Business Feasibility Analysis on Utilization of Green Waste Catfish for Aquatif Flea Cultivation

Pratama, D.A[1], Asih, H.M[1]*, Suharriyanto, T.T[1], Faishal, M[1]

[1] Department of Industrial Engineering, Faculty of Industrial Technology, Universitas Ahmad Dahlan Yogyakarta, Yogyakarta, 55191, Indonesia

*Corresponding author: hayati.asih@ie.uad.ac.id

Abstract

Catfish is a popular consumption fish and is easy to maintain. At the time of harvest or draining, the green water from catfish pond waste is usually only disposed of without any further use. This causes unpleasant odors from pond wastewater and pond sediment sewage into the environment. Processed catfish wastewater contains and is useful for the cultivation of water fleas. The utilization of green water from catfish pond waste makes wastewater clean, clear, and odorless. This study aims to determine the handling of catfish wastewater, business feasibility, and business development proposals. This study uses a business feasibility analysis covering market, technical, management, legal, environmental, and financial aspects. This study uses a SWOT analysis to determine the strategy used in the future and improve the company's shortcomings. The results of this study indicate that the business of utilizing green catfish waste for the cultivation of water fleas is feasible.

Keywords : Business feasibility, SWOT analysis, Forecasting, Water fleas

1. Introduction

Many people used to keep or cultivate catfish for decoration or consumption. Maintaining this fish is relatively easy because of the nature of catfish, which is easy to adapt to and has a robust immune system. Catfish can still grow well until the water in the pond or aquarium is dark green. For routine maintenance, you only need to feed adequately and regularly, and there is no need to drain or replace the pond regularly. Water changes are infrequent, usually only when the catfish are harvested, or new seeds will use the place. Catfish pond wastewater is usually just thrown away without any further use. If you do not use it, you will lose because this green water has many other ingredients and benefits, such as cultivating water fleas (daphnia). The catfish pond water turns green because of the content of Chlorella sp. It is a green microalga that is vital in providing nutrients for zooplankton in aquaculture systems, according to Neori (2011). More simply, Chlorella sp. is food for water fleas.

The green catfish wastewater is dried under direct sunlight so that the water has a greener color that is getting darker. Meanwhile, brown catfish wastewater cannot be used directly and must be treated first. Treatment of brown catfish wastewater is by mixing green water or Chlorella sp. to make the green water become abundant and concentrated. While mixing catfish wastewater, it is still dried directly under the hot sun to accelerate the growth of Chlorella sp. If the green water is very thick, it indicates the amount of Chlorella sp. Furthermore, water can be directly given to the water flea seeds so that the water fleas can get food and breed. If the catfish wastewater is dark green, water fleas can use the water directly to feed water fleas.

The choice of catfish wastewater is because there are many catfish breeders, so it is not challenging to get wastewater. It can also be made by keeping the catfish with effortless care. The amount of catfish wastewater thrown away is a form of water wastage. This catfish wastewater is used to cultivate water fleas which can be used as feed for young fish or sold again. In addition, catfish wastewater disposed of carelessly will cause an unpleasant odor or fishy smell.

Water fleas are aquatic animals with a minimal size or microscopic animals because their size is only 0.2-0.5 mm, and their bodies look reddish. These animals live floating in the water in groups of up to millions, so the water's surface looks reddish. Water fleas become one of the superior feed for a fish fry. The need for fish farmers for water fleas is very high. Fish farmers usually get water fleas from natural catches sold in fish shops, while their availability in nature is uncertain for many reasons. Water fleas sold in fish shops also have a short life span. When water fleas are in plastic wrap continuously, many water fleas die and are unsuitable for feeding fish fry. Therefore, fish breeders and ornamental fish shops that sell water fleas often experience problems with shortages of water fleas. On the other hand, not many people can cultivate water fleas on a large scale that can meet market demand every time.

Many ornamental fish farmers in the Yogyakarta. These water fleas are usually used as the main feed for small ornamental fish because they are also tiny, so the fish can eat them, one of which is betta fish. Water fleas are chosen because of their high nutritional level, namely 5% protein, 5% fat, and 9% fiber (Atmadjaja, 2009). In addition, water fleas do not cause the fry to become cloudy and dirty, which can cause the fry to die of the disease. There are still few water flea breeders, and the uncertain stock of water fleas in nature is a business opportunity if they can cultivate them and provide them at any time. Even though it has a relatively cheap selling price, which is generally IDR 5,000 to IDR 10,000 for each plastic bag with a size of a kilogram, with a large number of requests, it will generate a hefty profit.

A business feasibility study is an activity to assess the extent of the benefits that can be obtained in carrying out a business activity or project. The purpose of doing business analysis (Gray & Larson, 2007) are (1) to determine the level of profit that can be achieved through investment in a project; (2) to avoid wasting resources, namely avoiding the implementation of unprofitable activities; (3) to conduct an assessment of the existing investment opportunities to choose the most profitable alternative activities; (4) Determine investment priorities. Rangkuti in Syarif (2011) explains that marketing analysis is crucial for the company's success. If a company can sell more of the same product, of the same quality, at a higher price, or develop a more prosperous new product, it has relatively successfully used its marketing analytical skills.

This analysis needs to be done to avoid failure and see if the business will run as expected. In general, the purpose of conducting a business feasibility analysis study is to prevent significant overspending funds, but the industry is not profitable. It is better to have a feasibility study in a corporation on a large and small scale. Although in terms of the selling price of water fleas, including having a low price (small scale), it is necessary to do an analysis first to be sure to run this business.

2. Literature Review

This research was conducted through literature and field studies in the Yogyakarta City area at fish sales points and online buying and selling sites. Literature study or literature can be interpreted as a series of activities related to collecting library data, reading and taking notes, and processing research materials (Zed, 2003). The libraries used are journals and books. Field research, often also called field research, aims to study the background of the current situation and environmental interactions of a social unit of society (Suryabrata, 2014) intensively. This field research is conducted by examining the object directly to the location to be studied to get maximum results for the green catfish wastewater object used as research at Kiara Fish Farm and the home of Mr. Hariyadi Perum. Riverside A9, Rt 29 Rw 09, Muja-muju, Umbulharjo, Yogyakarta.

3. Methods

3.1 Forecasting

Forecasting is a method used to estimate the level of demand for a product in a certain period in the future. The use of forecasting aims to:

- Minimize the effect of uncertainty on the company.
- Forecasting aims to obtain a forecast that can minimize forecast errors which are usually measured by MSE (Mean Squared Error), MAE (Mean Absolute Error), and so on (Subagyo, 1986).

3.2 Business Feasibility Analysis

This analysis is needed to see how a business is before it is run by considering its various aspects. Learn what it takes to run a business. Predict what possibilities will be faced, which helps determine whether this business is worth running. In the business feasibility analysis, there are fundamental aspects, namely:

- Non-Financial Aspect
  Some things have a role in the running of a business. One thing that plays an important part is the non-financial aspect. Non-financial aspects can be market, technical, management, legal, and environmental. Market and marketing aspects are all things that include buying and selling activities. Technical aspects are all things that support the continuity of action, such as location, production process, and technology. The management aspect is in the form of the company's organization. The legal part is regarding licensing. The environmental factor is the impact of the business on the environment.
- Financial Aspect
  In a business, funds are needed for the continuity of the business. The funding can be in the form of capital and estimated costs required. In addition, there are also revenue estimates and sensitivity analyses in the financial aspect. An excellent financial aspect analysis will examine the calculation of expenses, income, and profits to be obtained.

4. Data Collection

Primary data collection in this study used direct observation methods and interviews with several entrepreneurs of green water cultivation of catfish waste. The observations were documented in photos and videos and conducted direct experiments. Secondary data from various books, journals, and other documents are also needed as reference material to enrich and support research results. The data is then processed according to the business feasibility analysis steps so that the results of this study can answer whether the business is feasible or not. Many water fleas can be directly harvested and ready to be sold. Sales use one kilo of plastic wrap: direct marketing and social media Facebook, WhatsApp, and Instagram.

5. Results and Discussion

The utilization of green catfish wastewater to feed water fleas costs money. Catfish keepers can obtain water by asking catfish keepers or buying it. More practically can be made yourself at a low cost. The production requires a fee to buy a bucket container with twenty thousand rupiahs per seed for catfish for Twenty-three thousand rupiah per kilo, and catfish feed per kilogram of Rp. 7,000,-. Water fleas will reproduce by themselves by being fed green water.
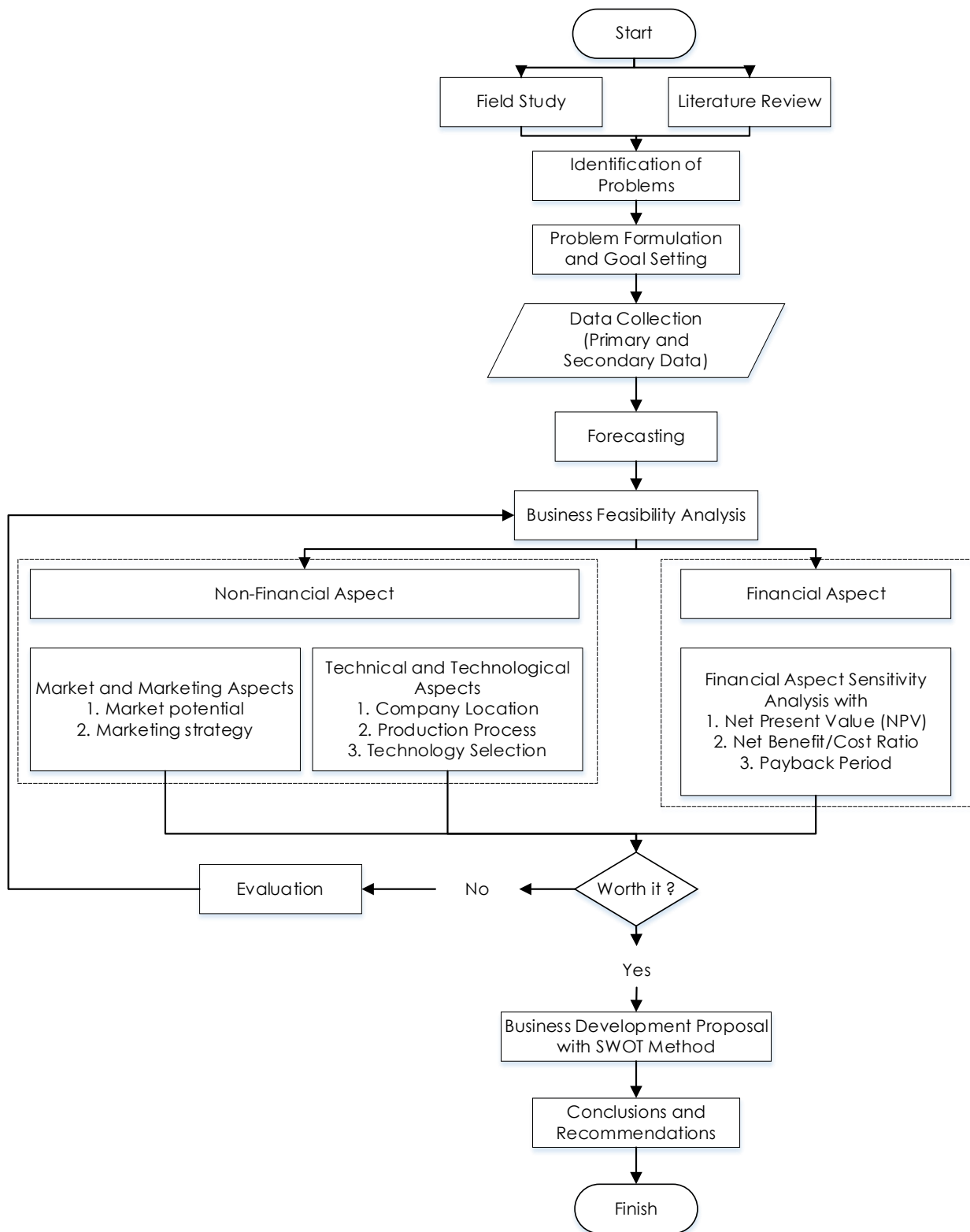
Figure 1. Research flowchart

5.1 Market and Marketing Aspects
5.1.1 Market Potential

People's interest in buying ornamental fish has increased with the implementation of regional quarantine. This interest seems to continue until the PSBB stops. Visitors choose ornamental fish at the Yogyakarta Animal and Ornamental Plant Market (PASTY) Yogyakarta, Sunday (21/6). Demand for ornamental fish and aquariums is relatively high during the rules for working at home and school holidays due to the Covid19 pandemic. Keeping ornamental fish is one of the escapes for residents to spend time at home (Republika, 2020); this also impacts the increasing demand for fish feed, especially water fleas. The growing demand becomes a profitable business field. Estimated market demand can be seen using demand forecasting.

People collected data in the last seven months to analyze demand forecasting for utilizing green catfish waste for water fleas cultivation. In April, the demand was 900 packs. In May, the demand was 810 packs, in June it was 825 packs, in July, it was 1200 packs, in August it was 1500 packs, in September it was 1800 packs, and in October, it was 1950 wrap.

5.1.2 Segmenting

Sales of water fleas are targeted to the DIY region covering five regions: Yogyakarta City, Bantul Regency, Sleman Regency, Kulon Progo Regency, and Gunung Kidul Regency. The marketing of this product targets all ages, men and women, because raising fish is loved by many people. This product targets fish farmers and hobbyists because water fleas are used as their main feed. Cultivators, especially fish hobbyists, will have the best feed products for their pets. This water flea is a natural live food that has good nutritional content.

5.1.3 Targeting

Entrepreneurs can do targeting or determine the target market in a more measurable and precise manner by evaluating the analyzed segments. This water flea product targets fish farmers and hobbyists because of its water flea qualities.

5.1.4 Positioning

This product differs from similar products, namely good quality, clean products, large doses, and affordable prices.

5.1.5 Marketing Strategy

Marketing is done directly and through social media and Facebook, WhatsApp, and Instagram. With social media, salespeople make it easy to market and donot rent a place to sell. Social media reach is also wider because it can cover outside the city. Even though the marketing reach can reach outside the city, many sellers cannot send it because they are afraid that water fleas will die on the way. In general, water fleas can only survive one day on sale. This is because the fleas are packaged in plastic, while the water used is freshwater that does not contain food which causes water fleas to die quickly. Hot temperatures also accelerate the death of water fleas. However, the provision of green water in heat-resistant packaging and packaging will make water fleas last longer so that they can serve orders within and outside the city.

5.2 Technical Aspect
5.2.1 Location Analysis

The location used to cultivate water fleas does not require a large area. It only requires a place the size of a bucket with a diameter of 50 cm, three pieces that always get direct sunlight to accelerate the growth of Chlorella sp. It can be said that there is no cost for a place to cultivate it.

5.2.2 Production Process Analysis

The concentrated green catfish wastewater can be directly used to feed water fleas if catfish waste water is not green. Catfish farmers can still use it by mixing it with green water (Chlorella sp). The mixture of catfish wastewater not green with green water is then dried under direct sunlight so that the water becomes dark green caused by the growth of Chlorella sp. To further accelerate, the green water can be assisted with lights at night. In addition, it is also necessary to stir to accelerate the maturation of green water (dense color), generally twice a day in the morning and evening. Regular provision of green water to water fleas will make the development of water fleas more numerous and can be harvested en masse to meet market demand.

It is also necessary to replace the water in the water flea cultivation area, which aims to remove the dirt in the breeding place, such as larvae and the rest of the dead water fleas. Water replacement is done when the container has seen a lot of dirt, especially those that have settled. Water fleas that have grown a lot in the cultivation container can then be harvested immediately, using a good scoop to pick up tiny water fleas. The water fleas are packaged in a one-kilo plastic container and ready to market.
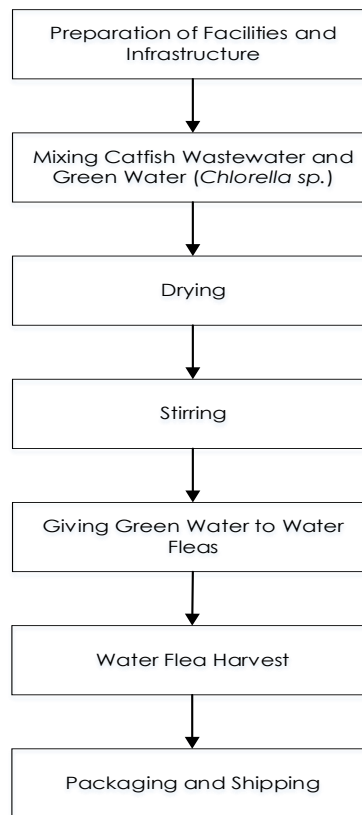
```
┌─────────────────────────────┐
│ Preparation of Facilities and │
│ Infrastructure               │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Mixing Catfish Wastewater and │
│ Green Water (Chlorella sp.)   │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Drying                       │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Stirring                     │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Giving Green Water to Water  │
│ Fleas                        │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Water Flea Harvest           │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Packaging and Shipping       │
└─────────────────────────────┘
```

Figure 2. Production process

5.2.3 Technology Selection Analysis

The technology used is in the form of lights that help accelerate the maturation of green water and an aerator that functions as an automatic stirrer. The technology will speed up the ripening process and produce more green water. However, this technology has not been used at the time of research.

5.3 Management Aspect

In this business, even though it runs with a small and straightforward organization, management can be feasible if it runs well.

5.4 Legal Aspect

The establishment of a water fleas business currently does not have a micro and small business license (I-UMK); a business license will be made in the future.

5.5 Environment Aspect

Catfish wastewater treatment activities reduce odor pollution in the surrounding environment. The community accepts both the processing and utilization of catfish wastewater. In addition, this business can increase the economic income of the community.

5.6 Numerical Results
5.6.1 Forecasting

The linear regression method is used to forecast demand in the future period with the following graph.

Table 1. Linear regression forecast

Month	X	Y	XY	X^2
April	1	900	900	1
May	2	810	1620	4
June	3	825	2475	9
July	4	1200	4800	16
August	5	1500	7500	25
September	6	1800	10800	36
October	7	1950	13650	49
Total	28	8985	41745	140

Based on these data, the calculation of the constant value (a) and the regression coefficient (b) is as follows :

$$a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2} \tag{1}$$

$a = \frac{(8985)(140) - (28)(41745)}{7(140) - (28)^2}$

$a = \frac{(1257900) - (1168860)}{980 - 784}$

$a = \frac{89040}{196}$

$a = 454,286$

$$b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2} \tag{2}$$

$b = \frac{7(41745) - (28)(8985)}{7(140) - (28)^2}$

$b = \frac{(292215) - (251580)}{980 - 784}$

$b = \frac{40635}{196}$

$b = 207,321$

Based on the results of the calculations that have been carried out, the value of the constant a and the regression coefficient b is obtained. The linear regression equation becomes like the following equation :

$$Y' = 454{,}286 + 207{,}321 \, x \tag{3}$$

The calculation of forecasting the number of requests in the next period for 7 periods can be solved using the above equation, below is the result of forecasting calculations for 7 periods.

Table 2. Forecasting results

X	A	B	Forecasting (Y')
8	454,2857143	207,3214286	2112,857143
9	454,2857143	207,3214286	2320,178571
10	454,2857143	207,3214286	2527,5
11	454,2857143	207,3214286	2734,821429
12	454,2857143	207,3214286	2942,142857
13	454,2857143	207,3214286	3149,464286
14	454,2857143	207,3214286	3356,785714

The calculation of the error forecasting results from the linear regression method is as follows :
- Mean Absolute Deviation (MAD) measures forecasting accuracy by determining the average results of forecasting errors.

$$MAD = \sum_{t=1}^{n} \left| \frac{Y - Y'}{n} \right| \tag{4}$$

Table 3. MAD calculation

X	|Y-Y'|
8	162,8571429
9	207,3214286
10	207,3214286
11	207,3214286
12	207,3214286
13	207,3214286
14	207,3214286
Total	1406,785714
MAD	201

- Mean Square Error (MSE) serves to evaluate a forecasting technique.

$$MSE = \frac{\sum_{t=1}^{n} |Y - Y'|^2}{n} \tag{5}$$

Table 4. MSE calculation

X	|Y-Y'|²
8	26522,44898
9	42982,17474
10	42982,17474
11	42982,17474
12	42982,17474
13	42982,17474
14	42982,17474
Total	284415,4974
MSE	40631

- Mean Absolute Percentage Error (MAPE) serves to determine the percentage of absolute error on average each period.

$$\text{MAPE} = \frac{\sum_{t=1}^{n} \left| \frac{Y - Y'}{Y} \right|^2}{n} \tag{6}$$

Table 5. MAPE calculation

X	|(Y-Y')/Y|²
8	8,351648352
9	9,812373225
10	8,935580697
11	8,202628232
12	7,580803134
13	7,046613256
14	6,582752169
Total	56,51239906
MAPE	8

5.6.2 Financial Aspect
- Capital Analysis and Cost Estimation
  The capital required is not significant because the tools used are not many. The funds used are as follows:

Table 6. Cost of production per pack

Description	Cost (Rp)
Raw Material Cost	152,-
Direct Labor Cost	267,-
Overhead Cost	34,-
Amount	453,-

The selling price is IDR 5,000 / small pack and IDR 10,000 / pack of one kilo. The costs required are not too significant, therefore funding from personal capital.

- Net Present Value (NPV)

Table 7. Net present value

Month	Df = 0%	Cash In	Cash Out	PWB	PWC
0		-	950000	-	950000
1	1	10565000	957189	10565000	957189
2	1	11600000	1050960	11600000	1050960
3	1	12640000	1145184	12640000	1145184
4	1	13675000	1238955	13675000	1238955
5	1	14710000	1332726	14710000	1332726
6	1	15745000	1426497	15745000	1426497
7	1	16785000	1520721	16785000	1520721
	TOTAL			95720000	8672232

$$NPV = PWB - PWC \tag{7}$$

= Rp 95.720.000,- - Rp 8.672.232,-
= Rp 87.047.768,-

- Net Benefit/Cost

$$Nett \ B/C = B/C \tag{8}$$

= Rp 95.720.000,- / Rp 8.672.232,-
= 11,04

- Payback Period

$$PP = \frac{Investation}{Cash\ Flow} \ X \ 1 \ month \tag{9}$$

$= \frac{950000}{10565000 - 957189}$ X 1 month
$= \frac{950000}{9607811}$ X 1 month
= 0,1 month or 3 day

The results of the financial analysis are as follows:

Table 8. Sensitivity analysis results

No	Eligibility Criteria	Eligibility	Description
1	NPV	NPV > 0	Rp 87.047.768,-
2	Net B/C	Net B/C > 1	11,04
3	Payback Periode	PP < Period of Time	0,1

Financial calculations and sensitivity analysis show that if there is an increase in production costs, this business is said to be feasible.

- Sensitivity Analysis
  Every business or business has challenges and factors that support or hinder the sustainability of the business. For example, the economy is experiencing a shock due to

the coronavirus outbreak, which impacts the amount of existing demand in the current condition. The assumptions used in this sensitivity analysis are a decrease in product demand by 20%, 40%, and 90%, while income does not change.

Table 9. Sensitivity analysis

No	1	2
Eligibility Criteria	NPV	Net B/C
Eligibility	NPV > 0	Net B/C > 1
20%	Rp 67.903.768,-	8,8
40%	Rp 48.759.768,-	6,6
90%	Rp 899.768,-	1,1
91%	Rp -57.432,-	0,99

Financial calculations and sensitivity analysis show that if there is an increase in production costs, this business is said to be feasible.

5.7 Graphical Results

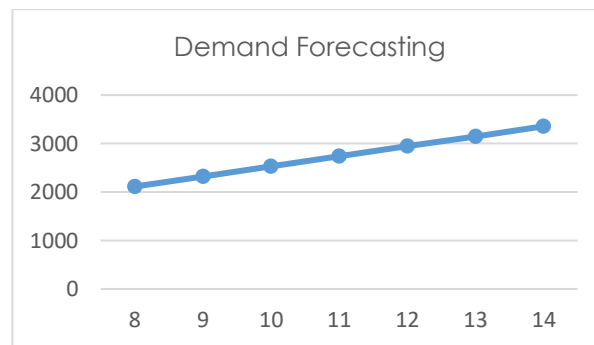The linear regression method is used to forecast demand in the future period with the following graph.

Figure 3. Demand forecasting chart

5.8 Proposed Improvements
5.8.1 SWOT Analysis

The business of utilizing catfish waste green water to cultivate water fleas has advantages and disadvantages. Therefore, it is necessary to identify the influencing factors to determine the strategy so that this business can continue to run and develop. The SWOT analysis factor is divided into 2, namely internal and external factors.

The first factor is the internal factor. Factors that have come from within that can affect the course of this business. In internal factors, there is a Strength factor that is owned in this business to have superior value. In addition, there is also a Weakness factor which is the weak point of the business owned. It is known to what extent the capability limit is used as an evaluation material so that improvements and updates are made so that this business gets better.

External factors also have a strong influence on this business. External factorsare factors from outside the business that affects the running of this business, such as Politics (Politics), Economics (Economy), Social (Social), Technology (Technology), Environment (Environment), and Legal (Regulations / Laws). These factors are focused on the Opportunity factor and the Threat factor.

5.8.2 Strategy Formulation

The SWOT analysis strategy for the use of catfish waste green water for water fleas cultivation is as follows:

Table 10. SWOT analysis

EXTERNAL/INTERNAL	STRENGTH	WEAKNESS
	1. Good Product Quality 2. Clean Product 3. Affordable Price 4. A Large Amount	1. Marketing Efforts are not Optimal 2. Distribution Network is not Maximized 3. Water Fleas Quickly die when they are in the Pack for a Long Time
OPORTUNITIES	**SO**	**WO**
1. Good Market Grwoth 2. Relationship with other Partners 3. Technological Development 4. An ample Supply of Green Catfish Wastewater	1. Maintain and Improve the Quality of Water Fleas (S1 O1) 2. Cooperating as a Provider of Water Fleas with Fish Farmers (S2 O2) 3. Make Innovations so that Water Fleas can Overgrow (S3 O3) 4. Add Stock and Variatis of Water Fleas (S4 O4)	1. Promote and Disseminate Information (W1 O1) 2. Cooperating with Delivery Service Owners (W2 O2) 3. Added Refrigerant and Oxygen for Life (W3 O3)
THREATH	**ST**	**SW**
1. Level of Competition 2. Pests appear in Green Water 3. Food other than Water Fleas 4. Lack of Green Water Drying during the Rainy Season 5. Decreased Green Water Content	1. Improve the Quality of Water Fleas (S1 T1) 2. Selecting the Results of Water Fleas Cultivation (S2 T2) 3. Provide Discounted Prices with Large Quantity Purchases(S3,4 T3,4,5)	1. Increase Market Share by adding Customers and other Promotional (W1 T1) 2. Pay attention to Shipping Problems and Compensation (W2 T2) 3. Guarantee the Confomity of Quality to Water Fleas Sold (W3 T3,4,5)

The following table shows that this business needs improvement because it still has weaknesses in several sectors. Water fleas need to be improved more cleanliness, maintaining green water quality so that the growth and development of water fleas become faster, increasing the variety of cultivated water fleas such as giant water fleas, and holding purchase promos. Promoting, and collaborating with delivery services and quality assurance to continue to grow.

6. Conclusion

Forecasting demand at the beginning of the next period is estimated at 2113 packs and continues to grow until the forecasting period for the 14th period reaches 3357 packs. These results become a viable business reference.

The results of the business feasibility analysis in every aspect are feasible, and the financial aspect shows that the positive NPV value is Rp. 87,047,768, - which means the revenue value is greater than the investment, Net B/C is 11, - more than one means this business is feasible. Executed, and PP of 0.1 means a speedy return on investment. The decrease in product demand by 20%, 40%, and 90% is not a problem because of the significant profit value.

The business development proposal is on the quality of water fleas that need to be improved, more cleanliness, so the development of water fleas can be fast, increasing the variety of cultivated water fleas such as giant water fleas, and holding purchase promos. Carry out promotions, cooperation with shipping services, and quality assurance following the SWOT analysis that has been carried out.

References

Astuti, A. M. I., & Ratnawati, S. (2020). Analisis SWOT Dalam Menentukan Strategi Pemasaran (Studi Kasus di Kantor Pos Kota Magelang 56100). *Jurnal Ilmu Manajemen*, *17*(1), 58–70.

Atmadjaja, J. 2009. *Cupang : panduan lengkap memelihara cupang hias dan cupang adu* (S. Proyugo (ed.)). Penebar Swadaya.

Gaspersz, V. (2005). *Production Planning and Inventory Control*. Gramedia Pustaka Utama.

Gray, C.F dan Larson, E.W. 2007. Manajemen Proyek. Edisi 3. Yogyakarta : Andi.

Hidayat, W. 2020. *Minat Warga Beli Ikan Hias di Yogyakarta*. Republika. https://www.republika.co.id/berita/qcabyf314/minat-warga-beli-ikan-hias-di-yogyakarta-1

Neori, A. 2011. "Green water" microalgae: The leading sector in world aquaculture. *Journal of Applied Phycology*, 23(1), 143–149. https://doi.org/10.1007/s10811-010-9531-9

Purnamasai, D., & Hendrawan, B. (2013). Analisis Kelayakan Bisnis Usaha Roti Ceriwis sebagai Oleh-Oleh Khas Kota Batam Dewi. *Jurnal Akuntansi, Ekonomi Dan Manajemen Bisnis*, 3(1), 83–87.

Rangkuti, F. 2011. Manajemen Persediaan Aplikasi di Bidang Bisnis. Jakarta: Raja Grafindo Persada

Subagyo, Pangestu. 1986. Forcesting Konsep and Aplikasi. BPEE UGM: Yogyakarta

Suryabrata, Sumadi. 2014. Metodologi Penelitian. Jakarta: Raja Grafindo Persada

Tangkilisan, H.N.S. 2005. Manajemen Publik. Jakarta: Grasindo.

Zed, Mestika 2003. Metode Penelitian Kepustakaan. Jakarta : Yayasan Obor Indonesia.