertilizer.

b. PowerWork

Each farming process uses a different number of workers according to needs, thus causing the Labor Variable. This can be seen in Table 6 below.

Table 6 Average Labor Expenditure (Rp) for Rice and Watermelon Farming.

No.	Type of work	Paddy 1 (Rp)	Watermelon (Rp)	Rice 2(Rp)
1	Seed sowing	40,000	32,000	30,000
2	Land processing	88,000	114,000	54,000
3	Planting	178,000	44,000	296,000
4	Fertilization	66,000	54,000	40,000
5	Spraying	62,000	68,000	68,000
6	Harvesting	694,584	57,600	694,584
	Amount	**1,128,584**	**369,000**	**1,182,584**

(Source: processed data)

Table 6 shows the average labor expenditure on rice and watermelon farming used by sample farmers. The largest labor expenditure was on the first rice harvest, amounting to Rp.1,128,584; watermelon harvesting, Rp. 369,000, and second planting rice, Rp. 1,182,584. This happened because farmers in the research area implemented a wage system for people with more modern harvesting machines for Rp in the rice harvesting process. 110,000/crop to the machine owner.

3. Total Production Cost

All costs incurred in rice production are included in the total production costs, including fixed costs (costs related to equipment depreciation) and variable costs (costs related to labor and maintenance), as seen in Table 7 below.

Table 7 Average Cost of Production Facilities of Sample Farmers in 1 Year

No.	Description	Paddy 1 (Rp)	Watermelon (Rp)	Paddy 2 (Rp)
1	Equipment depreciation costs	644,960.56	429,973.7	647,703,936
2	Cost of production facilities	2,184,260	1,546,460	2,172,140
3	Labor costs			
	a. In the family	308,000	216,000	252,000
	b. outside the family	246,000	96,000	236,000
4	Harvesting costs	694,584	57,600	694,584
	Amount	**4,077,804.56**	**2,346,033.70**	**4,002,427.94**

(Source: processed data)

Table 7 Overall production costs of rice and watermelon farming for Sample Farmers 1 to 50 during the first rice planting season amounted to Rp.4,007,804.56in the watermelon crop rotation of Rp 2,346,033.70 and the second rice planting season of Rp 4,002,427.94 because the additional cost for labor is greater than the cost of depreciation of equipment. The table above shows separate harvesting costs because the process does not use labor but a wage system.

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3. Farmers' Income

Income is the difference between processing income from rice planting and production costs incurred during production. Where money is generated by multiplying the amount of production. Table 8 shows the average income of rice and watermelon farming businesses as follows:

Table 8 Average Income of Rice and Watermelon Farmers in 1 Year

No.	Description	Paddy 1	Watermelon	Paddy 2
1	Production (Kg)	1676.2	4452.3	1883.6
2	Price (Rp)	6.100	2,400	6.100
3	Receipts (Rp)	10,224,820	10,690,320	11,323,430
4	Cost production(Rp)	2,184,260	1,546,460	2,172,140
4	Total production cost(Rp)	3,760,160	1,894,460	3,682,040
5	Net income (Rp)	5,819,699,444	8,365,888.3	6,293,452.46
6	Family potential(Rp)	308,000	216,000	253,000
7	Income family(Rp)	6,127,699,444	8,581,888.3	6,546,452.46

(Source: Processed data appendix 14)

From Table 8, it is known that the farmer's net income for rice in the first planting season was IDR 5,819,699,444 / year, watermelon was IDR8,365,888.3/Year, and in the second planting season of rice Rp.6,293,452.46 /yearby cultivating watermelon as an intercrop of rice can help increase the average income of rice farming families. The table also shows that family income is much higher than net income because of the use of labor from within the family, with a value of the first planted rice of Rp.6,127,699.444/year, watermelon plants Rp. 8,581,888.3/year and second planting season rice Rp. 6,546,452.46/year. Compared to farmers who do not use their land to plant watermelons, the income obtained differs greatly from those who use their land, which is Rp. 9,343,266.67/year for the first planting season of rice and Rp. 8,913,477.78/year for the second planting season of rice.

Thus, hypothesis (2) **is acceptable: Increasing Farmer Income by treating the Intensity of Paddy Field Utilization for Rice and Watermelon plants in one Year.**

Conclusion

The following conclusions can be drawn from the results of the research and discussion that have been presented in the previous chapter: Samples 1 to 50, each farmer in Paya Itik village carries out rice-watermelon-rice crop rotation activities every Year with an intensity of 25% on the first rice with a land area of 18.58 ha, watermelon has an intensity of 16.66% with a land area of 18.58 Ha and rice in the second planting season 25% with a land area of 18.58 ha. Samples 1 to 50, overall production costs have changed. Moreover, after adding up the whole thing from sample 1 to sample 50, the average is obtained for rice in the first planting season of Rp. 3,760,160 on Watermelon plants Average of Rp. 1,894,460 / year and rice in the second planting season Rp. 3,682,040 / year.

This happens because each planting season, the use of fertilizers and pesticides changes, and it can increase or decrease. The income obtained by rice farmers in the research area varies. After being added, it consists of the Average income and profit of rice in the first planting season of Rp 4,994,320.48/year, Watermelon Rp. 7,815,633.65/year and in the second planting season of rice of Rp 6,293,452.46 Based on the conditions at the research location, the variables that

affect the income of farmers in Paya Itik Village are the availability of fertilizer, the relatively high price of fertilizer and interfering factors such as unpredictable weather every month. Suggestion: Rice and Watermelon Farmers should pay more attention to the costs incurred each planting season to increase family income. Researchers also hope that farmers will seek more information through increasingly developing technology.

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