



UDC 332; DOI 10.18551/rjoas.2022-07.18

**TECHNICAL AND ECONOMIC ASPECTS OF DRIED EEL FISH BUSINESS
IN TINOMBALA VILLAGE OF PARIGI MOUTONG REGENCY,
CENTRAL SULAWESI PROVINCE, INDONESIA**

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ABSTRACT

This study analyses the feasibility of the dried eel fish business in Tinombala Village, Ongka Malino District, Parigi Moutong Regency, Central Sulawesi Province. Data were collected through direct observation and interviews with the owner of the dried eel business. Technical data analysis was carried out by qualitative descriptive and economic analysis using the income formula equation $TP=TR-TC$, Benefit-Cost Ratio (BCR), and Payback Period (PP). This study indicates that technically, drying eel fish starts from weighing, slaughtering, cleaning, washing, draining, stabbing, storing with ice cubes, drying, heating, and final storing. The feasibility analysis results show that the business gained IDR 92,916,000.00 profit per year for 24-time production. The Benefit-Cost Ratio (BCR) shows a result of 1.7 and a Payback Period (PP) of 2.8.

KEY WORDS

Economic aspects, business feasibility, benefits, dried eel, Central Sulawesi.

Eel fish has high economic value due to its increasing demand at home and abroad. The demand even reaches 60 tons per day in the Asian market, and only 10% of the demand can be fulfilled (Adli, 2020).

Eel (*Monopterus albus zuiewu*) has a high nutritional content. Andasari & Zukhri (2018) state that eel fish has many advantages for the human body—it can fulfill protein needs, increase growth and intelligence, maintain eye health, fulfill mineral needs, and increase concentration and endurance. In Indonesia, the eel menu can be found in various daily food — fried, sauteed, or baked and can be processed into chips (Najmah, 2020). Eels are freshwater fish with an elongated round body and fins on their back. Generally, eels live in rice fields, swamps, muddy areas, and lakes. Eel fish has been known since 1979. Eel has been popular in Indonesia and has become an export commodity (Dimarjati & Thomas, 2017).

Ongka Malino District has a rice field area of 2,557.9 Ha, and Mepanga Village, adjacent to Tinombala, has a rice field area of 3,300.0 (BPS, 2021). The fairly large rice field supports the existence of eels as the raw material for producing dried eels. In addition, the people, generally the Javanese, are accustomed to consuming eels from rice fields, which has led to the search for eels in nature.

Only one person has the dried eel fish business on our study site. The raw material comes from natural catches carried out by the business owner and collectors. Some raw materials are often imported from outside the region to meet consumer demand.

This production is carried out on a household scale. These products are directly marketed to Jakarta. The business, however, has not been able to increase its production from quantity and variety of processed products because of the limited raw materials and the lack of knowledge of the business owner in processing eel fish.

Based on the description above, the study aims to analyze whether the dried eel business in the research location is technically and economically feasible. We wanted to reveal the feasibility of the business. We expected that the findings related to economic feasibility would be helpful for the business owner and inform the government and the general public wanting to do business in processed fishery products.



METHODS OF RESEARCH

The study site was chosen purposively by considering the existence of the dried eel fish business. The study took place in Tinombala Village of Parigi Moutong Regency, Central Sulawesi Province. The study lasted for six months, from January to June 2021.

We collected primary and secondary data. Primary data came from observations and interviews with respondents knowing about and involved in the business. Secondary data came from relevant government institutions.

We conducted qualitative and quantitative data analysis to answer the research problems. The following formula is used to measure the business income:

$$TP = TR - TC$$

Where: TP = Total Production (IDR); TR = Total Revenue (IDR); TC = Total Cost (IDR).

The Benefit-Cost Ratio (BCR) formula was used to analyze the business feasibility. If $BCR > 1$, the business is profitable and can be continued; if $BCR = 1$, the business reaches a break-even point (no profit, no loss); if $BCR < 1$, the business is not profitable and must not be continued (Effendi & Oktariza, 2006):

$$BC \text{ Ratio} = \frac{TR}{TC}$$

Where: TR = Total Revenue (IDR); TC = Total Cost (IDR).

The Pay Back Period (PP) is used to analyze investment return (Effendi & Oktariza, 2006):

$$Pay \text{ Back Period} (PP) = \frac{\text{Investment}}{\text{Profit}}$$

Where: Investment = Initial Capital of a Business; Profit = Cash flow.

RESULTS AND DISCUSSION

Geographically, Tinombala Village is located in Ongka Malino District, Parigi Moutong Regency. It is located at 120.78530 East Longitude and 0.49750 North Latitude. Tinombala village is approximately 210 km from Parigi, the district capital. Parigi Moutong Regency is one of the regencies in Central Sulawesi Province with a coastline of 472 km and is directly adjacent to Gorontalo Province in the north. The regency is located at an altitude of 0-2,900 masl.

The study site has quite promising potential for eel fish; it offers good prospects for the community to increase their household income. Masitoh & Chayati (2020) state that rice field eel can be developed as aquaculture fish in the future and can become a source of community protein. The rice fields in Ongka Malino support the life of various types of eel fish well; Scabra & Azhar (2019) mention that rice fields are a natural habitat for eels.

Eels are unique organisms that can survive in two places. Eels breathe using gills in a watery environment, but they can directly take oxygen from the air in a dry environment. Eels have an additional respiratory system in the form of thin slimy skin found in their mouth cavity, and this thin skin can absorb oxygen directly from the air (Sarwono, 2011).

As much as 50% of eel fish's body contains very good animal protein. Eels have a protein value of 18.49 grams/100 grams, higher than egg protein (12.89 grams/100 grams). The protein digestibility value of eels is also very high, so it is suitable as a protein source for every age group (Candra & Rahmawati, 2018). Eels change genitalia—their female genitalia changes into male genitalia in adult eels (protogynous hermaphrodites). The change process from female to male occurs because their sex glands can differentiate.

Eels are slaughtered using several methods, depending on the purpose of cooking. If eels are consumed immediately, we hit their head to slaughter.



The most common way to make eels stay fresh is by reducing the temperature and freezing. When fish are stored at low temperatures, the growth of spoilage bacteria and biological and chemical reactions in the fish body becomes slower, and fish freshness can be maintained (litay et al., 2017). The storage temperature is always low or close to 0°C to maintain freshness. Storage conditions must be stable and protected from direct sunlight, which can cause the storage temperature to rise. Irianto & Soesilo (2007) state that reducing the temperature of fish can be done by adding ice to the storage media with a ratio of ice and fish of 1:1. Wibowo et al. (2012) mention that in the handling and cleaning stages, to keep the temperature of the fish low, ice can be used with a ratio of 1 ice for 2 fish. The most crucial stage is the drying stage in making dried eel fish. Drying activities can be carried out under the sun and in the oven. Murniyati & Sunarman (2000) mention that drying under the sun takes a long time, so spoilage often occurs before the fish dries completely. The Sun-drying process is sometimes uneven and is strongly influenced by weather conditions. It also requires a large area.

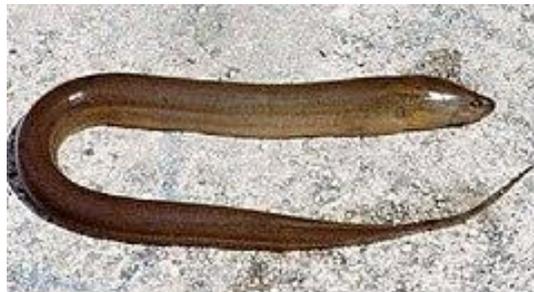


Figure 1 – Rice Field Eel (Source: <https://id.wikipedia.org/>)

In traditional drying, sunlight can penetrate the cell tissue of the raw material. Artificial drying is a method of drying that uses tools, but the heat source is the same as traditional drying, sunlight (Yunita, 2016). Yudi (2018) states that the drying temperature using direct energy from sunlight is around 35°C to 45°C.

Ovens are used for heating, baking, and drying. The drying system using a heating device (oven) has better advantages than drying using the sun's heat. However, the drying time is also influenced by the type of material to be dried. The dryer that household-scale manufacturers widely use is an electric oven with an electric element as the heating mechanism. Harrison (2000) states that the energy sources used in heating devices are gas, oil, coal, and electricity.

The last stage in processing dried eel is the packaging. Mulyawan et al. (2019) mention that packaging needs to be done properly and correctly to keep the food quality and lengthen its shelf life. Preserving food quality depends on the nature and type of packaging material used. Packaging activities are carried out to avoid damage caused by microorganisms. Plastic packaging is strong, lightweight, and thermoplastic; plastic does not rust.

Plastic packaging can prevent the entry of a microbe into food products by blocking the entry of oxygen and air, which contains much contamination. The use of packaging plastic results in longer shelf life and prevents the product from being damaged due to contamination.

The economic aspect of the dried eel fish business can be valued from the amount of production that can provide benefits for the business. Production appraisal is now becoming more widespread. Production can be understood as an effort or activity carried out by the community to increase the value of raw materials so that they have a higher value. Current forms of production include agricultural and fishery products and services (Petiana et al., 2015).

Bhakti & Patahiruddin (2021) stated that every effort to increase production will increase income. The product price determines income, and the price is determined by the costs incurred to produce the product and the expected profit. Therefore, determining product prices is important because it can affect business profits.



According to Mulyadi (2007), the economic aspect of a business can be analyzed to determine the financial flows and see whether the business can bring a good profit for producers. The financial aspect is determined by how much production capital is owned, sources of funds, capital structure, expected loan sources, and business capability in terms of capital.

Business can be categorized as healthy if the business can provide reasonable profits and cover the costs incurred. The financial analysis consists of an analysis of investment criteria. One of the business valuation methods is the method of Benefit and Cost Ratio (BCR) analysis and the Payback Period (PP) analysis.

BCR analysis calculates the profits from a business or investment made. Generally, BCR analysis compares the total revenue and total costs incurred during 1 year of production. Mulyadi (2007) states that if the BCR value > 1 , then this business is feasible to be developed; if the BCR value < 1 , then the business is not feasible to be developed; if the BCR value is equal to 1, then this business neither profitable nor unprofitable.

PP is a measure of how quickly investment returns. PP is calculated by dividing investment (capital) by cash flow (profit). The calculation technique emphasizes the speed at which capital has been invested using the cash flow obtained from the investment (Effendi & Oktariza, 2006).

The dried eel business activities at the research location were still on a household scale. The raw materials used for the business came from collectors in Tinombala Village. The drying process starts by weighing the raw materials, cleaning, handling the eels, drying the eels, and drying with the oven and packaging. The time required for this process ranges from 6 to 7 days.

The business occupies an area of 600 m². This business does not yet have a special building or room for processing. Currently, the production is carried out in a house of 225 m². The house serves as a place for drying, starting from the preparation of eels to packaging dried eels. Drying was done with a simple tool. The technical stages of making dried eel are:

1. Eel Collection. Eels are collected from collectors in the study site and outside of the study site until they reach a certain amount as targeted by the business owner. Eels are collected for the business owner to know how many eels are ready for production. The collected eel fish is placed in a tarpaulin tank sized 200 cm in length x 150 cm in width x 50 cm in height. The business has 4 tanks that can hold up to 250 kg of eels per tank. The tanks are filled with water of 30 cm in depth;
2. Weighing. Weighing aims to determine the number of eel fish to be dried. Eel fish is taken from the tank using a big basket and is put on a scale with a capacity of 100 kg. The result shows that the average weight of each eel is 11.11 grams. Thus, 1 kilogram consists of 90 eel fish. Each drying process needs 100 kg of eel fish or around 9,000 eel fish;
3. Slaughtering. After weighing, eel fish is put into a styrofoam box sized 75 cm in length x 42 cm in width x 32 cm in height. The box is filled with water of 30 cm in depth. The upper part of the box is layered with sacks and stones; the purpose is to kill the eel fish. The time needed to kill the eel is 3 hours (8 to 12 AM);
4. Cleaning. Cleaning starts by splitting the eel fish from below the head to the end of the tail using a sharp knife. Cleaning is the same as gutting. The business owner must clean 9,000 eel fish or 100 kg in one production; the process is done by 10 employees. During cleaning or gutting, eel fish is classified based on size and put in baskets for small and big eel fish. The eel fish going through the drying process has a length of 24 to 28 cm. It takes 5 hours to clean all the eel fish from 1 to 6 PM;
5. Washing. Washing comes after gutting to clean the eel fish thoroughly. Washing is done three times under running water;
6. Draining. It aims to reduce the water content in the eel so that the following process does not take a long time. The eel that has been gutted, washed, and separated based on size is left for 4 hours, from 4 to 8 PM;
7. Skewing. The drained eel is skewed using bamboo skewers to make drying easier. Some eel fish is put in one skewer. The bamboo skewer has a length of 37.4 cm and



a width of 1 to 1.5 cm. The drained eel is skewed from below the head to the end of the mouth, with its body hanging sideways. One skewer is for 10 eel fish. Thus, a kilogram of eel fish (90 eels) needs 9 bamboo skewers, and within one production, 1 total of 900 bamboo skewers are needed. The skewer size is adjusted to the size of the eel fish. The process starts at 8 PM and ends at 11 PM. After that, the eel fish is kept in a styrofoam box until tomorrow morning;

8. Keeping in a styrofoam box. After skewing, the eel fish is kept in a styrofoam box. The bottom part of the box is filled with 5 ice cubes placed horizontally, the eel fish is put on the ice cubes, and the box is closed. One styrofoam box can be used to store 20 kg of cleaned eel fish. The eel fish is kept in the styrofoam box from 12 AM to 7 AM;

9. Drying:

- Under the sunlight:

The bamboo-skewed eel is immediately dried on a wooden table covered with an iron sheet in the morning. The body parts of the eel are opened (butterflied) when drying in the sun. Drying time ranges from 3 to 5 hours according to the sunlight. Under suitable sunlight, drying takes only 3-4 hours, and the eels will have a perfect color. However, if the weather is not good, then the drying time can be up to 5-6 hours, and the color of the eels may not be so good. When it rains, drying cannot be done and oven must be used, and it can take 5-8 hours until the eel fish is dehydrated. After drying, the average weight of eels is 5 grams per eel, and the number of eels per 1 kg is 200 eels. The total weight of the eel after the drying process is only 45 kg;

- Using the oven:

After the sun-drying process is done, the eel fish is put in the oven. The oven is handmade by the owner. It uses wood and an iron sheet. The oven is 200 cm in height and 100 cm in length. It has 6 stacks, and 1 stack at the bottom has two holes for the fire to spread evenly. The eel fish is spread horizontally. Each stack can hold up to 20 skewers of eel fish or around 200 eels. Thus, a drying process using the oven will dry 1,200 eels or 6 kg within 3-4 hours. Drying all 100 kilograms of eels take 2 days—4 times drying on the first day and 3 times on the next day. After drying in the oven is done, the eel fish is weighed. The result shows an average of 2.2 grams per eel, and 1 kilogram of dried eel fish contains 450 eels. After drying, the total weight of the eel fish is 20 kilograms;

10. Storing. After drying, the eel fish is kept in a big storage cabinet. The cabinet is handmade using wood and plywood with a height of 200 cm and a width of 200 cm. It comes in a cube size with sliding doors. The dried eel fish is left in the oven to cool down before they are stored in the cabinet. The eel fish is classified by size and color. After that, the eel fish is stacked using bamboo. One stack consists of 5 bamboos or 50 dried eel fish. The stacks are tied with a rope for storing in the cabinet.

The business produces 20 kilograms of dried eel fish within one production cycle. For 100 kilograms of eel fish for one delivery, the effective drying process is 5 times. Therefore, the total production for one year is 480 kilograms.

The income/one production cycle:

$$TR = P (\text{Price}) \times Q (\text{Quantity}) = \text{IDR}9,000,000$$

The income within 5 production cycles (100 kilograms) for one delivery:

$$TR = P (\text{Price}) \times Q (\text{Quantity}) = \text{IDR}45,000,000$$

The income within 24 production cycles (one year):

$$TR = P (\text{Price}) \times Q (\text{Quantity}) = \text{IDR}216,000,000$$

Thus, the total income for 1 year or 24 production cycles is IDR216,000,000. Production costs play an essential role and are the main factor and initial driver in



establishing a business. Costs affect the size of a business. Production costs incurred in the dried eel fish business for 1 year consist of fixed and variable costs. The total fixed costs are IDR36,240,000, and non-fixed costs are IDR86,844,000. The following calculation presents the total cost of the dried eel business in 1 year or 24 production cycles.

$$\text{Total Cost (TC)} = \text{Fixed costs} + \text{Non-fixed costs}$$

Income or profits earned for 1 year or 24 production cycles is = IDR92,916,000.

Benefit-Cost Ratio (BCR) Analysis:

$$BC \text{ Ratio} = \frac{\text{Total Income}}{\text{Total Cost}} = 1.7$$

The BCR score is $1.7 > 1.00$, meaning that one time of income results in IDR1 profit. Thus, the business is feasible to develop.

Payback Period (PP) Analysis:

$$Payback \text{ Period (PP)} = \frac{\text{Investment}}{\text{Profit}} = 2.8$$

A period of 2.1 years or 2 years 9 months 18 days is required for the return of capital, while the remaining time is the time for generating profit. The Payback Period is very good.

CONCLUSION

Technically, the steps taken in producing dried eel fish are weighing, slaughtering, cleaning, washing, draining, storing, drying under the sunlight, drying with an oven, packaging, and storing. To maintain and improve the quality of dried eel produced, the business owner must follow technical instructions recommended by experts for the product to be more attractive. Analysis results show that the dried eel business sells 400 kilograms of dried eels in one year. The total cost incurred in 1 year of production is IDR123,084,000, and the total income is IDR216,000,000. Thus, the profit in one year is IDR92,916,000.00. BCR has a score of 1.7, meaning that the business is feasible to be run. The investment cost is IDR262.800.000.000, and the profit is IDR92.916.000.000,00. The PP score is 2.8, meaning that the capital return takes 2 years 9 months 18 days.

The dried eel business can be carried out using alternative strategies, namely: (1) formulating a strategic plan for market opportunities following the development of the dried eel market, (2) developing appropriate technology for production activities, (3) expanding and maintaining existing marketing, (4) increasing production quality to maintain cooperation with available existing markets, (5) improving the management of eel raw materials, (6) increasing business capital, (7) making business legal, (8) promoting eel fish maintenance, (9) increasing production yields, and (10) introducing and marketing processed products in marketplaces and social media.

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