Evaluation of salted fish supply chain policy at pasar Lawang Seketeng, Bogor

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Abstract. Bogor is one of trading centers of salted fish for Bogor and surrounding areas. Salted fish products are marine fishery products that are salted and dried. Consumers like the products, but in the market, we could find harmful additives in them. The purpose of this research is to analyze the policy of salted fish supply chain from supplier to final consumer and formulate recommendation related to supervision and improvement of salted fish quality in Lawang Seketeng market, Bogor in order to assure that the salted fish products in the market are safe for people’s health. The results show that there are four types of salted fish products supply chain in Lawang Seketeng Bogor market. Based on the results analysis, it shows that the largest marketing margin does not mean the biggest profits for business actors. The choice of supply chain also depends on sales volume, lead-time, capital and warehouse capacity. The results based on confusion matrix also indicate that not all business actors could confirm the existence of dangerous additive content in their products. Based on SMiE-BAG model, monitoring and coaching system need to be implemented by the Bogor City Office of Industry in order to improve the safe supply chain performance for consumers.

1. Introduction
Salted fish is a product processed from both marine and fresh water fisheries products through salting and drying. Dry fish product should have minimum salt content of 12% of the final product weight [1]. The salted fish products are much favored by Indonesian citizens. Salted fish as a common food eaten with rice, especially for the lower economic level community [2].

There are still many problems found in salted fish products on the market, especially in traditional markets. In addition to inexistence of standardization, salted fish products are still vulnerable to food fraud. One form of food fraud is the addition of formaldehyde to salted fish products because it can prevent deterioration of fish quality, extend shelf life and improve fish appearance [3]. The reason of doing that is low knowledge about the safety of food products and deliberated act due to economic reasons to get greater profit.

Indonesian government is always trying to increase the quality of the food products in Indonesia. One of the quality improvement efforts is development and implementation of Indonesian National Standard (SNI). The SNI 8273:2016 contains standards or salted and dried fisheries products. Unfortunately, the application of this SNI is still voluntary.

Lawang Seketeng market at Bogor city has been known as a center of salted fish trading since 1940. This market serves salted fish trade for Bogor city and surrounding areas. The purpose of this
research is to analyze the policy of salted fish supply chain from supplier to final consumer and formulate recommendation related to supervision and improvement of salted fish quality in Lawang Seketeng market, Bogor in order to assure that the salted fish products in the market are safe for people’s health. In order to do that, we should first identify the supply chain of the salted fish and profit gains at the producers level. Then secondly, identify the policy implementation by interviewing the salted fish sellers’ knowledge and develop recommendation for supervision and improvements of policy implementation of salted fish in Lawang Seketeng market, Bogor.

2. Methodology

2.1. Data collection
Primary data were collected on May until August 2018. For identifying actors, profit gained and understanding’s survey, data are acquired through interviewing the 20 salted fish merchants in Lawang Seketeng market. Experts from National Standardization Body (BSN) and Agro Industrial Center (BBIA) are needed to provide an assessment using confusion matrix.

2.2. Salted fish supply chain and profit gains calculation.
Salted fish supply chain is developed after identifying actors who play a role in salted fish market at Lawang Seketeng, Bogor. The supply chain is analyzed by calculating profit gains. Profit gain is defined as a difference between the purchase or selling price in every marketing actor. The profit is expressed in Rp/kilogram [4]. Considering many variations of salted fish products sold, anchovy (teri nasi) is chosen because it has a high quantity of sales. We consider that the anchovy could represent the common salted fish supply chain at Lawang Seketeng market, Bogor.

2.3. Survey of salted fish SNI implementation readiness analysis
In order to analyze the policy implementation of salted fish products at Lawang Seketeng, Bogor, we should identify first knowledge of regulation applied for salted fish product considering that SNI implementation is still optional, and also the programs that have been done by governments to salted fish products. The survey of salted fish SNI implementation readiness is conducted by interviewing salted fish merchants in Lawang Seketeng Market, Bogor. The questions given during interview were related to the merchant’s knowledge about salted fish products, SNI 8273:2016 and government’s policy implementation concerning salted fish. The result was validated using confusion matrix. Confusion matrix or error matrix is a matrix that describes the number of correct and wrong prediction from a model and compares to the actual condition [5]. Each question correlates to one condition as a comparison result between prediction and actual condition. The result of the confusion matrix is the number of True Positive (TP), False Positive (FP), True Negative (TN), and False Negative (FN).

As mentioned previously, confusion matrix is used to validate the confusion matrix in order to acquire the accuracy. Prediction accuracy is calculated by:

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\text{Accuracy} = \frac{TP + TN}{N} \times 100\% \tag{1}
\]

with TP is the number of true positive, TN is the number of true negative and N is the number of class. There were 7 questions asked to 20 salted fish merchants in Lawang Seketeng.

2.4. Salted fish recommendation formulation
The recommendation strategy is formulated using a descriptive analysis. A common model is developed in order to suggest recommendation to Bogor government in order to increase the readiness level of salted fish SNI implementation.
3. Result and discussion

3.1. Lawang Seketeng salted fish market profile and characteristics

There are 20 salted fish merchants in Lawang Seketeng Market consisting 8 wholesalers and 12 retailers. The main difference between wholesaler and retailer is categorized based on minimum quantity of selling unit, purchase and sales frequency and inventory. The salted fish selling unit of wholesaler is ranging between 0.25 kg to 500 kg, however the selling unit from retailers between 0.25 kg to 1 kg. The purchase and selling volume for every salted fish product varies every day. Just like any other agricultural commodity, fish is a seasonal commodity that is highly dependent to the climate and oceanography phenomenon [6]. Fishes captured by the fishermen can affect the supply of raw fish in the level of salted fish processors. The quantity provided at wholesaler and retailer level is influenced by the availability of salted fish from the processors. The purchase and selling volume are also influenced by the market demand. In one day, retailer can sell 300 kg to 500 kg of salted fish, whereas wholesaler can sell 500 kg to 10 ton of salted fish.

Storage of salted fish is very important process to maintain the flow of sales. Salted fish product that does not contain chemical preservatives and stored at room temperature can maintain its freshness for a week [7]. All wholesalers of salted fish in Lawang Seketeng market have cold storage facilities with different capacity. Retailers do not own a cold storage facility.

3.2. Identification of Actors in salted fish supply chain

Salted fish supply chain describes the relation between actors from the processor of salted fish until it is delivered to the customers. Salted fish marketing chain generally consists of fishermen, salted fish processors called pengasin, and salted fish sellers (distributors, wholesaler and retailers). Every actor has different roles. Fishermen catch fishes from the sea. Pengasin processes raw fish into salted fish. The main steps of making salted fish products are salting and drying. Every actor in the marketing chain can do activities that can potentially harm the consumers. There are three types of food frauds; full or partial substitution of food and addition of harmful substances to conceal bad quality of food product, removal of valuable substances in food ingredient or product, and false claim upon a food ingredient or product [8]. Those frauds that are done to get an economic benefit are called Economically Motivated Adulteration (EMA). The form of EMA that can possibly be conducted by the salted fish maker is the addition of formaldehyde to prolonged the shelf-life, improve the fish’s appearance, and reduce weight loss during the drying process [9]. EMA action that could possibly be conducted by the salted fish merchant is rewashing and re-drying the fish to conceal its deterioration.

3.3. Supply chain and profit gains analysis

Based on the actors identification, we could present 6 parties involved in salted fish supply chain; fishermen, pengasin, distributors, wholesaler, retailer and customers. Since this research is focused on salted fish products, the supply chain begins from the processors of salted fish (fishermen are excluded from the actor), called market chain. We could identify four types of market chain at Lawang Seketeng market in Bogor.

The first type of salted fish market chain begins with pengasin, wholesaler, retailer and customer (presented at figure 1). As shown in the figure, wholesalers purchase salted fish directly from the salted fish processor (pengasin). Pengasin are located near the beach from several places in Indonesia, namely Lampung, East Java, Papua, and Belitung. Wholesalers market their products to retailers in Bogor area and retailers sell the products to customers. With this pattern, it is known that the purchasing price of salted fish in the wholesaler level is Rp 80,000.00 to Rp 85,000.00 and the purchasing price in the retailer level is Rp 83,000.00 to Rp 95,000.00 per kilogram. This shows that the profit gains in this type is Rp 3,000 to Rp 5,000.
The second type of the salted fish market chain begins with distributors, wholesaler, retailer and customers. Wholesalers buy salted fish products directly from distributors in DKI Jakarta Province, especially in Muara Angke and Pantai Indah Kapuk area. Wholesalers buy salted fish product for Rp 80,000 to Rp 100,000 per kilogram and sell it to the customer for Rp 83,000 to Rp 105,000 per kilogram. Marketing margin for this type is Rp 3,000 to Rp 5,000 per kilogram, which is the same number with those in 1st type chain. There are several considerations for the wholesalers choose 2nd type of market chain that are: easy to choose products, short lead time, and cheap shipping cost. The second type of market chain is presented at figure 2.

The third type of salted fish market chain begins with distributor, retailer and customers. Retailers buy directly from distributors and sell to customers. The selling price of one kilogram of salted fish in distributor is Rp 85,000 to Rp 100,000 and the selling price is Rp 90,000 to Rp 100,000. The profit for the retailers is Rp 5,000 to Rp 10,000 per kilogram.

The last type of salted fish market chain begins with wholesalers that sell directly to retailers. This is the common type used by the small retailer at Lawang Seketeng market. The selling price of one-kilogram salted fish in wholesaler level is Rp 85,000 to Rp 105,000, while the selling price in retailer level is Rp 90,000 to Rp 120,000. The profit gains in the retailer level for this type are Rp 5,000 to Rp 15,000.
Figure 4. Fourth type of salted fish maker chain at Lawang Seketeng, Bogor.

Based on the salted fish marketing chain identified, we could see the difference of profit gains. The fourth type of marketing chain gives the highest margin, but surprisingly it is not the best choice preferred by the sellers of salted fish. This can be shown if we compare it with the income per day (Table 1). Profit is calculated by multiplying sales volume with the margin [10]. Based on the table we can see that type I gives more profit compared to other types of marketing chains. This also shows that besides margin, there are others factors involved in determining the profit: sales volume, warehouse capacity and ease of purchase. Warehouse capacity is very important if sellers buy salted fish in a large quantity. Ease of purchase also plays an important role for sellers to determine whether they want to buy from the distributors or from the wholesaler.

Table 1. Comparison of profit gains of marketing chains at Lawang Seketeng market.

| Market chain | Margin (Rupiah/kg) | Sales volume (kg/hari) | Income (Rupiah/hari) |
|--------------|--------------------|------------------------|----------------------|
| TYPE I       | 3.000 - 5.000      | 8000                   | 15,000,000 - 25,000,000 |
| TYPE II      | 3.000 - 5.000      | 500                    | 1,500,000 - 2,500,000 |
| TYPE III     | 5.000 - 10.000     | 300                    | 1,500,000 - 3,000,000 |
| TYPE IV      | 5.000 - 15.000     | 100                    | 500,000 - 1,500,000   |

3.4. Survey result of SNI 8273:2016 implementation readiness level and validation

As mentioned above, the survey is conducted in order to identify the knowledge of salted fish sellers concerning regulations applied for fish salted products. Seven questions are asked to 20 salted fish merchants in Lawang Seketeng market that have different education backgrounds. The first question is about the knowledge of SNI in general. The second and third questions are about salted fish SNI, the fourth and fifth questions are about the socialization and monitoring programs from the governments. The sixth and seventh questions are about the awareness of product safety. Table 2 shows the results of the answer and the accuracy of prediction using confusion matrix.

Table 2. Result of survey and prediction accuracy.

| No | Question has been asked                             | Act YES | Act NO | Accuracy of prediction |
|----|-----------------------------------------------------|---------|--------|------------------------|
| 1  | Do you know about SNI in general ?                  | 6       | 14     | 30%                    |
| 2  | Do you know about the SNI for salted fish ?         | 0       | 20     | 70%                    |
| 3  | Do you implement the SNI for salted fish for quality assurance? | 0       | 20     | 100%                   |
| 4  | Has there ever been an inspection from the authorities ? | 3       | 17     | 85%                    |
| 5  | Have you ever received socialization from the authorities ? | 0       | 20     | 100%                   |
| 6  | Do you know the presence of ingredients in the product you sell? | 4       | 16     | 35%                    |
| 7  | Are you sure about the safety of the salted fish you sell ? | 9       | 11     | 65%                    |
For the first question, the “Yes” answer means the respondent knew about SNI in general, as for “No” means the respondent did not. Not all high school graduates and undergraduate that were in salted fish business knew about SNI in general. Actual condition shows that 70% of the merchants did not know SNI in general. This indicates the low knowledge of merchants about SNI. The accuracy of the prediction was 70%, showing that education background influences the knowledge level of merchants. Based on the first confusion matrix, it could be predicted that the knowledge of SNI 8273:2016 about salted fish is also low.

The second and third questions respectively aim to test the knowledge of Salted Fish SNI and to identify the implementation of Dried Salted Fish SNI on the products marketed in Lawang Seketeng Market. Based on the result of the first question, it is predicted that 6 merchants who had already known SNI generally would know Dried Salted Fish SNI. Surprisingly, in the actual condition no merchants know about the Salted Fish SNI, giving the prediction accuracy only 70%. Getting the results of salted fish SNI knowledge, we could predict that nobody implements the salted fish SNI. It is proven that the accuracy level for the fourth question is 100%. The non-implementation of SNI for salted fish in the products at Lawang Seketeng market show that the quality and safety of the products circulating in Lawang Seketeng market are not yet known.

The fourth and fifth confusion matrix is related to government’s role in monitoring the policy implementation related to the distribution and sales of salted fish in the markets. The fourth question aim to identify whether the merchants had received a direct inspection from the authorities. The prediction accuracy was 85%. The interview result showed that 3 merchants had received an inspection towards the marketed products, but the other 17 had never received such inspection.

Interview was also given to all merchants regarding to whether the merchants had ever received any socialization about food quality and safety from the authorities. Accuracy of the fifth prediction was 100% because result show that no merchants had received any form of socialization from the authorities.

Most of the merchants in Lawang Seketeng market have been operating in the business for more than 5 years, so we could predict that most of them knew about harmful substances in the product based on the experience on handling the salted fish trade yearly. Four merchants were predicted not knowing because their experience in the business had not reached 5 years. The accuracy of this prediction was 35%. This shows that the business age does not guarantee the knowledge regarding the harmful substances in the products.

Twenty salted fish merchants in Lawang Seketeng market were also interviewed regarding their confidences about their products’ safety. It was predicted that no merchants were confident about the products’ food safety. The prediction was based on the lack of knowledge about Dried Salted Fish SNI. The actual condition showed that, 9 merchants were confident that their products are safe, on the contrary, the other 11 were not sure about that. The prediction accuracy was 55%, showing that the confidence of merchants about their products was not fully influenced by their knowledge about Dried Fish SNI.

All seven confusion matrix results indicate the low level of knowledge of the salted fish products quality. This shows the not-readiness of merchants to implement Dried Salted Fish SNI. The lack of socialization and inspection from the authority was suspected to be one of the reasons for the lack of knowledge of salted fish merchants in Lawang Seketeng market. The good quality of salted fish products is needed to protect consumers. The effort of quality improvement must involve all actors in the supply chain, not limited only to the fishermen and the salted fish craftsmen.

3.5. Dried salted fish SNI implementation in Lawang Seketeng Market strategy recommendation

Based on the result of SNI implementation readiness level, we discovered that the knowledge of salted fish merchants in Lawang Seketeng market regarding to the standardization and quality is still low. Because the basic knowledge is still low, the recommendation model should be considered on improving the knowledge of salted fish, then socialize the program developed for salted fish products and lastly monitor and evaluate the completion of the program. All stakeholders related to salted fish
that have been identified previously should be involved in this operation in order to increase the
knowledge of the salted fish sellers including the safety of salted fish marketed.

The governments, in this case the National Agency of Drug and Food Control (BPOM), Industrial
Service of Bogor City (Dinas Perindustrian Kota Bogor), Ministry of Marine and Fisheries (KKP),
and Ministry of Industry (Kemenperin), have not done any socialization or inspection in the last 10
years. Industrial Quality Management Assessor in Agro Industrial Center (BBIA) and a staff of Center
for Standard Application Systems and Complaint Handling at the National Standardization Agency
(BSN) were functioned as experts to identify the perspective of two government instances in the effort
to implement SNI.

BBIA is one of the internal units of the Ministry of Industry that reside in Bogor City. BBIA does a
consulting service for industries through certification process, especially for industries located in
Bogor area. Beside the consulting services, BBIA also gives socialization for the merchants in
traditional market and for the society upon the invitation of Regional Government. Socialization that is
delivered consists information about food safety and Good Manufacturing Practices (GMP). Until
now, there is no socialization conducted for salted fish merchants.

BSN is responsible for supervising, developing, and coordinating the activities in standardization
nationally. BSN also gives a socialization function regarding the introduction of SNI, especially the
compulsory ones. Socialization is usually done with the specific SNI formation technical committee. It
is usually targeted to the industry, testing laboratory, product certification body, and the society. The
biggest constraint in the socialization program is time and cost constraints, so socialization needs to be
done based on its priority level. The type of food SNI that becomes a priority is the ones whose level
are increased from voluntary into compulsory, for example biscuits, instant noodle, bread, canned
tuna, and instant coffee. Dried Salted Fish SNI is voluntary based, thus it has not been the priority of
BSN to socialize about it.

Even though Dried Salted Fish SNI has not become a priority, its implementation will be very
beneficial to protect customers and increase the product competitiveness. To achieve that, the
coordination between government and salted fish merchants as the business is required. The fraud risk
that can threat the food safety can occur in the wholesaler and retailer level. The monitoring in the
form of inspections that has been done in other cities in Indonesia has not been effective without the
prior socialization and education.

Government needs to put its attention by partnering with salted fish merchants and academicians.
The relationship between the three actors consist of three functions; socialization, monitoring, and
evaluation. The importance of synergy between A (academicians), B (business), and G (government)
in fostering the creative industry [11]. The three actors must be able to work together to build an
innovation system that is strong and sustainable. This concept is named triple helix. Academicians of
university have a role in the development of innovation through sustainable education, training, and
supervision to the creative industry [11]. Academician is not limited into students, lecturers, or
researchers. It can be from university or research body like BBIA.

In order to increase the competitiveness of salted fish especially at Lawang Seketeng market, Bogor
a specific model called SMiE-BAG model has been developed. SMiE-BAG is the abbreviation of
Socialization-Monitoring in Implementation and Evaluation program conducted by three actors,
Business (salted fish merchants), Academicians and Government of Bogor. The SMiE-BAG model is
presented at figure 5.
Based on the figure, we know that the first function is socialization. Socialization can be in the form of seminar and training about hygiene and sanitation, management, standardized packaging and storage, food safety, and food safety certification application procedure. For socialization program three actors are involved. Government can socialize the policy and or the SNIs for the business party. Academicians can also provide socialization of information about technical information to the business party. The relation between government and academicians can be in form of collaboration, socialization program can be delivered directly by the government as the policy-maker or by academicians to the salted fish merchants.

The second function is Monitoring in Implementation. Monitoring is gathering information regularly to ensure that a job is on track and measure its progress [12]. Supervision can be carried out directly and/or indirectly. Direct supervision means the government conducts field inspections of salted fish merchants through interviews and observations. This direct supervision can be carried out by relevant government agencies. Indirect supervision means that the government receives progress reports from the results of socialization by academics. During the supervision process, business actors can consult with the government and/or academicians. For this function, the direct parties are Government and Business party; Academicians can give suggestion or consultancy to both parties.

The last function is evaluation. Evaluation is an in-depth study to assess and measure achievements, changes, and get learning. The aim is to improve group performance and maintain the sustainability of the results of activities [12]. Evaluation of the salted fish quality improvement is related to the follow-up of previous activities.

The government and academics conduct an evaluation of the socialization program that has been given previously. The government evaluates directly to the business of salted fish. Evaluation is based on predetermined indicators. Evaluation results can be used as a basis for decision making for program evaluation and for subsequent policy planning. Salted fish merchants can consult the government in implementing quality improvement and certification efforts.

Based on the marketing chain analysis, 10 retailers of 20 salted fish merchants in Lawang Seketeng market get its supply from the wholesalers in the area. This shows a dependency of retailers to the wholesalers. Conducting a socialization, monitoring, and evaluation program with SMiE-BAG model, the first target should be the wholesalers. Wholesalers are more ready to receive socialization and do a quality improvement as well as implement SNI because they have more capital, larger selling volume, and more adequate facility. Wholesalers also have bigger influence on the retailers in Lawang Seketeng Market. By doing this there will be an acceleration of time of implementation for achievement of success.
4. Conclusion and recommendation

The actors in the salted fish marketing chain are fishermen, salted fish processors, merchants, and consumers. There are four types of marketing chains in the distribution of salted fish at the Lawang Seketeng market, Bogor. Every business actor has consideration in choosing marketing channels, including; sales volume, capital, ease of purchase, and warehouse capacity. Greater marketing margins do not mean greater profits for business but depend on sales volume per unit time.

Interviews with salted fish merchants that have been validated with confusion matrix show that the knowledge of salted fish merchants in the Lawang Seketeng market regarding SNI and the quality of products sold is still low, indicating the not-readiness of salted fish merchants to apply Dried Salted Fish SNI. Currently the Dried Salted Fish SNI is still voluntary, so it has not become a priority in its application. Improvement of knowledge and product safety are the priority programs for the salted fish sellers.

The SMiE-BAG model could become solution for increasing the salted fish quality sold in Lawang Seketeng market, Bogor. The model proposed collaboration of three parties; Business parties, Academicians and Government with three functions; socialization, supervision and evaluation. These three functions can be targeted first to wholesalers at Lawang Seketeng market as actors who are considered more prepared and influential.

The marketing chain of salted fish is analyzed using marketing margins and only focuses on salted fish traders. Further research should involve efficiency of the marketing chain for salted fish products. Besides that, it is better to involve the fishermen in the SMiE-BAG model in order to complete the role of each actor.

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