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FEASIBILITY ANALYSIS OF FISH HANDLING PRACTICES IN THE SABILULUNGAN MODERN FISH MARKET

Analisis Kelayakan Cara Penanganan Ikan Di Pasar Ikan Modern Sabilulungan

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ABSTRACT

In 2018 the Ministry of Maritime Affairs and Fisheries built the Sabilulungan modern fish market in Bandung Regency. This modern fish market was built the main aim of eliminating the public's image of fish markets as dirty, muddy, smelly, and dirty. This research was conducted to determine the appropriateness of fish handling methods in modern fish markets. Analysis of the feasibility of fish handling methods is carried out by referring to the fish handling practice implementation checklist regulated by the Ministry of Maritime Affairs and Fisheries for supplier units. The assessment is modified with the Guttman scale and the finalo result will conclude the feasibility of the treatment method in the form of a percentage. The research result stated that the method of fish handling in modern fish market sabilulungan was not feasible with a feasibility value of 40.4%. It is recommended that modern fish market sabilulungan immediately create a management standard operating procedure, complete a documentation system, be firm in developing traders, appoint a special officer to be responsible for quality, complete and recognize facilities and infrastructure according to requirement, provide counseling regarding the principles of hygienic sanitation and training on good fish handling methods.

Keywords: Feasibility Analysis; Fish Handing Practice; Modern Fish Market

ABSTRAK

Pada tahun 2018 Kementerian Kelautan dan Perikanan membangun pasar ikan modern (PIM) Sabilulungan di Kabupaten Bandung. Pasar ikan modern ini dibangun dengan tujuan utama menghilangkan citra masyarakat terhadap pasar ikan yang kotor, becek, bau dan jorok. Penelitian ini dilakukan untuk mengetahui tingkat kelayakan cara penanganan ikan di pasar ikan modern tersebut. Analisis kelayakan cara penanganan ikan dilakukan dengan mengacu pada *checklist* penerapan CPIB yang diatur oleh Kementerian Kelautan dan Perikanan untuk unit *supplier*. Penilaian dimodifikasi dengan skala *Guttman* dan hasil akhir akan

menyimpulkan kelayakan cara penanganan dalam bentuk persentase. Hasil penelitian menyatakan bahwa cara penanganan ikan di PIM Sabilulungan tidak layak dengan nilai kelayakan 40,4%. PIM Sabilulungan disarankan untuk segera dibuat SOP pengelolaan, melengkapi sistem dokumentasi, ketegasan dalam membina pedagang, mengadakan petugas khusus sebagai penanggung jawab mutu, melengkapi dan menata kembali sarana dan prasarana sesuai persyaratan, memberikan penyuluhan mengenai prinsip sanitasi higiene serta pelatihan cara penanganan ikan yang baik.

Kata Kunci: Analisis Kelayakan; Cara Penanganan Ikan; Pasar Ikan Modern

INTRODUCTION

Sabilulungan Modern Fish Market is a fish market built by the Ministry of Marine Affairs and Fisheries located in Soreang District, Bandung Regency, West Java. The construction of this fish market is one of the government's efforts to bring fish closer to the people of West Java, especially the people of Bandung Regency, so that the location of Bandung Regency which is far from the sea does not become a barrier for people to be able to consume protein sources from the sea.

Fish is a food ingredient with a high protein content, but fish is also a food ingredient that is easily degraded (perishable food), in addition, dead fish cannot be improved in freshness, it can only be maintained through good and correct fish handling methods. In the Decree of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia No. 01 / MEN / 2007 concerning Requirements for Quality Assurance and Safety of Fishery Products in the Production, Processing and Distribution Processes, it is reaffirmed the importance of implementing a quality management system in producing fishery products from upstream to downstream. The implementation of this quality management system is one of them in the fish handling unit, namely the fish market. According to Metusalach *et al.*, (2014), fresh fish handling includes all activities aimed at maintaining the quality of fish from the time the fish are caught until they are consumed, which activities include inhibiting the decline in fish quality, preventing contamination and avoiding physical damage to fish. The decline in fish quality and high post-harvest damage are caused by, among others, the method of catching, the method and facilities of handling, and the length of the supply chain. One of the activities involving fresh fish handling is fish handling activities in the market. In Indonesia, fish are widely marketed in traditional markets which are generally depicted as smelly, slippery, dirty and filthy. Traditional market management is not service-oriented, but rather prioritizes income so that building conditions and comfort are neglected (Sulistyo & Cahyono, 2010). In addition, crowded market conditions can cause the market to be unclean if cleanliness is not really considered.

To erase that image, in 2018 the Ministry of Maritime Affairs and Fisheries built the Sabilulungan modern fish market in Bandung Regency as a pilot project. In this modern fish market, fish are handled from the time they arrive until they are sold to consumers or stored again if they are not sold out. The modern fish market is one of the supplier units that must implement the requirements for quality assurance and food safety of fishery products. As stated in the Decree of the Minister of Maritime Affairs and Fisheries Number: 52A/KEPMEN-KP/2013, the requirements for quality assurance and safety of fishery products must be implemented by every fishery business actor, both individuals and business entities. The requirements for good fish handling methods in the supplier unit are regulated in the Regulation of the Head of BKIPM Number: 47/PER-BKIPM/2019.

There has been no study on the feasibility of good fish handling methods in this modern fish market, so this study aims to determine the level of feasibility of good fish handling

methods in the market. By conducting an analysis of the level of feasibility of good fish handling methods, it can be seen the aspects that influence the level of feasibility of good fish handling methods at PIM Sabilulungan, which can then be used as input for improvement.

RESEARCH METHODS

Time and Place of Research

Data collection was conducted in September 2020 for 3 weeks. The location of the research object is the Sabilulungan modern fish market located in Bandung Regency, West Java.

Data Collection Instruments

Respondents to obtain data on the assessment of the feasibility of fish handling methods are stall owners or people who work to help stall owners sell fish who handle fish. One stall can be filled by one to two people. The number of active fresh fish stalls at PIM Sabilulungan is 22 stalls. Researchers use the Slovin formula in determining the number of samples. Quoted from Setiawan (2007), the Slovin formula is used in determining the number of samples.

$$n = \frac{N}{Nd^2 + 1}$$

Description:
N: population size
n: sample size
e: sampling error tolerance limit (10%)

Based on the formula calculation above, the number of respondents taken was 18. Data collection in this study was carried out using a quantitative good fish handling checklist instrument. The conformity assessment refers to the Regulation of the Head of the Fish Quarantine, Quality Control, and Fishery Product Safety Agency Number 47/Per-Bkipm/2019. As shown in Table 1.

Table 1. Aspects assessed in the implementation of CPIB

No	Aspect	Indicator
1	Water and ice safety	Water supply
		Water safety
		Water and clean water contamination
		Ice handling
2	Product contact surfaces	Equipment in direct contact with the product
3	Cross contamination prevention	Handling methods
		Waste handling
		Construction and layout
4	Sanitary facilities	Number of toilets
		Toilet sanitation and cleanliness facilities
		Design and hand washing facilities
5	Employee health and hygiene	Behavior of traders handling the product
		Systems that can prevent employees from getting sick handling the product

No	Aspect	Indicator
6	Sanitary facilities	Prevention measures against the entry of pests
		Measures to eliminate pests
7	Process control	Control and monitoring of the quality and safety of raw materials and auxiliary materials during handling
		Control and monitoring of temperature during handling
		Handling technology
8	Packaging	Packaging
9	Storage	Storage of the final product

The assessment method is measured using the Guttman scale. The Guttman scale used consists of two categories, each category has a different value or score made in the form of a checklist. Based on the explanation of Triana & Widyarto (2013) measurement with the Guttman scale will get a firm answer, namely "yes" and "no". The Guttman scale is presented in Table 2.

Table 2. Guttman Scale

No	Score	Description
1	Score 1	Yes
2	Score 0	No

Data Analysis

The quantitative data analysis method is in the form of percentages and is used to determine the feasibility of fish handling methods. To calculate the average percentage of feasibility, the following formula is used:

$$Results = \frac{\text{Total score obtained}}{\text{Maximum Score}} \text{ x } 100\%$$

The average results of the eligibility categories are based on the criteria referring to Furqan (2017) as shown in Table 3.

Table 3. Criteria for the suitability of handling methods

Score in percent (%)	Eligibility categories
0 - ≤ 34 %	Very unworthy
35 - ≤ 50 %	Unworthy
51 - ≤ 64 %	Less worthy
65 - ≤ 80 %	Almost worthy
81 - ≤100 %	Worthy

RESULT

Of the nine aspects of assessment regarding good fish handling methods, Sabilulungan Modern Fish Market has an unworthy category with an average value of 40.4% as shown in Table 4.

Table 4. Feasibility of CPIB aspects at Sabilulungan Modern Fish Market

No	Aspect	Eligibility (%)
1	Water and ice safety	75
2	Product contact surfaces	38,9
3	Cross contamination prevention	16,7
4	Sanitary facilities	33,3
5	Employee health and hygiene	0
6	Pest control	0
7	Process control	0
8	Packaging	100
9	Storage	100
Average		**40,4**

DISCUSSION

Water and Ice Safety

The average result of the assessment of four indicators on the water and ice safety aspect is 75%. The indicators assessed are water supply (100%), water safety 0%), contamination of dirty water and clean water (100%) and ice handling (100%).

The availability of water for handling purposes and other activities is adequate. The water used at PIM Sabilulungan is fresh water from groundwater drilled around PIM, there is one reservoir to store water before being distributed to the handling area with a capacity of 100 m^3. Water is used as an aid to cooling when fish are stored, washing fish, washing equipment, materials for making ice, media for live fish and toilets.

The water used for handling does not meet safety requirements. The water that will be used for handling fish is only processed by filtering and has never been tested for quality. From the results of physical observations, the water for handling is not clear, has a slight odor and there are small solids coming out of the water hose in the stall used for washing fish and equipment. According to Purnawijayanti (2001), the requirements for water used in food processing are that it is free from harmful bacteria and free from chemical impurities, clean and clear, colorless and odorless and does not contain suspended materials.

There is no possibility of contamination between the dirty water and clean water used. The clean water pipes are separate and there is no cross-connection with the dirty water pipes. The water used to wash the fish is channeled through separate special pipes so that contamination between dirty water and clean water is not possible, the clean water pipe is at the top of the sales stall, while the dirty water pipe is at the bottom of the sales stall area. According to Barang and Saptomo (2019) water pollution is a very important thing to pay attention to.

The ice used for the handling process is in the form of flake ice which is made using a flake ice machine in an area separate from the fish sales area. The ice is brought by fish traders using a cool box to the fish sales area. The ice to be used by traders is placed in special styrofoam for storing ice so that the ice remains clean and does not melt easily. This is in accordance with what was stated by Vatria (2006), namely that ice must be handled and stored in a clean place to avoid external contamination.

Surfaces in Direct Contact with the Product

The average result of the assessment on the surface aspect that is in direct contact with the product is 38.9%. The indicators assessed are equipment that is in direct contact with the product.

The surface condition of equipment that is in direct contact with the product during handling allows contamination to occur. Equipment that has been used such as cutting boards, knives and plastic baskets are not placed in a separate and clean place, equipment for handling fish is not washed immediately after use. This is not in accordance with sanitation and hygiene practices, because less clean equipment can cause products to spoil quickly (Ristyanadi & Hidayati, 2012).

Cross Contamination Prevention

The average result of the assessment of three indicators on the aspect of preventing cross-contamination is 16.7%. The indicators assessed are handling methods (0%), waste handling (50%) and construction and layout (0%).

Handling methods do not prevent cross-contamination. Traders sell fish without using containers and without being given a base, this is because of the limited containers so that traders sell fish directly at the stall without being given a base. Fish that are in direct contact with the stall allow contamination to occur because the stall is filled with water used to wash hands, tools and fish. Poor handling methods cause microbial contamination and the rate of decay becomes faster (Ouadi & Mgawe, 2011).

Fish handling waste is not handled properly and has the potential to cause cross-contamination. Fish handling waste consists of solid waste and liquid waste. Solid waste comes from the process of weeding fish, trash fish (destroyed fish), plastic waste, food scraps, and cigarette butts, while liquid waste comes from water used to wash fish, melted ice and washing handling equipment. Solid waste is disposed of in waste containers provided around each trader's stall, but the waste containers are not kept clean and are not equipped with covers, inviting insects to enter the sales area. The solid waste produced is disposed of in a temporary disposal site located in the market area, while liquid waste is channeled to the IPAL which is also located in the market area, to be processed using a biofilter system. According to Amin *et al.*, (2018), poorly managed waste is a deviation from the implementation of sanitation standards.

The construction and layout designed do not support the prevention of cross-contamination. In the fish handling area, no special place is provided or made to store fish handling equipment, as a result, the equipment is stored on the floor and in random places without paying attention to its cleanliness. The designed building also cannot prevent the entry of pests. Cross-contamination can be prevented by implementing a good layout, in addition, a good layout can also provide a short distance for moving materials and efficient flow of materials (Avianti *et al.*, 2022). The construction of the stalls at Sabilulungan Modern Fish Market can be seen in Figure 1.

Figure 1. Construction of stalls at the Sabilulungan modern fish market

Sanitation Facilities

The average result of the assessment of three indicators on the sanitation facilities aspect at Sabilulungan Modern Fish Market is 33.3%. The indicators assessed are the number of toilets (Y 100%), toilet facilities and cleanliness (0%) and the number, design and hand washing facilities (0%).

The number of toilets at Modern Fish Market Y is adequate. The number of toilets is 30 units with 6 units with a squat design and 24 units with a sitting design, the number of stalls (wet stalls, dry stalls, live fish sales stalls and food courts) occupied at the Modern Fish Market is 83 stalls, plus an average number of consumers of 140 and a staff of 4 people so that the total is 227. If one toilet is for 0-15 people, the number of toilets that must be provided is 16.

The toilet facilities and cleanliness are inadequate and not maintained. The toilet also does not have soap, hand dryers or disposable tissues, the toilet gives a dirty impression, smells bad and is not cleaned properly. According to Flores *et al.*, (2011), toilets are an important means of measuring the quality of sanitation management. The cleanliness of the toilets at the Sabilulungan Modern Fish Market can be seen in Figure 2.

Figure 2. Cleanliness of toilets at Sabilulungan Modern Fish Market

In Sabilulungan Modern Fish Market, hand washing facilities are provided in each stall which is also used to wash fish and equipment but is not equipped with hand washing soap. According to Shojaei *et al.* (2006), washing hands with soap can reduce the frequency of microbial contamination on the hands of food processors in Iran from 109 people to 48 people. The hand washing place at Sabilulungan Modern Fish Market can be seen in Figure 3.

Figure 3. Hand washing area at Sabilulungan Modern Fish Market

Employee Health and Hygiene

The average result of the assessment of two indicators on the aspect of preventing cross-contamination at Sabilulungan Modern Fish Market is 0%. The indicators assessed are the behavior of traders who handle products (0%) and systems that can prevent employees with diseases from handling products (0%).

The behavior of traders who handle products does not maintain individual hygiene and can cause contamination of the fish being sold. Traders do not wear complete work clothes such as head coverings, boots, gloves and aprons. The boots used by traders in fish handling activities are also used outside the market area. Indirect contamination involving fish handlers can occur in two ways, humans acting as vectors and the clothes they wear (Sakriani, 2017). The work clothes of fish traders at Sabilulungan Modern Fish Market can be seen in Figure 4.

Figure 4. Work clothes of fish traders at Sabilulungan Modern Fish Market

There is no system in place to prevent sick employees from handling products. There are no health checks and no records of the fish traders' medical history, so it is not known whether or not there are sick traders handling fish. Supervision of employee health conditions must be considered to prevent contamination. Employee health supervision needs to be carried out periodically (Rianti *et al.*, 2018).

Pest Control

The average assessment of the two indicators assessed in the pest control aspect is 0%. The indicators assessed are preventive measures against the entry of pests (0%) and measures to eliminate pests (0%).

Sabilulungan Modern Fish Market does not have preventive measures against the entry of pests. There are no measures to prevent pests from entering the fish sales area, there are no

insect killers, mouse traps or other facilities that can prevent pests from entering the fish handling area. As a result, pests such as cats and flies enter the fish handling area which have the potential to contaminate the product. There are 8 insect killer units, but they are not maintained and cleaned so they do not function properly and there are no mouse traps and other facilities that can prevent pests from entering the handling area. According to Mohede & Saptorini (2015), one of the food contaminations by *E. coli* bacteria is supported by the presence of flies that carry many sources of contamination from gutters and trash cans.

Sabilulungan Modern Fish Market does not have measures to eliminate pests. Cats roam the fish sales area. In addition to disrupting fish sales activities, pests can also bring dirt from outside which can cause contamination of the fish being sold. Prevention and elimination of pests should not be ignored because pests are one of the biological contaminants that can contaminate products. According to Ristyanadi & Hidayati (2012), pest control needs to be considered because it is feared that contamination from animal waste or diseases that usually attack animals can also be transmitted to humans and are dangerous to product quality. Pests at Sabilulungan Modern Fish Market can be seen in Figure 5.

Figure 5. Pests at Sabilulungan Modern Fish Market

Process Control

The average assessment of the two indicators in the process control aspect is 0%. The indicators assessed are control and monitoring of the quality and safety of raw materials and auxiliary materials during handling (0%), control and monitoring of temperature during handling (0%) and handling technology (0%).

Control and monitoring of the quality and safety of raw materials and auxiliary materials during handling is not carried out periodically. At Sabilulungan Modern Fish Market there is no special unit to monitor the quality and safety of raw materials and auxiliary materials periodically. The Provincial Fisheries Service has conducted quality inspections on fish sold and has not conducted quality testing on auxiliary materials, these activities are also not carried out routinely. The raw materials are fish sold, while the auxiliary materials used are water, ice and salt. Salt is used to cool the fish by mixing salt with water and ice so that the temperature of the fish drops faster. Water is used to wash equipment, hands and wash fish. The safety of the water is not ensured and the salt used as an auxiliary material for handling fish is not handled cleanly, the salt is placed in dirty styrofoam and is infested with flies. According to Nurani *et al.*, (2012), salt water must not be a source of contamination.

Traders are not equipped with temperature measuring devices and do not monitor the temperature during handling, so the temperature of the fish being handled is unknown and the time to add ice so that the center temperature of the fish is not more than 50 C, some traders do not add ice back to the fish being sold after the previously added ice melts.

Fish traders at Sabilulungan Modern Fish Market do not handle fish with appropriate technology. Fish traders only add ice to the fish being sold and stored, while when the fish are sorted, no ice is added, the ice used for handling fish is not enough to maintain the low temperature of the fish. The average comparison of ice used with fish cooled at Sabilulungan is 1:4, the average temperature of fish sold is 11.80 C. Ideally, the comparison between ice and fish marketed during the sales process is 1:1, meaning 1 kg of ice for 1 kg of fish so that the temperature of the fish can be maintained at 0^0 C until the end of the sale (Metusalach *et al.*, 2014). The detection of fish sold at Sabilulungan Modern Fish Market can be seen in Figure 6

Figure 6. Fish detection for sale at the Sabilulungan Modern Fish Market

Packaging

The average assessment result on the packaging aspect at Sabilulungan Modern Fish Market is 100%. The indicator assessed is packaging (100%).

Traders at Sabilulungan Modern Fish Market carry out hygienic packaging, fish packaging is done by putting the weighed fish into plastic provided by the trader. Packaging is done in a separate and clean place. Inadequate packaging of a food product can cause damage to the product (Moniharapon, 2013). Fish packaging at Sabilulungan Modern Fish Market can be seen in Figure 7.

Figure 7. Fish packaging at Sabilulungan Modern Fish Market

Storage

The average assessment result on the storage aspect is 100%. The indicator assessed is the storage of the final product (100%).

Storage is carried out in the hold using a cooling system with the addition of ice and salt to accelerate the decrease in fish temperature and maintain the fish temperature so that it remains low for a long time. The average storage time for fish is 12 hours. Fish storage is able to guarantee the temperature according to the specifications of the fish product. The average storage temperature for fish is -1.3^0 C. The recommended storage temperature for wet seafood is -10 C $\pm$ 5^0 C (Sydney Fish Market, 2015). Materials that can be used as cooling media for handling fish include wet ice, dry ice, cold water, sea water cooled with ice, mechanically cooled sea water, ice plus salt, and cold air (Nugroho & Adietya, 2016).

CONCLUSION

Sabilulungan Modern Fish Market has not met the requirements of the quality assurance system that must be applied to business actors in the fisheries sector. The method of handling fish has not met the requirements with the category of unfit. Aspects that meet the requirements are packaging and storage.

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