Probe - Fishery Science & Aquaculture 2024, 6(1), 2236.
https://doi.org/10.18186/fsa2236

Article

Feasibility of *snakehead fish* hatchery (*Channa striata*) using a round pond in Labuan Amas Selatan district, Hulu Sungai Tengah regency, Kalimantan Selatan province, Indonesia

Rina Mustika*, Irma Handayani, Irma Febrianty

Fisheries Socio-Economics Study Program, Faculty of Fisheries and Marine Sciences, Lambung Mangkurat University, Banjarbaru 70714, Indonesia

*** Corresponding author:** Rina Mustika, rina.mustika@ulm.ac.id

CITATION

Mustika R, Handayani I, Febrianty I. Feasibility of snakehead fish hatchery (Channa striata) using a round pond in Labuan Amas Selatan district, Hulu Sungai Tengah regency, Kalimantan Selatan province, Indonesia. Probe - Fishery Science & Aquaculture. 2024; 6(1): 2236. https://doi.org/10.18186/fsa2236

ARTICLE INFO

Received: 1 July 2024
Accepted: 10 September 2024
Available online: 11 November 2024

Abstract: This study aims to determine the technicalities and analyze the feasibility of *snakehead fish* (*Chana striata*) hatchery using round ponds in Labuan Amas Selatan District. The data collection methods used are observation, interviews, and documentation. The data analysis used is a qualitative descriptive analysis to determine the technical aspects of the fish hatchery, financial analysis to determine the feasibility of the business with profit analysis, Payback Period (PP), Break Event Point (BEP), Net Present Value (NPV), Net Benefit Cost (Net B/C), and Internal Rate of Return (IRR). The study results show that *snakehead fish* hatchery using round ponds produces *snakehead fish* seed in 7 cycles in one year; in each cycle, 6–10 pairs of *snakehead fish* are used, which can be spawned with an average nursery time of 1.5 months. *Snakehead fish* cultivation techniques include broodstock maintenance, broodstock selection, spawning, larval transfer and maintenance, nursery, harvesting, and marketing. The results of the business feasibility analysis obtained a profit value of IDR 63,465,000/year with a speedy return on investment for 1.64 years, the BEP value of production = 20,742 seed < the production value = 56,000 seed, and the BEP price of IDR 667/seed < the current price = IDR 1,800/seed. The NPV value at the hatchery reached IDR 366,007,925, meaning NPV > 0, Net B/C > 1 value of 4.62, and IRR value of 62.81%, which means it is greater than the current interest rate of 6%. Based on various financial analyses, the *snakehead fish* hatchery business using round ponds is profitable and feasible.

Keywords: *snakehead fish* hatchery; round pond; business feasibility

1. Introduction

Snakehead fish (*Channa striata*) is a freshwater fish with high economic value. This fish is often called the *snakehead fish*, because of its wide head and large scales, sharp-angled mouth, long dorsal and anal fins, and almost the same height [1]. The potential of *snakehead fish* is quite significant as a food ingredient. It is rich in properties as a supplement for healing post-operative wounds [2–5], and burns [6], improving nutritional status [7], and improving the neurological status of stroke patients [7,8]. Based on the research results, *snakehead fish* contains albumin with many sulfhydryl groups (SH) which can function as a radical binder. Proteins rich in SH groups can bind harmful metals, compounds with antioxidant effects, and sialic acid [9].

Most *snakehead fish* caught in the wild are less than 30 cm long; and rarely measure 50 cm [10]. In addition to destroying the living habitat of *snakehead fish* in nature, the high demand for *snakehead fish* has led to excessive exploitation of

snakehead fish, and it is feared that this could cause the *snakehead fish* population in nature to decline [11].

The demand for *snakehead fish* continues to increase, and this shows that the economic potential of *snakehead fish* can still be used for public consumption and in industries such as processed food [12]. The need for *snakehead fish* in South Kalimantan is mainly met by-catches and a small part by cultivation [13]. The obstacle to fulfilling *snakehead fish* from cultivation is due to limitations in cultivation techniques and the availability of seed. Using seed of natural origin often raises problems such as seasonal availability, variation in number, and non-uniform size. This makes it difficult to estimate the availability of seed in *snakehead fish* [14].

Hulu Sungai Tengah (HST) region is one of the important regions in the context of fish seed production in Kalimantan Selatan. This area is a natural habitat for various types of fish, making it a suitable environment for fish breeding. Known as a center for producing diverse fish seeds, this region has a strategic role in supporting the local and regional fishing industry and supports the sustainability of the fisheries sector in South Kalimantan.

Table 1. Total freshwater aquaculture fisheries seed production in HST regency, 2019–2022.

Number	Types of fish	Production/year (thousand heads)			
		2019	**2020**	**2021**	**2022**
1	*Climbing perch*	20,000	480,450	78,081	85,450
2	*Snakehead*	70,000	80,100	106,150	111,750
3	*Goldfish*	16,000	404,050	161,800	168,990
4	*Nile Tilapia*	795,000	202,690	288,690	275,730

Source: HST Regency Food Security and Fisheries Office, 2023 [15].

Table 1 shows the production of freshwater aquaculture fishery seed in Hulu Sungai Tengah Regency, explaining that the production of *snakehead fish* seed from 2019 to 2022 has increased production, reaching 111,750,000 *snakehead fish* seed.

In order to support the fulfilment of *snakehead fish* seed, fish farmers in Labuan Amas Selatan District, South Hulu Sungai Tengah Regency, developed a new innovation in *snakehead fish* hatchery using round pond media. This innovation aims to increase *snakehead fish* hatchery production and overcome the high risk of unpredictable flood disasters in the future.

A round pool is round shaped pool with a wide surface, surrounded by a series of iron and covered with a tarp as a container for this round pool. Tarpaulin ponds are widely used in freshwater fish cultivation because their use is more practical and easier. Apart from that, tarpaulin pools can also maintain the temperature in the pool. This has been proven by several fish farmers. The smell of fish will not be as bad as mud in soil media. The harvesting process in a tarpaulin pond is of course much easier to do. The health of *snakehead fish* is also easier to monitor because the media is safer. [16].

The seed produced come from broodstock purchased previously from *snakehead fish* catchers in rivers or swamps, which are then raised in a particular pond for broodstock with a pond size of 4 m × 5 m, in one pond filled with ten broodstock. The

broodstock is kept until it is thought they have reached sexual maturity. In the rearing, the broodstock can get three months or more until it is estimated to be mature.

The process of hatching *snakehead fish* is carried out in a round pond with semi-artificial seeding technology which begins with selecting mature male and female broodstock, then inserting the broodstock in a ratio of 1:1 into a special mating pond with a pond diameter of one meter, The spawning time lasts for ten days. Fertilized eggs will hatch within three days. *Snakehead fish* with an average length of 31.3 cm with a broodstock weight ranging from 310.7 g can produce 8423 eggs per broodstock with an egg-dropping capacity of 7086 or 84.1% in one spawning. Meanwhile, based on the research survey results, the weight of male and female broodstock now only reaches 200 g–250 g, and can lay eggs in the range of 500–2000 eggs with a hatching capacity of 300–1200 fish larvae [17].

The *snakehead fish* hatchery business in Labuan Amas Selatan District has recently experienced a low egg hatching rate, and at least *snakehead fish* eggs were produced from one broodstock. This is allegedly influenced by the fact that the broodstock fish that are ready to be raised only reach a size of 200 g–250 g; besides that, this business is also relatively new and is still in the learning stage. Based on these problems, the author is interested in researching the feasibility of a *snakehead fish* hatchery business in Labuan Amas Selatan District, Hulu Sungai Tengah Regency, Kalimantan Selatan Province, Indonesia.

2. Research methods

2.1. Time and place

The research was conducted from January 2024 to May 2024, and location was deliberately determined to be Labuan Amas Selatan District, Hulu Sungai Tengah Regency, Kalimantan Selatan Province, Indonesia. At this location, *snakehead fish* (*Channa striata*) hatchery uses a round pond.

2.2. Data collection methods

The data collection methods used during the implementation of this research activity include observation, interview, and documentation.

2.3. Sampling techniques

Samples were taken deliberately from 11 *snakehead fish* breeders in the Labuan Amas Selatan District.

2.4. Types and sources of data

The types of data used in this study are qualitative and quantitative data. The data sources used in this study are primary data and secondary data.

2.5. Data analysis

2.5.1. Descriptive analysis

Qualitative descriptive analysis was used to determine the technical cultivation of the *snakehead fish* hatchery in Labuan Amas Selatan District.

2.5.2. Financial analysis

Financial analysis is a method used to determine a business's feasibility. It is usually used to determine profit/loss, entry cost ratio (R/C), Break Event Point (BEP), time to return (PP), Net Benefit Cost Ratio (Net B/C), Net Present Value (NPV), and Internal Rate of Return (IRR).

Profit/loss analysis aims to determine the company's ability to earn profits. This calculation is taken from the remaining business results over a certain period. An effort is profitable when the value of the receipts (Total Revenue) is greater than the total expenditure [18]. The formula used as a calculation of net income is as follows:

π = Profit.

Information:

TR = Total revenue.

TC = Total Cost = Fixed cost + variable cost.

Break Event Point (BEP) is the point at which entrepreneurs do not experience profits or losses. This break-even point is used to study the relationship between sales, production, selling price, costs, and profit and loss. The formula used as the BEP calculation is as follows:

$$\text{BEP Production} = \frac{\text{Total Cost}}{\text{Selling Price}}$$

$$\text{BEP Price} = \frac{\text{Total Cost}}{\text{Total Production}}$$

The criteria for production BEP are as follows:

- If BEP < the amount of production, then the business is profitable
- If BEP = amount of production, then the business breaks even (no profit/no loss)
- If the BEP > the amount of production, then the business is not profitable

The BEP pricing criteria are as follows:

- If BEP < the selling price, then the business is profitable
- If BEP = selling price, then the business breaks even (no profit/no loss)
- If BEP > the selling price, then the business is not profitable [19].

Method Payback Period (PP) is a technique for assessing the period required for the return on investment from cash inflows [20]. The formula used for the calculation of PP is as follows:

$$\text{PP} = \frac{\text{Total Investment} \times 1\ \text{year}}{\text{Profit}}$$

Selection Criteria:

- PP < three years, the rate of return on capital is said to be fast
- 3-year PP < 5-year < PP, the rate of return on capital is said to be moderate
- PP > five years, the rate of return on capital is said to be slow

Net Present Value (NPV) is the present value of all cash flows to the end of the existing project. A project is said to be accepted if the NPV value > 0 or the most considerable NPV value [21–25]. The formula used for the calculation of NPV is as follows:

$$\text{NPV} = \sum_{T=1}^{\text{N}} \frac{(\text{B}t - \text{C}t)}{(1+i)^2}$$

Information:

B*t* = Receipt (benefit) in the *t*-year

C*t* = Cost of the *t*-year

I = Applicable interest rate

t = Length of investment time/life

Selection Criteria:

- NPV > 0, feasible business
- NPV < 0, business is not feasible
- NPV = 0, effort in breakeven or TR = TC

Net Benefit Cost Ratio (Net B/C) is an overview of the effect of additional costs on the benefits received [21–25]. The formula used as a net B/C calculation is as follows:

$$\text{Net B/C} = \frac{\sum_{i}^{\text{n}} = 1 \frac{\text{B}t}{(1+i)t}}{\sum_{i}^{\text{n}} = 1 \frac{\text{C}t}{(1+i)t}}$$

Information:

B_t = Receipt (benefit) in the t-year

C_i = Cost of the *t*-year

I = Applicable interest rate of 6%

t = Length of investment time/life (longest economic life)

Selection Criteria:

Net B/C Ratio > 1, then the business is worth continuing

Net B/C Ratio < 1, then the business is not worth continuing

Internal Rate of Return (IRR) is a method used to calculate interest rates that equate the value of investments now with the value of net cash receipts in the future [21–25]. The formula used for the calculation of IRR is as follows:

$$\text{IRR} = i_1 + \frac{\text{NPV}_1}{\text{NPV}_1 - \text{NPV}_2}(i_2 - i_1)$$

Information:

NPV_1 = Net Present Value (+)

NPV_2 = Net Present Value (−)

i_1 = Discount Rate that results (+)

i_2 = Discount Rate that results (−)

Selection Criteria:

IRR > the applicable discount rate, the business is feasible

IRR < the applicable discount rate, business is not feasible to carry out

IRR = the applicable discount rate, the business is not feasible

3. Results and discussion

3.1. *Snakehead fish* cultivation techniques

3.1.1. Broodstock selection

The broodstock that will be used comes from the Mandiangin Seed Center because it is more ready to be planted. In addition, broodstock from wild nature is bought from fishermen in Mahang Baru village, but broodstock from this wild nature must first be maintained until it is ready to be slaughtered. *Snakehead fish* are kept in a pond measuring 4 m × 5 m, with a density of 10–20 fish with a water level of 60 cm–80 cm. The female and male broodstock will enter the selection stage, namely by looking at the condition of the females who already contain eggs and males who are already large, the weight is balanced between males and females, which is in the range of 250–350 g/head, the broodstock used is one year old.

3.1.2. Spawning

Spawning is carried out naturally in a round pond with a diameter of 1 m; the round pond used is made of tarpaulin. The water level is 60cm–80 cm, and the pond will be covered as a net and given additional plants. The spawning process lasts 7–10 days until the eggs are laid.

3.1.3. Larvae rearing

Larval rearing lasts for ten days, and they are fed water fleas or Daphnia sp. Feeding is done two times per day, with the amount depending on the number of *snakehead fish* larvae or the equivalent of two tablespoons.

3.1.4. Nursery

Nursery fish will be fed silkworms twice a day with two spoons of worms, or depending on the number of *snakehead fish* seed, feeding *snakehead fish* with silkworms is carried out for ten days. Then, the fish are fed a combination of silkworm food and fine artificial food to get the *snakehead fish* used to eat pelleted food and avoid death when given the main food. This feeding lasts for 15 days.

3.1.5. Harvesting

Seed two months old and 5 cm–7 cm in size is often bought because they are suitable for keeping. Harvesting is done by throwing water into the drainage channel. The fish are caught using a net and then ready to be counted and packaged.

3.1.6. Marketing

Snakehead fish seed are marketed by order from buyers. Buyers come from *snakehead fish*-rearing cultivators in various regions in South Kalimantan, including Hulu Sungai Tengah Regency, Tabalong Regency, Kandangan City, and Banjar Regency. *Snakehead fish* seed measuring 5 cm–7 cm is priced at IDR (Indonesian Rupiah) 1800/seed.

3.2. Feasibility analysis

3.2.1. Investment costs

This investment cost is the initial capital that will be invested in goods and equipment to support a business's sustainability. **Table 2** presents the investment costs incurred in a *snakehead fish* hatchery using round ponds.

Table 2. Average investment cost of *snakehead fish* hatchery.

Number	Description	Vol	Unit price (IDR)	Economical Life (years)	Sum (IDR)	Depreciation
1	Land	1	8,000,000	-	8,000,000	-
1	Broodstock pond	2	1,300,000	10	2,600,000	260,000
2	Spawning pond	16	1,200,000	10	19,200,000	1,920,000
3	Nursery pool	9	5,000,000	10	45,000,000	4,500,000
4	Water pumps and installations	1	16,000,000	10	16,000,000	1,600,000
5	Electrical installation	1	3,000,000	10	3,000,000	300,000
6	Snakehead fish broodstock	30	25,000	2	750,000	375,000
7	Feed warehouse and packing area	1	6,000,000	10	6,000,000	600,000
8	Happa	20	300,000	5	6,000,000	1,200,000
9	Scop net	20	15,000	3	300,000	100,000
10	Bucket	30	30,000	3	900,000	300,000
11	Hanco	15	30,000	5	450,000	90,000
12	Washbasin	30	30,000	3	900,000	300,000
Sum (IDR)			32,930,000		109,100,000	11,545,000

Source: Primary data processed.

The investment cost or initial capital incurred in the *snakehead fish* hatchery business using a round pond is IDR 101,100,000. The pond has an economic life of up to 10 years and a depreciation cost of IDR 11,545,000.

3.2.2. Fixed costs

Fixed costs that have a fixed benefit or have no effect on production volume are incurred. Average fixed costs for the *snakehead fish* hatchery business in Labuan Amas Selatan district are presented in **Table 3**

Table 3. Average fixed cost of *snakehead fish* Hatchery.

Number	Description	Volume	Unit Price (IDR)	Sum/Year (IDR)
1	Depreciation			11,545,000
2	Electricity	1 Month	100,000	1,200,000
3	Land rent	1 package	2,400,000	2,400,000
	Total			**15,145,000**

Source: Primary data processed.

The fixed cost incurred for a *snakehead fish* hatchery with a round pond is IDR 15,145,000/year, consisting of electricity costs of IDR 100,000/month, land maintenance for one year of IDR 2,400,000, and depreciation costs of IDR 11,545,000/year.

3.2.3. Variable costs

Variable costs depend on the production volume produced, so variable costs fluctuate because they are affected by production volume. Average variable costs for the *snakehead fish* hatchery business in Labuan Amas Selatan district are presented in **Table 4.**

Table 4. Average variable cost of *snakehead fish* hatchery.

Number	Description	Volume	Unit price (IDR)	Sum/production (IDR)	Sum/year (IDR)
1	Broodstock feed	60 Kg	14,500	870,000	6,090,000
2	Seed feed	50 Kg	20,000	1,000,000	7,000,000
3	Silkworm	20 Measure	25,000	500,000	3,500,000
4	Athlete's foot	20 Measure	25,000	500,000	3,500,000
5	Daily harvest labor	1 Person	300,000	300,000	2,100,000
Total/production (IDR)				3,170,000	22,190,000

Source: primary data processed.

Variable costs incurred when producing *snakehead fish* hatchery with round pond media in one production cycle can cost variable costs of IDR 3,170,000. The variable cost in 1 year is IDR 22,190,000 with seven times production. As for the price of daily labor, it is a person who helps in the harvesting process only, in 1 harvest one person IDR 300,000.

3.2.4. Operational costs

Operational costs are all costs or total costs incurred by business actors. Average operasional costs for the *snakehead fish* hatchery business in South Labuan Amas District are presented in **Table 5**.

Table 5. Average operational costs of *snakehead fish* hatchery.

Number	Cost type	Total/year
1	Fixed cost	15,145,000
2	Variable costs	22,190,000
Operasional cost		37,335,000

Source: primary data processed.

The cost of producing *snakehead fish* seed using a round pond is IDR 37,335,000 in one year.

3.2.5. Revenue

Revenue is the total income business actors receive as money from the production and sale of goods. Average revenue of *snakehead fish* hatchery with round pond media are presented in **Table 6**.

Table 6. Average revenue of *snakehead fish* hatchery with round pond media.

Number	Production	Volume	Unit price (IDR)	Sum/production (IDR)	Sum/year (IDR)
1	*Snakehead fish* seed 5–7	8000 seed/cycle	1800/seed	14,400,000	100,800,000
Sum (IDR)				14,400,000	100,800,000

Source: Primary data processed.

The production of *snakehead fish* seed with a size of 5 cm–7 cm in one cycle is as many as 8000 seed. The seed produced are sold for IDR 1,800/head, so the receipt of one production cycle is IDR 14,400,000. There are seven production cycles in one year, so the revenue in one year is IDR 100,800,000.

3.2.6. Profit analysis

Profit Analysis is used to determine the amount of profit obtained. The average profit is obtained from revenues minus total costs.

Profit = Total revenue (TR) − Total costs (TC)

- = IDR 100,800,000 − IDR 37,335,000
- = IDR 63,465,000/year
- = IDR 5,288,750/month

Based on the analysis results, the average profit obtained by research respondents in South Labuan Amas District, Hulu Sungai Tengah Regency, net profit from *snakehead fish* hatchery was IDR 5,288,750/month.

3.2.7. Payback period analysis

The Payback Period is the period needed to return on the investment that has been invested. The results of the Payback Period from *snakehead fish* hatchery using round ponds in South Labuan Amas District are as follows:

Payback Period (PP) = (Total Investment)/Profit × 1 Year

- = (IDR. 109,100,000)/(IDR. 63,465,000) × 1 Year
- = 1.72 years

The payback Period for the *snakehead fish* hatchery business is 1.72 years, based on the payback period analysis results. The results explain that the payback time is smaller than the economic life.

3.2.8. BEP analysis

Analysis Break Event Points (BEP) are the production values needed for a business to reach the break-even point, i.e., not experiencing profits or losses. The company will be declared feasible if the BEP production value and BEP price value are lower than the current production amount and price.

Production BEP = (Total cost)/(Selling price)

- = 37,335,000/1,800
- = 20,742 seed

BEP pricing = (Total cost)/(Total production)

- = 37.335.000/56.000
- = IDR 667/seed

Based on the results of the BEP calculation, production was obtained at 20,742 seed, and the current production amount is 56,000 seed/year, so the business is feasible because it is more than the production BEP. The BEP price is obtained at IDR 667/seed, and the current selling price is IDR 1800/seed, so it is feasible because the current price is greater than the BEP price.

3.2.9. Investment criteria analysis

Results of Analysis Net Present Value (NPV), Net Benefit Cost Ratio (Net B/C), and Internal Rate Of Return (IRR) in *snakehead fish* hatchery cultivation using round ponds in South Labuan Amas District with Discount Factor (DF) 6% as follows:

- NPV: IDR 366,007,925
- Net B/C: 4,62
- IRR: 62,81 %

The results of the Net Present Value (NPV) analysis were IDR 366,007,925 or an NPV value > 0. Based on the criteria, a business can be said to be feasible if the NPV value is > 0 [25,26]. So, based on the NPV investment criteria, a *snakehead fish* hatchery using round ponds in Labuan Amas Selatan District is worth pursuing.

The Net Benefit Cost Ratio (Net B/C) analysis obtained a value of 4.62. A business is feasible if the Net B/C value is > 1 [25,26]. So, based on the Net B/C investment criteria, the *snakehead fish* hatchery business using round ponds in Labuan Amas Selatan District is worth continuing because the value is more than 1.

Based on the Internal Rate of Return (IRR) analysis results, an IRR value of 62.81% was obtained. A business is said to be worth running if the IRR > the applicable interest rate (discount rate) [25,26]. This means the *snakehead fish* hatchery business using round ponds in Labuan Amas Selatan District can continue based on the IRR criteria because IRR = 62.81% > discount rate = 6%.

4. Conclusion

4.1. *Snakehead fish* cultivation techniques

Snakehead fish hatchery uses a round pond in Labuan Amas Selatan District for as many as seven production cycles in one year; in each cycle, 6-10 pairs of *snakehead fish* are used, which can be spawned with an average nursery time of 1.5 months. *Snakehead fish* cultivation techniques include broodstock maintenance, broodstock selection, spawning, larval transfer and maintenance, nursery, harvesting, and marketing. Technically, the spawning activity of broodstock fish is very vulnerable if male and female pairs do not have compatibility, which can lead to aggressive behavior that causes higher mortality rates; also, at this stage, the fish eggs are very prone to not dripping due to prolonged hot weather to make the quality of the water used not good with cloudy and smelly watermarks

4.2. Business feasibility

The feasibility of the *snakehead fish* hatchery business using a round pond in Labuan Amas Selatan District with various analyses of profitable and feasible investment criteria to be developed. This business is also relatively easy to run, so existing businesses can expand their scale to increase profits.

Author contributions: Conceptualization, RM, IH and IF; methodology, RM, IH and IF; software, IH; validation, RM and IF; formal analysis, IH; investigation, RM; resources, RM; data curation, RM; writing—original draft preparation, RM, IH and IF; writing—review and editing, RM; visualization, RM; supervision, RM; project administration, RM; funding acquisition, IH and IF. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

References

1. Akbar J. Maintenance of Snakehead Fish (Channa striata) in Sour Sulfate Soil Ponds (Indonesian). Lambung Mangkurat University Press; 2020.

2. Suryanti Y, Hadisaputro S, Nugraheni S. The Effect of Snakehead Fish (Channa striata) Extract on Blood Leukocyte Number and Cesarean Sectio Wound Healing. In: Proceedings of the 5th International Conference on Science, Education and Technology; 29 June 2019; Semarang, Central Java, Indonesia. pp. 596–598.
3. Ummah W, Ningrum NB. Healing Post Sectio Cesarea (SC) Wounds With Snakehead Fish (Channa Striata) Extract (Indonesian). Care: Jurnal Ilmiah Ilmu Kesehatan. 2022; 10(3): 413–420. doi: 10.33366/jc.v10i3.3853
4. Winarni L, Silvia S. Giving Shredded Snakehead Fish (Channa Striata) to the Wound Healing Process (Indonesian). J. Kesehatan. 2020; 8: 29–35.
5. Zuiatna D, Pemiliana PD, Manggabarani S. Comparison of Giving Snakehead Fish and Chicken Eggs to Healing Post-Surgery Post Sectio Ceaserea Wounds (Indonesian). Jurnal Maternitas Kebidanan. 2021; 6(1): 14–24. doi: 10.34012/jumkep.v6i1.1411
6. Tungadi R. Potential of Snakehead Fish (Ophiocephalus striatus) in Accelerating Wound Healing (Indonesian). Jambura Fish Processing Journal. 2019; 1(1): 46–55. doi: 10.37905/jfpj.v1i1.4505
7. Kasim VN, Pateda SM, Hadju V, et al. Supplementation of snakehead fish albumin extract on the nutritional status and immunity of stroke patients (Indonesian). Jurnal Gizi Klinik Indonesia. 2017; 13(3): 91–98. doi: 10.22146/ijcn.21964
8. Ningrum DM, MS ES. The Effect of Giving Snakehead Fish Supplements on the Neurological Status of Ischemic Stroke Patients at Patuh Patut Patju Regional General Hospital (Indonesian). Jurnal Penelitian dan Kajian Ilmiah Kesehatan Politeknik Medica Farma Husada Mataram. 2021; 7(2): 85–90. doi: 10.33651/jpkik.v7i2.243
9. Kusumaningrum GA. Test of albumin levels and growth of snakehead fish (Channa striata) with different protein levels of commercial feed (Indonesian). Universitas Airlangga; 2013.
10. Makmur S. Biology of reproduction, food and growth of snakehead fish (Channa striata Bloch) in the Musi River flood area, South Sumatra (Indonesian) [Master's thesis]. Institut Pertanian Bogor; 2003.
11. Adipu Y, Rovik A. Quality Performance of Snakehead Fish Eggs (Channa striata blkr) With Different Feeding in Controlled Containers (Indonesian). Gorontalo Fisheries Journal. 2018; 1(1): 70–79. doi: 10.32662/v1i1.108
12. Sihananto B, Supriyono E. Snakehead Fish Seed Nursery Strategy as a Step to Anticipate Population Decline Using Biofloc Technology (Indonesian). Policy Brief Pertanian, Kelautan, dan Biosains Tropika. 2023; 5(4): 790–795. doi: 10.29244/agro-maritim.0504.790-795
13. Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia. Haruan Snakehead Fish Cultivation Cultivation (Channa striata bloch) (Indonesian). Direktorat Jenderal Perikanan Budidaya, Balai Budidaya Air Tawar Mandiangin; 2014.
14. Muslim, Syifudin, M. 2012. Domestication of potential parent snakehead fish (channa striata) in a cultivation environment (concrete pond) (Indonesian). Majalah Ilmiah Sriwijaya. 2012; 21(15): 20–27.
15. Food Security and Fisheries Service, Hulu Sungai Tengah Regency. HST Regency Fisheries Production Data for 2022 (Indonesian). Barabai, halaman. 2023.
16. Amiruddin A, Kartina, Awaludin, et al. Round Tarpaulin Pond to Support the Development of Pokdakan Catfish Cultivation on the Boundaries of Aji Kuning Village, Sebatik Tengah District, Nunukan Regency (Indonesian). Jurnal Pengabdian Kepada Masyarakat ITK (PIKAT). 2023; 4(1): 58–64. doi: 10.35718/pikat.v4i1.873
17. Ansyari P, Slamet. Application of Semi-Artificial Snakehead Fish Hatchery Technology for the "Mufakat" Fish Cultivator Group in Mahang Baru Village, South Kalimantan (Indonesian). Jurnal Ilmiah Hospitality. 2022; 11(1).
18. Kesuma, Y.F dan Riswan. Financial Report Analysis as a Basis for Financial Performance Assessment of PT. Budi Satria Wahana Motor (Indonesian). Akuntansi & Keuangan Journal. 2014; 5(1). Bandar Lampung University.
19. Soekartawi. Basis for Preparing Project Evaluations (Indonesian). Pustaka Sinar Harapan Publisher. Jakarta; 2006.
20. Yasuha, Julay XL, Muhammad S. Investment Feasibility Analysis of Plans to Add Fixed Assets (Case Study at PT Pelabuhan Indonesia III (Persero) Tanjung Perak Branch, Nilam Terminal). (Indonesian)Jurnal Administrasi Bisnis S1 Universitas Brawijaya. 2017; 46(1).
21. Husein, Umar. Business Feasibility Study (Indonesian) 3rd ed. Gramedia Pustaka Utama Publisher; 2013.
22. Suad H,Muhammad, S. Business Project Feasibility Study (Indonesian) 5th ed. Cetakan Pertama.UPP STIM YKPN Publisher; 2014.
23. Ibrahim HMY. Studi Kelayakan Bisnis Edisi Revisi. Rineka Cipta Publisher; 2013. Jakarta
24. Kasmir, Jakfar. Business Feasibility Study (Indonesian) 6th ed. Ghalia Indonesia Publisher, Jakarta; 2017.

25. Mahreda ES, Mustika R. Performance of Catfish (Pangasius sp.) Cultivation with Pond Media: Case Study in Banjar Regency, South Kalimantan Province, Indonesia. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. 2022; 22–3: 689–697.
26. Marini IAK, Artika IBE. Analysis of Feasibility Study of Tilapia Fish Cultivation Business in Sigerongan Village, Lingsarka District, West Lombok Regency (Indonesian). Ganec Swara. 2018; 12(2): 15–21.