

# *The Feasibility FF Smoked-Fish Processing In Sipujuk Farm, Padang, West Sumatera*

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**Abstract** – Several coastal areas in Indonesia have industrial areas for smoking fish, which are mostly home-based industries. One of which is the Fish Processing Unit (FPU) named Si Pujuk Farm in Padang, West Sumatra Province. The feasibility of fish processing becomes a guarantee that an FPU has applied the proper principles of fish handling and processing. This study aims to determine the level of readiness of the aforementioned FPU to earn the Fish Processing Feasibility Certification (FPFC). The feasibility of the factory was analyzed through a survey method and analyzed descriptively qualitatively. Gap analysis applied retrieved a weighted value of certification readiness level of 68.88 %. This evaluation suggests information that FPU Si Pujuk Farm does not meet the requirements for FPFC.

**Keywords** – Smoking Fish; Feasibility; FPU; Fish Processing; Gap Analysis

## I. INTRODUCTION

Fish smoking is one of the fish processing technologies to preserve the fish and has certain characteristics (Patty *et al.*, 2015). It becomes the oldest method since the process is mostly done traditionally, where the process of penetrating volatile compounds in fish meat is produced from burning woods (Palm *et al.*, 2011). The process can provide an aroma with a distinctive taste (Bower *et al.*, 2009), give a long shelf life due to anti-bacterial activity in the smoke (Abolagba and Igbinebo, 2010), inhibit the enzyme decomposition process in fish so that it can affect the quality of smoked fish (Kumolu-Johnson *et al.*, 2010).

Smoked fish is a combination of salting and smoking methods, which can reduce the water content in fish meat, so the growth and reproduction of bacteria are inhibited. Besides, it does not rot quickly, making it lasts longer. In the future, smoked fish will become a potential business since the demand from developed countries for the fish is quite high, turning it into a promising export commodity (Sulistijowati *et al.*, 2011).

One of the raw materials for smoked fish at the Fish Processing Unit (FPU) of Si Pujuk Farm is silver catfish (*Pangasius sp.*). It catches the interests of the Indonesian people. Due to its great demand, the fish currently becomes the leading commodity in boosting aquaculture productivity. The fish production data recorded from 2015 to 2018 have increased by an average of 6.52%.

The average growth of aquaculture production in the first to the third quarter of 2018, catfish is the third-highest commodity after carp and catfish, which is 31.76% or 492 thousand tons (DJPB, 2018).

Most fish smoking business practiced by the community is carried out individually. This business activity requires supports from investors and the intervention of the local government, so the business can be developed, such as getting easier access to higher capital. Indirectly, the business will improve the regional economy. With the availability of abundant raw materials, affordable prices, efficient fish processing, and high demand, the business of smoked fish processing brings a promising opportunity to gain profits (Asri *et al.*, 2018).

Nevertheless, most of the smoked silver catfish processing is still conducted traditionally with simple methods and tools. Many still do not meet the Indonesian National Standard, as a result, the quality of the product is not commercially proper, even contains carcinogens. Additionally, it may cause environmental pollution due to the smoke used and resulted during the production (Swastawati *et al.*, 2017).

Therefore, as a place to process fish, FPU, which has facilities and infrastructures like buildings and equipment for fish handling and processing, should have a Fish Processing Feasibility Certificate (FPFC) as a guarantee that FPU has implemented appropriate principles of fish handling and processing. If it is done, where this ideal may encourage entrepreneurs to run their business hygienically and protect consumers from consuming fish processed with harmful materials. Thus, the objective of this study is to discuss the feasibility of FPU certification and evaluate the gaps existing in Si Pujuk Farm.

## **II. MATERIALS AND METHOD**

The materials observed and evaluated in this study were the information retrieved from the FPU owner and the two documents – Good Manufacturing Practice (GMP) and Standard Sanitation Operational Procedure (SSOP) – in the FPU, while the commodities applied as the observation object were the African Sharptooth and silver catfish in the Farm Cultivation Unit (FCU) of the FPU. Then, the instruments deployed to evaluate the feasibility is pens and a checklist under the Regulation of the Minister of Marine Affairs and Fisheries Number 17 of 2019 related to the Requirements and Procedures for Issuing the FPFC. Also, other supporting instruments such as cameras, masks and work equipment, are used.

Furthermore, the data collection technique was conducted through direct observation and interview. Principally, to depict the real conditions of the FPU, the research method implemented in this study is a qualitative method, which is then to analyze qualitatively the relationship between potential factors affecting the fish processing feasibility requirements in the FPU.

### **Data Analysis**

The data processing refers to the feasibility requirements of the FPU by designing a gap analysis checklist to determine the gap between the basic eligibility requirements and the real conditions in the field. Gap analysis is used to identify the necessities required to fix the gaps found (Admaja, 2013). It compares current conditions with the expected conditions, discovers the causes of the gap between the two conditions and provides inputs on existing gaps (Aksorn and Hadikusumo, 2012).

This method was initiated by identifying the gap between the parameters of the requirements to issue an FPFC contained in the aforementioned regulation and the conditions in the field. After examining the gap, the researchers constructed several improvement recommendations according to unfulfilled aspects.

According to Prakarsa *et al.* (2015), the determination of the score weight for the case above is as follows (Prakarsa *et al.*, 2015):

- |         |   |
|---------|---|
| Score 0 | : FPU does not meet what is needed  |
| Score 1 | : FPU does not carry out the activity.  |
| Score 2 | : FPU considers that the activity is recommended to apply, yet it is not conducted. |
| Score 3 | : FPU applies the activity occasionally.  |
| Score 4 | : FPU applies the activity improperly.  |
| Score 5 | : FPU applies the activity properly.  |

The calculation for the percentage of the gap analysis was done by examining the number of aspects based on the suitability scales or points, which had been determined by following the formulation of Nurdiansyah (2010) and Rudiyanto (2016) below.

$$Y=(n_0 \times 1)+(n_1 \times 1)+(n_2 \times 2)+(n_3 \times 3)+(n_4 \times 4)+(n_5 \times 5)$$

$$\% \text{ deviation} = \frac{\text{score obtained}}{\text{total maximum score}} \times 100\%$$

Description:

Y : total scores of deviations obtained

n<sub>0</sub> : number of aspects having score 0 in the form

n<sub>1</sub> : number of aspects having score 1 in the form

n<sub>2</sub> : number of aspects having score 2 in the form

n<sub>3</sub> : number of aspects having score 3 in the form

n<sub>4</sub> : number of aspects having score 4 in the form

n<sub>5</sub> : number of aspects having score 5 in the form

After the result of the score, the calculation was obtained, then the readiness level of the FPU was examined, which was based on the weight calculation range as displayed in Table 1.

Table 1. Weight Calculation Range

Range	Description	Information
75 % – 100 %	FPU is ready to complete the requirements and applies for the certification	Meets the requirements
50 % – 74%	FPU still has to make improvements to increase the readiness for certification	Less meets the requirements
1% – 49%	FPU certainly needs improvements since it is quite different from the certification requirements	Do not meet the requirements

Source: (Bahtiar dan Purwanggono, 2009)

### III. RESULTS AND DISCUSSION

FPU Si Pujuk Farm, which was established in 2017, in detail, is located at Jalan Bakti Abri Sikuliek, Koto Panjang Ikua Koto Village, Koto Tengah District, Padang City, West Sumatra Province. As has been mentioned earlier, through FCU, the FPU processes smoked fish like African Sharptooth catfish (*Clarias gariepinus*) and silver catfish (*Pangasius sp.*) as the main commodities. All raw materials for smoked fish are sourced from their FCU with a capacity of 200-250 kg/day to process the materials.

In principle, the smoking technique is the process of drawing water from various compounds from the smoke. It is then formed due to incomplete combustion with a limited amount of oxygen. The durability of smoke is quite limited, which depends on the length and thickness of the smoke. To have last-longer fish, the smoking must be combined with other preservation methods, for instance, storing at low temperatures.

Following the parameters in the processing feasibility certification process as stated in the Regulation of the Minister of Marine Affairs and Fisheries Number 17 of 2019 related to the Requirements and Procedures for Issuing the FPFC, the field observations and the score calculations resulted in the percentage level of readiness for certification of FPU Si Pujuk Farm as displayed in Table 2.

Table 2. Percentage of Readiness of Feasibility Certification for Fish Processing at FPU Si Pujuk Farm

Parameters	Number of Parameters	Maximum Scores	Scores Achieved	Percentage	Information
Management commitment	1	5	4	80	Meets requirements
Environment	1	5	5	100	Meets the requirements
FPU building	9	45	25	55.55	Less meets the requirements
Equipment arrangement and maintenance	2	10	6	60	Less meets the requirements
Additional raw materials/packaging sets	3	15	13	86.66	Meet the requirements
Product storage	1	5	5	100	Meet the requirements
Water Waste Treatment Plant (WWTP)	1	5	2	40	Do not meet the requirements
Water and ice	3	15	10	66.66	Less meets the requirements
Equipment and tools having direct contacts with the product	2	10	4	40	Do not meet the requirements
Washing facilities	2	10	9	90	Meets the requirements
Construction and layout of the process flow	3	15	6	40	Do not meet the requirements
Hygiene of rooms and equipment	2	10	8	80	Meets the requirements
Employee facilities	6	30	12	40	Do not meet the requirements
Chemicals and hazardous materials	2	10	6	60	Do not meet the requirements
Solid and other wastes	2	10	8	80	Meets the requirements
Packaging and labeling	3	15	12	80	Meets the requirements
Hygiene and health of employees	2	10	7	70	Less meets the requirements
Upskilling	1	5	4	80	Meets the requirements
Pest control	1	5	3	60	Less meets the requirements
Average				68.88	

Source: (Primary data, 2021)

Based on Table 2, the average weight percentage of the FPU readiness level is 68.88% with 9 parameters that meet the requirements for certification; 6 parameters that less meet the requirements; and 4 parameters that do not meet the requirements. In addition, the observation results show that four parameters – WWPT, equipment and supplies having direct contacts with the product, construction and layout of the process flow, and employee facilities should have comprehensive improvements to increase the readiness for the certification. The results of the weighting calculation for the certification readiness are in the range

of 50% - 74%. It means that FPU Si Pujuk Farm still needs improvements to increase readiness for FPFC. Bahtiar *et al.* (2009) state that companies that meet readiness for certification must meet the weight requirements of 75% - 100%.

#### IV. DISCUSSION

##### *The Evaluation of the Readiness for FPFC*

Referring to the Regulation of the Minister of Marine Affairs and Fisheries Number 17 of 2019, FPFC guarantees that an FPU has applied the principles of proper fish handling and processing. The existence of the certification is indeed to encourage entrepreneurs to run their business hygienically and protect consumers from eating processed fish using hazardous materials.

Similarly, the gap analysis in this context is to evaluate the processing feasibility in the FPU. If a gap is found, it is expected that a company can improve all aspects of the feasibility (Anggraini *et al.*, 2019). The results of the observations show that the percentage for the certification readiness is 68.88%, which is categorized as not meeting the requirements for the certification. Therefore, several proposed improvements to the existing gaps are figured in Table 3.

Table 3. Proposed Improvements to the Gaps

Parameters	Conditions of the FPU	Proposed Improvements
Management commitment	The FPU management has a strong commitment to implementing the basic requirements, yet there are no records although GMP and SSOP documents exist.	The top management must communicate and monitor employees about their duties and responsibilities as well as remind them of the importance of recording activities (KKP, 2019).
Environment	The location of Si Pujuk Farm is sanitary and hygienic and does not become a source of contaminants. Besides, it is separated from the place of residence.	The location has met the requirements.
FPU building	Si Pujuk Farm does not have doors, windows, ventilation, and bulkheads between the production process rooms.	The FPU doors must be made of smooth and water-resistant materials; The FPU floor surface must be smooth, without cracks, and do not cause puddles; The FPU ceilings must be free from cracks and gaps, uneasy to fall off, have proper lighting; The FPU windows must prevent entering bags of dust and are easy to clean; and the FPU ventilation circulation must have enough air to prevent condensation. (SNI CAC/RCP, 2011)
Equipment arrangement and maintenance	a. The arrangement of equipment is adjacent to the production room, making it becomes a source of cross-contamination. b. The equipment cleanliness is done after use only.	a. The arrangement of equipment must be separated from the production room to prevent cross-contaminations. b. The equipment should be cleaned before, during and after use.
Additional raw materials/packaging sets	The raw materials are fresh and have quarantine ponds. This is comparable to the packaging materials, which meet food-grade requirements.	The additional raw materials/packaging sets have met the requirements.
Product storage	The raw material storing is carried	The product storage has met the requirements.

	out following the product characteristics at room temperature.	
Water Waste Treatment Plant (WWTP)	The FPU does not have WWTP.	The FPU must build WWTP with a simple treatment (SNI CAC/RCP, 2011)
Water and ice	The FPU provides clean, odorless and colorless waters (laboratory testing has been carried out with the results meeting the requirements).	The water pipes should be repaired to prevent cross-contamination occurrences (SNI CAC/RCP, 2011).
Equipment and tools having direct contacts with the product	<p>a. The equipment having direct contact with the product is not made of stainless steel, so it has the potentials to become a source of contamination.</p> <p>b. The signs of tool usage are not made, so tools used are not separated between work areas.</p>	<p>a. The FPU must have a fish smoking machine made of stainless steel.</p> <p>b. The FPU must provide signs, and separate equipment and tools used between work areas.</p>
Washing facilities	The design and washing facilities and the amount of water supply have met the requirements.	The washing facilities have met the requirements.
Construction and layout of the process flow	The construction of FPU buildings is open, so it has potentials for contamination occurrences. Besides, it is unable to prevent the arrival of nuisance animals and their dung.	<p>a. The FPU construction must be designed to prevent the coming of contamination sources, nuisance animals and dungs (SNI CAC/RCP, 2011).</p> <p>b. The FPU must reconstruct the production layout by separating the storage room from the feed-making room as well as production process areas (SNI CAC/RCP, 2011).</p>
Hygiene of rooms and equipment	The room condition and availability of equipment are sufficient.	The hygiene of rooms and equipment has met the requirements, but providing labels or signs should be done.
Employee facilities	The FPU does not have foot sinks, employee changing rooms, storage lockers, sanitation toilets (covering the availability of soaps, disinfectants and hand dryers), signs for appropriate instructions and warnings (for example, no smoking, no littering, no spitting, no jewelry used during the production process, and so the like).	The FPU must improve the employee facilities, such as foot sinks, changing rooms, lockers storage, toilet sanitation, and warning signs. The facilities also must be supplied with adequate air ventilation, which should be separated from storage ponds and fish feed processing rooms (SNI CAC/RCP, 2011).
Chemicals and hazardous materials	The chemical materials are not labeled or marked specifically for using and storing.	The chemical materials must be labeled and stored separately in special containers (KKP, 2019).
Solid and other wastes	The solid wastes like gills are directly stored, handled and	The solid and other wastes have met the requirements.

	placed in special sealed containers.	
Packaging and labeling	The packaging and labeling are done quickly, carefully and sanitarly, however necessary records carefully should be made.	The packaging and labeling have been eligible, but the First In First Out (FIFO) system should be integrated, particularly in the packaging (KKP, 2019).
Hygiene and health of employees	The work clothes are not available and the employee hygiene is not checked before entering the process room.	The FPU must design a standard operating procedure for work clothes. In addition, the factory must carry out hygiene socialization, monitoring and supervision upon employees (KKP, 2019).
Upskilling	The management and employees receive inputs and training regularly and periodically.	The upskilling has met the requirements, but the monitoring and supervision of the training should be carried out (KKP, 2019).
Pest control	Due to the poor building construction, nuisance animals or vermin cannot be prevented since the FPU does not have adequate ventilation and doors or barriers.	a. The FPU must make a standard operating procedure for pest control. Also, it must communicate and supervise the duties and responsibilities assigned to employees (KKP, 2019). b. The FPU must rebuild the building construction and layout. Too, it should provide buffer nets and insect killers (SNI CAC/RCP, 2011).

Source: Primary data (2021)

## V. CONCLUSION

Based on the results of the gap analysis, the FPU Si Pujuk Farm retrieved a weight percentage of 68.88%, which did not meet the requirements for FPFC. To earn the certificate, the FPU must improve 10 parameters, namely the buildings; the equipment arrangement and maintenance; WWTP; water and ice; the equipment and tools having direct contacts with the product; the construction and layout of the process flow; the employee facilities; the chemicals and hazardous materials; the hygiene and health of employees; and the pest control.

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