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FEASIBILITY STUDY OF DOMESTICATION OF WADER FISH (*Puntius binotatus*) IN THE BRANTAS WATERSHED AREA, EAST JAVA

Yunetta Ferawati, Moh. Khusaini, Rita Parmawati, Anthon Efani
Environmental Science Doctoral Program of Brawijaya University, Indonesia
Email: yunetaferawati@gmail.com

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ABSTRACT

Wader fish (*Puntius binotatus*) in the Brantas River Basin, East Java has an essential position in society and the environment. Therefore, it is essential to make an effort to maintain its sustainability, one of which is through domestication. This study aims to analyse further whether the domestication of Wader fish is feasible as an alternative farming business for the community in the Brantas River Basin, East Java. The feasibility analysis of Wader fish domestication was carried out by analyzing the market, financial, technical, management, social, and environmental. The results of the study show that the market share of Wader fish seeds where the demand for seeds is greater than the existing supply. Technically, there are no obstacles or problems that hinder the running of the business. Domestication implementers can run their businesses because they already have a pretty good organizational structure. Social and environmental analysis shows that the Wader fish seed business is very feasible to run because it has a positive impact on society and maintains the sustainability of the surrounding natural environment. Financially, the Wader fish breeding business at UPT PBAT Umbulan obtained an NPV value greater than zero, which is Rp109,256,722. Net B/C is more significant than one, which is 2.35. The IRR value obtained from the financial analysis of the Wader fish farming business is 30.16 percent, where the IRR value is greater than the applicable discount rate of 4.75 percent, which means that the Wader fish farming business is financially feasible to be implemented.

Keywords: business feasibility; domestication; *Puntius binotatus*

INTRODUCTION

One type of local fish that is under threat is the Wader fish, according to IUCN Red List (Juriani *et al*., 2020). Wader fish usually live in lakes and rivers, even gutters but with clear water. Wader fish are typically found living in groups at the bottom of small, rocky rivers with calm to moderate currents, with a temperature range of between 22^0C - 24^0C and a pH between 6.0 - 6.5 (Froese *et al*., 2016; Hartoto & Mulyana, 1996). In East Java, there are two types of Wader fish, namely the Wader Cakul (genus Puntius) and the Wader Pari (genus Rasbora). Risjani *et al*. (1998) found 50 types of local fish in the Brantas River Basin (DAS) of East Java from the Cyprinidae, Gobiidae, and Cluppeidae families, including the Wader fish (*Puntius binotatus*) which is classified as the Cyprinidae genus. The *Puntius binotatus* type of Wader fish found in the Brantas River Basin has differences compared to the types of Wader fish in other areas. The *Puntius binotatus* type of Wader fish has differences compared to those of Plin Central Java and West Java. This finding is proven by testing at the genetic level (Astuti *et al*., 2020; Dahruddin *et al*., 2017). This shows that local wealth in the Brantas River Basin has not been utilized. Therefore, this research use the *Puntius binotatus* type of Wader fish as an object as a type of local endemic fish that only lives and grows in the waters of East Java.

For the Brantas River Basin community, the *Puntius binotatus* type of Wader fish has a vital position in society. Based on the benefits obtained by the community, Wader fish is the most well-known and preferred fish by the community for consumption compared to other types of local fish. Wader fish has a delicious, savory taste and can be eaten directly without removing the bones. High protein content, namely 14.8 g / 100g (Setiyoko *et al*., 2022) Various processed Wader fish are pretty well received by the community and even become a mainstay regional product (Lailiati *et al*., 2022). The high demand and exploitation of Wader fish are not comparable to domestication and intensive cultivation efforts. This will lead to extinction (Retnoaji *et al*., 2017; Rukayah & Lestari, 2021). People are more accustomed to catching Wader fish in rivers than carrying out domestication and intensive culture. When carrying out fishing activities, people do not know for sure about fish species and their characteristics. They also do not understand whether the activities carried out affect the existing fish stock, growth, and sustainability of the species (Iskandar *et al*., 2023). Given the critical position of the *Puntius binotatus* type of Wader fish in the Brantas Watershed of East Java, it is essential to make an effort to maintain its sustainability, one of which is through domestication.

Researchers have conducted a series of internal research trials to study feed requirements, gonad maturation process, fecundity, spawning process, and cultivation of Wader fish which have been carried out at the Umbulan Freshwater Aquaculture Development Unit (PBAT), East Java Provincial Marine and Fisheries Service since the end of 2018. The success of domestication will later produce seeds that will be widely cultivated by fishery farmers. Considering its ecological and economic role, the domestication of wader fish is a strategic step to maintain its sustainability while improving community welfare. Therefore, this study aims to assess the feasibility of wader fish domestication as an alternative aquaculture business in the Brantas watershed area, East Java.

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RESEARCH METHODS

Research Time and Location

This feasibility study on the domestication of the *Puntius binotatus* wader fish uses two methods, namely field research and laboratory research. Field research is a type of research that studies phenomena in their natural environment with primary data coming from the field. Laboratory research is research conducted in a controlled environment. (Mulyana, 2013.

The pilot project of domestication farming was only carried out in the laboratory of the Umbulan Freshwater Cultivation Development Unit, Sidepan Village, Winongan District, Pasuruan Regency, East Java Province in February 2017. However, the pilot project of seeding/rearing farming was also carried out in fostered groups in Pasuruan Regency.

Domestication Step

The steps for domestication of Wader fish carried out at the Umbulan PBAT Unit include four activities, namely:

1. Inventory and collection of Wader fish;
   There number of Wader Cakul (*Puntius binotatus*), as many as 450 fish
2. Implementation of domestication
   The wader fish caught were then taken to the pond that had been prepared at the UPT PBAT Umbulan
3. Laboratory-scale seed production
   The laboratory maintenance conditions that are controlled are salinity, temperature, pH and DO levels.
4. Mass-scale seed production
   The success rate in laboratory scale production such as spawning rate, egg hatching and seed survival, so that it can produce seeds in large quantities as a basis for mass scale seed production.

The feasibility analysis of the domestication of the Wader fish of the *Puntius binotatus* type was carried out according to Kasmir & Jakfar (2017) by analyzing the market, technical, management, social, and environmental aspects first before conducting a financial analysis so that it can provide complete information about the feasibility of the Wader fish cultivation business. After the financial analysis, a sensitivity analysis was then carried out to test the feasibility of the business and see if there were changes in costs, prices, and a decrease in income.

RESULT AND DISCUSSION

The feasibility analysis of the domestication efforts of Wader fish as an alternative farming business for the community in the Brantas River Basin, East Java was carried out in five aspects, namely market, technical, management, social environmental, and financial aspects. The existence of local fish species native to Indonesia has not been widely known and used in fish farming. Indonesia's local indigenous fishes are directly exploited by catching from nature, so it is feared to endanger its existence in nature. Strategy steps to overcome one of them is by reducing the intensity of catching in nature and trying to be able to cultivate it. The wader fish is one of the native Indonesian local fish species whose existence is currently rarely found so that to avoid extinction and restore the existence of the endangered wader fish there is a need to conserve the fish resources, among others, through the efforts of domestication. Production data and distribution following season or time of availability in each waters still vary great accuracy and information of potential and business opportunity of wader also still very little. The purpose of this study are : (1) knowing the process of domestication and cultivation of wader fish in the study area, (2) analyzing the suitability of the condition of wader fish cultivation in the research area in terms of technical aspects, management aspects, social aspects, and market aspects, (3) analyze the financial feasibility of wader fish farming business from NPV, IRR, Net B / C, and Payback Period.

This research was conducted at UPT PBAT Umbulan and the assisted groups (Pokdakan Rasbora 15 and Pokdakan Mina Jam Tiga) with research object is the process of domestication and financial feasibility analysis of wader fish cultivation. Data analysis method used in this research is descriptive analysis. The feasibility analysis of hatchery wader breeding (*Puntius binotatus*) includes cost and benefit analysis, cash flow value, then calculated with several investment criteria, Net Present Value (NPV) Net Benefit Per Cost (B / C Ratio), Internal Rate Return (IRR) and Payback Period (PP).

The domestication process of wader fish is an attempt to tame the wader fish that usually live in the wild until it can be cultivated. The implementation of domestication in UPT PBAT Umbulan includes four stages: 1). Inventory and collection of wader fish, 2). Implementation of domestication, 3). Production of laboratory-scale seeds, and 4). Mass production of seeds. Suitability of condition based on market aspect, technical aspect, management aspect, social and environmental aspect, hatchery business and fish wader breeding done by UPT PBAT Umbulan and the assisted group is feasible to run. The results of financial feasibility analysis of hatchery wader fish in UPT PBAT Umbulan and the assisted group is feasible to run, because it meets the criteria of eligibility requirements that are: a). Hatchery business in UPT PBAT Umbulan, NPV value Rp.264.782.913,-; Net B/C value 3.50; IRR value 54.9 and Payback Period 0.51 years. b). Hatchery business in Pokdakan Rasbora 15, NPV value Rp.10.998.520, -; Net B/C value 2.23; IRR value 33.5 and PP 1.52 Years. c). Hatchery business in Pokdakan Mina Jam Tiga, NPV value of Rp. 20.263.375, -; Net B/C value 2.33; IRR of 59.1 and PP 0.86 years. The result of financial feasibility analysis of the business cultivation of wader fish in UPT PBAT Umbulan feasible to run, because it has fulfilled the eligibility criteria that is obtained NPV value of Rp. 109.256.722, -; Net B/C value 2.35; IRR of 30.16 and PP 0.77 Years. Sensitivity analysis by switchiing value method on hatchery wader fish showed that the assumption of 25% cost increase and 17.5% decrease of the sale result in Hatchery business in UPT PBAT Umbulan and Pokdakan Mina Jam Tiga is feasible to keep running, but on Pokdakan Rasbora 15 is not feasible to run. At the effort of the cultivation of wader fish at UPT PBAT Umbulan, the assumption of a 20.5% decrease of sales result resulted in the cultivation effort not feasible to continue but with the assumption of 25% increase of effort of wader fish cultivation still feasible to run.

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Market Aspect Analysis

According to Adnyana (2020), basically a market can be interpreted as a meeting place between sellers and buyers, or a place where the forces of demand and supply meet to form a price. The market aspect is important for showing potential demand at a profitable price level. It is one aspect of the business's feasibility analysis. Market aspect analysis is carried out to observe demand, supply, the marketing mix consisting of products, prices, marketing locations, and locations.

Demand

Demand is the consumer's desire to buy goods or services at various price levels during a certain time period (Rahardja & Mandala, 2019). The demand for Wader fish is relatively high. So far, the fulfillment of Wader fish consumption needs in the community has only come from catches in nature, while Wader fish consumption is increasing. The increasing need for Wader fish consumption has resulted in high Wader fish catches in nature. Based on the survey results, it is known that the need for Wader fish consumption in Trowulan culinary stalls reaches 150 - 300 kg/day. the number of Wader culinary in Trowulan Village reaches 10 Wader chili sauce stalls. At the Wader Ngantang culinary stall, Malang Regency, it can reach 100 kg/day. This need cannot be met due to the decreasing number of Wader fish catches from nature. So, the fish sold in Wader culinary are generally not pure Wader fish.

The existence of Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia Number 1115/MEN/2009 concerning Types of fish and re-dispersal areas and fish capture based on cultivation which states that only local fish types are used for restocking activities and prohibits restocking using invasive/foreign fish, has increased the demand for Wader fish seeds for restocking needs increase. The need for local fish seeds for restocking activities, especially in East Java, is at least 2 million per year. The estimated demand projection for Wader fish needs/year in Trowulan Village, Mojokerto Regency, Ngantang Malang, Cultivation and restocking needs can be seen in Table 1.

Table 1. Projection of Demand for Wader Fish (*Puntius binotatus*)/year

No.	Wader Fish Demand	Fish/ Year
1.	Trowulan, Mojokerto (consumption)	24.525.000
2.	Ngantang, Malang (consumption)	10.950.000
3.	Budidaya Jatim dan Jateng (consumption)	2.000.000
4.	Restocking (Fish seed distribution)	2.000.000
5.	Jakarta (consumption)	360.000.000
	Total	399.475.000

Source: Secondary Data (UPT PBAT Umbulan)

The data projection of demand for Wader fish above, it shows that the need for Wader fish is projected to reach 399,475,000 fish, and it is estimated that the need could increase every year. The projection of demand for Wader fish according to Table 1 is only to meet the consumption needs of Wader fish in Mojokerto Regency, Malang Regency, cultivation and restocking needs in East Java Province. In contrast, the need for Wader fish in other areas in East Java has not been recorded.

Information about the success of Wader fish being domesticated and cultivated has attracted the attention of fish farmers, both beginners and experts/skilled, to learn Wader fish cultivation techniques because they have high economic value/relatively high consumption prices compared to other types of freshwater fish. The selling price of wet Wader fish varies depending on each region, ranging from IDR 25,000 to IDR 35,000 per kg, compared to the unstable price of catfish on the market with prices ranging from IDR 11,000 to IDR 15,000 per kg.

Supply

Supply is a number of goods sold or offered at a certain price and time. While demand is a number of goods purchased or requested at a certain price and time (Kotler *et al*.,2022). The number of domesticated Wader fish broodstock is still limited. Domesticated Wader fish broodstock at Unit Pelaksana Teknis Pengembangan Budidaya Air Tawar (UPT PBAT) Umbulan (Generation 0) is 450. It has been propagated to Generations 1 to 3 with a total of 3,834 male broodstock and 2,166 female broodstock. The number of broodstock in each Foster Group is 800 for Rasbora Group 15 and 2,000 for Mina Jam Group 3. The target production of larvae produced can be seen in Table 2.

Table 2. Target Production of Wader Fish Larvae (*Puntius binotatus*)/year

No.	Unit Name	Broodstock Number (fish)	Target Production of Wader Fish Larvae (*Puntius binotatus*)/year
1.	UPT PBAT Umbulan	6.000	2.940.000
2.	Rasbora 15	800	336.000
3.	Mina Jam3	2.000	735.000
	Total	8.800	4.011.000

Source: Primary Data (processed)

The limited number of Wader broodstock used for this Wader fish farming business has resulted in the very high demand for Wader fish seeds not being met. Based on Table 2, the target production of larvae produced by UPT PBAT Umbulan is 4,011,000. This shows that this Wader fish farming business is feasible and has good opportunities to be run because the demand for seeds is higher than the supply.

Marketing Strategy

Marketing strategy is a series of goals and objectives, policies and rules that provide direction to a company's marketing efforts from time to time, at each level, references and allocations, especially as a company response to the ever-changing environment and competitive conditions (Aji *et al*., 2020). The relatively new Wader fish farming with the high demand for Wader fish seeds for both cultivation and restocking activities, requires business actors to plan an optimal strategy to be able to meet the market needs for Wader fish seeds. This plan can be summarized in a strategy called a marketing mix. The marketing mix includes product, price, place, and promotion strategies.

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1. Product and price strategy

The products produced by UPT PBAT Umbulan and fostered groups in the Wader fish seed business are seeds measuring ± 1 cm or 20-25 days after hatching and seeds measuring 2-3 cm or 50-60 days after hatching. To maintain the quality of seeds sold, good harvesting techniques are carried out. Harvesting is carried out at low temperatures (morning and evening), and then drying is carried out for at least 2 hours.

The seed packaging/packing system uses a closed system, namely, using plastic bags and providing pure oxygen. The density of the packaged seeds is adjusted to the distance of the consumer's location. UPT PBAT Umbulan as a price maker in the market as well as the inventor of Wader fish cultivation technology markets its seed production for IDR 15, - per tail for a size of 1 cm and IDR 30, - per tail for a size of 2-3 cm. This pricing is based on the Market Penetration Pricing method, namely setting the lowest possible price so that at a low price it can be reached and attract people to cultivate Wader fish while still calculating business profits.

2. Location/distribution channel

Wader fish seeds produced by UPT PBAT Umbulan and fostered groups are currently still used mainly to meet the needs of local fish restocking carried out by the East Java Provincial Marine and Fisheries Service, NGOs, and Regency/City governments in East Java every year and to meet the needs of fish farmers in the Wader fish farming business.

The distribution channel for Wader fish seeds produced by UPT PBAT Umbulan and fostered groups are centered at UPT PBAT Umbulan for marketing, but it does not rule out the possibility that fostered groups can also market their production directly to fish farmers. The distribution channel is depicted in Figure 1.

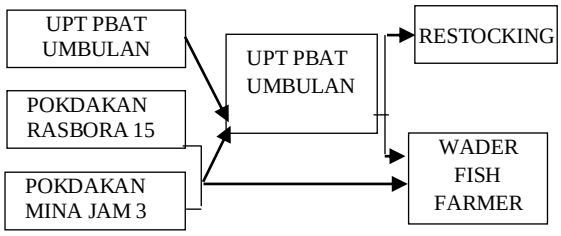

Figure 1. Distribution Channel of Wader Fish

3. Promotion

Promotion is one of the marketing strategy tools for products by providing correct and precise information so that consumers can get to know them and ultimately it is hoped that they can become consumers of the products being sold. Wader fish is a new type of fish that can be cultivated, and currently, many people still think that Wader fish cannot be cultivated. However, the public knows a lot about the taste and deliciousness of Wader fish when used as a side dish in meals at a relatively high price. Therefore, UPT PBAT Umbulan has carried out manypromotions to the community starting with the promotion of Wader fish sustainability, with the existence of GERTAK WADER (Wader fish preservation movement), followed by socialization and coaching to the community to be interested in Wader fish cultivation.

Based on the results of the market analysis aspect of the Wader fish seed business carried out by UPT PBAT Umbulan and the fostered group, it is feasible to run. This can be seen from the market share of Wader fish seeds where the demand for seeds is greater than the existing supply. In addition, even though it is still a new business, this Wader fish farming business has the opportunity to participate in maintaining the sustainability of Wader fish, which has been decreasing in nature.

Technical Aspect Analysis

The technical aspect is the main aspect that needs to be considered because in this aspect the calculation of project input and output in the form of goods and services is carried out based on the actual production flow. Thus, other aspects of the project analysis will only be able to run if the technical analysis can be carried out.

Some of the main questions that need to be answered from the technical aspect are:

1. Project Location

The location of the project is discussed in technical analysis, and the main variables are the availability of raw materials, the location of the target market, labour supply, and transportation facilities.

2. Availability of raw materials

The availability of raw materials referred to in the cultivation of Wader Cakul fish (*Puntius binotatus*) is the availability of water with adequate volume and quality. Wader fish usually live in public waters such as rivers, reservoirs, lakes, and others, so they require sufficient volume and quality of water in their cultivation efforts..

The location of the Wader (*Puntius binotatus*) fish farming business, namely at the Umbulan PBAT UPT, Rasbora 15 Fish Farming Group, and Mina Jam 3 Fish Farming Group, has sufficient and abundant water availability. The availability of water at the Umbulan PBAT UPT never decreases every year. This is because the water source used for cultivation activities comes from the Umbulan Spring which is located ± 500 meters from the Project location. The Umbulan Spring is a spring that has the most significant water discharge volume in Southeast Asia, with a water discharge of 5,000 liters/second. Water intake from the Umbulan Spring for cultivation activities at the Umbulan PBAT UPT is through a unique channel 300 meters long with a water discharge volume of 50-75 liters/second.

In the Rasbora Fish Farmer Group, the availability of water for Wader fish farming activities is very adequate. The water source used in Wader fish farming activities utilizes the overflow of artesian wells at the project location. The overflow of this artesian well is collected in a pond with an area of 3 x 20 meters before entering the cultivation pond.

3. Location of the target market

The Wader Fish Farming Business is a new business and not many fish farmers have done it, so the location of the target market does not affect the cultivation business. The production of Wader fish cultivation by UPT PBAT Umbulan and the fostered groups, namely the Rasbora 15 and Mina Jam 3 Fish Farming Groups, which are produced, is not comparable

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to the amount of demand for Wader fish consumption in the market. So far, Wader fish have been difficult to find in both traditional and modern markets. This is because the existence of Wader fish in nature is increasingly rare and the catch is decreasing. So far, all Wader fish produced by UPT PBAT Umbulan and the fostered groups can only be used to meet the needs of restocking Wader fish to be returned to nature and only a little to meet the needs of community consumption. Current conditions indicate that the market/consumers come directly to the producers / Wader fish farmers to order/get products, so the location of the target market does not have much influence.

Figure 2. Umbulan Spring (Covered by Blue Building) and its Overflow

Figure 3. Artesian Well at the Pokdakan Rasbora 15 location

4. Labor supply

In running a cultivation business, namely the seeding and rearing of Wader Cakul fish (*Puntius binotatus*), UPT PBAT Umbulan has special workers to handle it, namely from the Technology Section staff totaling 6 people. The number of members of the ornamental fish farmer group "Rasbora 15" when it was first formed was 9 people, along with the development of the group to achieve the same goal, from 2014 until now the number of members has increased by 17 people. Meanwhile, the Mina Jam 3 Group has 12 members, all members of whom come from residents in the area of the fish farmer group group's area.

5. Transportation facilities

Transportation facilities are not a problem in this Wader fish farming business, because UPT PBAT Umbulan already has very adequate transportation facilities. The transportation facilities owned are 1 (one) operational car unit. This transportation facility can be used to transport seeds produced by the fostered groups of UPT PBAT Umbulan for both seed transfer activities and seed sales activities.

Cultivation Technology

The transfer of domestication and cultivation technology for Wader Cakul fish began in 2020 to the fostered groups of UPT PBAT Umbulan. The stages/guidelines in Wader Cakul fish cultivation technology have been outlined in the form of SOP (Standard Operational Procedure) for Wader Cakul Fish Cultivation (*Puntius binotatus*). In implementing the SOP for Wader fish cultivation, it can be adjusted to the conditions of the facilities and infrastructure owned by the cultivation business actors. The SOP for Wader Cakul breeding techniques is determined by the UPT Fish Health and Environmental Laboratory of Pasuruan, the Marine and Fisheries Service of East Java Province. The developed species are freely distributed to the public based on the Decree of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 62 of 2024 concerning the Release of Wader Cakul Fish (*Puntius binotatus*) Jatimbulan.

Production Input

The inputs used in the Wader fish (*Puntius binotatus*) seed and rearing business at the Umbulan PBAT UPT and the Fostered Group consist of two parts, namely fixed input and variable input. Fixed input is the pond and its equipment and variable input is all materials whose quantities are adjusted to production needs. The types of fixed and variable inputs can be seen in Table 3.

Based on the results of the technical analysis above, in each technical analysis criteria as a whole, there are no obstacles or problems that hinder the running of the business. The selection of the project location (business location, availability of raw materials, market location, and transportation facilities), layout, production process, UPT PBAT Umbulan, and fostered groups can produce products optimally so that technically it is feasible to be run.

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Table 3. Input Requirements for Wader Fish (*Puntius binotatus*) Cultivation Business at the Umbulan PBAT UPT and the Fostered Grop

No.	A. FIXED INPUT		
1.	UPT PBAT UMBULAN	RASBORA 15	MINA JAM 3
	a. Investment	a. Investment	a. Investment
	- Spawning Pond	- Spawning Pond	- Tarpaulin Pool
	- Nursery Pond	- Nursery Pond	- Styrofoam Box
	- Rearing Pond	- Male Wader Parent	- Male Wader Parent
	- Male Wader Parent	- Female Wader Parent	- Female Wader Parent
	- Female Wader Parent	b. Equipment	b. Equipment
	b. Equipment	- Scales	- Scales
	- Scales	- Tub	- Tub
	- Tub	- Bucket	- Bucket
	- Bucket	- Larva Seser	- Larva Seser
	- Larvae scoop	- Seed Seser	- Seed Seser
	- Seed scoop	- Spawning Happa	- Palm Fiber
	- Seed scoop	- Palm Fiber	
	- Spawning Happa	- Weight	
	- Palm fiber	- Brush	
	- Weights	- 2-meter Parent Selection Happa	
	- Brush		
	- 2-meter parent selection happy		
2.	B. INPUT VARIABLE		
	Parent feed	Parent feed	Parent feed
	Larvae feed	Larvae feed	Larvae feed
	Seed feed	Seed feed	Seed feed
	Plastic Packing	PlasticPacking	PlasticPacking
	Rubber	Rubber	Rubber
	Oxygen	Oxygen	Oxygen
	Organic fertilizer		
	Lime		

Management Aspect Analysis

UPT Freshwater Aquaculture Development (PBAT) Umbulan is a government organization engaged in the development of freshwater fish farming businesses and has an organizational structure that has been stipulated in the Regulation of the Governor of East Java No. 115 of 2016 concerning the Organization and Work Procedures of the Technical Implementation Unit of the Fisheries and Marine Service of East Java Province.

Wader fish farming efforts, both seeding, and rearing, in their production activities are carried out by technology application staff who are directly under the leadership of the Head of the Production and Technology Application Section, the sales department in the business and service section handles sales service activities.. Domestication pilot projects were also carried out in two community fish farming groups, namely the Rasbora 15 Fish Farming Group, a group of ornamental fish farmers located in Karang Sentul Village, Gondang Wetan District, Pasuruan Regency, East Java. And the Mina Jam 3 Fish Farming Group in Sumbergedang Village, Pandaan District, Pasuruan

Based on the results of the management analysis above, it can be seen that the Umbulan PBAT UPT and the Fostered Group are worthy of running their business because they already have a pretty good organizational structure so that there is a proper division of tasks and functions to ensure that a business can be carried out correctly. Each section is responsible for carrying out its respective tasks so that all Wader fish breeding efforts can run smoothly.

Analysis of Social and Environmental Aspects

Before the domestication efforts and Wader Cakul fish breeding efforts (*Puntius binotatus*) were carried out, the number of Wader fish in nature had decreased. The domestication of Wader fish and the implementation of restocking activities in public waters in East Java province of 5 (five) million fish, has had a positive impact on the existence of Wader fish in nature. In addition, the Wader (*Puntius binotatus*) fish breeding effort has had a positive impact on the community and the environment of inland public waters in East Java. With the success of the Wader fish domestication process, more and more people are interested in learning Wader fish cultivation technology (fish farmers, students, and lecturers). After mastering the Wader fish cultivation technology, several people including fish farmers and Wader traders came to UPT PBAT Umbulan to seek information and learn about Wader fish cultivation. Students, students, and lecturers also use wader fish cultivation technology at UPT PBAT Umbulan as the title of Comparative Study, Internship, Industrial Work Practice (PRAKERIN), Internship Work Practice (PKM), and research activities. This is very important and very good because we have introduced new technology to the younger generation while encouraging them to participate in preserving local/native fish whose cultivation techniques are

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not yet known through research activities. The production and distribution of Wader fish at UPT PBAT Umbulan and fostered groups can be seen in Table 4.

Table 4. Production and Distribution of Seeds from the Domestication Trial of Wader Fish at the Umbulan PBAT UPT and Fostered Groups

Year	Production (Fish)	Distribution	Number of seeds (Fish)
1	2	3	4
2018	400.000 *	Regency Malang	300.000
		Regency Madiun	100.000
2020	2.525.000 *	Regency Tuban	200.000
		Regency Mojokerto	200.000
		Regency Ponorogo	100.000
		Regency Trenggalek	120.000
		Regency Madiun	300.000
		Regency Ngawi	500.000
		Regency Pamekasan	15.000
		Regency Bojonegoro	600.000
		Regency Kediri	200.000
		Regency Tulungagung	200.000
		Regency Gresik	10.000
		Regency Ngawi	80.000
2022	2.078.000 *	Regency Pasuruan	100.000
		Kota surabaya	50.000
		Regency Kediri	100.000
		Regency Gresik	100.000
		Regency Bojonegoro	265.000
		Regency Blitar	3.000
		Kota Batu	10.000
		Regency Probolinggo	50.000
		Regency Ngawi	100.000
		Provinsi Jatim	1.300.000
2023	590.000	Regency Mojokerto	200.000
		Regency Kediri	200.000
		Regency Bondowoso	100.000
		Regency Situbondo	80.000
		Regency Banyuwangi	10.000

Description: * = for restocking needs
Source: UPT PBAT Umbulan (2023)

The number of Wader fish seeds restocked from 2018 to 2023 is approximately 5,000,000 seeds to all Inland Public Waters including rivers, reservoirs and lakes in East Java Province. The positive impact of restocking is that the presence of wader fish in nature which was previously difficult to find, has now been found in abundance. The BAPPEDA JATIM report uploaded on the BAPPEDA website on September 28, 2015, on its website stated that "Dozens of Fish Species in the Brantas River Disappear", including Wader fish.

Its status has changed according to Petrus (2019) in his report on the Mongabay Indonesia website, explaining that the results of the river census by ECOTON, show that local/native fish are starting to be found, because the condition of the Brantas River shows recovery. The BKIPM (Fish Quarantine Agency, Quality Control and Safety of Fishery Products) report on its website dated September 14, 2022 with the title "Mapping the Distribution of Prohibited, Protected, and Invasive Fish Species (JADDI) in the Barantas River Basin, East Java", has succeeded in covering the types of fish in the Brantas River. The mapping results, that the Wader fish has been found again.

Another positive impact on the community is the emergence of fish farming groups engaged in wader fish farming and becoming fostered groups of the UPT PBAT Umbulan, namely the Rasbora 15 and Mina Jam 3 Fish Farming Groups. For fostered groups, this Wader fish seed business can provide additional income for group members. Based on the results of social and environmental analysis, show that the wader fish (*Puntius binotatus*) seed business is very feasible to be pursue because it has a positive impact on the community and maintains the sustainability of the surrounding natural environment.

Financial Aspect Analysis

Assumptions for Increasing the Scale of Wader Fish (*Puntius binotatus*) Farming Business

The Wader Cakul fish (*Puntius binotatus*) farming business is carried out at the Umbulan PBAT UPT. The assumptions used in the financial feasibility analysis of the Wader Cakul fish (*Puntius binotatus*) farming business are:

1. The project life of 10 years is based on the economic life of the pond construction used in farming activities.
2. The Wader Cakul fish farming (*Puntius binotatus*) will start in 2020.
3. The Discount Rate is adjusted to the Bank Indonesia interest rate in 2020 of 7.5%
4. The Wader Cakul fish farming cycle lasts two and a half months or five times a year.
5. The Wader fish are harvested after 60 days of maintenance.
6. The Survival Rate or percentage of fish survival is 50-60%.

Inflow

Income is the result of multiplying the quantity of production produced by the selling price set in a period. In the Wader (*Puntius binotatus*) fish farming business carried out by UPT PBAT Umbulan, the income obtained from the sale of Wader (*Puntius binotatus*) fish with a size of ± 3 grams/tail for Rp. 25,000,-/kg. The maintenance period for 60 days after seed distribution and land preparation ranges from 7-10 days. So in one year, there are 5 (five) harvests. The Survival Rate or percentage of Wader Cakul fish survival ranges from 50-60%.

The survival of fish in the Wader Cakul fish farming at UPT PBAT Umbulan is due to the low temperature of the cultivation pond ranging from 22ºC – 25ºC and the fairly low abundance of plankton. So the amount of Wader fish production is 600 kg/cycle. The selling price of consumption of Wader fish is Rp. 25,000,-/kg. The income from the rearing business in one cycle is 600 kg x Rp. 25,000,-/kg = Rp. 15,000,000,-. In one year, production produces 3,000 kg of consumption fish, so the income from the Wader fish rearing business is Rp. 25,000,-/tail x 3,000 kg = Rp. 75,000,000,- (Table 5).

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Table 5. Income from Cakul Wader Fish (*Puntius binotatus*) Breeding Business at UPT PBAT Umbulan

Period/ Year	Number of harvests (kg)	Price (Rp)	Total (Rp).
0	0	25.000	0
1	600	25.000	75.000.000
2	600	25.000	75.000.000
3	600	25.000	75.000.000
4	600	25.000	75.000.000
5	600	25.000	75.000.000
6	600	25.000	75.000.000
7	600	25.000	75.000.000
8	600	25.000	75.000.000
9	600	25.000	75.000.000

Source: Primary Data (processed)

Residual Value

Residual value is the value of goods or equipment that are not used up during the business. The residual value becomes an additional benefit for the business. The calculation of the residual value is done by dividing the purchase price of the goods by the economic life, where at the end of the economic life it is assumed that the value of the goods is used up. In the Wader (*Puntius binotatus*) fish farming business, no value of goods or equipment has yet used up its economic life at the end of the analysis period.

Outflow

The financial feasibility analysis of the Wader (*Puntius binotatus*) fish farming business at the Umbulan PBAT UPT, consists of investment costs and operational costs (fixed costs and variable costs). The analysis of costs or expenses (Outflow) reflects the expenses that will occur during the project's life.

Investment Costs

Investment costs are costs incurred at the beginning of the project year or Table 6 below shows the of the period and at certain times to obtain benefits several years (periods) later. The investment costs in the Wader (*Puntius binotatus*) fish farming business can be seen in Table 6 below.

Table 6 shows the initial investment of IDR 80,650,000 for the Wader (*Puntius binotatus*) fish farming business at the Umbulan PBAT UPT. The largest investment is in the construction of a farming pond, with an investment value of IDR 75,000,000.

Operational Costs

Operational costs are the total costs related to the operational activities of the Wader (*Puntius binotatus*) fish farming business at the Umbulan PBAT UPT. These costs are incurred periodically during the business, and consist of variable costs and fixed costs.

Variable Costs

Variable costs are costs that must be incurred along with changes in production, increasing or decreasing production volume. Variable costs will change if the production volume changes. The variable cost per production cycle of Wader fish at the Umbulan PBAT UPT is IDR 5,950,000 and for one year of production it is IDR. 29,750,000,- which includes consisting of the purchase of seed feed, Wader fish seeds, plastic packaging, manure, and lime. Table 7 explain in details variable costs for this wader fish business.

Table 6. Investment Costs for Cakul Wader Fish (*Puntius binotatus*) Breeding Business at UPT PBAT Umbulan

No	Description	Amount	Unit	USE	Unit Value (Rp)	Value (Rp)
1	Land Lease (10 years)	0,1	Ha	10	500.000	5.000.000
2	Growth Pond	1000	m^2	10	75.000	75.000.000
3	Scale	1	Unit	5	300.000	300.000
4	Ban	5	Buah	1	50.000	250.000
5	Pail	2	Buah	1	15.000	30.000
6	Seed Scoop	2	Buah	1	10.000	20.000
7	Harvesting Happa	2	buah	1	25.000	50.000
	Total Investment					80.650.000

Source: Field Observation (processed)

Table 7. Details of Variable Costs of Wader Fish (*Puntius binotatus*) Breeding Business at UPT PBAT Umbulan

No	Description	Amount	Unit	Unit Value (Rp)	Earned Value (Rp)
1	Seed feed	120	kg	10.500	1.260.000
2	Wader seeds size 1-2 cm	300.000	ekor	15	4.500.000
3	Plastic packing	1	roll	100.000	100.000
4	Manure	10	Sak	6.000	60.000
5	Lime	10	sak	3.000	30.000
	Amount				5.950.000
	Variable Cost per Year	5 Production Cycle			29.750.000

Fixed Costs

Fixed costs are the total costs that must be incurred during one year with or without production. The fixed costs incurred do not change even if the production volume changes. The fixed costs in the Wader (*Puntius binotatus*) fish farming business at the Umbulan PBAT UPT are Rp. 17,666,500 per year. These fixed costs consist of depreciation, maintenance costs, and labor, in detail can be seen in Table 8.

Investment Criteria Feasibility Analysis

In the financial analysis, the feasibility criteria used to assess the feasibility of a project are Net Present Value (NPV), Net B/C Ratio, Internal Rate Return (IRR), and Payback Period (PP). The results of the calculation of the financial feasibility analysis of the Wader (*Puntius binotatus*) fish farming business at the Umbulan PBAT UPT can be seen in Table 9.

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Table 8. Details of Fixed Costs of the Wader (*Puntius binotatus*) Fish Breeding Business at the Umbulan PBAT UPT

No	Description	Cost (Rp)
1.	3 workers Rp. 500,000,-/cycle	9.000.000
2.	Maintenance Cost	756.500
3.	Depreciation	7.910.000
	Total	17.666.500

Table 9. Financial Feasibility of the Wader (*Puntius binotatus*) Fish Farming Business at the Umbulan PBAT UPT

No.	Investment Criteria	Result
1.	NPV	Rp. 109.256.722,-
2.	Net B/C	2,35
3.	IRR	30,16
4.	PP	0,77 tahun

Source: Primary Data (processed)

Based on the results of the financial analysis of the Wader (*Puntius binotatus*) fish breeding business at the Umbulan PBAT UPT, the NPV value is greater than zero, which is Rp109,256,722, - which means that the Wader (*Puntius binotatus*) fish farming business is feasible to implement. The NPV of Rp109,256,722, - also shows the net benefits received from the business during the project life against the prevailing interest rate. The net B/C is greater than one, which is 2.35, which means that this business is feasible to implement. Net B/C is equal to 2.35, meaning that every rupiah spent during the project life produces a net benefit of 2.35 rupiah. The IRR value obtained from the financial analysis of the Wader fish farming business is 30.16 percent, where the IRR value is greater than the applicable discount rate, which is 4.75 percent. The IRR value shows the internal rate of return of the project of 30.16 percent, and because the IRR value is greater than the discount rate, the Wader fish farming business at UPT PBAT Umbulan is feasible to implement. This business has an investment cost payback period of 0.77 Periods or 0.77 years.

Sensitivity Analysis

Sensitivity analysis is an analysis carried out to review so that the effects that occur due to changing conditions can be identified. A sensitivity analysis is carried out to see the level of sensitivity of the business if there are changes to the price variables and cost and benefit calculations. The sensitivity analysis method uses the switching value method. The switching value method is a method of changing one or more variable values that are considered the most sensitive in the Wader (*Puntius binotatus*) fish breeding and farming business until the business is not feasible to run or the feasibility variables have passed the break-even point of the business.

Wader Cakul Fish Seedling Business (*Puntius binotatus*)

The parameters changed in the sensitivity analysis of the Wader Cakul fish seedling business (*Puntius binotatus*) at the UPT PBAT Umbulan . They fostered groups used three assumptions, namely the assumption of a 25% increase in costs and a 17.5% decrease in the number of seed sales. The projection of the results of the sensitivity analysis calculation can be seen in Table 10.

Table 10. Projection of the Results of the Sensitivity Analysis Calculation

Project Location	Assumption	NPV (Rp)	Net B/C	IRR (%)
UPT PBAT Umbulan	Costs up 25%	216.188.901	3,04	47,5
	Sales down 17.5%	165.648.810	2,57	38,9
Pokdakan Rasbora 15	Costs up 25%	(82.896)	0,99	7,3
	Sales down 17.5%	(253.837)	0,97	6,8
Pokdakan Mina Jam Tiga	Costs up 25%	10.570.964	1,70	36,1
	Sales down 17.5%	14.678.325	1,97	27,7

Source: Primary Data (processed)

The assumptions used in the sensitivity analysis are based on the possibility of changes in business conditions during the operation. These changes in conditions can be in the form of increased costs and decreased sales of seeds with the aim of finding out how the business is affected or finding out the project's sensitivity to changes that may occur in the future.

1. Assumption of a 25% increase in costs

The assumption of a 25% increase in costs is based on poor economic conditions so most operational costs have increased. The results of the calculation of the sensitivity analysis of the Wader fish seed business at the Umbulan PBAT UPT obtained an NPV value of Rp. 216,188,901, -; Net B / C = 3.04; IRR = 47.5 and at the Mina Jam Tiga Pokdakan with an NPV value of Rp. 10,570,964, -; Net B / C = 1.70; IRR = 36.1 indicates that the Wader fish breeding business at UPT PBAT Umbulan and Pokdakan Mina Jam Tiga is still feasible to run even though there is a 25% increase in costs per year. Meanwhile, the Wader Cakul fish breeding business at Pokdakan Rasbora 15 is not feasible to run because the calculation results show the NPV value = - Rp. 82,896,-; Net B/C = 0.99, meaning that the Wader (*Puntius binotatus*) fish breeding business at Pokdakan Rasbora 15 will experience a loss of Rp. 82,896,- during the project life. Net B/C of 0.99 means that everyone rupiah of costs incurred will result in a loss of Rp. 0.01,-. The IRR value = 7.3% indicates the internal rate of return of the project of 7.3 percent where the IRR value is smaller than the applicable discount rate of 7.5 percent, so the Wader (*Puntius binotatus*) fish seed business in Pokdakan Rasbora 15 is not feasible to implement.

b. Assumption of sales results down 17.5%.

The determination of the assumption of sales down by 17.5% is due to uncertain environmental factors at this time. The presence of disease attacks or natural disasters and others results in fish deaths and decreased purchasing power of fish farmers, which can result in decreased sales of seed business results. The results of the sensitivity analysis calculation with the assumption of a 17.5% decrease in sales for the Wader (*Puntius binotatus*) fish seed business. In the Wader (*Puntius binotatus*) fish seed business at UPT PBAT Umbulan, the results obtained were NPV = Rp. 165,648,810, -; Net B / C = 2.57; and IRR = 38.9% and in Pokdakan Mina Jam Tiga the results obtained NPV value = Rp. 14,678,325,-; Net B/C = 1.97; and IRR = 27.7.

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The calculation results indicate that the NPV value is more than zero, the Net B/C value is more than one and the IRR is more than the applicable discount rate of 7.5 percent so that the Wader (*Puntius binotatus*) fish seed business at UPT PBAT Umbulan and Pokdakan Mina Jam Tiga is feasible to be implemented. However, in the seed business at Pokdakan Rasbora 15, the results obtained NPV value = - Rp. 253,837,-; Net B/C = 0.97 and IRR = 6.8% indicate that if there is a decrease in sales results by 17.5% it will result in a loss of Rp. 253,837,- during the project life. Net B/C of 0.97 means that every one rupiah of costs incurred will result in a loss of Rp. 0.03,-. The IRR value = 6.8% where the IRR value is smaller than the applicable discount rate of 7.5 percent, then the Wader (*Puntius binotatus*) fish breeding business in Pokdakan Rasbora 15 is not feasible to implement. Based on the results of the sensitivity analysis above, both the assumption of a 25% increase in costs and a decrease in sales results of 17.5% in the Wader (*Puntius binotatus*) fish breeding business at UPT PBAT Umbulan and Pokdakan Rasbora 15 show a fairly high business sensitivity, meaning that this business has a fairly high tolerance for shocks due to rising costs or reduced benefits. On the other hand, the Wader (*Puntius binotatus*) fish breeding business in Pokdakan Rasbora 15 has a low business sensitivity so the business being implemented is not feasible due to increased costs and reduced benefits.

Cakul Wader Fish Farming Business (*Puntius binotatus*)

The sensitivity analysis calculation uses the replacement value technique or switching value. The use of the replacement value technique in sensitivity analysis is done by replacing several elements in the project analysis until the project analysis reaches the minimum feasibility figure.

The method used by the author in the replacement value technique is to increase costs by 25 percent and reduce sales results by 20.5 percent, although historically there has not been a decrease in sales of 20.5 percent, but this could happen considering the weather conditions that are increasingly difficult to predict changes. After the increase in costs and the decrease, the Cakul Wader fish farming business (*Puntius binotatus*) run by UPT PBAT Umbulan became unfeasible to continue. The results of the sensitivity analysis calculation projection can be seen in Table 11.

Table 11. Projection of Sensitivity Analysis Calculation Results

No.	Assumption	NPV (Rp)	Net B/C	IRR (%)
1.	Increase in costs 25%	21.965.449	1,27	10,75
2.	Decrease in sales revenue 20.5%	(1.253.000)	0,98	4,35

Source: Primary Data (processed)

The results of the sensitivity analysis with the assumption of a 25% increase in costs do not make the Wader fish farming business at UPT PBAT Umbulan unfeasible, because even though there is a 25% increase in costs, the sensitivity of the business is quite high with an NPV value of Rp. 21,965,449, -; Net B / C = 1.27 and IRR = 10.75%, meaning that this business has a fairly high tolerance for shocks due to a 25% increase in costs.

The resulting feasibility indicator is an NPV of Rp. 21,965,449, - meaning that the Wader fish breeding business run by UPT PBAT Umbulan will get a profit of Rp. 21,965,449, - during the project life. Net B/C of 0.98 means that every rupiah of costs incurred will generate a profit of Rp. 0.02 and IRR of 10.75% percent means that every cost incurred will benefit the business by 10.75 percent of the cost each period. However, in the second assumption, namely a decrease in sales results of 20.5%, the results obtained are NPV = - Rp.1,253,000, -, Net B/C = 0.98 and IRR = 4.35% meaning that the Wader (*Puntius binotatus*) fish farming business will experience a loss of Rp. 1,253,000, -, during the life of the project. Net B/C of 0.98 means that every rupiah of costs incurred will generate a loss of Rp. 0.02 and IRR of 4.35 percent means that every cost incurred will harm the business by 4.35 percent of the cost each period. Based on the results of the sensitivity analysis of the Wader (*Puntius binotatus*) fish farming business at the Umbulan PBAT UPT, the assumption of a 20.5% decrease in sales results has a greater influence than the assumption of a 25% increase in costs on business feasibility.

CONCLUSION

Based on the results of the market aspect analysis of the Wader fish seed business carried out by UPT PBAT Umbulan and the fostered group, it is feasible to run. This can be seen from the market share of Wader fish seeds where the demand for seeds is greater than the existing supply. The results of the technical analysis above, in each technical analysis criteria as a whole there are no obstacles or problems that hinder the running of the business. The selection of the project location (business location, availability of raw materials, market location, and transportation facilities), layout, production process, UPT PBAT Umbulan, and the fostered group can produce products optimally so that technically it is feasible to run. Based on the results of the analysis, it can be seen that UPT PBAT Umbulan and the Fostered Group are feasible to run their business because they already have a fairly good organizational structure so that there is a proper division of tasks and functions to ensure that a business can be carried out properly.

The results of the social and environmental analysis show that the Wader (*Puntius binotatus*) fish seed business is very feasible to run because it has a positive impact on the community and maintains the sustainability of the surrounding natural environment. The results of the financial analysis of the Wader fish breeding business at the Umbulan PBAT UPT obtained an NPV value greater than zero, which is Rp 109,256,722. Net B/C is greater than one, which is 2.35. The IRR value obtained from the financial analysis of the Wader fish-rearing business is 30.16 percent, where the IRR value is greater than the applicable discount rate, which is 4.75 percent, which means that the Wader fish rearing business is financially feasible.

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