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Increasing the Productivity of Rice Fields with the Mina Sari Cultivation Technique in Kenderan Village, Tegallalang District, Gianyar Regency

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ABSTRACT

Mina Sari cultivation technique is a rice field farming cultivation technique that combines intercropping cultivation techniques with mina padi cultivation techniques. This study aims to increase the productivity of rice fields in Kenderan Village, Tegallalang District, Gianyar Regency. The research method used is the experimental method with Randomized Block Design (RAK) with 2 treatments. Data analysis in this study used descriptive analysis, quantitative analysis and farming business analysis. The results of the study showed that the mina sari cultivation technique was able to produce 3 types of commodities with gonda plant production of 1,760 kg/ha, rice plants 6,780 kg/ha, and tilapia fish as much as 1,390 kg/ha. The sales results from all commodities allow farmers to earn an income of IDR 83,300,000 per hectare. Monoculture system, rice fields are only able to produce rice plants with a yield of 7,334 kg/ha. The rice yield obtained from the monoculture technique is slightly higher than the Mina Sari technique, the income from farmer sales with the monoculture system is much lower, which is IDR 44,004,000 per hectare. The results of the R/C analysis showed a value of 2.02 in the Mina Sari cultivation technique and a value of IDR 2.47 in monoculture. The R/C value in farming with the Mina Sari and monoculture cultivation techniques showed a value > 1 so that both cultivation techniques were profitable.

Keywords: Cultivation Techniques, Mina Sari, Monoculture, Rice Fields, Productivity.

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1. INTRODUCTION

Indonesia is an agricultural country that relies on the agricultural sector as a source of livelihood and as a support for national development (Retno & Amalia, 2017). Agricultural development is one of the systems that can support the success of national development (Nearti *et al.*, 2020). According to Lismawati *et al.*, (2020), agricultural productivity in Indonesia is still far from what is expected. One of the factors causing low agricultural productivity in Indonesia is the lack of technology that can support farmers in

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increasing the productivity of their land (Purbata *et al.,* 2020). The majority of farmers in Indonesia currently still use manual systems in processing agricultural land (Gadang, 2011).

Kenderan Village is one of the areas that has potential in the agricultural sector in terms of area and most of its people still work in the agricultural sector. Land use in Kenderan Village is divided into residential areas of 34,465 ha, plantations of 270,835 ha and rice fields of 364,300 ha (Kenderan Village, 2022). Most of the rice fields in Kenderan Village are used for rice cultivation. Rice is a food crop commodity that produces rice, which is one of the important foods for most of the world's population (Mergono *et al.,* 2021; Asmuliani *et al.,* 2021). The development of rice plants in Kenderan Village is supported by the availability of abundant water sources so that farmers are able to cultivate rice plants throughout the year. The potential of natural resources, especially rice fields in Kenderan Village, has not been optimized to date. This is indicated by the low income of rice field farmers in Kenderan Village. According to Mr. I Wayan Tangkas Subrata (Head of Subak Kenderan), the average area of land cultivated by farmers in Kenderan Village is 30-40 ares with an income of IDR 7,500,000 to IDR 10,500,000 per planting season (3-4 months). Suboptimal cultivation technology is one of the factors that affects the income of farmers in rice fields (Reka *et al.,* 2019). Farmers in Kenderan Village have been cultivating rice fields using monoculture cultivation techniques. Monoculture is a cultivation method in utilizing land by planting one type of plant in one area of cultivated land (Diputri *et al.,* 2021). The monoculture cultivation system has several weaknesses such as being easily attacked by pests and plant diseases (Nurdarmawan *et al.,* 2017). The use of monoculture techniques can increase the risk of losses faced by farmers because monoculture techniques require a lot of money and if there is a crop failure due to attacks by plant pests, farmers will experience great losses because they rely on one type of commodity (Wandini *et al.,* 2020). Based on the problems faced by farmers in Kenderan Village, we designed a cultivation technique called the Mina Sari cultivation technique. The Mina Sari cultivation technique is a development of rice field agricultural cultivation techniques by combining intercropping cultivation techniques with rice-fish cultivation techniques. The Mina Sari cultivation technique is able to increase land productivity because it is able to produce three types of commodities on one land. The commodities that will be developed in the Mina Sari cultivation technique are rice plants, gonda vegetables and tilapia. The application of mina sari cultivation techniques is expected to increase farmers' income because in one plot of land farmers can cultivate three different types of commodities.

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2. METHODS

Place and Time

This research was conducted in Kendera Village, Tegallalang District, Gianyar Regency, Bali. The research period starts from June to October 2024.

Materials and Tools

The materials used in this study were Sertani variety rice seeds, goat manure, gonda seeds, tilapia fish, fish pellets. The tools used in this study were hoes, buckets, plastic ropes, nets, cameras and computers.

Research Method

The research method used was an experimental method using a Randomized Group Design (RAK) with 2 treatments. The treatments in this research are mina sari cultivation techniques and monoculture cultivation techniques (following the cultivation techniques used by farmers in Kenderan Village), with the aim of comparing mina sari cultivation techniques with monoculture so that we can find out which cultivation technique is most appropriate to use to increase the productivity of rice fields. in Kenderan Village. This research will be carried out on farmers' land in Subak Kenderan.

Data Analysis Method

Data analysis in this study used descriptive, quantitative and farming business analysis. The data obtained were processed and simplified with the help of a calculator and computer using Microsoft Excel (Wati *et al.,* 2017). The results are presented in table form and described descriptively. To find out the farming business analysis of the application of mina sari cultivation techniques and mono culture cultivation techniques, the formula is used :

1) Cost Analysis

To determine the amount of total cost, the following formula is used (Suratiyah, 2015) :

TC = TFC + TVC

Description:

TC = Total Cost
TFC = Total Fixed Cost
TVC = Total Variable Cost.

2) Revenue analysis

To determine the amount of revenue, the following formula is used (Suratiyah, 2015):

TR = Y x Py

Description:

TR = Total Revenue (Total Revenue)
Y = Production Amount
Py = Price

3) Revenue Analysis

To determine the amount of revenue, the following formula is used (Suratiyah, 2015):

Pd = TR – TC

Description:

Pd = Revenue
TR = Total Revenue (Total Revenue)
TC = Total Cost (Total Cost)

4) R/C Analysis

According to Suratiyah (2015), R/C is the comparison between revenue and total cost.

$$R/C = \frac{\text{Total Revenue (TR)}}{\text{Total Cost (TC)}}$$

Description:

Revenue = Amount of revenue obtained
Cost = Amount of costs incurred

There are three criteria in the calculation, namely:

a. If R/C > 1, it means that the farming business is profitable.

b. If R/C = 1, it means that the farming business is breaking even.

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c. If R/C < 1, it means the farming business is making a loss.

3. RESULT AND DISCUSSION

Productivity of Rice Fields Using Mina Sari and Monoculture Cultivation Techniques can be seen in Table 1. The research results in Table 1 show that the Mina Sari cultivation technique has better productivity of rice fields compared to the monoculture planting system. The application of the Mina Sari technique allows farmers to produce three types of commodities simultaneously in one field per planting season, thereby increasing farmer income. Income is the amount of money obtained by farmers from the sale of the commodities they produce (Nurjaman *et al.,* 2017). To calculate the value of income from farming, multiply the amount of production of each commodity by the selling price at the farmer level (Simatupang & Nike, 2018).

With the Mina Sari cultivation technique, the land can produce 1,760 kg/ha of gonda plants, 6,780 kg/ha of rice plants, and 1,390 kg/ha of tilapia. The sales results from all these commodities, farmers earn an income of IDR 83,300,000 per hectare. In contrast, in the monoculture system, rice fields are only able to produce rice with a yield of 7,334 kg/ha. Although this rice yield is slightly higher than the Mina Sari technique, the income from farmer sales with the monoculture system is much lower, which is only IDR 44,004,000 per hectare. This comparison shows that the application of the Mina Sari technique as a whole provides greater benefits through commodity diversification. This not only increases agricultural yields but also increases the potential income for farmers. According to Utami *et al.,* (2024) the application of polyculture planting patterns, namely planting more than one commodity in one land, farmers can increase their income by two times or more, as well as. In addition, this planting pattern also contributes to reducing pest and disease attacks, as well as optimizing the use of production costs, including fertilizer costs, pesticides, labor wages, and other costs (Karsilawati *et al.,* 2020; Zulfahmi *et al.,* 2016).

TABLE I.
Productivity of Rice Fields Using Mina Sari and Monoculture Cultivation Techniques

Cultivation Techniques	Commodity	Production/ha (kg)	Price/Kg	Sales results /ha (Rp)	Total Revenue
Mina Sari	Gonda Vegetables	1,760	10,000	17,600,000	83,300,000
	Rice Plants	6,780	6,000	40,680,000	
	Fish	1,390	18,000	25,020,000	
Monokultur	Rice Plants	7,334	6,000	44,004,000	44,004,000

Source: processed data (2024)

Analysis of Farming Business Mina Sari Cultivation Techniques and Monoculture in Rice Fields Farming business analysis is a science that studies how someone allocates available resources effectively and efficiently to achieve the goal of making a profit in a certain period (Rohmaniyah *et al.,* 2022). Every business aims to maximize profits and achieve sustainability, which can be achieved by

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minimizing costs incurred (Arnold *et al.*, 2020). Fixed and variable costs of farming using mina sari and monoculture techniques can be seen in table 2. Table 2 shows the fixed costs of farming using mina sari cultivation techniques of IDR 19,525,000, and variable costs of IDR 21,810,000. The total cost required for farming with mina sari cultivation techniques per planting season in Kenderan Village is IDR 41,335,000 per hectare. In the monoculture cultivation technique, the fixed costs required are IDR 13,850,000, and the variable costs are IDR 3,990,000. The total cost required for farming with the mina sari cultivation technique per planting season in Kenderan Village is IDR 17,840,000 per hectare. The difference in total costs between the two cultivation techniques is due to variations in the number of commodities developed. According to Aprillaita & Fauzia (2019), the more commodities managed by farmers, the costs incurred per unit area of land tend to increase.

TABLE II.
Total Cost of Mina Sari and Monoculture Cultivation Techniques on Rice Fields

No	Cost Allocation	Cultivation Techniques	
		Mina Sari	Monokultur
Fixed Costs			
1	Land Rental	8,500,000	8,500,000
2	Tool Depreciation	225,000	150,000
3	Land Cultivation	1,700,000	1,300,000
4	Making Fish Ditch	2,500,000	
5	Fish Seed Distribution		
6	Rice Planting	2,200,000	2,200,000
7	Planting Gonda	1,500,000	
8	Fertilization	200,000	200,000
9	Harvesting	2,700,000	1,500,000
	Total Fixed Costs	19,525,000	13,850,000
Biaya Variabel			
1	Rice Seeds	1,050,000	1,190,000
2	Fish Seed	15,000,000	
3	Gonda Seeds	400,000	
4	Manure	1,500,000	1,500,000
5	Fish Feed	3,160,000	
6	Inorganic Fertilizer	500,000	950,000
7	Pesticide	200,000	350,000
	Total Variable Cost	21,810,000	3,990,000
	Total Production Cost	41,335,000	17,840,000

Source: processed data (2024)

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Income from farming is the main source of income used by farmers to meet their needs (Sutaminingsih & Sujana, 2020). According to Hastuti (2017), income is income obtained by a company or person from production activities to meet their needs. Farming income is analyzed by calculating production, price, revenue and farming costs (Djafar *et al.*, 2022). Farming income with mina sari and monoculture cultivation techniques in Kenderan Village can be seen in Table 3. Based on the results of the study, it is known that income with mina sari cultivation techniques in Kenderan Village is IDR 41,965,000/ha per planting season. In monoculture cultivation techniques, farmers only get income of IDR 26,164,000/ha. The mina sari cultivation technique provides a much greater income than monoculture in Kenderan Village with a difference in income of IDR 15,801,000/ha. Mina sari cultivation techniques generate higher incomes compared to previously existing technologies, such as the application of jajar legowo and mina padi. Based on research by Bano *et al.* (2021), farmers who use jajar legowo technology earn an income of IDR 16,864,155 per hectare. In addition, the application of mina padi technology also generates lower incomes than mina sari, where farmers only earn IDR 27,875,548 per hectare (Ilahi *et al.*, 2019).

TABLE III.
Analysis of Farming Using Mina Sari Cultivation Techniques and Monoculture on Rice Fields

No	Cultivation Techniques	Cost	Revenue	Benefit	R/C
1	Mina Sari	41,335,000	83,300,000	41,965,000	2.02
2	Mono Kultur	17,840,000	44,004,000	26,164,000	2.47

Source: processed data (2024)

The results of the R/C analysis on farming with mina sari and monoculture cultivation techniques showed a value of 2.02 for the mina sari cultivation technique and a value of Rp. 2.47 for monoculture. The R/C value on farming with mina sari and monoculture cultivation techniques showed a value > 1 so that both cultivation techniques were profitable (Nearti *et al.*, 2020). The R/C value for both cultivation techniques can be interpreted that for every Rp. 1,000 spent, an income of Rp. 2,020 was obtained for the mina sari cultivation technique and an income of Rp. 2,470 for the monoculture technique. This shows that the higher the R/C value, the greater the profit obtained, so by obtaining a higher R/C value, the level of income efficiency is automatically better and more profitable, worthy of being pursued (Ibrahim *et al.*, 2021).

4. CONCLUSIONS

The results of the study showed that the Mina Sari cultivation technique has superior rice field productivity compared to the monoculture planting system. By applying the Mina Sari technique, farmers can produce three types of commodities simultaneously: rice, gonda, and tilapia. In detail, the production results for gonda plants reached 1,760 kg/ha, rice plants 6,780 kg/ha, and tilapia 1,390 kg/ha. The combination of all these commodities allows farmers to achieve a total income of IDR 83,300,000 per hectare. In the

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monoculture system, rice fields can only produce rice plants with an amount of 7,334 kg/ha. Although this rice yield is slightly higher than that obtained through the Mina Sari technique, the income from sales in the monoculture system is much lower, which is only IDR 44,004,000 per hectare. Comparative analysis of farming efficiency, the ratio of income to costs (R/C) in the Mina Sari cultivation technique was recorded at 2.02, while in the monoculture system it reached 2.47. Although the R/C values for both techniques show numbers above 1, indicating that both are profitable, the Mina Sari technique offers greater potential in terms of diversification and total revenue.

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