(RESEARCH ARTICLE)

Feasibility analysis of paddy-fish (Minapadi) system business in Toraja, South Sulawesi

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Abstract

Paddy-fish (Minapadi) is a fish and rice maintenance system at a particular time and in the same place. Generally, Paddy-fish activities are done in rice fields. The rice field constructs are slightly different from the patterns of excavations in some parts for puddles. This study aims to analyze the feasibility of the Paddy-fish business from four aspects: NPV, Net B/C, IRR, and PBP. Research has been conducted in Makale, Toraja, and South Sulawesi Province. The research method used was a quantitative approach by using a survey. The study was used open questionnaires. The data were collected by using the purposive sampling technique. It involved 30 respondents of farmers who do Paddy-fish activities. The data analysis method used was a financial analysis covering; estimated values of NPV, Net B/C, IRR (Internal Rate of Return) and PBP (Payback Period). The study shows that the Paddy-fish business is very feasible to strive. The four indicators of business feasibility show a decent indication of effort. NPV value was 13,139,008 where the value implies >0, net value B/C was 2.52 where the value implies >1.0, IRR value was 20.47% where the value implies >MARR (18%), and payback period value was 1,917,108 in the second year of business.

Keywords: Feasibility; Paddy-fish (Minapadi); Benefit; Cost; Toraja Regency

1. Introduction

The Paddy-fish (Minapadi) system is one of the ways to cultivate food crops, especially rice, along with the maintenance of fish in a particular place such as rice fields or fields and at the same time (Khairuman & Khairul 2002). According to Suriapermana et al. (1994), paddy-fish is a fish farming and rice plant in the same rice fields. Furthermore, Supartama (2013) states that the Paddy-fish system is used to optimize the potential of rice fields to increase farmers' income by utilizing appropriate technology or other systems. For example, changing the agricultural system from a monoculture system to an agricultural diversification system through applying a Paddy-fish cultivation system or technology. The Paddy-fish system increases agricultural output and farmers' income, increases soil and water fertility and reduces rice crop pests. According to Sularno & Sodiq (2014), the paddy-fish business system has been developed in Indonesia since a century ago.

Besides potential physical factors, Indonesia is an agrarian country that has a high potential for agricultural resources. For example, rice production reaches 10.66 million hectares in 2020, and Miled Dry Grain (GKG) production level reaches 54.65 million tons per year. The high production that is optimized can make Indonesia has the potential to be the world's food production and bring state foreign exchange and income for the community. In addition, the agricultural sector has become one of the fundamental sectors that have a role in the country's foreign exchange income (Najam, 2000). The development of the agricultural sector, especially the subsector of food crops, has a vital and strategic role because the subsector of food crops has a vital role in supporting people's lives.

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Socio-economic factors of the community are also very supportive of the paddy-fish system development. The system provides food as a source of carbohydrates and protein. Thus, it can improve the food quality of rural residents (Nabiu, 2003). The proper application of technology of paddy-fish may bring a high income for the community. The income comes from both rice and fish production. According to Suriapermana et al. (1994), paddy-fish can increase rice and fish production, reduce pesticides utilization, inorganic fertilizers, weeding and soil processing. The rice production is taken from the system or rice planting techniques by legowo planting 2:1 or 4:1. Based on the study, the *legowo* planting system can increase rice production by 12-22%. In addition, the legowo planting system provides a very suitable large space to combine with the paddy-fish system. The fish produced can cover the farming costs, so does increase farmers' income. Legowo planting technology is a planting technique that regulates the planting distance between clumps and rows. Thus, rice clumps are compaction in rows, widening the distance between rows as if rice clumps are on the edge of the rice field and as a border effect (Siregar, 2015). The results show that the rice clumps in the edge of the line were 1.5-2 times higher than those insides.

It is very strategic to develop the paddy-fish system to become a way to increase farmers' income. Toraja is one of the regions in South Sulawesi that has a very potential agricultural. It is the third-largest area in South Sulawesi after Bone and Wajo, and it is 54,615.0 ha. The paddy-fish system has also long been applied in Toraja and is spread across almost all sub-districts. By applying a proper irrigation system, Toraja becomes one of the rice barns in South Sulawesi. To continue the development of the paddy-fish system, it is essential to conduct a study related to the feasibility analysis of the paddy-fish system business.

2. Material and methods

2.1. Description of the study sites

The study was conducted at Makalen Subdistrict, Toraja, South Sulawesi Province. Makale was chosen since the district has a paddy-fish system that has been going on for generations.

2.2. Method of the study

The research method used was quantitative research through a survey. According to Yusuf & Daris (2018), survey research is conducted on large and small populations. However, the data is taken from population samples to find relative events, distributions, and relationships between variables. The population in this study were paddy-fish farmers in Makale, Toraja. The survey was conducted through open questionnaires. The questionnaire involves several questions, with the answer involving respondents' opinions. The respondents in this study were 30 persons, all of whom were farmers who applied the paddy-fish system. According to Sekaran (2006), the questionnaire is a list of written questions answered by respondents and has been clearly defined.

2.3. Method of collecting data

The data collection method is done by purposive sampling technique that determines respondents intentionally, namely farmers who apply the paddy-fish system to their agricultural activities. The data collection method becomes very important, mainly since the primary data is obtained first from respondents. According to Sugiyono (2017), data collection methods are techniques that researchers use to collect primary and secondary data. The data was collected by interviewing 30 farmers. The interview was conducted using questions guidelines related to the amount of investment, cost, and income.

2.4. Method of data analysis

The data were analyzed using financial analysis, including estimated values of NPV, Net B/C, IRR (Internal Rate of Return) and PBP (Payback Period). According to Afandi (2012), the financial analysis compares costs and benefits to determine whether it is worth doing something or not.

- Net Present Value (NPV) is a method that calculates the difference between the capital outlays and the net cash flow during the investment life (Arshad, 2012). The NPV method assumes that an amount of money today is worth more than that same amount in the future. According to (Žižlavský, 2014), this is due to the interest factor (discount rate), which decreases the currency's value as the year progresses. The determination of NPV value eligibility is based on Stahl & Daves, 2012, with the following formulas:

$$NPV = \sum_{t=1}^{n} \frac{Bt - Ct}{(1 = i)^t}$$

Where;

NPV = Net Present Value (IDR)
Bt = Total benefit on Period t
Ct = Total cost on period t
r = discount rate (%)
t = period (year)

The npv value eligibility criteria are based on Berkovitch & Israel, 2004. It states that if the value of NPV > 0, then the business is feasible. If the value of NPV = 0, then the business is break-even, and if the value of NPV <0, then the business is unfeasible.

- Net Benefit Cost Ratio (Net B/C) is a method of assessing business feasibility by comparing the level of acceptance and the level of costs incurred to obtain such receipts in one unit of time (Weber, 2014). The Net B/C indicator is also used to measure efficiency in capital use (Sofiah & Septiana, 2017). Net B/C is estimated by the following formulas:

$$Net\ B/C = \frac{\sum_{t=1}^{n} \frac{Bt - Ct}{(1 - i)^t}}{\sum_{t=1}^{n} \frac{Bt - Ct}{(1 - i)^t}}$$

Where;

Bt = Total Benefit in the t-year
Ct = Total Cost in the t-year
i = Discount rate (%)
t = Period (year)

The eligibility criteria are based on Tiku, 2008. It states that if the net value of B/C ≥ 1, the business is profitable and worthy, and if Net B/C <1, then the business is not profitable and unfeasible for business.

- Internal Rate of Return (IRR) is an indicator of business feasibility by looking at the rate of return on business capital. Harding et al. (2018) state that IRR is one of the indicators of business feasibility on the financial aspect and becomes one of the references to calculating the efficiency of business investment. Weber (2014) states that the IRR is a discount rate that produces equal to zero NPV. IRR is estimated by the following formulas:

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} x\ (i_1 - i_2)$$

Where:

NPV_1 = NPV positive
NPV_2 = NPV negative
i_1 = Discount rate of positive NPV
i_1 = Discount rate of negative NPV

The business eligibility criteria are based on the IRR value. It is based on comparing the value of the IRR and MARR (Gallo, 2016). MARR is the Minimum Acceptable Rate of Return or Minimum Attractive Rate of Return (MARR), the minimum interest rate return that attracts the business to be invested. It is feasible if the value of IRR > MARR.

- Pay Back Period (PBP) is the period or amount of time (year) needed to return the value of investments that have been spent in a business (Vajpayee et al., 2019). In other words, the time spends to regain the initial capital of the business. The PBP value is estimated formula by the Ardalan (2012) as follows:

$$PBP = \frac{Initial\ Investment\ Value}{Cash\ Flow} x\ 1\ Year$$

Where;

PBP = Payback Period
Cash Flow = Benefit-Cost
Initial Investment Value = Total Investment

Business eligibility criteria of PBP values are based on Vajpayee et al. (2019). It states that if the planned business has gained a profit or is positively valued, it is a year of profit, and the faster the time it takes to be positive, the more reputable the business will b

3. Results and discussion

The results of the analysis of paddy-fish business services (tilapia – rice plant) in Makale District, Toraja based on financial aspects (NPV, Net B/C, IRR, PBP) were obtained as follows:

Table 1 Indicators of business feasibility (financial aspect) of paddy-fish business in Makale District, Toraja, South Sulawesi

Financial Indicators	Value	Criteria	Decision
NPV	13,139,008	> 0	Feasible
Net B/C	2.52	> 1	Feasible
IRR	20.47%	> MARR 18%	Feasible
Payback Period	1,917,108	-	Feasible

Based on the financial analysis, the four indicators show that paddy-fish was done in the farming community in Makale District of Toraja is very worth to do.

The value of NPV was IDR.13,139,008, which was a positive value (>0), or it implies the paddy-fish business was feasible. The feasibility of the value was taken through the present positive value (PV+) and the present negative value (PV-). The study results are in line with Barniati, 2007; Tiku, 2008; Supartama, 2013; and Widodo et al., 2017, who also mentioned that paddy-fish business is very worth to do
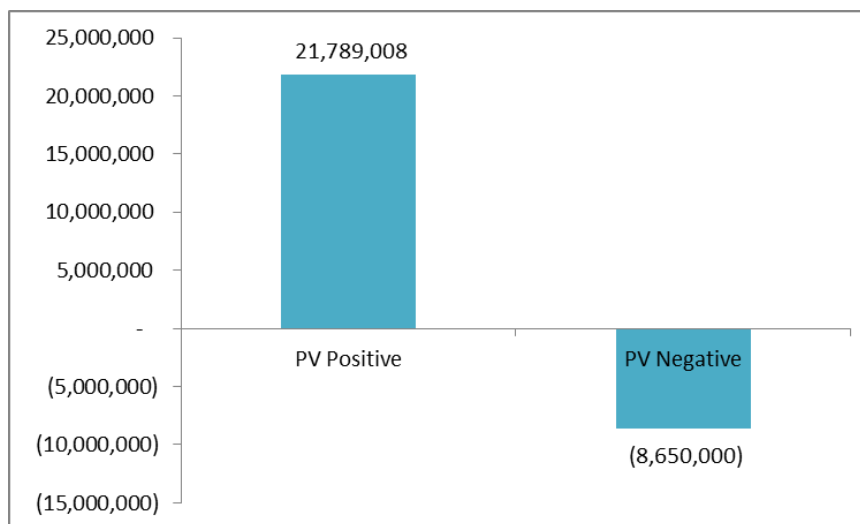

Figure 1 Comparison of positive PV with negative PV values

Net value B/C paddy-fish business in Makale District, Toraja was 2.52, which shows that the business is worth trying since the value is greater than 1.0. The value of 2.52 indicates that each additional cost of 1.0 will increase the business profit by 2.52%. Thus, based on the business feasibility net value B/C criteria, the paddy-fish business (tilapia and rice plant) in Toraja was feasible. These results are also in line with Widodo, 2002; Tiku, 2008; Sularno & Sodiq, 2014, which state that paddy-fish business based on net criteria B/C is very worthy of trying.
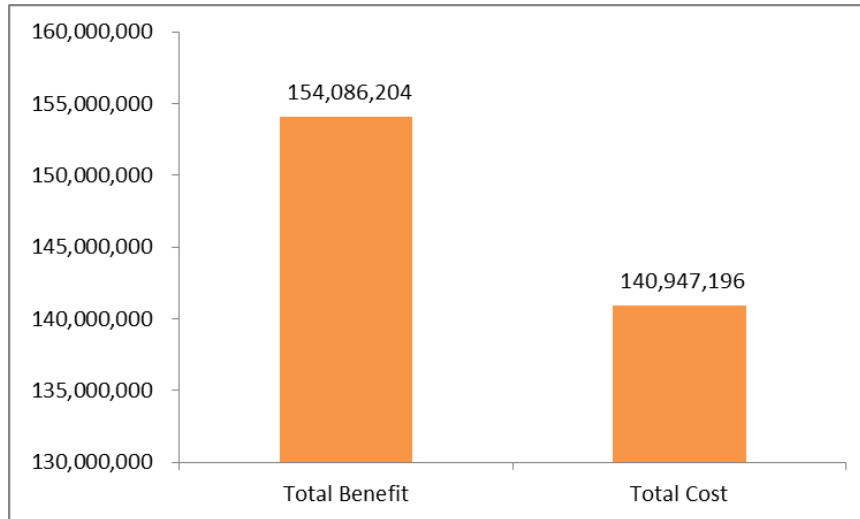
Figure 2 Comparison between total benefit and total cost

The IRR of the paddy-fish business was 20.47%. It indicates that the paddy-fish business is worth trying since the IRR is greater than the MARR (18%). MARR (Minimum Acceptable Rate of Return) is the value of interest rate (attractive) to strive in the field studied, in this case, it is a paddy-fish business. In other words, MARR becomes the benchmark interest rate to take decisions related to the decision made. The interest rate of the paddy-fish business is estimated at 15% per year, and MARR is at 18% per year. If the bank's interest rate when the business is running on is 12% per year (1.0% per month) with the capital of IDR.28,650,000, then the business will gain about 3.44 million rupiah at the end of the year.

Meanwhile, if the business capital is invested in the paddy-fish business, the business will gain 5.86 million rupiah at the end of the year. Thus, the difference between those businesses is 2.42 million rupiah per year. Therefore, the paddy-fish is quite interesting to do.
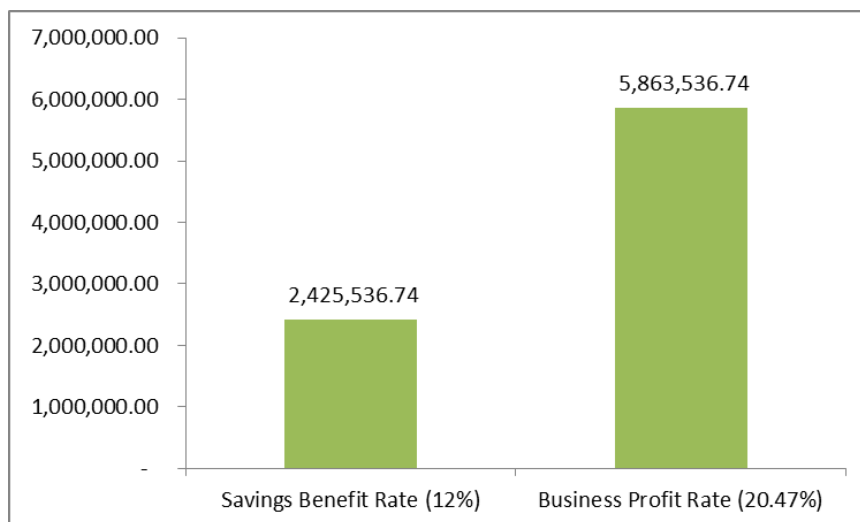
Figure 3 Comparison of profits earned of deposited funds in the bank and cultivated paddy-fish

The results of PBP analysis (Payback period) show that paddy-fish business is very feasible to strive. It shows that in the 2nd year of business, the profit (NPV+) has been gained about 1.91 million rupiah. In other words, the paddy-fish business only takes two years to return business capital and has been profited from the business.
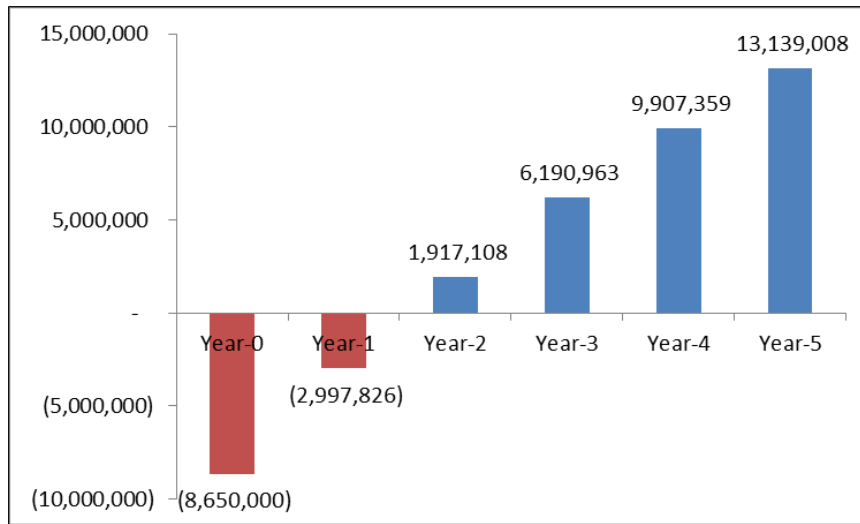

Figure 4 Growth in profits earned in paddy-fish business

4. Conclusion

The paddy-fish is worth business to try since it is very feasible. The four indicators of feasibility show a decent indication of business. The NPV was IDR.13,139,008, which the value is >0, the net B/C was 2.52, which the value is >1.0, the IRR was 20.47% which the value is > MARR (18%), and the payback period was IDR.1,917,108 in the second year of business.

Compliance with ethical standards

Acknowledgments

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