



## Feasibility Analysis of Koi Fish Cultivation with the Use of Rice Fields as Cultivation Sites

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### Abstract

The use of rice fields is very diverse for all type of agriculture but other than that the main thing to see here is paddy fields that have harvested rice and are heavily irrigated land productive. Rice fields can also be land that can be used as fish land after rice harvest. Indonesia's biodiversity is very diverse, especially ornamental fish, both seawater and fresh water ornamental fish. Commodities of freshwater ornamental fish cultivated in Indonesia are not only local ornamental fish but imported freshwater ornamental fish such as Koi (*Cyprinus carpio*) have also been cultivated in several regions of Indonesia. Kediri is a very potential area, especially in the field of ornamental fish cultivation. The Koi fish cultivation center in Kediri is not inferior to the cultivation in the Blitar area which is already famous for Koi fish cultivation. The traditional pond pattern using rice fields as a place for Koi fish cultivation has proven that with makeshift facilities the people of Pranggang Village are able to help their economy. These advantages make this commodity have business prospects that can be developed through cultivation activities. so it is necessary to do a business feasibility analysis to develop a koi fish farming business in the future. Retrieval of data used in this study is the method of observation, interviews and documentation. while for the analysis using qualitative methods, where the researcher as the key instrument, data collection techniques were carried out by means of triangulation (combined). Qualitative method analysis carried out in this study includes business management, production inputs, production processes, outputs, marketing and business development plans.

**Keywords:** Business feasibility, rice fields as places for fish cultivation, koi fish

### A. Introduction

Indonesia's biodiversity is very diverse, especially ornamental fish, both seawater and fresh water ornamental fish. Commodities of freshwater ornamental fish cultivated in Indonesia are not only local ornamental fish but imported freshwater ornamental fish such as Koi (*Cyprinus carpio*) have also been cultivated in several areas such as Bali, Bandung, Blitar, Bogor, Bojonegoro, Cirebon, Cibinong, Jakarta, Kediri, Magetan, Malang, Surabaya, Semarang, Tulungagung, Yogyakarta.

According to statistical data from the Ministry of Marine Affairs and Fisheries in 2020, East Java Province is one of the 5 largest provinces contributing to ornamental fish exports with an export value in 2019 of US\$ 275,818 with a national market share of 1.39 percent. In the data, the trend of export volume of ornamental fish in Indonesia from 2018 to 2020 increased 11.56 percent with the trend of increasing export value of ornamental fish reaching 29.38 percent in the same period. Export destinations are to Singapore (US\$ 1,935,503), Japan (US\$ 1,608,213), America (US\$ 1,605,028), Malaysia (US\$ 1,273,255) and China (US\$ 1,238,254). This production result is due to Indonesia's natural conditions which have favorable physiographical diversity for

aquaculture. In addition, the relatively high and stable tropical water temperature also allows cultivation activities to take place throughout the year (Ministry of Maritime Affairs and Fisheries, 2020).

Commodity of freshwater ornamental fish is one of the leading commodities that are in great demand by the public. One of them is a superior commodity which is still attractive and has a wide variety of types. Broadly speaking, koi fish are divided into 13 categories, namely kohaku, sanke, showa, bekko, utsurimono, asagi, shusui, tancho, hikari, koromo, ogon, kinginrin, and kawarimono (Firdaus, 2010). Kediri is a very potential area, especially in the field of fisheries. The Kediri Regency area is divided into: 26 sub-districts 343 villages, of which 124 villages are potential fisheries villages. This fishery activity consists of: fish hatchery, consumption fish cultivation, ornamental fish cultivation, and fishing in public waters. In consumption fish farming, the fish commodities that are cultivated are catfish, carp, tilapia. As for the cultivation of ornamental fish, the fish commodities that are cultivated are koi fish, goldfish, betta fish, and comet fish. The center for consumption fish cultivation is located in the Badas area, with a superior product, namely catfish. Meanwhile, ornamental fish cultivation centers are in the Pranggang, Kandat, Wates, Islamic Boarding Schools, Jamsaren, and Tempurejo areas with their main commodities, namely Koi fish and Betta fish (Kediri Regency Government, 2019).

Basically, the use of rice fields is very diverse for all type of agriculture but other than that the main thing to see here is paddy fields that have harvested rice and are heavily irrigated land productive. Rice fields can also be land that can be used as fish land after rice harvest (Mafredi, 2019). Villagers who only plant rice twice a year. Minapadi is a way of maintaining fish between rice plants, this is one of the appropriate technologies in paddy fields. The types of fish that can be maintained on the system are carp, tilapia, tilapia, catfish, and others (Sumiarsih et al., 2019). By applying millennial technology (Minapadi legowo with local fish) which is a rice farming system with fish farming in a rice fields at the same time. This technology aims to increase yield income farmers with high productivity of rice yields and increased local fish production (Mahendra et al., 2019).

Pranggang Village is the first pioneer of Koi fish farming in the Kediri region. The existence of a Koi fish cultivation center in Pranggang Village covering an area of almost 35 hectares in the form of 247 plots of rice field ponds/traditional ponds, 135 tide pools and 5 units of fiber tub pools and 10 filer ponds has raised the economy of the people of Pranggang Village as well as other Koi fish cultivators who are in Kandat and Wates (Kediri Regency Government, 2019). The Koi fish cultivation center in Pranggang is not inferior to the cultivation in the Blitar area which is already famous for Koi fish cultivation. In fact, Blitar sometimes still takes Koi fish from Pranggang, even though there aren't many. The traditional pond pattern using rice fields as a place for Koi fish cultivation has proven that with makeshift facilities the people of Pranggang Village are able to help their economy.

Koi fish (*Cyprinus carpio*) is a high-economy ornamental fish belonging to the carp family. Koi fish have various body colors with various types and patterns (Aisyah et al., 2016). According to (Putra et al., 2016), the criteria for selecting good koi fish are an ideal body shape that is not widened, the spine is not bent, bright and contrasting colors without any color gradations or shadows, fish movements are calm but agile and not lonely and sick. The color of koi fish is a genetic, environmental and nutritional factor. Ornamental fish cultivation business is able to provide more profits for cultivators who cultivate them. The marketing of ornamental fish is increasing, because many are starting to pursue the business of cultivating ornamental fish in aquariums to decorate rooms and small ponds in gardens or yards (Wulandari, 2023).

One type of freshwater fish that is very popular with the public is koi fish (*Cyprinus carpio*). Koi fish originating from Japan are known as nishikigoio (*Cyprinus carpio*) and are commonly used to decorate ponds at home because they have beautiful colored shapes, besides that they are believed to be able to relieve stress experienced by their owners. The bright and attractive colors on the koi fish scales can calm the mind, emotions and heart. Therefore there are many koi fish fans (Maulia, 2019).

Koi fish have attractive color characteristics and very diverse types. Broadly speaking, koi fish are classified into 13 categories, namely Kohaku, Sanke, Showa, Bekko, Utsurimono, Asagi, Shusui, Tancho, Hikari, Koromo, Ogon, Kinginrin, and Kawarimono. Koi fish is a type of freshwater ornamental fish that has high economic value, both in national and international markets, so many fish enthusiasts in Indonesia are interested in keeping this fish. Like the research conducted by (Mulya et al., 2021) in Sleman district and (Andriani et al., 2019) in Sukabumi district regarding improving the quality of koi fish to meet market needs. the two researchers conducted research

on modern ponds. Seeing the market prospects which are quite high and promising, the koi fish business seems quite profitable. However, to generate high enough profits, superior fish seeds are needed. Therefore research is needed to develop knowledge, skills, soft skills and high insights about the maintenance and breeding of koi fish in traditional pond cultivation. These advantages make this commodity have business prospects that can be developed through cultivation activities. so, it is necessary to analyze the feasibility of the business to develop the koi fish farming business in the future.

## **B. Methodology**

Research on business analysis of koi fish cultivation was carried out in Pranggang Village, Plosoklaten District, Kediri Regency, East Java. In the small-scale koi fish farming business or home industry owned by Mr. YAS from July to September 2020. The methods used in this study were observation, interview and documentation methods.

According to (Soeratno & Arsyad, 1993), observation is a way of collecting data by carefully and systematically recording which involves researchers as participants (participants) in carrying out activities directly. This method of data collection is done by interview where the interviewer seeks information from respondents to obtain information needed for a study (Mubyarto & Suratno, 1981). According to (Black & Champion, 1999) interviews are the most sociological data collection technique of all social research techniques. This is because the form comes from verbal interaction between the researcher and the respondent, where a researcher can listen directly to information or statements from the respondent. In the Big Indonesian Dictionary (KBBI) documentation is something written, printed/recorded that can be used as evidence or information (Junaidi, 2019) The documentation that was carried out in this Field Work Practice was the collection of population data in Pranggang Village, Plosoklaten District, Kediri Regency.

According to (Sugiyono, 2011) a qualitative method is a method used to research on natural object conditions, where the researcher is a key instrument, data collection techniques are carried out in a triangulation (combined) manner. Qualitative method analysis carried out in this study includes business management, production inputs, production processes, outputs, marketing and business development plans.

## **C. Findings and Discussion**

The location of this research is in Pranggang Village, Plosoklaten District, Kediri Regency, East Java Province. This village has an area of 740,510 Ha which is divided into six hamlets including Banjarjo, Bangunrejo, East Pranggang, West Pranggang, Sumberjo, and Mangunrejo hamlets which consist of 12 RWs and 51 RTs. Pranggang Village is on the slopes of Mount Kelud which has a land elevation of 136 above sea level.

Fish farming in rice fields in an integrated way is able to provide benefits up to three times more than rice paddies which are only planted with rice, and is a cost-effective, environmentally friendly product, low cost, low risk with multiple benefits and also provide food source of animal protein for the community. This concept is in line with the results of research carried out by (Kusdiarti et al., 2022), namely growing fish instead of rice plants is fish farming intermittently, it is carried out after the work of the rice fields while waiting for the planting of the rice. Growing fish with rice means raising fish in the rice fields made with paddy. The duration of the maintenance is since rice seeds are planted until the first weeding, second weeding, or until the rice plants flower (begin to form), even until drying. Fish farming as a replacement for crops is an important maintenance carried out as crop replacements in the rice rotation. The objective is to restore the fertility of paddy soils. In general, maintenance of fish in culture, carried out after two periods of planting rice in a row.

The area of Pranggang Village is almost 740,510 hectares consisting of settlements, plantations, cemeteries, yards, rice fields and ponds. The rice fields are 81 hectares of agricultural areas and 35 hectares of fisheries. Pranggang Village consists of flat mountain slopes which are densely populated areas. Based on the characteristics of natural resources (SDA), the area of Pranggang Village can be categorized as a residential area and fishery area (pond). The fishery business in Pranggang village is the traditional cultivation sector, which includes the cultivation of tilapia, carp, comet, bogi, and the most developed is the cultivation of koi fish. Pranggang Village has 247 paddy fields/traditional ponds, 135 tide pools and 10 filer ponds. This is due to the fertile soil and favorable water conditions. In addition, there is also an association of koi cultivators, namely Pranggang Koi Farm (PKF) as a means to exchange opinions in terms of developing a koi

cultivation business. In a business, production inputs are needed which are usually called factors of production. This production input consists of:

a. Seed

The seeds used by Mr. Yudi were obtained from natural spawning between male and female parents belonging to Mr. Yudi himself. As a result of this spawning, 80,000-120,000 seeds were obtained depending on the weight and length of the broodstock. The age of the seeds used in stocking the seeds is 14 days or 2 weeks. In one cycle, Mr. Yudi was able to sow 120,000 koi fish seeds. To maintain the continuity of seed supply, Pak Yudi has increased the number of sires. Apart from that, in maintaining the passing of life from seeds is to rely on natural food that is already available, such as phytoplankton and zooplankton. As for protection from predators (bird) attacks, Mr. Yudi uses water hyacinth as a hiding place for fish so that predators don't see him.

b. Feed

Mr. Yudi's koi fish farming pond uses artificial feed and natural feed. Artificial feed in the form of pellets and natural feed in the form of compost (from chicken manure). The pellets used in this cultivation business are Breeder Pro purchased from fish feed traders in Kediri. While the natural feed is in the form of composted chicken manure without mixture purchased from chicken breeders from Sumber Agung Village. In feed management, Mr. Yudi places more emphasis on natural feed, due to the cheap price of chicken manure compost. In addition, the presence of chicken manure compost can increase the abundance of nutrients available in nature so as to accelerate the growth of fish and maintain the availability of natural feed.

In the koi fish farming business, input management starting from the procurement of seeds, feed, recruitment of labor and capital is carried out properly so that it affects the continuity of the production process. In the koi fish farming production process, it is carried out optimally starting from pond preparation, seed stocking, pond maintenance, and fish maintenance so as to produce quality output. One of the marketing strategies is to use the Koi Show event facility which is held for local and national level Koi fish contests.

c. Venture capital

Business capital is a very important factor in running a business. The size of the capital can determine the scale of the business to be built. At the beginning of this cultivation business, Mr. Yudi used Rp. 33,000,000 in capital, which came from personal capital. This capital was used by Pak Yudi to rent a plot of land with an area of 175 ru and to buy equipment for production such as fiber tubs, pumps, nets and broodstock as well as to build filter ponds to run the koi fish farming business. Meanwhile, the feed comes from kopyokan fish sellers and relies on natural feed. Proceeds from every 2 months of selection are used for maintenance and additional investment in the form of broodstock, as well as land rent for aquaculture ponds.

d. Production cost

The total fixed cost of Mr. Yudi's koi fish farming business per cultivation cycle or for 6 months is IDR 24,475,500.00. The following is a table detailing fixed costs.

**Table 1. Total Fixed Cost of Koi Fish Farming**

No	Type	Amount (IDR)
1	Tax (1 year)	1.100.000
2	Treatment (1 year)	8.000.000
3	Depreciation (1 year)	12.351.000
4	Pool rental (1 year)	27.500.000
	Total	48.951.000
	Total per cycle	24.475.500

Source : Primary data is processed, 2023

In this koi fish farming business owned by Mr. Yudi, each cycle or every 6 months incurs a variable cost of IDR 11,995,000.00. The following is a detailed table of variable costs. The total costs incurred by Mr. Yudi in the koi fish farming business amounted to IDR 36,470,000.00. This amount is obtained from the total fixed costs added to the variable costs.

**Table 2. Total Variable Cost of Koi Fish Farming**

No	Type	Amount	Price/Unit (IDR)	Total (IDR)
1	Feed/ cycle (6 months)			
	• Natural : compost	600	5.750	3.450.000
	• Artificial : pellets	26	260.000	6.760.000
2	Oxygen	5	80.000	400.000
3	Plastic bags	1	80.000	80.000
4	Rubber bracelet	1	5.000	5.000
5	Electricity			480.000
6	Salt	100	1200	120.000
7	Seldene	20	35.000	700.000
	<b>TOTAL</b>			<b>11.995.000</b>

Source : Primary data is processed, 2023

The amount of income received by Mr. Yudi in the koi fish farming business in each cycle is IDR 120,100,000.00. These results were obtained from the total yield of class A koi fish of 1,140 multiplied by the price per head, which was Rp. the yield of class C koi fish is 5,280 multiplied by the price per fish, which is IDR 5,000.00.

The profit earned in Mr. Yudi's koi fish farming business is IDR 88,919,500.00 for each cycle or for 6 months. The profitability value obtained from Mr. Yudi's koi fish farming business is 269.483% per year. In Mr. Yudi's koi fish farming business, the RC Ratio value is 3.562 per year. This shows that Mr. Yudi's koi fish farming business is feasible. In Mr. Yudi's koi fish farming business, the annual BEP yield is IDR 53,930,987.00. As for the BEP for each class of koi fish, the results are as follows: in class A the BEP unit is 388 units and the BEP sales are IDR 25,192,478.00; class B for BEP units is 896 units and BEP sales are IDR 26,084,106.00; and class C for BEP units is 7,770 units and BEP sales are IDR 38,850,000.00. This shows that the koi fish farming business is making a profit.

#### e. Inhibiting and supporting factors

The inhibiting factors in Mr. Yudi's koi fish farming business include:

- The location of the aquaculture ponds is far from settlements so that they are prone to theft which Mr. Yudi experienced when he started his business in 1994 and caused losses to his business
- There are fish-eating birds that often attack ponds during the day (fish less than 10 cm) and cause a 20% loss in each production.

Supporting factors in Mr. Yudi's koi fish farming business are as follows:

- The use of traditional ponds supports the availability of abundant natural feed so as to save on feed costs
- The price of koi fish can reach hundreds of millions for good quality koi fish. This is because koi fish fans are willing to pay high prices to get the koi fish they like
- High market segmentation, export opportunities are also wide open for koi fish

#### Business Development Plan

Pak Yudi's koi fish farming business has progressed from year to year. This can be seen from the harvest and the high demand for koi fish. Even so, the koi lineage greatly affects the offspring produced. If the koi brooders used are of low quality, the offspring they produce will also be of low quality and will reduce demand which will automatically reduce production. So far, the breeders used in the koi cultivation business are local breeders, so the quality of the production produced is not optimal. Therefore, to develop this business, Mr. Yudi uses quality sires imported from Japan. Even though breeders from abroad are more expensive than domestic ones, this is equivalent to the quality they produce. So that the resulting output is higher and of higher quality. Marketing through the internet and social networks can also increase consumers (hobbyists), so they can get high profits. In addition, through Koi Show contests held both at the local and national levels can also be a strategy to develop this business. The Koi Show Contest can be used as a means of promoting the koi fish produced as well as a plan to increase investment in quality breeders and expand the network so that the koi fish farming business can develop. This

research is in line with previous research by (Kusrini et al., 2015) regarding the development of koi fish farming in Depok. Hatchery success is also heavily influenced by good brood management, optimal feeding management, and more controlled environmental management, which will affect the fitness of the broodstock, gonad maturity, and egg quality which ultimately can increase overall seed production. In addition, (Pasaribu, 2020) related to the strategy for developing koi fish farming in Karanganyar, namely the strategy of increasing the quantity and quality of production to meet market demand, attracting consumer interest by adding different types of koi fish colors, utilizing technological and information developments in the process of marketing ornamental koi fish, collaborating with hobbies and koi fish lovers to simplify the marketing process.

#### D. Conclusion

From the results of research conducted on koi fish (*Cyprinus carpio*) cultivation, it can be concluded that this business is feasible and profitable. but the author gives some constructive suggestions as consideration in increasing the business, namely installing ropes tied to wooden sticks 50 cm long and plugged all over the edge of the pond to deal with fish-eating birds, so that the amount of koi fish production can increase and increase the promotion of koi fish through social media so that Mr. Yudi's koi fish can be known to the wider community by creating a blog, Facebook or other social media regarding the koi fish farming business accompanied by how to order it.

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