Available online at : http://josi.ft.unand.ac.id/

Jurnal Optimasi Sistem Industri

| ISSN (Print) 2088-4842 | ISSN (Online) 2442-8795 |

Case Study

Feasibility Study of Canned Smoked Fish as the Micro Enterprises in South Sumatra Province, Indonesia

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ARTICLE INFORMATION

Received : February 12, 2022
Revised : May 20, 2022
Available online : May 31, 2022

KEYWORDS

Smoked fish, feasibility study, micro enterprise, *Pangasius*, South Sumatera

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A B S T R A C T

This paper analyzes several aspects (technical, marketing, economic, social, and financial) of canned smoked fish (Pangasius) as a micro-industry in South Sumatra Province, Indonesia. This article adopts mix-methods. A quantitative method is used to explain technical, marketing, economic, and financial aspects, while the social aspect is explained using a qualitative method. The author collects the Pangasius species sample from nine districts in South Sumatra Province for the technical aspect. This sample transformed into canned smoked fish using several steps: preparation, making and cooking, filling process, exhausting, sealing sterilization, and cooling process. The author also collects secondary data and interviews several key informants to analyze the non-technical aspect of the canned smoked fish industry. A canned smoked fish (Pangasius) has excellent potential to develop as a micro-enterprise in South Sumatra, Indonesia. In the long-term, it could be an instrument for the local government to increase citizens' well-being based on local resources and penetrate the ASEAN free trade area. In a short time, it could be an instrument for the local government to manage the economic effect of COVID-19 in South Sumatera, Indonesia. This study could be a baseline for the government to create a policy for developing the smoked fish industry. The result of this study could be a second opinion in planning capital investment within the smoked fish industry at the SSP for the investor and the entrepreneur.

INTRODUCTION

In 2005, the United Nations declared the Sustainable Development Goals (SDGs) that a world free of poverty, hunger, disease and want, where all life can thrive, access to quality education at all levels, to health care and social protection, regarding the human right to safe drinking water and sanitation and hygiene; and where food is sufficient, safe, affordable and nutritious, human habitats are safe, resilient and sustainable and access to affordable, reliable and sustainable energy [1]. In Indonesia, SDGs are an agenda for changing sustainable development based on human rights and equality in social, economic and environmental development with the encouragement of leadership from local governments [2].

In the South Sumatra Province (SSP), smoked fish as a part of small-medium enterprises has a strategic position to achieve these goals. It is not only related to poverty, hunger, and health issue, but also related to gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation, reduced inequalities, sustainable cities and communities, responsible consumption and production, life below water, and life on land. This attribute implies that a systematic intervention to the smoked fish industry will affect the multiple SDGs' goals.

Although the SSP has the potency to develop as the center of freshwater fisheries in Sumatra Island, Indonesia, the government of SSP does not prioritize fishery affairs. In 2020, the SSP has 99,626 fisherman household (marine capture: 42,891 household and aquaculture: 56,735 households) and 26,840 boats (non-powered boat: 18,131 boats, outboard motorboat: 8,192 unit, and inboard motorboat: 517 unit) that produced 665,774-ton fish from marine capture (127,492 ton) and aquaculture (538,282 ton). However, the fishery sector only contributed as much as 3.28 percent of the economic growth of SSP [3]. This value indicated that all resources in the fishery sector are underutilized. For example, the SSP has more than 50 rivers that can be used as a location for fish farming, especially *Pangasius* species with a higher production value than other aquaculture commodities. This paper is a first step to bring scientific evidence about smoked fish as an economic opportunity to achieve the SDGs through developing micro-enterprises in the fishery sector at the SSP.

The smoked process affects the content of basic nutrients, microbes, sensory and minerals in fish so that it has an impact on the quality of results. Poisoning due to the smoked process using

DOI: 10.25077/josi.v21.n1.p10-19.2022
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plastic, wood and kerosene greatly affects the quality of smoked fish [4]. The smoked process increases the concentration of some basic nutrients and reduces the fat and mineral content [5,6]. Smoked fish during storage encased with lactic acid bacteria (BAL) will produce histamine and tyramine which are beneficial to maintain immunity [7]. Some alternative resources and with appropriate temperatures can process more hygienic smoked fish [8,9]. Microbial and sensory quality in the fish fumigation process due to very high hygiene, EC requirements and quality assurance system based on HACCP [10]. Total plate numbers (ALT), Escherichia coli and Salmonella in smoked fish still meet the microbiological standards contained [11].

Some studies have found that the process of fumigation in fish causes impacts on the contamination of environmental and health pollutants such as Poly Brominated Diphenyl Ethers (PBDEs), detoxifying PBDEs (MeO-PBDEs) [12]. A total of 57 out of 301 (18.9%) of fresh fish and smoked fish samples positively contained *Listeria monocytotgen* which is a source of disease for human health [13–15]. Levels of lead metal contamination and microbial production fishery products exceed health thresholds [16]. The quality of smoked fish was microbiologically tested negative or unpolluted with *Escherichia Coli* bacteria [17]. Smoked fish have tested positive for Staphylococcus aureus bacteria that can cause mild infections to food poisoning to systemic infections. Infections that occur such as food poisoning [18,19].

In smoked fish, a process is needed for the reduction of *polycyclic aromatic hydrocarbons* (PAHs) which are environmental pollutants found in processed foods [20]. PAHs in smoked fish contained such as *S. Scombrus, benzo(a)pyrene, C. gariepinus* and *E. fimbriata* that can affect health [21,22]. With washing methods (washing on) on fish fumigation can affect PAHs [23]. Using water-flue mixture technology on fish fumigation can reduce the impact of PAHs on health [24]. Quantification of PAHs in smoked fish products often requires multiple clean-up steps to remove fat and other compounds that may interfere with the chemical analysis [25].

To maintain the quality of smoked fish, several methods are needed to keep smoked fish safe for health. Shelf-life of smoked fish using several technologies such as high pressure [26], Microflora of cold-smoked fish at the end of shelf-life are lactic acid bacteria (LAB) [27], time-temperature integrators [28], consumer preference [29,30], technical efficiency and sustainability assessment of traditional smoked fish processing [31], and empowering fisherman community through smoked fish [32]. Then, analyzing the effect of smoked fish consuming on human health [33] or effect traditional smoked fish processing on the smoked fish worker [34].

However, no prior research gives a detailed explanation of the feasibility of smoked fish as the potency of micro-enterprises that create employment and income-generating for the fisherman household. Moreover, current technology on smoked fish in developed countries cannot be applied in Indonesia because it creates for big industry. Many Indonesian scholars had shown that smoked fish processing in Indonesia has attributed to micro-enterprises/small-medium enterprises/home industry. They use local wisdom [35], traditional technology for processing smoked fish, and oriented toward the domestic market. This situation triggers many researchers to modify traditional technology of smoked fish processing so that it more economical, ecological, safety, and healthy for the smoked fish worker or consumer [8], [36–38]. The availability of low-cost technology does not make the smoked fish industry grow in a better direction. The government and private investors need more scientific information on smoked fish so that they willing to make intervention (government) or invest capital in this sector. This research, at praxis level, updating new scientific information on the smoked fish industry for the government and the private sector, especially in the SSP.

Smoking is one of the oldest methods of preserving and protecting food. It still widely used for fish processing in many countries and produced smoked fish. Today, the smoking practice could be classified into two categories. First, traditional smoking that used smoke from various materials (wood, husk, sawdust, corncob, coconut shell, coconut coir, sugarcane pulp briquette, and so on) to dry the fish. In this method, the flow and distribution of smoke depend on the construction of the kiln and the weather conditions. Secondly, modern smoking use smoke from external generators under controlled conditions of temperature and air access, while airflow is forced and controlled by a mechanical device [39]. Based on the temperature of the smoke, modern smoking could classify into three types: cold smoking (12–25 °C), war smoking (25–45 °C), and hot-smoking (40–100 °C) [40]. Both traditional and modern methods can produce different quality of smoked fish. It depends on fish species, fish material (freshwater or frozen fish), ingredient, temperature, source of smoke, preservation technique, smoking duration, and so on.

As shown in the previous sections, smoked fish can contain contaminants that interfere with human health. This situation encourages the government in many countries to adopt a certain standard for assessing smoked fish as safe food for daily human consumption. In Indonesia, based on the World Trade Organization code of good practice, the Government of Indonesia has regulated the smoked fish industry through several regulations such as SNI 2725:2013, SNI ISO 9001, SNI ISO 22000, and SNI 01-4872.1-2006.

In Indonesia, smoked fish has various names in different culture such as *salai* (Sumatra Island), *asar* (Maluku archipelago), *kayu* (Sulawesi Island), and *pe* (Java Island). Indonesian people also have different treatments to make smoked fish. In Situbondo, East Java, people use several bananas midrib stem above the furnace that made of cement and bricks, while the fuel use coconut coir, which created the typical flavors of the smoked mackerel tuna [35]. As a fuel material in the smoking process, people also used various materials such as rubberwood (*Hevea brasiliensis*), coconut (*Cocos nucifera*) shell or coconut choir, and sugarcane (*Saccharum officinarum*) bagasse. This material produces a different effect in the smoking process because they have different values in the heat value, particle density rate, combustion rate, distribution of fuel to the temperature change [37]. This attribute makes it difficult for smoked fisherman households to meet national industry standards set by the government. For example, Anggraeni et al. [41] found that SME did not meet the regulation required by the government, and the product has been severely contaminated.

However, the discovery of liquid smoke technology could be used by fishermen households to minimize the processing of smoked fish that is not qualified with industry standards. The

smoke liquid is a mixture of the substance of light, acid liquid, and gas, possessing numerous benefits, including as a preservative and deodorizer. These properties provide many advantages for fish production businesses, including *Pangasius*, which contains fat, causing the perception of a strong smell. The existence of a smoke liquid, therefore, becomes a beneficial futuristic solution among industries and societies that engage in the food industry. The smoke liquid is obtained through the condensation process, from both direct and indirect fire. Hence, it contains lignin, cellulose, hemicellulose, carbon, and other chemical compounds, obtained via distillation [42].

Unlike the practice in developed countries, many producers smoked fish processing in Indonesia is the micro or small enterprises. Although the regional government in several areas has promoted these producers into the formal economy, however, many of them still trapped in the informal economy. The previous finding shows that most of Indonesia's informal firms are very small, micro-enterprises, with fewer than five employees. They pay low salaries, relatively unproductive if compared to large firms, managed by individuals with low educational achievement, selling products to local markets, and have not attempted to increase their operations. They do not register their companies either because they do not want to expand or borrow from formal financial sources or because they avoid tax [43]. They also have various bottleneck: lack of access, a conducive commercial environment, good physical infrastructure, access to foreign technologies and markets, avoidance of an intrusive government presence [44–46]. They also do not aware of free trade areas in ASEAN countries [47]. In the coastal area, many fishermen live in poor households. However, some researchers suggest that informal firms have a good social capital that can reduce transaction costs, making economic activity run efficiently, and innovation capability [48,49].

Because every region has different characters, resources, culture, and institutional setting, it is important to understand the opportunity of the smoked fish market in each region. Hence, a feasibility study could facilitate to achieve this goal. By definition, a feasibility study is a preliminary study that examines the profitability of the project, the soundness or feasibility of the product of the project, the marketability of the product or service, alternative solutions, and the business demands that generated the request [50]. The methodology to conduct a feasibility study is remarkably similar to the problem-solving method: defines the problem explicitly, describes the problem limits, defines the feature of solutions, rates alternatives, sets out suggestions together with the reason for the option, and provide a rough estimate of timetable and expenses [51].

The aim of the feasibility study is to find out more specifics of the project, including digging deeper into the market need or demand that led to the project, and to suggest alternatives. A feasibility study is typically performed when projects are complicated in nature, bigger than the ordinary projects that the organization normally undertakes, require significant amounts of money to complete, or try to do something entirely new that the organization has never done before [52]. Feasibility studies examine such things as the viability of the project's product, the technical issues surrounding the project or project's product, and the reliability and feasibility of the proposed tec'nology or product [52].

METHOD

This article adopts mix-methods. A quantitative method uses to explain technical, marketing, economic, and financial aspect, while social and environmental aspects explained using a qualitative method. For the technical aspect, the author collects the *Pangasius* species sample from nine districts in South Sumatra Province. This sample transformed into smoked fish using liquid smoked through several steps: preparation, making, and cooking process, filling process, exhausting, sealing, sterilization and cooling process. To perform marketing analysis, the author collected data on demand, supply, opportunity, and competitor of smoked fish. The economic aspects analyzed include the benefits of the business towards businessmen, indigenous society, and local government, for its regional own-source revenue (*Pendapatan Asli Daerah* or PAD), and as a culinary food. Furthermore, a financial analysis was divided based on three considerations:

The financial aspect is a financial analysis by consuming the length of the project period including; Long and many and labor wages, a lot of production and packaging per month, many prices of raw materials and additional materials, including investment costs such as costs 50 to operational costs such as raw material costs and others. Financial aspects will be analyzed by the Net Present Value (NPV), Method (IRR), and Payback Period (PP) methods.

The NPV method is an analysis by comparing the present value of net cash inflows with the present value of the cost of an investment. Formula used to calculate NPV:

$$\text{Net PresentValue (NPV)} = \sum_{t=0}^{n} At/(1+k)1t \quad (1)$$

The IRR method is basically a method of calculating interest rates that can equalize the present value of all cash inflows with cash outflows from a project investment. Formula used to calculate IRR:

$$\text{Internal Rate of Return (IRR)} = \sum_{t=0}^{n}[A1\ (1+r)] = 0 \quad (2)$$

A payback period (PP) is a method of calculating the length of time required to return invested money from the annual cash inflows of the investment project. If the returns are the same each year, the PP of an investment can be calculated by dividing the amount of the investment (expenses) by the annual returns. The formula used is: = Annual Net Cash Investments. Compute PP that has unequal revenue value each year, then compute accumulation of revenue first such that accumulated cash entry is zero.

RESULT AND DISCUSSION

Technical analysis

Smoked fish using liquid smoke (Figure 1) is made in the Laboratory of Civil Engineering, Bina Dharma University, South Sumatra, Indonesia, following several steps: *preparation* (preparing the main material such as *Pangasius*, ingredients, liquid smoke, and hygienic cans). The pyrolysis process with coconut shell material at a combustion temperature of 500-700°C

DOI: 10.25077/josi.v21.n1.p10-19.2022



(a) (b)

Figure 1. (a) Smoked fish. (b) Liquid smoke Materials

produces liquid smoke, which is then converted into liquid oil of a specified quality by the condensation process. The main compound content of liquid smoke originating from the pyrolysis process is cellulose, hemicellulose, and lignin. Cellulose and hemicellulose will produce organic acids such as acetic acid, which acts as an antibacterial and carbonyl as a color formation. Lignin is a compound that functions to strengthen plant structures by resisting microbial attack and oxidative stress. The results of the pyrolysis of the three compounds produce phenols, which play a role in providing flavor and antioxidants and in inhibiting the oxidation process when liquid smoke is applied. The highest total phenol content of liquid smoke was obtained at a pyrolysis temperature of 600°C for 90 minutes, which was 17.966%. Phenol is a component of smoke which is used as a quality parameter in determining smoke quality. Phenolic compounds are responsible for the formation of flavors in smoking products and have antioxidant activity that affects the shelf life of food. The presence of phenolic compounds in liquid smoke provides antioxidant properties to the fat fraction in the smoked product. The components of phenol compounds that play a role in flavor formation are guaiacol, 4-methylguaiacol, siringol, and 2,6-dimethoxyphenol.

The use of liquid smoke in fish processing contains phenol compounds, which can inhibit the growth of bacteria / fungi so that they can be used as preservatives or disinfectants. Utilizing smoke waste in the coconut shell charcoal manufacturing industry into liquid smoke will raise added value for the industry, even overcoming environmental pollution [53]. The use of liquid smoke as a preservative for smoked fish has a positive impact on customers' health. Concerns concerning the presence of pyrolysis-derived chemicals result in potentially mutagenic substances/ingredients in foods, posing a health risk. Liquid smoke from coconut shells contains non-toxic and harmless substances that can be used in recipes. Volatile component identification Liquid smoke is made up of 40 different solvents and does not contain any carcinogens.

C*ooking process* (this step ought to follow the appropriate steps and recipe, using machines and stainless-steel tools, which include bone shredder, drainer and mixer, and blender). *Filling process* (the cans were filled up to 150 grams/can), exhausting (it was conducted by heating the materials within the can, utilizing hot steam, in order to avoid a leak, breaks, or volume elevation in the can. This was followed by the vacuum process in order to reduce the life of bacteria and prevent corrosion. Moreover, the entire process was carried out through steam for 15 minutes at 90°C), sealing (it was conducted subsequently, with the aim of preventing contamination from superficial objects. This was performed under hot conditions in order to eliminate air in the can. Furthermore, the automatic sealing process involved the use of electricity, sterilization, and cooling process (it was initiated at 121°C for 15 minutes, using an autoclave, followed by the cooling process, involving the use of shock therapy on bacteria, with the aim of inhibiting the growth of thermophilic species).

Canning is one of the heat-based food preservation methods; the sterilization process requires the most heat. It can be protected from contamination by germs, insects, or other foreign things that might cause decay and distort the appearance and taste when hermetically sealed. Food can also be protected from undesirable changes in water content by using cans. Furthermore, cans can protect food from atmospheric absorption of oxygen, other gases, smells, and radioactive particles. As a result of the researchers' findings, the product's durability with liquid smoke preservative will be three times safer than without it, implying that this smoked fish sauce product will survive more than a year, or 14 months at room temperature. The smoked fish sauce was evaluated for 14 months and shown to have no change in quality, texture, or taste after canning.

The process of cooking fish with a method of fumigation with a certain hot temperature will affect the nutrients and proteins contained in it, therefore, the temperature is very decisive to maintain the stability of taste and protein content to be maintained [54]. The cooling process was divided into three steps: (a) water used should be clean and chlorinated; (b) it should also be flowing in order to keep the spores alive, and (c) the entire process must be conducted speedily. The cooling process as a method of improving quality stability during storage can extend shelf life, microbial growth, meat quality and sensory degradation in fish [55].

Marketing Analysis

A canned smoked fish (*Pangasius*) could be considered as a gift from South Sumatera. According to the Bureau of Statistics [56], domestic and foreign visitors to Palembang City with the total 2.201.840 [57]. Based on the analysis of satisfaction and purchasing power data in the strategic plan of the tourism agency targets that for domestic and foreign tourists have the potential to be interested in buying souvenirs by 2 percent of the total visitors [58]. Consequently, an increase in population (*see* Table 1) leads to an elevation in consumption rate, and subsequently, the tendency to change utilization pattern (from domestic to fish product), thus, the demand for this commodity ought to increase in the near future. With population growth will significantly encourage the ability of the community to utilize the existing potential as a form of economic development [59].

With the assumption of one percent of the population consuming one canned smoked fish daily, about 72,226 cans would be consumed per annum. Therefore, the data above shows the potential of the demand for this product to reach 147,226 cans

Table 1: The number of population and population growth in South Sumatera Province, 2015-2018 [56]

	2015	**2016**	**2017**	**2018**
Population	6,899,892	7,019,964	7,121,790	7,222,635
Growth rate	2.13	1.74	1.45	1.42

per year. As shown in the previous section, the availability of the main material (*Pangasius*) is not an issue. There was an increase in the production of *Pangasius* every year. The availability of the main material was not affected by weather; hence, the continuation and the quality remained good.

Based on competitors, there was no direct opposition, due to the absence of a similar product in the market. However, indirect competition could arise from products of sardines, widely known by society, due to its wide targeted market, extensive penetration, and lower price, which could become an obstacle in marketing. However, this could be tackled by emphasizing the absence of preservatives in the smoked fish because the original product from South Sumatera possesses high nutrition and hygiene. Another competitor was fresh *Pangasius* because of the cultured preference of fresh product consumption over the processed variety. Furthermore, the existence of numerous restaurants of various scales could be both the advantages and a threat to this development.

The market opportunity for this product, both at the local and national levels, was guaranteed. Therefore, societal interest on the consumption of fish became the main factor influencing demand, and the incidence of ease to rot created the opportunity for processed food business. Contemporarily, simple values and a healthy instant lifestyle has become the guidance of consumers. The new product of canned smoked fish is expected to possess promising marketing strategies, due to the significant impact observed towards its sales. However, the first impression of a consumer towards a novel brand determines its judgment. This was further divided into four parts: product, price, promotion, and place (P4), which have been applied in the marketing mix strategy.

Socio and Economic Analysis

According to field observations, there is the probability of producing canned smoked fish, as a government program termed Movement of Eating Fish (GEMARIKAN), which supports the increase in fish consumption and its products. Meanwhile, the Bureau of Statistics [56], reported that people in South Sumatera, allocated about 1.9 % and 3.9 % of their income on the processed fish product. This survey also showed the non-existence of similar businesses in South Sumatera, as most enterprises focused on traditional-smoked fish, brining fish, fermentation, salting, and any other product, canned smoked fish made in prototype scale. This condition was due to the lack of knowledge and information on production, as well as the lack of modal availability from businessmen.

The existence of investment in the smoked fish canning business has an impact on the economy, namely income for the surrounding community, providing employment opportunities so as to provide direct benefits for employers, the surrounding community as labor, and fishermen as raw material providers. Judging from the relatively new processing business unit in South Sumatra, this business, if packaged properly, can be used as one of the attractions for domestic tourists by making the business location a culinary tourist destination. Canning of smoked fish can be classified as an effort to diversify fishery processed products so as to help the government in increasing protein intake for the community. Processing smoke fish is done by choosing fresh fish with the aim that the nutritional content and quality of fish are maintained because rotten fish cannot be made into smoked fish because of the processing of canning sambal. In the process of canning fish Waste treatment is done by making fish feed, making margarine made from *Pangasius* fat, and others so that zero waste is produced that is safe for the environment.

Financial Analysis

From the cash flow, the analysis of feasibility showed that: (a) IRR reached 48.75%, therefore, the rate of discount revealed that NPCV project was the same with zero, which is way higher than rare of interest in bank; (b) it also attained 920,276,093, which means NPV > 0, in order for the financial project to be worth doing; (c) Net B/C ratio was 2.70, which is greater than 1, hence, it was worth conducting; (d) payback period was 0.72 year, which indicates that rate of return took less than 1 year. These four financial aspects further indicate that the canned *smoked fish* project was of economic value to the local government of South Sumatera. The result of financial analysis is presented in Appendix 1-4 which consists of the cost of investment (Appendix 1), annual operational cost (Appendix 2), projection of production and sales (Appendix 3), and projection of cash flow (Appendix 4).

CONCLUSIONS

This article shows that canned smoked fish has fulfillment technical, marketing, socio-economic, and financial criteria to be developed as the micro and small business. This argument supports the previous finding, especially Indonesian scholars, that promote smoked fish as an entry point to empowering the fisherman community [34,38,40]. It is also supporting the effort of Indonesians scholars that attempt to create more economical, ecological, safety, healthy, and low-cost technology for smoked fish in Indonesia However, due to limited time and resources, the author does not examine the aspect of stability, conductivity, expiry data, organoleptic, microbe, metal contamination, and Scanning Electron Microscope (SEM) a canned smoked fish. This finding is also strengthening the smoked fish industry as an instrument for the local government to achieve SDGs goals in South Sumatra, Indonesia. If the government makes a systematic intervention to the smoked fish industry, then many SDGs goals could be achieved simultaneously. However, this is no easy task. The smoked fish industry can not only fulfill the domestic market but also can penetrate the ASEAN free market. In a short time, the smoked fish industry is an alternative instrument for local government to managing the economic effect of COVID-19 in South Sumatra.

ACKNOWLEDGMENT

This project is fully funded by the Ministry of Research, Technology, and Higher Education Republic of Indonesia based on contract number: 011/SPK/LPPM/Univ-BD/IV/2018, 12 April 2018.

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DOI: 10.25077/josi.v21.n1.p10-19.2022

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APPENDIX 1

Cost of Investment

Type of cost	Unit	Quantity	Price/Unit	Price	Economical age (year)	Depreciation per year	Residual value
License	One packet	1	5.000.000	5.000.000	3		0
Building renovation	m^2	80	1.000.000	80.000.000	30	2.666.667	66.666.667
Machines/production tools	unit	1	464.500.000	464.500.000	10	95.566.667	66.666.667
Autoclave	unit	1	150.000.000	150.000.000	5	30.000.000	0
Steamer,	Unit	2	2.000.000	4.000.000	5	800.000	0
Seamer, sealed machine	Unit	1	300.000.000	300.000.000	5	60.000.000	0
Cooler	Unit	1	5.000.000	5.000.000	5	1.000.000	0
Preparation table	Unit	1	500.000	500.000	5	100.000	0
Refrigerator	Unit	1	5.000.000	5.000.000	5	1.000.000	0
Sub quantity				464.500.000		95.566.667	66.666.667
Other tools							
Pan, knife (another kitchen stuff)	Unit	4	100.000	400.000	5	80.000	0
Digital balance (kg)	Unit	1	3.000.000	3.000.000	5	600.000	0
Quarantine shelf	Unit	3	1.500.000	4.500.000	5	900.000	0
Clothes, shoes, mask, hat for workers	Unit	6	250.000	1.500.000	5	300.000	0
trolley	Unit	1	5.000.000	5.000.000	5	1.000.000	0
Sub quantity				14.400.000		2.880.000	0
Total cost of investment				**563.900.000**		**98.446.667**	**66.666.667**

APPENDIX 2

Operational Cost

No.	Types of Cost	Unit	Qty / year	Price / Unit	Price (Rp)
1.	Main material				
	- Patin fish	Kg	5.625	17.000	95.625.000
	- Onion	Kg	225	22.000	4.950.000
	- Chili	Kg	45	30.000	1.350.000
	- Salt	250gr	45	1.000	45.000
	- Vegetable Oil	bottle	1.125	6000	6.750.000
	- Lemon grass	Kg	23	10.000	225.000
	- Smoke liquid	litre	1.500	1500	1.687.500
	- Gallon water	Gallon	225	3.500	787.500
	Sub quantity				111.420.000
2.	Additional material				
	- LPG 3 kg	Tube	45	14.000	630.000
	Sub quantity				630.000
3.	Operational stuff				
	- Can	piece	22.500	2.000	45.000.000
	- Printing	piece	22.500	1.000	22.500.000
	Sub quantity				67.500.000
4.	Transportation	Month	11	100.000	1.100.000
5.	Electricity	Month	12	1.000.000	12.000.000
6.	Telephone fare	Month	12	150.000	1.800.000
7.	Labor				
	- Managerial staff	Person	1	1.000.000	12.000.000
	- Permanent staff	Person	3	900.000	32.400.000
	Sub quantity				44.400.000
8.	Maintenance				56.390.000
Total of operational cost					**295.240.000**

APPENDIX 3

Projection of Production and Sales

No	Description	Unit	Quantity/month	Quantity/year	Unit price	Price (Rp)
1	Annual production					
	a. Quality I	can	3.000	36.000		
	Total			36.000		
2	Annual sale					
	a. Quality I	can	3.000	36.000	20.000	720.000.000
	Total	**kg**		**36.000**		**720.000.000**

DOI: 10.25077/josi.v21.n1.p10-19.2022

APPENDIX 4

Cashflow Projection

Description	Year					
	0	**1**	**2**	**3**	**4**	**5**
Inflow						
a. Income	0	720.000.000	720.000.000	720.000.000	720.000.000	720.000.000
b. Internal fund						
c. Investment credit	0					
d. Working capital loan	0					
e. Residual value						66.666.667
Total	0	720.000.000	720.000.000	720.000.000	720.000.000	786.666.667
Inflow of IRR	0	720.000.000	720.000.000	720.000.000	720.000.000	720.000.000
Outflow						
a. Investment cost	563.900.000	0	80.000.000	80.000.000	85.000.000	80.000.000
b. Working capital	12.301.667					
c. Operational cost		295.240.000	295.240.000	295.240.000	295.240.000	295.240.000
d. Principal payment		0	0	0	0	0
e. Cost of interest		0	0	0	0	0
f. Tax (15%)		48.947.000	48.947.000	48.947.000	48.947.000	48.947.000
Total	576.201.667	344.187.000	424.187.000	424.187.000	429.187.000	424.187.000
Outflow of IRR	576.201.667	344.187.000	424.187.000	424.187.000	429.187.000	424.187.000
Total cash flow	0	375.813.000	295.813.000	295.813.000	290.813.000	295.813.000
Cumulative cash flow	0	375.813.000	671.626.000	967.439.000	1.258.252.000	1.554.065.000
Cumulative cash flow (residual value)	0	375.813.000	671.626.000	967.439.000	1.258.252.000	1.487.398.333
Cash flow of IRR	-576.201.667	375.813.000	295.813.000	295.813.000	290.813.000	295.813.000