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Analysis of Investment Feasibility of Fishery Product Diversification as Economic Strengthening of the Outermost Islands of Indonesia's Border (Case Study of Rupat Island and Bengkalis Island)

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ABSTRACT

This study aims to determine the feasibility study of fish-based processed products caught by fishermen on Bengkalis Island and Rupat Island as one of the islands included in the category of Border Islands. In this study, several aspects of the feasibility study were examined which included aspects of market feasibility and marketing (product quality and taste, determination of processed product users and market maps and customer needs for products), production aspects (type of production, production capacity and use of technology) and aspects of financial (investment and economy). trials for making products using lomek fish (Harpodon nehereus), biang fish (Ilisha elongata) and gonjeng fish (Coilia mystus) with processed products that have been successfully produced are dimsum, chips, otak-otak, meatballs and nuggets. The results of this study indicate that the quality and taste of nugget products using the organoleptic and hedonic tests of the resulting product obtained for the aroma indicator is in the 3.61 interval range with the delicious/fragrant category, then for the taste indicator in the delicious category with an interval value of 3.70. Furthermore, the panelist's assessment of product texture was at an interval of 3.35 with the soft/soft category and for the color of the panelists gave an interval of 2.80 with a slightly appetizing category. Likewise with other products, the results of the organoleptic and hedonic tests showed that the panelists received and gave good responses to each test in the available indicators. The overall financial feasibility aspect of the product is feasible to run and develop more optimally, as seen from the R/C>1 test results. This research is expected to bring up new business opportunities that can help improve the welfare and improve the economy of the people in the outermost island areas of Indonesia's borders

Keywords: Feasibility Study, Business, Blue-economy, fishery products, maritime economy

1. Introduction

Rupat Island and Bengkalis Island are the outer border islands under the territory of the Bengkalis Regency Government which are directly adjacent to the State of Malaysia. Opportunities for processing the potential capture and aquaculture sector on Rupat Island and Bengkalis Island can be categorized as quite large. Data from the Bengkalis Regency Central Bureau of Statistics (BPS), Fisheries Production on Rupat Island is 2,784.53 tons and Fishery Production on Bengkalis Island is 3,552.04 tons. in 2021, while the potential for shrimp cultivation reaches 200-250 tons per month (BPS Bengka-lis, 2021). Conditions in the field show the main problem, namely the level of welfare through the income generated and economic growth in the region is still considered very unfavorable. Due to the unavailability of the market they sell it at a very lower price than the normal price. Then the low downstream business in producing processed fishery products. As a result of these main problems, it has a broad impact on: 1) Often business actors sell their catch to Malaysia's neighboring countries through local collectors, 2) Many business actors to obtain large profits use illegal methods to exploit the results of wealth the sea so that it can damage marine ecosystems, 3) The produce suffers from spoilage and decline in quality due to the difficulty of access to marketing resulting in a much lower selling price. 4) The income earned by fishermen is small so that the level of welfare is difficult to reach 5) Not a few fishermen become couriers or

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auxiliary workers for drug suppliers across border routes to generate more income, 6) Many fishermen and cultivators stop and switching professions to become Indonesian Migrant Workers (TKI) both legally and illegally to Malaysia, 7) Failure to fulfill local supplies for daily produce because business actors prefer to sell to suppliers who market to Malaysia because of profit margins obtained better from the local market. 8) The catch affects the level of income earned by fishermen. Fisherman household income will affect food and non-food household consumption expenditure and the level of welfare, thus household expenditure depends on the amount of income earned by fishermen

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Figure 1. Fishery Products Rupat Fishermen Sell Fish to Malaysia (source: https://www.antaranews.com/berita/242084/nelayan-rupat-jual-ikan-ke-malaysia)

Diversification of capture fishery and aquaculture products in the study locations must be based on the basic principles of the blue economy, innovation and creativity as a step for added value and increasing selling prices which have an impact on the income earned by business actors is an urgency for conducting this research. The application of the blue economy concept can minimize destructive use or excessive exploitation of natural resources so that it is more efficient (Prayuda et al., 2019). Processing and preservation is one way to diversify fishery products. The diversification of fishery products is aimed at increasing the economic value of fishery products, improving the taste of fishery products, maintaining quality, increasing product shelf life, and expanding product distribution and marketing.

The research began with conducting field observations of capture and aquaculture products in the Bengkalis Island and Rupat Islands which are included in the outermost islands of Indonesia. Field observations found that the most commonly caught fish were lomek fish (Harpodon nehereus), biang fish (Ilisha elongata) and gonjeng fish (Coilia mystus). The team then tried to interview fishermen and found that the selling price was low if there were too many catches and the catch was often wasted and could not even be sold.

The team conducted interviews with several small-scale Home Industry (IRT) entrepreneurs who process fish into fish chips which are sold in local markets and have been running their business for approximately 4 years. From the results of these interviews it was found that the income earned was from marketing Then the team tried to find references on the procedures for making surimi made from caught fish, this procedure was then practiced directly by the fishermen's wives, the trial succeeded in making fish catches into surimi, but the problem is that the texture of the fish meat cannot stick together properly because the texture of the fish is runny but it can be processed into processed food, such as dim sum, chips, otak-otak, meatballs and nuggets.

Processing of fishery products can be processed into preparations such as filet, surimi, salted fish, smoked fish, shrimp paste, meatballs, kamaboko, chikuwa, sausages, nuggets, Otoshimi, Minced Fish, otak-otak, ekado, fish croquettes, and others. With this research, it is hoped that the utilization of fish caught and cultivated is expected to become a local commodity that has high competitiveness thereby creating new business opportunities that can help improve welfare and improve the economy in the outermost islands of Indonesia's borders, Rupat Island and Bengkalis Island, Riau Indonesia. As in the results of the study, the processing of fishery products in Tanjung Baru village, Indragiri Hilir, which was carried out by fishermen's wives, has been proven to increase household income (Astuti & Nugroho, 2020).

This study aims to provide information on analysis of aspects of market feasibility and marketing (quality and taste of products, determination of users of processed products and market maps and customer needs for products), aspects of production (type of production, production capacity and use of technology) and financial aspects (investment and economy).

2. Research Method

The way chapter titles and other headings are displayed in these instructions, is meant to be followed in your manuscript. This research is located on Bengkalis Island and Rupat Island, Riau Province, which are the border islands of Indonesia and Malaysia. The type of data used in this research is primary and secondary data. Primary data obtained directly from the data source through observation, interviews, and questionnaires. Secondary data were obtained from various existing sources such as the Central Bureau of Statistics (BPS), books, reports, journals, and others related to this research. The method of data analysis in this study used to determine the level of acceptance and income as

well as the feasibility of diversifying processed fishery products include:

1. Market and marketing aspects

Marketing is an activity carried out by companies in conveying product or service information that they have to customers so that customers are attracted and provide benefits to the company. Marketing is based on needs, wants and demands. The purpose of marketing is to know and understand the customer in such a way that the product suits him and can be sold by itself (Pratama & Anita, 2022). In conducting market analysis and marketing, several things are taken into consideration, including:

a. Product quality and taste

In this study, product quality and taste were measured using or-ganoleptic and hedonic test parameters. Organoleptic test is a method of testing using the human senses as the main tool for measuring the acceptability of the product produced. In the assessment of food ingredients, the characteristic that determines whether a product is acceptable or not is its sensory properties. The senses used in assessing sensory characteristics are the senses of sight, touch, smell and taste (Pratama & Anita, 2022; Suryono et al., 2018). The hedonic test is designed to measure the level of preference for a product (Pratama & Anita, 2022). Sometimes these assessments can lead to very thorough judgments. In some cases sensory assessment even exceeds the accuracy of the most sensitive tools (Zhao et al., 2011). In the data analysis, the organoleptic and hedonic scales were transformed into numerical scales according to the preference level of the interval scale as shown in the following table (Pratama & Anita, 2022; Suryono et al., 2018).

Table 1. Table of score intervals for organo-leptic and hedonic test scores

Interval	Aroma	Interval	Taste
0 - 1,0	Very unpleasant/very not	0 - 1,0	Very unpleasant
1,1-2,0	Fragrant	1,1 - 2,0	Not good
2,1-3,0	Not good	2,1 - 3,0	Quite tasty
3,1-4,0	Fragrant	3,1 - 4,0	Delicious
4,1-5,0	It's not good/ somewhat	4,1 - 5,0	Very tasty

Interval	Texture	Interval	Colour
0 - 1,0	Very hard/very not soft/very oily	0 - 1,0	Very unex-citing taste
1,1-2,0	keras/tidak lembut/ berminyak	1,1 - 2,0	Tidak mengung-gah selera
2,1-3,0	A little hard/a little soft/a little	2,1 - 3,0	Quite uploading
3,1-4,0	Oily	3,1 - 4,0	taste
4,1-5,0	Soft/soft/non-oily	4,1 - 5,0	Uploading

Interval	Hedonic Test (Preference evaluation of the product)
0 - 1,0	Very Disliked
1,1-2,0	Do not like
2,1-3,0	Kinda like it
3,1-4,0	Love
4,1-5,0	Very like

a. Determination of processed product users and Market map

Determining the users of processed products explains the market potential of the products produced through the determination of Segmentation, Targeting and Positioning (STP) and an overview of the distribution of the products to be sold. This determination is based on the goal that the products produced can be marketed to the right consumers and have a competitive advantage. While the determination of the market map is analyzed based on the secondary data available, as a picture of the market potential of the products produced.

b. Customer needs for products

The potential and description of the needs are obtained from the results of observations and field surveys on existing similar businesses. Data needs are obtained through the dissemination of questionnaires and interviews with users and providers of existing products.

1. Production aspects

The production aspect of the fishery processing business must be in accordance with the basic principles of the blue economy. In simple terms, industrial qualification studies used in the planning and analysis of fisheries processing operations include:

1. Analysis/planning of technology use
2. Analysis/planning of production capacity,
3. Analysis/planning of production types,

2. Financial aspects

The financial aspect of this study will describe the need for business investment including, Total Cost, Total Revenue, Net Profit, Break Even Point (BEP), Return On Investment (ROI), Revenue Cost Ratio (R/C).

• Total Cost and production costs

The total cost aspect is reviewed from all economic production that must be produced to produce goods. The use of costs comes from fixed costs (fixed costs) whose total remains within the range of the volume of agricultural activities. Variable cost (variable cost) is a cost whose size depends on the volume of agricultural activities (Pratama & Domos, 2022) by calculation using the formula:

$$TC = TFC + TVC$$

Detail:
TC = *Total Cost/Total Income*
TFC = Total Fixed Cost
TVC = Total Variable Cost

$$\text{Production Cost} = \frac{TC}{TQ}$$

TC = *Total Cost*
TQ = *Total Quatity*

- *Total Revenue (Benefit)*

The income aspect is obtained from the selling price of the product produced and then multiplied by the total quantity (quantity) of the plant (Pratama & Domos, 2022) mathematical calculation with the formula:

$$TR = PxQ$$

Detail:
TR = Total Revenue (Rp)
P = Price (Rp)
Q = Total Quantity

- *Net Benefit*

Profit is obtained from the reduction of total income with total cost (Pratama & Domos, 2022), with the formula:

$$\pi = TR - TC$$

Detail:
π = Net Benefit
TR = Total Revenue
TC = Total Cost

- *Break Even Point (BEP)*

Break Even Point (BEP) is an analysis to determine and find the amount of goods or services that must be sold to consumers at a certain price to cover the costs that arise and obtain profit (Pratama & Domos, 2022) with the formula:

Break Even Point (BEP) Production:

$$BEP = \frac{Total\ Biaya\ (TC)}{Harga\ Jual\ (\beta)}$$

Break Even Point (BEP) Price:

$$BEP = \frac{Total\ Biaya\ (TC)}{Jumlah\ Produk\ (£)}$$

- *Return On Investment (ROI)*

Return On Investment (ROI) is an analysis to see how much profit can be obtained from the total capital invested in a business (Asnidar & Asrida, 2017; Pratama & Domos, 2022) with the ROI formula:

$$ROI\ \frac{Laba\ Usaha}{Modal\ Usaha} x\ 100$$

- *Revenue Cost Ratio(R/C)*

R/C ratio analysis is a ratio used to see the profit obtained in a project or business. R/C ratio is a comparison between revenue and cost. Mathematical formulation method of Revenue Cost Ratio (R/C), (Pratama & Domos, 2022):

$$\frac{R}{C} = \frac{TR}{TC}$$

Detail
:
R/C = Revenue Cost Ratio
TR = Total Revenue
TC = Total Cost

Asumption of R/C Ratio (Pratama & Domos, 2022):

- If R/C>1, eligible to expand.
- If R/C Ratio = 1, then it is at a break-even point or not making a profit.
- If R/C Ratio < 1, then the business is not worthy to be developed

3. Result and Analysis

In this research, the types of fish used in the diversification of fishery products are lomek fish (Harpodon nehereus), barb fish (Ilisha elongata) and gonjeng fish (Coilia mystus). The fish are then processed into various processed food products, such as dim sum, chips, brain chips, meatballs and nuggets. The obstacle in processing the fish is due to the texture of the meat which has a large enough water content that it requires a food softener containing Sodium Tripolyphosphate (STPP) which has complied with the BPOM (Drug and Food Regulatory Agency) standard so it is safe for BTP (Food Additives). . The safe and optimal amount for chewy meatballs is 0.2 to 0.4% of the total weight of the dry dough. STTP FG is able to maintain the water content in the meat so that it is not excessive and the measurement is just right, improving the texture of the meat and increasing the chewiness of the meatballs as well as stabilizing the aroma and color of the meat (Rialita et al., 2021). Here is a picture of the fishery products produced:

Fish Meatballs

Dimsum

Otak-otak **Fish Nugget**

Picture 2. The product produced

1. Market and marketing aspects

After the product trial was successful, the team tried to test the level of liking of the product to the community as potential users. product testing using organoleptic and hedonic tests with a total of 54 panelists with panelist descriptions as follows:

Table 1. Description of Panelists

		Frequency	Percent
Gender	Male	24	44,4
	Female	30	55,5
Total		54	100
Age	10 – 20	32	59,26
	26 – 36	12	22,22
	37 – 47	8	14,81
	48 ++	2	3,70
Total		54	100

Sumber: data processed, 2022

Berdasarkan data diatas, mayoritas panelis adalah anak dan remaja dengan rentang usia 10-20 tahun dengan jumlah 32 orang, kemudian orang tua muda dengan rentang usia 26 – 36 tahun dengan jumlah 12 orang, setelah itu panelis selanjutnya berusia 37 tahun ke atas dengan jumlah 10 panelis.

Please use the SI set of units as much as possible. Wherever the application domain uses a different set of units widely, please minimize the use of non-standard units or non-standard symbols for those units. As examples, the use of “a” for year (annum) is depreciated and the use of “y” is encouraged instead. Similarly, “h” should be used for hours instead of “hr” and “t” instead of “ton” or “tonne”. It is important to take care of the case in which the measurement units are typed. E.g. “Km” does not mean “kilometers”, but “Kelvin-meters”. When providing numerical values followed by measurement units, please leave a regular space or non-breaking space between each value and the measurement unit. This also includes percentages and degrees Celsius (e.g. 42 % or 35 %, 234 °C, 504 K). This rule also applies to the unit for litre, which is recommended to be capital “L”.

The authors are encouraged to render the numbers according to the International rules, specifying the dot as a decimal separator and the comma as a thousands separator.

5. Equations

Make sure that placing and numbering of equations is consistent throughout your manuscript.

$$b(\theta)=\frac{\langle P(\theta)\rangle}{\langle P(\theta=0°)\rangle}=\frac{\frac{(Mp_{max})^2}{R}(1+\cos\delta)}{\frac{(Mp_{max})^2}{R}(1+\cos 0°)} \quad (1)$$

$$b(\theta)=\frac{\frac{(Mp_{max})^2}{R}(1+\cos(kd\sin\theta))}{2\frac{(Mp_{max})^2}{R}}=\frac{(1+\cos(kd\sin\theta))}{2}$$

Left align the equation and put the number of the equation flush-right, using a Right Tab on the right margin. Please reference equations in the text by writing: Persamaan (1). In principle, variables are to be presented in italics.

6. Figures and Tables

6.1. General

Positioning Figures and Tables: Place figures and tables at the top or bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use “Gambar 1”and “Tabel 1” in bold fonts, even at the beginning of a sentence. EPS (or PDF): Vector drawings, embed all used fonts.

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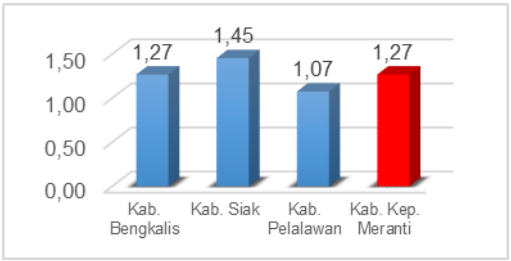

Figure 1. Graphic of the Ratio of District Income to District Expenditure Based on Regency in 2016

(Source: BPKAD Riau Province)

6.2. Tables

Set table number and title flush left above table. Horizontal lines should be placed above and below table headings and at the bottom of the table. Vertical lines should be avoided. Title

should use Arial 8, with 10 pt before and 4 pt after the paragraph, left justified at the top of the table. Tables have to be included into the text. If a table is too long to fit one page, the table number and heading should be repeated on the next page before the table is continued. Alternatively the table may be spread over two consecutive pages (first an even numbered, then an odd-numbered page) turned by 90□, without repeating the heading. Table titleshould be placed above the table and adjust text to table width.

Table 1. Ease of obtaining after-sales service

No	Category	Amount	Persentase
1.	Very Satisfied	35	35%
2.	Satisfied	40	40%
3.	Neutral	22	22%
4.	Not satisfied	3	3%
5.	Very Dissatisfied	0	0%
	Amount	**100**	**100%**

Source: Data Processed 2019

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