POTENTIAL FOR DEVELOPMENT OF RICE FISH CULTIVATION AS AN EFFORT TO INCREASE FARMER'S INCOME AND SUSTAINABLE AGRICULTURE

(Case study: Subak Umalayu, Penatih Village, Denpasar City)

Luh Putu Kirana Pratiwi[1] Nyoman Yudiarini[2]

Agribusiness Study Program Agriculture Faculty[1,2]
Mahasaraswati Denpasar University, Jl Kamboja No 11A Denpasar, Bali 80233
*Corresponding author: kirana.pratiwi@unmas.ac.id

DOI: 10.31364/SCIRJ/v8.i10.2020.P1020817
http://dx.doi.org/10.31364/SCIRJ/v8.i10.2020.P1020817

Abstract-The existence of subak as an institutional that is socio-agriculture-religious began to be threatened due to the degradation of urban agricultural land which is increasing every year. Therefore, the Denpasar City Government has designed the establishment of a Subak Lestari Zone to create a sustainable food agriculture land. This study aims: (1) To analyze differences in rice farming income after the development of fish rice; (2) To identify alternative strategies that are effectively developed in fish farming for sustainable agriculture in urban areas. The analytical method in this study was carried out quantitatively namely feasibility analysis and qualitatively through SWOT analysis. The results showed that the rice mina farming has a higher feasibility compared to the previous rice farming. Net income from rice mina is IDR 7,165,250 (35.29%), with an R / C ratio of 2.97. The alternative strategies developed are the SO (Strength Opportunities) Strategy by: (a) Increasing production and quality according to market demand, (b) Establishing market institutions, (c). Implement environmentally friendly cultivation and handling of product yields, (d) Organism Control Integrated Control as early as possible in accordance with economic threshold, and (e) Development of Human Resources quality skills.

Keywords*: Optimization, Rice, Sustainable Agriculture, Urban Subak*

1. INTRODUCTION

Subak is a Balinese farmer organization that manages irrigation water in paddy fields with socio-agrarian-religious characteristics (Sumantra, Widnyana, Yuesti, & Sudiana, 2020). The existence of subak began to be a threat both directly and indirectly that originated from Bali tourism, namely the condition of agricultural land which is increasingly shrinking. The conversion of paddy land to non-agricultural land in Bali from 85,776 ha in 2000 to 81,144 ha in 2010 with an average of more than 660 ha or 0.77% per year (Department of Agriculture of Food Crops of Bali Province, 2010). Budiasa (2012) states that several factors for the conversion of paddy fields are: (1) The attractiveness of other sectors in the form of higher income in the non-food crops sub-sector (such as plantations), industry, and services that also encourages farmers to switch professions; (2) Socio-economic conditions can also encourage owners to sacrifice their fields to be sold to investors to cover living costs (including health) and / or to invest in children's education or work in other sectors; (3) The existence of policies and regulations which actually become a disincentive for farmers to maintain their paddy fields such as the stipulation of Land and Building Tax based on NJOP; and (4) Weak control and enforcement functions of regulations related to spatial planning and unfair land use change by related institutions.

Basically the agricultural sector in Bali is in a very weak condition (Sukerta, Suryana, & Yuesti,2020). and marginalized. According to Windia (2001) it indicates that the growth of the agricultural sector is the lowest compared to other economic sectors, which is around 2.1% per year. The contribution of the agricultural sector to Bali's GRDP continues to decline and is now at 19%. The labor force working in the agriculture sector turned out to be the highest, at more than 40%, while the growth of workers who wanted to enter the agricultural sector was estimated at 2% per year. Without rice fields, subak is impossible to exist and without subak sustainability for sustainable agricultural development in Bali will be threatened.

Due to very high land degradation, the Denpasar City Government designed the establishment of a Subak Lestari

http://dx.doi.org/10.31364/SCIRJ/v8.i10.2020.P1020817

Zone to create a sustainable food agriculture land. In an effort to reduce degradation of agricultural land, the government made a Green Line Regulation in the Subak Urban Area. In principle, it is permitted to sell agricultural land, but it is not permitted to transfer land, but is still managed as agricultural land, and is able to increase the productivity of farmers in synergy with the distribution network of rice sellers and rice processing, and protect farmers' grain production in the city of Denpasar. (Department of Agriculture, Food Crops, Hoticulture and Plantation, 2016).

In the context of optimizing land narrow agriculture in urban areas is carried out by technological innovations from only rice farming to mina-rice. From an economic point of view, mina rice cultivation is an integrated cultivation that can increase the productivity of paddy fields, that is, besides not reducing rice yield, it can also produce fish. In terms of ecology, rice mina directs agriculture towards organic. Paddy fields become fertile with fish manure containing various nutrients, so as to reduce the use of fertilizer. Fish can also limit the growth of other plants that are competitive with rice in the utilization of nutrients, so that it can also reduce the cost of weeding wild plants. Minapadi cultivation is carried out in 2 (two) cropping patterns, namely interrupts and intercropping. The cropping pattern of tenders is the maintenance of fish in the paddy fields ahead of rice planting, while waiting for the results of the rice seedlings to be planted. With intensive rice mina development techniques it is expected to be able to optimize agricultural land, streamline production costs through the use of organic dasticide fertilizers from fish dung, as well as efforts increasing farmers' income and preserving sustainable agriculture in Denpasar City.

2. MATERIAL AND METHODS

This research was conducted on Subak Umalayu farmers in Penatih Village, East Denpasar District, Denpasar City. The location selection method is purposive, with the main reason that Subak Umalayu is one of the pilot subaks in the Subak Lestari Area of Denpasar City which cultivates mina-rice. The population in this study were 75 farmers, the sample selected based on cencus sampling were all farmers in Subak Umalayu of 75 people. This is because the number of respondents is below 100 people (Sugiyono, 2012). The method of collecting data through structured interviews with the help of questionnaires to farmers in Subak Umalayu. This study also conducted in-depth interviews with key informants such as: Head of the Penatih Village, Pekaseh Subak Umalayu, as well as local community leaders. This research data collection method is also equipped with documentation and literature study.

The analysis in this study was carried out quantitatively using income and feasibility analysis to find out the increase in farmers' income in the usina rice farmers measured using R / C ratio calculation analysis. Whereas qualitatively to determine effective internal, external and alternative strategies in the development of sustainable micro-rice farming through SWOT analysis.

The IFAS matrix is used to evaluate internal factors for developing mina-rice cultivation, which are related to strengths and weaknesses. While the EFAS Matrix is used to evaluate external factors relating to opportunities and threats. After the difference between the score of strengths with weaknesses, opportunities and threats obtained, then the results of this score difference are applied to the Cartesius Diagaram SWOT Analysis, to determine the quadrant position occupied by the company based on the difference in score. Then the SWOT(Strength-Weakness-Opportunitty-Threaths) matrix is used to match the results obtained on the IFE and EFE matrices. The results obtained from the SWOT matrix are alternative strategies that are feasible to use in developing strategies for effective rice cultivation as an effort to increase income and sustainable agriculture. This matrix can produce four possible alternative cell strategies, namely the S-O (Srenghts-Opportunity) strategy, W-O (Weakness-Opportunity) strategy, W-T (Weakness Threats) strategy, and S-T strategy (Strenghs-Threaths) (Rangkuti, 2002).

3. RESULTS AND DISCUSSION

Income and Business Feasibility of Mina Padi Farmers

The following are details of the results of research in terms of the level of income and feasibility of rice mina farming conducted in Subak Umalayu, Penatih Village, East Denpasar District, Denpasar City.

Table 1. Income and Business Feasibility of Mina Padi Farmers

No	Description	Ciherang Paddy (Rp)	Parrot Fish (Rp)	Total (Rp)
1	Land area	0,53 are	0,05 are	
2	Rice and fish seeds	432.000	1.364.500	1.796.500
3	Tillage	1.925.000		1.918.000
4	Making ponds		2.150.000	2.150.000
5	Nursery	535.000		535.000
6	Farmer's wages (irrigation, planting, weeding, fertilizer, spraying	2.325.000		2.325.000
7	Fish feed (pellets)		1.445.250	1.445.250
8	Inorganic fertilizer	655.000		655.000
9	Organic fertilizer	945.000		945.000
10	Labor's Wage in Maintenance of rice fields		375.000	375.000
11	Harvest Cost	1.798.000		1.798.000
	Total Cost	8.615.000	5.334.750	13.949.750
	Production Revenue	20.700.000	12.500.000	41.420.000
	Net Profit	12.085.000	7.165.250	19.250.250
	R/C Ratio			2,25

Source: Primary Data Processing Research, 2019

http://dx.doi.org/10.31364/SCIRJ/v8.i10.2020.P1020817

In rice fish farming for rice using ciherang varieties on an average irrigated paddy area of 0.53 ha. The technological innovations applied in rice farming are integrated crop management, among others: ciherang variety, jajar legowo planting system, fertilizing according to Minister of Agriculture Regulation (Permentan No 40 of 2007), the use of organic fertilizer, intermittent irrigation, Control of plant-disturbing organisms refers to integrated pest control. In controlling plant-disturbing organisms as early as ossible, as soon as symptoms of an attack appear and approaching the economic threshold scale is immediately controlled. Whereas in the Parrot fish business by utilizing technical irrigated rice fields by making a pond near the rice field dike as needed. Fish seeds are sown by 5.000 parrot fishseeds or with a density per m^2 of 20-25 parrot fishseeds. From the results of tilapia farming when harvested an average of 5-7 heads per kg. In this rice mina farming business, it can receive an income of Rp.41.420.000. While the net profit gained Rp. 27.469.650. The R/C ratio is 2,97. Value added the results of the analysis of rice mina farming show that it can provide added value, namely additional revenue of Rp 7.165.250, -. Previously, only in rice farming, the net profit received was Rp. 20.304.400. So with the additional benefits from the tilapia business, the total net profit received will be Rp. 27.469.650. Presented in Table 1.

Mina Padi Cultivation Development Strategies as Efforts to Increase Farmer's Income and Sustainability of Sustainable Agriculture

Based on the results of the research, the strategy of developing mina-paddy cultivation as an effort to increase farmers' income and preservation of sustainable agriculture at the research sites of Subak Umalayu, Subak Umalayu, Penatih Village, East Denpasar District, Denpasar City, is described as follows.

In detail, the development strategy of fish rice cultivation as an effort to increase farmers' income and the preservation of sustainable agriculture in Denpasar City, is described as follows:

S-O Strategy

1. Increase production and quality according to market demand. Rice food is a basic need so that it is needed by many people, farmers are used to rice cultivation. Likewise, fish is a household consumption need to improve family nutrition, so that consumers / markets always need it. Therefore, production and product quality must be maintained.
2. Establish market institutions. The market is the spearhead for marketing products, therefore it is necessary to establish a good and maintained relationship. Product continuity needs to be maintained to meet market and restaurant demands. This will be mutually beneficial for both parties and for the continuation of mina rice farming.

W-O Strategy

1. Implement environmentally friendly cultivation and harvesting of products. For the use of production facilities, especially drugs, medicines must be chosen that are not harmful to fish. Need types of drugs that are environmentally friendly or organic, and its application needs attention.
2. Improving the handling of post-harvest products through the implementation of grading and care, namely after the fish is harvested it needs to be sorted and treated before being taken to the market and restaurants. Therefore, for novice farmers is needed adequate skills.

S-T Strategy

1. Pest control as early as possible according to the economic threshold. Plant-disturbing organisms (OPT) are a threat in rice and fish cultivation if not controlled seriously will hamper and even frustrate the business. Therefore this pest control must be non-negotiable.

W-T Strategy

1. Development of Human Resources skills, so that rice mina farming can be more successful, farmers still need to be fostered so that they are more involved in controlling what is threatening and maintaining and handling product yields before being marketed to support sustainable rice mina business.

http://dx.doi.org/10.31364/SCIRJ/v8.i10.2020.P1020817

Table 2. SWOT Matrix Analysis Research In Subak Umalayu, Penatih Village, Denpasar City.

IFAS / EFAS	Strength	Weakness
	a. Rice cultivation is usually done intensively	a. Lack of distribution of irrigation water for fish maintenance due to infrastructure network improvements
	b.Fish food can be made by farmers	b. Many farmers are still controlling crop pest organisms with chemicals that have an impact on the death of tilapia
	c. Parrot fishcan be harvested together with rice plants (double income)	c. Nutrition has not been maximized that affects the weight of tilapia
	d.Parrot fishcontain high protein, low fat, and safe for consumption	d. Treatment of sorting and grading has not been maximized so that the price sold by farmers is below the market price
Opportunity	**S-O Strategy**	**W-O Strategy**
a. Hard is a basic need that is much needed by the community.	a. Increasing production and quality according to market demand	a. Implement environmentally friendly agricultural cultivation
b. Fish seeds are easy to get	b. Establishing market institutions	b. Improve post-harvest handling of product yields
c. Market and restaurant requests for lots of tilapia	c. Establishing market institutions	
d.Price for selling fish is quite good	d. Organism Control Integrated Control as early as possible in accordance with economic threshold	
	Development of quality skills in Human Resources	
Threat	**S-T Strategy**	**W-T Strategy**
a.Organism plant pests in rice plants always develop	a. Control of plant-disturbing organisms and predators as early as possible according to the economic threshold	a. Development of human resources skills in the management of production, post-harvest, marketing of environmentally friendly rice products
b. Predatory organisms (snakes, pestle) often prey on fish		

Source: Primary Data Processing Research, 2019

4. CONCLUSIONS AND SUGGESTIONS

Conclusions

1. Net income from rice mina is Rp. 7.165.250 (35,29%), with an R/C ratio of 2,97.
2. The alternative strategy developed is the SO (Strength Opportunities) Strategy by: (a) Increasing production and quality according to market demand, (b) Establishing market institutions, (c). Implement environmentally friendly cultivation and handling product yields, (d) Organism Control Integrated Control as early as possible in accordance with economic threshold, and (e) Development of quality skills in Human Resources.

Suggestion

1. For farmers, the development of rice fish to be more intensive is carried out at each planting season as an effort to increase income and preserve sustainable agriculture.
2. For the government, through agricultural extension services, agriculture and fisheries services to be more

http://dx.doi.org/10.31364/SCIRJ/v8.i10.2020.P1020817

optimal in the application of organic-based urban agriculture, as well as partnerships in accessing capital and marketing of agricultural products.

REFERENCES

[1] Budiasa, Wayan. 2012. *Efforts to Control the Conversion of Rice Field Functions for Subak Conservation and Agricultural Sustainability in Bali*. Denpasar: dwijenAgro.Vol 2. No 2.
[2] Department of Agriculture, Food Crops, Horticulture, and Plantation City of Denpasar..
[3] *Subak Lestari Area D*esign. http://distanprovinsibali.com. Accessed November 15, 2018.
[4] Sugiyono. 2012. *Quantitative and Qualitative Research Methods and R&D*. Bandung : Alfabeta.
[5] Sukerta, I. M., Suryana, I. M., & Yuesti, A. (2020). Value potential of dry land for future agricultural development in Bali. *EurAsian Journal of BioSciences*, *14*(1), 683-697.
[6] Sumantra, I. K., Widnyana, I. K., Yuesti, A., & Sudiana, A. K. (2020). Membangun Sinergitas Sektor Pertanian Dan Pariwisata Berbasis Masyarakat Kawasan Subak Lepud Desa Baha. *Jurnal Aplikasi Dan Inovasi Iptek*, *1*(2), 118-130.
[7] Windia, W., N.G. Ustriyana, I W. Budiasa, I W. Ginarsa, dan I W. Sudarta. 2001. *Sustainability of Tri Hita Karana's Values for Preservation of Cultural Resources in Gianyar Regency*.Denpasar: Faculty of Agriculture, Udayana University.

http://dx.doi.org/10.31364/SCIRJ/v8.i10.2020.P1020817