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Halal Products Assurance Policy Model and Its Impact on Sustainability Fish Ball SMI with Dynamic System Simulation Approach

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Abstract

Indonesian government requires all products distributed and traded in Indonesian territory are halal certified. However, the ability of Small and Medium Industries (SMI) to implement this law of halal product assurance is relatively low. For this reason, it is crucial to review the application of halal assurance policy on the sustainability of fish ball SMI since fish ball grinding process is usually performed in public places, so that it is relatively risky to be contaminated with non-halal product. The objective of this research is to establish halal product assurance policy model and its impact on the sustainability of fish ball SMI. The approach used to review SMI policy and sustainability model was dynamic system simulation method supported by Vensim software. Dynamic system simulation generates two scenarios; the first scenario was fish ball SMI that applies halal assurance, and the second scenario was fish ball SMI that does not apply halal assurance and standard under the competitor. The simulation result showed that halal assurance gives better market share value that leads to the increasing operational cost variable, followed by the significant increase of business cash and better sustainability in the business. Therefore, the SMI actors will be able to comprehensively understand their obligation to comply with the government regulation which stated that all products distributed in Indonesia are required to have halal certification and it should be able to keep the sustainability of fish ball SMI.
Keywords: dynamic system, halal control point, model, policy, sustainability

INTRODUCTION

In 2030, Moslem population in Indonesia is projected to increase around 30%, while the world population growth increases 23% or 1.8 billions people (Omar & Jaafar, 2011). As the Moslem population growth in Indonesia increases, the demand of halal food is also growing. Halal food issue becomes more prominent since this aspect is not only about a religious practice for Moslem but also about the highest food quality concept that can assure general food quality (Pujianto, 2014) as well as guarantee the quality, security and cleanliness of what the people consume every day (Ambali & Bakar, 2014). Halal guaranteed products is the main requirement to be accepted by Moslem consumers in Indonesia (Riaz & Chaudry, 2004), so that the necessity and demand of halal certification are increasing in Moslem and non-Moslem countries (Fathi et al., 2016). Halal certified products symbolized in halal logo will promote consumers' trust as this indicates that the ingredients and production process used here is in accordance with the requirements stipulated by Sharia Law (Yunos, Mahmood, & Mansor, 2014), in which current parameter in assuring high quality and safe food can be seen from the halal assurance that is shown by halal label in the product.

Halal label does not always assure that a product in the packaging is halal. Misuse of halal labelling is often conducted by cheat manufacturers, where they substitute the composition of the ingredients after obtaining halal certification or falsify halal label of their products (Nuryati, 2008). This occurs on halal-labeled food product containing lard that is usually found in the community (Hilda 2014). Similarly, frozen food products that widely spread over society also do not have MD distribution license, yet the halal label is attached (Maryati, Syarief, & Hasbullah, 2016). Based on Alqudsi's (2014) observation, consumers' knowledge of Halal products is limited, so that they have no doubt on the authenticity of halal logo stamped in the package and they are pretty sure that the product they buy is halal. This is because the community considers that each product produced by Moslems is always halal

(Gillani, Ijaz, & Khan, 2016). For that reason, this phenomenon is used by cheat manufacturer to falsify halal guarantee. Any case on halal assurance falsification has leads the government to enact Law Number 33 Year 2014 on Halal Product Assurance that requires all distributed and traded products within Indonesian territory to be halal certified. As a consequence, all products distributed in Indonesian territory must be halal certified. This applies not only for large scale enterprises, but also for small and medium-sized manufacturing enterprises which are obliged to earn halal certification.

According to a number of researchers, halal certification is vital to SMI for the sake of their production sustainability. This is in line with the result of Ali & Suleiman's (2016) research which stated that halal standard influences the sustainability of SMI's production result. Similarly, Rahmat, Chew & Hamid (2014) also mentioned that the sustainability of food production needs to be fully considered, as the increased population and consumption growth for the next 40 years will contribute to the national food demands. Ahmed et al., (2019) argued that in assuring halal products, public information transparency and the industries readiness to show the production process and ingredients used are highly needed, so that the consumers have no doubt on the halal product they consume, and food safety contributing to halal product sustainability can be maintained.

According to Ni'mah, Nur & Aibak (2018), the capability of small and medium industries (SMI) in realizing Law of Halal Product Assurance is still low and full of doubt. Nusran & Jamran (2015) and Waharini & Purwantini (2018) also state that the level of halal certification ownership is relatively low. This is due to high cost and complicated document that is needed to be fulfilled by the SMIs to obtain halal certification (Maryati et al., 2016). Additionally, it is also caused by one of the requirements stipulated by Indonesian Ulama Council (MUI) that is Traceability system (Handayani & Haryono, 2018). For this reason, Nusran & Jamaran (2015) make serious effort to increase the amount of halal certified product by arranging a policy on halal products. Masruroh et al., (2017) analyzed the government policy in organizing halal certification as the form of Islam practice implementation. Similarly, Khalid (2016) stated that food safety policy is able to cooperatively manage the halal assurance control system to met the national food safety.

A lot of researches have discussed halal certification for SMI related to halal assurance policy, production sustainability, but those researches have not considered the sustainability impact for SMI that does not have halal certification. Thus, this research will review halal assurance policy and its impact on SMI that is applying halal certification and SMI that is ignoring halal certification on the SMI sustainability. It is expected that small industry actors understand the impacts of the existence or the absence of halal certification for its business sustainability.

The approach used in reviewing SMI policy and sustainability model is dynamic system simulation method. Dynamic system is believed to be the best method to solve complex system problems in the real world that emphasizes on the policy which can be modeled (Richardson & Pugh, 1986). In a similar way, Bouloiz et al. (2013) used dynamic system in modeling industry system activity. Besides, this dynamic system can be used to evaluate and fix a system policy (Nuhoğlu & Nuhoğlu, 2007). In the same way, Nusran & Jamaran (2015) used dynamic system to arrange a policy to improve halal certification. Similarly, Skandhakumar et al. (2018) creates security policy model for access control system with new operational scenario. Xu & Szmerekovsky (2017) applied dynamic system to evaluate policy alternative related to food in a long-term and medium-term.

The implementation of dynamic system can be used to model the policy and also to analyze the sustainabilty of a system. This is proven by Shamsuddoha (2015), who made a supply chain integration model for manufacture sustainability. Similarly, Bastan et al. (2018) used dynamic system model in developing sustainability in agriculture industry. Further, Orji & Wei (2015) used dynamic modeling in their research in sustainability green manufacture, since the dynamic system is an approach to investigate behavior dynamics on the system changes that complies with system variable changes (Sterman, 2000). Thus, dynamic system approach can be applied to model a problem's policy in reality (Forrester, 1999).

The objective of this research is to arrange halal assurance policy model and its impact on fish ball SMI sustainability, by using dynamic system simulation. It is considered necessary to apply halal certification to fish ball products since it has high halal control point (HCP). This is due to high risk of haram risk in fish ball that is contained in meat and other ingredients of fish ball dough. Besides, the production sites that

ignore hygiene aspect will lead to a chance of contamination of fish ball dough. For this reason, halal assurance policy model and its impact on the fish ball SMI sustainability can support government program to require all food industries to have Halal certificates from MUI.

METHODS

The stages performed in halal assurance policy model and its impacts on the SMI product sustainability were divided into several stages: (1) Model formulation, (2) Causal loop diagram completion, (3) Model verification, (4) Stock and Flow Diagram, (5) Model Validation, and (6) making model scenarios.

1) The first stage was model formulation by creating initial conceptual model, which reflected the connection between main variables that form the model. Then, initial causal loop was created to reflect more details on the causal effect relation among variables. From this stage, some cause and effect diagrams were obtained to be the underlying aspect of creating stock & flow diagram. Causal loop diagram was made by using Vensim™ software.
2) The second stage was the completion of causal loop diagram. From the arranged causal loop, the mathematic formulation of the cause and effect was created to represent the real condition of the data with the observation data as its formulation basis. In this stage, some simulation model plannings were made by stock and flow diagram concept using Vensim™ software. The first step was designing a loop and entering its mathematics formula. The mathematics formula was made by analyzing the data. Afted considered appropriate, then it should be continued by adding the next loop in the simulation file. These steps were performed until all influencing entities have been entered in simulation model, and the model is ready to operate.
3) The third stage was verification of the model to inspect whether the model is error-free. Verification process was performed by using Vensim simulation software, by doing formulation inspection (equation) and also inspecting variable unit of the model. If there was no error found in the model, the model could be considered as verified.
4) In the fourth stage, stock and flow diagram was created. This stage was based on the final causal loop diagram, and then dynamic system diagram was made using Ventana Simulation (Vensim) software, that was stock and flow diagram. In this stage, formulation in the model was arranged in accordance with the information that had been previously known, and continued by verification and validation process. Information collection was performed through interview and questionnaire distribution
5) The fifth stage was a model validation where this validation was used to compare model structure and system behaviour in the real condition so that it is safe to say that the model can represent the real system. The applied method for validation process is white box validation and black box validation. These tests are including in white box validation:

a. Structure Validation Test

This test was performed by ensuring the model structure in accordance with the real system. This activity was the easiest step to do by ensuring model by model conceptual and confirming our model to users performing this model in the real world.

b. Model Parameter Test

This test was conducted by operating the available “synthesim” facility in Vensim to figure out whether the sensitive parameter really has a significant impact on model behaviour changes. Synthesim mode will appear when automatically simulate on change menu is pressed.

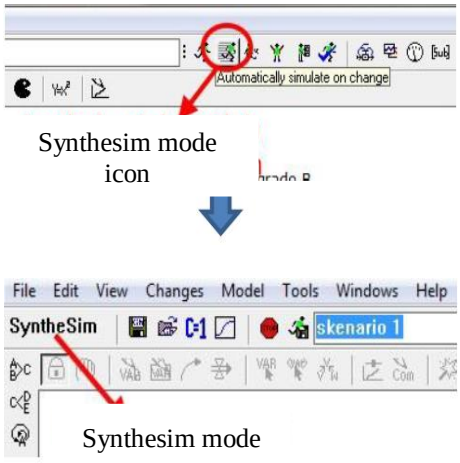

Figure 1 Move to Shynthesim Mode

c. Boundary Adequancy Test
d. Extreme Condition Test

Black box validation is a quantitave testing process in dynamic system modeling (Barlas, 1996) which is conducted by:

i) Mean Comparison with validation value < 10%
ii) The comparison of amplitude variations (% error variation) with the validation value of < 30%

6) The sixth stage was the creation of model scenarios where some simulations, evaluations and analysis were applied to obtain some influence reflection on the created model. Eventually, the best scenario will be selected in compliance with the provisions.

RESULTS AND DISCUSSION

Causal Loop Diagram

Causal loop diagram is a conceptual model depiction of the real system and formed based on the identified main variables. Causal loop diagram showed cause and effect relationship among variables that is reflected by arrow and the positive or negative link will be determined in all direct association of each variable (Orji & Wei, 2015). Positive arrow represented directly proportional relationship, where adding variable's value will lead to increasing value on the impacted variable.

Variable link and impact on the system behaviour can be understood through causal loop diagram. All influencing variables on the issues were involved in the model, while several variables in causal loop diagram showing feedback relationship showed by two left-right arrows will be depicted as level/stock in the model simulation. From the result of this stage, some cause and effect diagrams were obtained to be the underlying aspect of creating stock & flow diagram. Causal loop diagram was made by using Vensim™ software. Causal loop diagram of halal assurance policy is shown in Figure 1.

Figure 1 shows how causal loop diagram formed. For example, selling price is affected by buying interest and production amount. On the contrary, buying interest is affected by the competitor price, product demand amount, competitor halal assurance, consumer halal awareness, halal assurance, selling price. In causal loop diagram formed, there are four closed loops reflecting each condition in the real system. Therefore, four closed loops those are production amount closed loop, buying interest closed loop, halal assurance closed loop and income closed loop.

Halal assurance causal loop diagram or cause and effect diagram is formed from the main process of production amount and – selling – income – production capital that form a positive loop, which means that the process is ideally interconnected. In the real system, the cause and effect is not only in the circle. There are other influencing factors. Selling price as a result of the production cost is the direct impact that can reduce loop reinforcement. An increase on operational cost can affect selling price. This influences consumers' buying interest. Consumers' buying interest is one of the important determinants on the selling level.

The result of reference review and direct obsevation shows that there are two aspects that weaken each other when halal impacts of society's buying interest recorded. Trust level of a product halal status positively influence on society's buying interest.

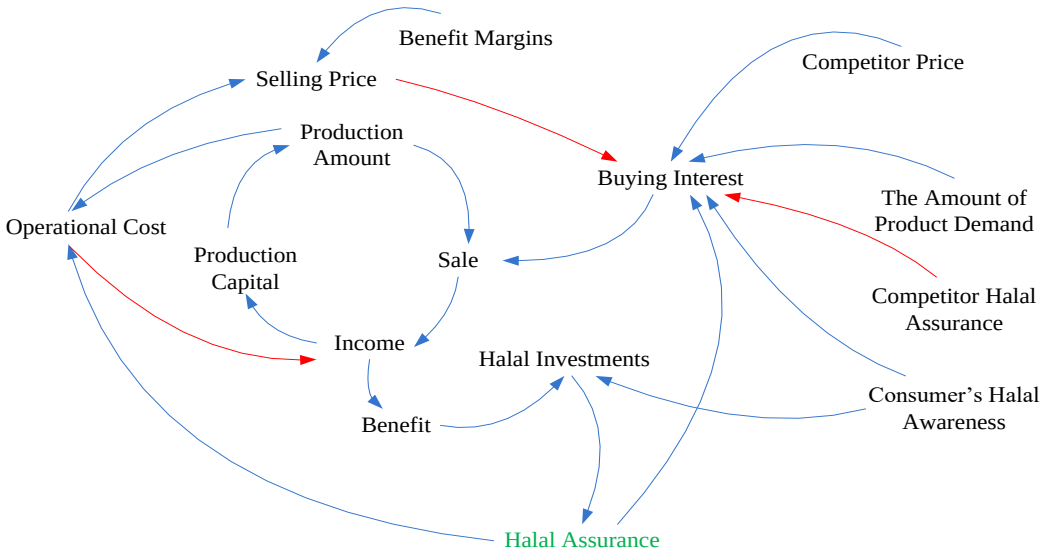

Figure 1. Causal Loop Diagram Halal Guarantee

On the contrary, improving halal level will bring impact on higher operational cost. Operational cost directly influences society's buying interest that leads into declining society's buying interest if the price is increasing. These two variables can influence sale process, if halal value is considered higher then buying interest is eventually still increasing. But even so, if consumers are more concerned on the price of halal trust level, then buying interest will decline.

The halal awareness level of the society tends to increase from time to time. So that halal preference versus current price will be different from halal preference versus future price. The competitors of fish ball seller will also influence buying interest and some of the sellers increase its halal trust level with halal certification.

The following simulation is used to expect the sustainability of Fish Ball SMI in the next ten years if they do not apply the halal process. Closed loop can be explained as follows:

1. Closed loop of the production amount is the negative closed loop showing system behaviour which tries to achieve certain ideal value.

Table 1. Variable identification

No	Variable	Description	Unit
1	Base Capital	Current capital (existing cash)	Rupiah
2	Raw material cost	Raw material purchasing cost	Rupiah
3	Energy cost	Salary, etc.	Rupiah
4	Production cost	Electricity, building	Rupiah
5	Selling price		Rupiah
6	Competitor selling price		Rupiah
7	Sales rate	The amount of product sold per month/year (portion/kg)	Portion/kg
8	Cost of halal assurance registration	Scale of 1-5 related to halal cost, the higher the cost, the better 0. 0 Rp 1. Cost of BPOM registration 2. Cost of MUI halal assurance registration	Rupiah
9	Additional cost of halal raw ingredients	Additional cost as a consequence of raw ingredients	Rupiah
10	Additional cost of halal production process	Additional cost of halal production process noticing halal status	Rupiah
11	Market share		Percentage
12	Competitor amount		Unit
13	Competitor price		Rupiah
14	The amount of competitor having halal assurance		Percentage
15	Halal awareness level	The scale of 1-5 on halal awareness, the higher the scale, the better the awareness 0. Do not understand at all 1. Understand about halal and haram products, but do not care about that 2. Slightly care, as long as the seller is Moslem 3. Need a reference from local religius leaders 4. Approved by BPOM 5. MUI Halal Mandatory	Scale
16	Halal registration duration	The duration required for obtaining MUI halal assurance, the time needed from the scale of 1-5 of halal preference	Time (month/year)
17	Halal preference scale	0. Non-Moslem without label 1. Abangan Moslem 2. Shayari outfit Moslem 3. Approved by local religius community 4. Halal assurance from BPOM 5. MUI Halal Mandatory	Scale

2. Buying interest loop reflected benefit flow in positive halal assurance that shows an increase in system behaviour if there is changing variable.
3. Halal assurance loop showed cost positive loop.
4. Income loop, negative closed loop which shows the relationship between sale and production amount.

In Table 1, halal assurance management variables include several points, such as a) cost of holiday greetings, b) cost of Moslem dress, and c) inviting ulama in salvage event are the identity of Moslem fish ball sellers. Therefore, the consumers feel assured if fish ball is halal, although fish ball SMI does not have halal certification. That identity shows that Moslem feels sure that the product they buy is halal, since the seller identity is Moslem. Moslem consumers believe that Moslem sellers will not mix their products with haram ingredients as they comprehend the consequence of prohibition on consuming food containing haram ingredients. Thus, the cost incurred is not only a halal assurance cost, but also additional cost in attribute fulfillment as a Moslem. But even so, halal label is quite important to indicate a product quality (Ambali & Bakar, 2014). Particularly, when it is combined with 'thoyyiban' which means that it is safe to consume (Halim & Salleh, 2012). This is proven by the result of Stitou & Rezgui (2012) research which states that 56% of 223 respondents will not buy a product if they are in doubt about the halal status of the food product.

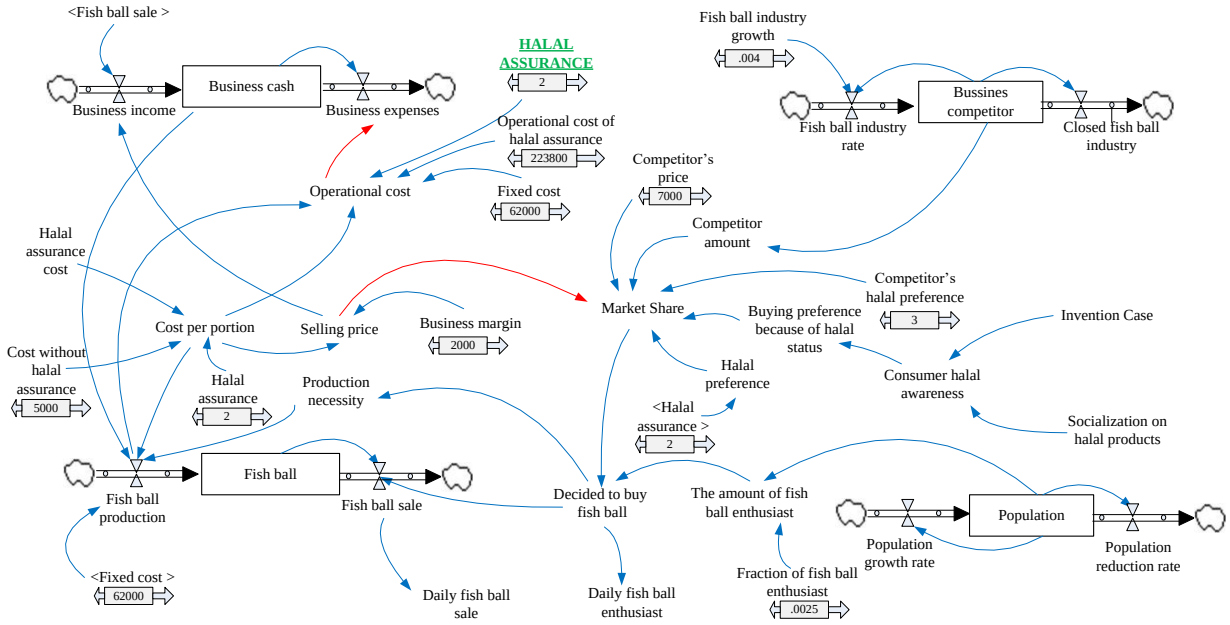

Figure 2. Stock & Flow Diagram of Fish Ball Halal Assurance

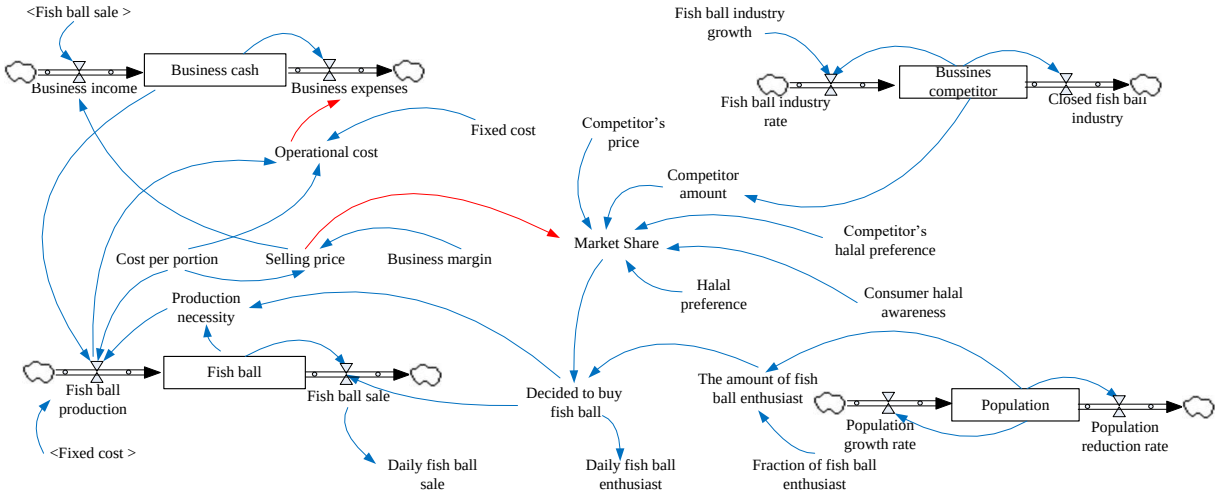

Figure 3. Sub-model of Fish Ball Halal Assurance

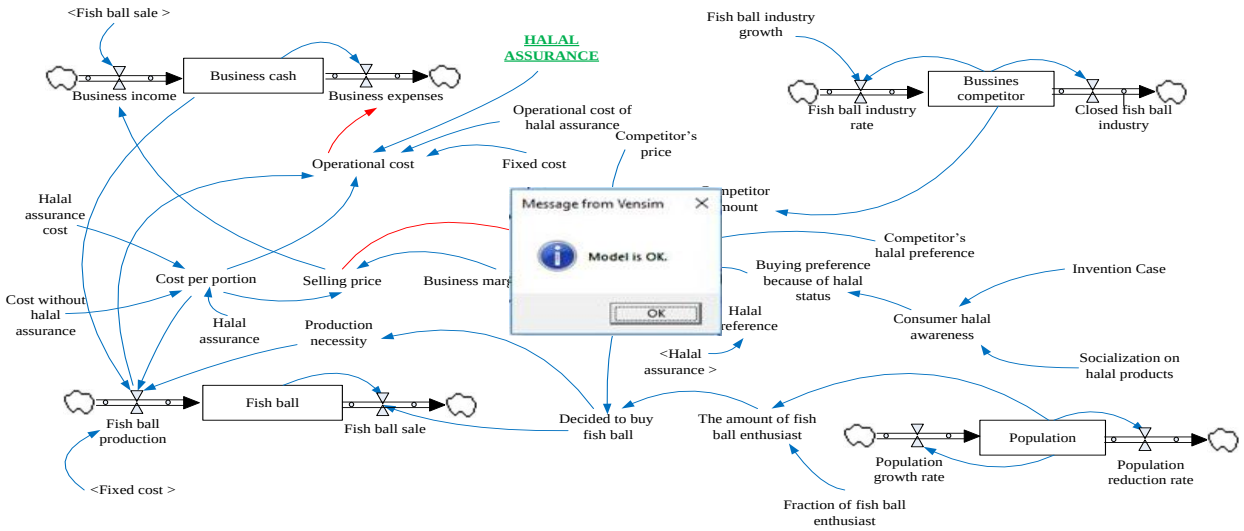

Figure 4. Model Verification

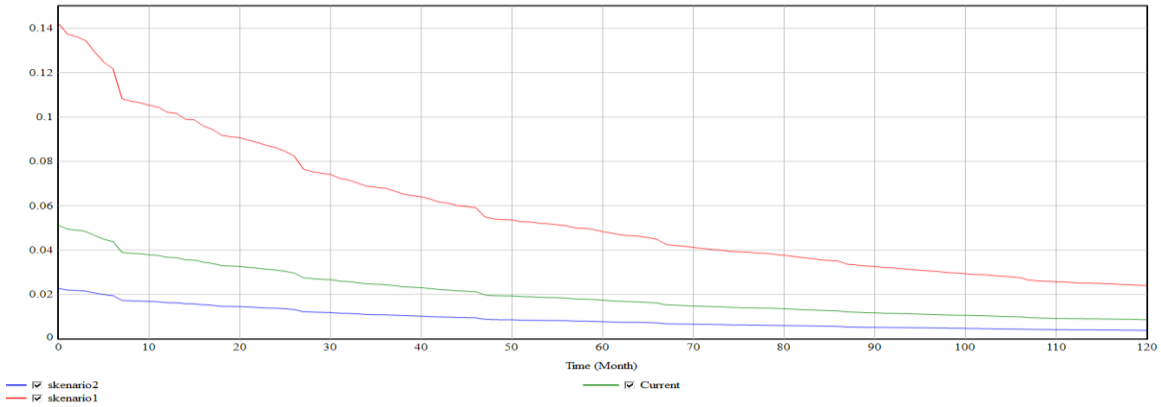

Figure 5 Market Share Graphic of Fish Ball SMI

The Arrangement of Stock and Flow Diagram

Creating stock & flow diagram is started with developing cause and effect diagram on the conceptual model. The development was conducted from field observation result and expert discussion. In details, the relationship of each variable is explained in the stock & flow diagram of each sub-model. Stock and flow diagram is arranged into several parts to ease the understadding of modeled system (Figure 2). Submodel is included in halal assurance sub-model (Figure 3).

Model Simulation Result

The summary of the simulation result for 120 months is shown in Figure 5 up to Figure 9**.** Simulation was performed in three conditions, those are the existing conditions that show any existing variables and simulated in the period of 10 years. After that, the simulation was conducted with scenario 1 by taking halal assurance. This affected the expended operational cost and selling price. Eventually, as comparison of SMI, halal status is ignored. From the simulation result, it can be seen that the society's halal awareness is increasing from time to time. The increasing halal level can raise the society's buying interest although it gives impact on the increasing of fish ball price Demand of halal food is rising because it was not only consumed by Moslem customers, but also non-Moslem customers (Soon, Chandia, & Regenstein, 2017). Indonesia has potential and promising food industry since around 255 millions or 87.2% of the overall population are Moslem (Ayuniyyah, Hafidhuddin, & Hambari, 2016).

Market Share

Market share of all scenarios are declining. This decreasing market share happens as a result of growing fish ball competitors. In Figure 5, graphic of market share in scenario 1 is still higher than the existing condition and scenario 2. Declining market share percentage is reflected in Figure 5. Graphic of market share does not indicate overall decreasing sale. Sale is decreasing as

a consequence of the growth of fish ball SMI which erodes the market. Meanwhile, an increase in fish ball enthusiasts which leads to decreasing market share does not reduce the purchasing amount. In the fifth years, there is even a trend of increasing sale amount.

Business Cash

In scenario 1, business cash is declining as a result of more expensive halal certification registration and operational cost (Figure 6). But even so, the tendency of higher halal food consumers with halal preference has made that investment a positive impact on the sale. It can be seen that the constant business cash increases if it is compared with the existing condition and declining scenario 2.

In this simulation, there are 2 policies or scenarios. For market share of scenario 1, halal assurance with scenario 2 was taken under the competitor. In the simulation, the market share achieved by scenario 1 was always above scenario 2. This means that, in accordance with the hypothesis, the existence of halal assurance will give more market share value. Related to the declining market share in Figure 6, graphic of market share is mostly about higher competitor growth than the population growth, so that the market share amount will decrease as the amount of competitor grows. The ratio of population amount with the amount of fish ball seller is getting smaller. It is proven that business cash variable still increases significantly.

Fish Ball Sale

In the beginning, the variable of fish ball sale in scenario 1 is increasing (Figure 7). As the time goes by, it decreases and in the end of simulation, it increases. This is due to some cases like blending mice meat or pork into the fish ball (Ramlan & Nahrowi, 2014), so that the consumer will feel more safe to buy fish ball with halal assurance. Meanwhile, in the scenario 2, fish ball sale is under the scenario 1. Thus, the society starts to care about halal food. This statement is in accordance with the result of MUI survey which states that society awareness level significantly increases (Nurhasanah, Munandar, & Syamsun, 2017).

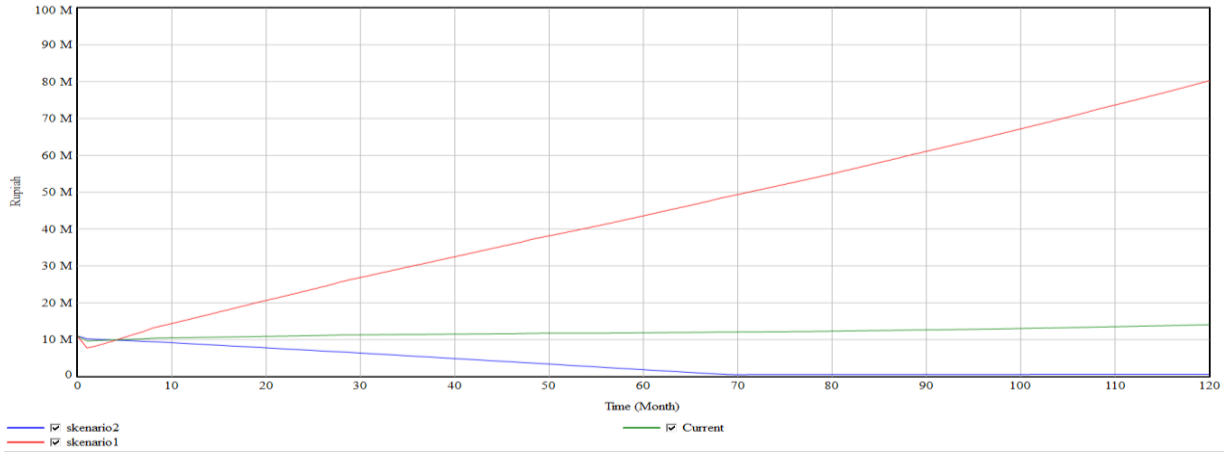

Figure 6 Business Cash Graphic of Fish Ball SMI

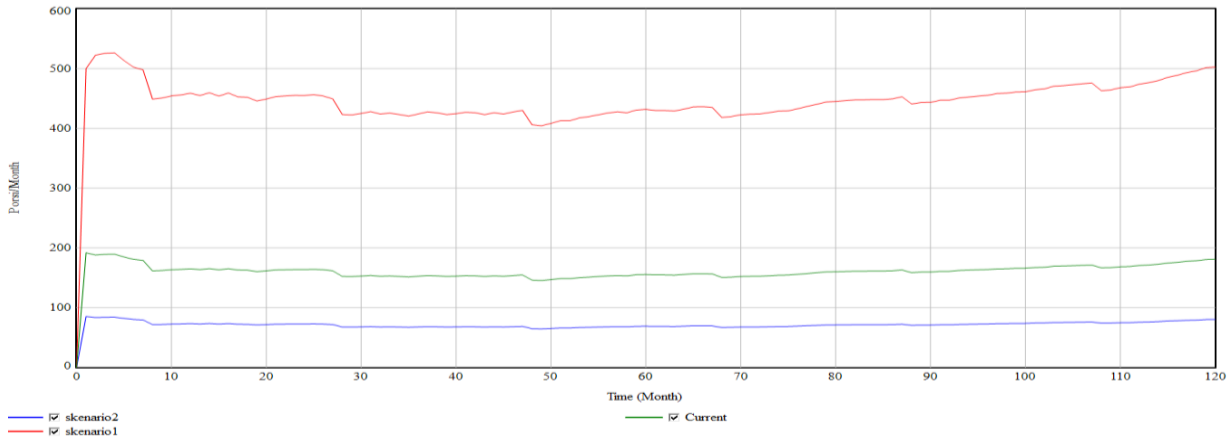

Figure 7 Selling Graphic of Fish Ball

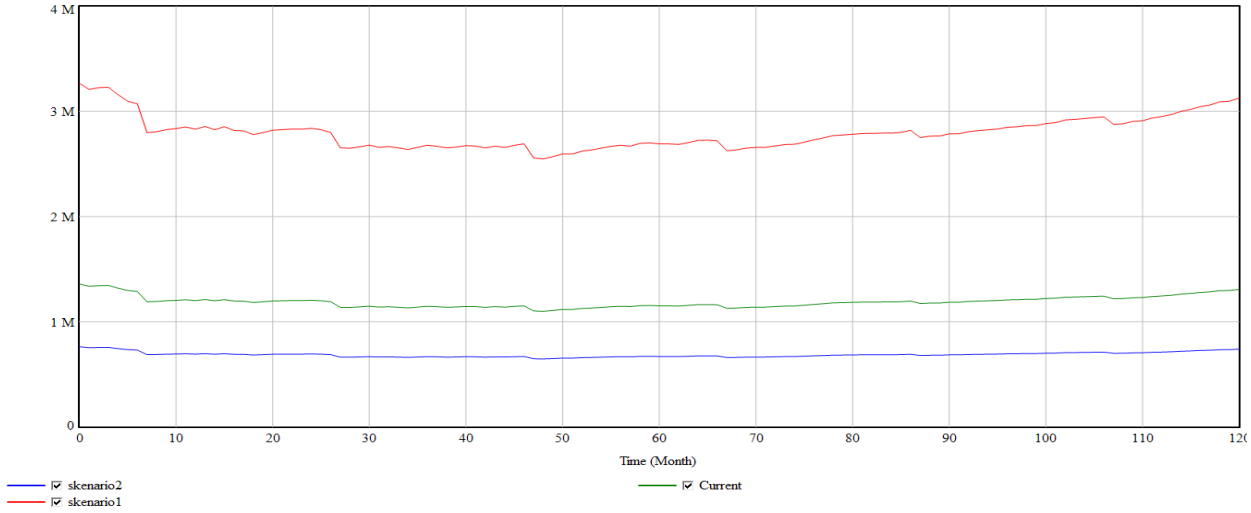

Figure 8 Operational Cost Graphic of Fish Ball SMI

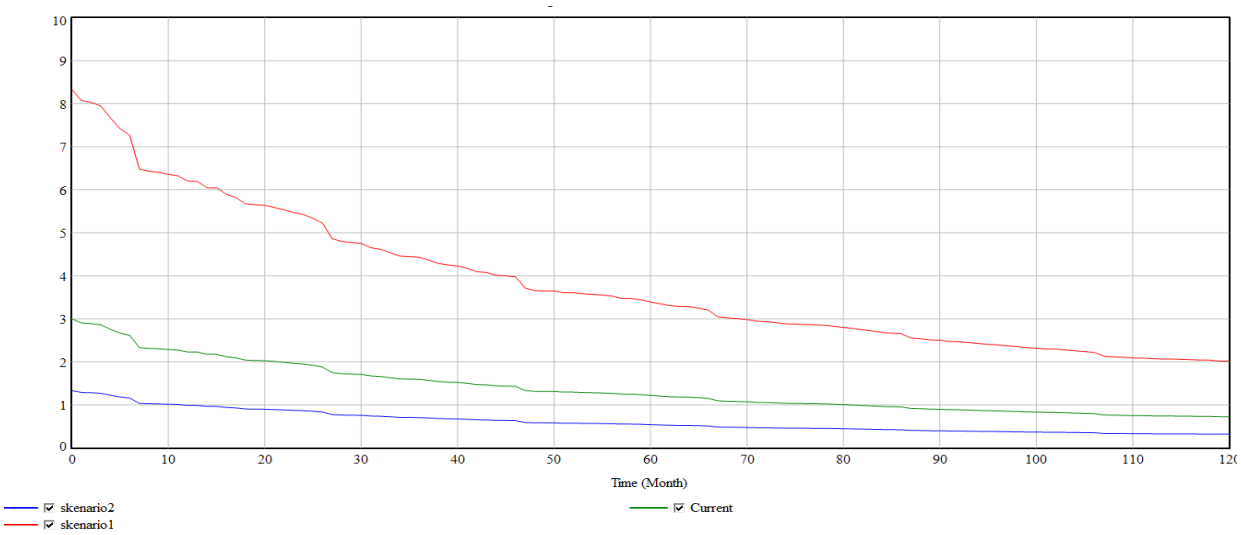

Figure 9 Graphic of the Preference on Buying Fish Ball because of Halal Product

Business cash variable in scenario 1 tends to increase. Because of the business assurance, then any cost expended by fish ball SMI will increase. This is due to the investment that needs to be done to meet halal assurance standard. As stated by. Sholichah et al. (2017) maintaining halal products will cause additional cost. For instance, in fish ball SMI, fish grinding machine for making fish ball should not be mixed with grinding machine for non-halal meats. Scenario 2 without any halal assure tends to decline. The trend of operational cost variable of scenario 1 and scenario 2 is almost the same when scenario 1 is declining. This also happens in scenario 2 although the cost is different. The cost of scenario 1 is larger than scenario 2. The graphic of purchasing halal product preference is the same as in market share variable. Halal preference which consists of abangan Moslem and shayari clothes Moslem, are acknowledged by local religion community, halal and healthy assurance from BPOM and the halal requirements from MUI.

Halal Assurance against Sustainability

Today, food products must fulfill the mandate of Law Number 33 Year 2014 on Halal Product Assurance (HPA). This provision will significantly influence business actors as the requirements states that all goods and services regulated in that Law must have halal certification. Halal assurance as stated in the certification will give impact on the sustainability of fish ball SMI production. Prioritizing halal production that is begun from the upstream sector, such as supply of halal catfish and halal production process, will be the obligation of manufacturers in complying with the Law of halal assurance Number 33 Year 2014. Fulfilling law of halal assurance will keep the

sustainability of SMI fish ball. This is due to any products with no halal certification are prohibited to distribute in the market. Automatically, the consumers choose to purchase any halal certified products. Halal food will increase around 18.3% of the global food expenses to US $ 1,914 billion in 2021 (Wahyuni, Vanany & Ciptomulyono, 2019).

Halal certified products will give guarantee that the products must be safe or healthy to consume, all negative impacts in the environment must be minimalized, less chemicals is used, and in overall better concern on the food safety (Capone et al., 2014; Rezai et al., 2013). Thus, the halal production criteria gives assurance on the wholeness and integrity of food products, from the farming process until it is ready to serve (Ali et al., 2014), halal food production has met the criteria of sustainability production, so the sustainability of fish ball SMI will be maintained.

CONCLUSION

Dynamic system modeling can simulate the real system complexity in halal assurance policy. Because of halal assurance, SMI's expenditure is expected to increase and it is directly proportional to the increased sale of fish ball. Halal assurance will give market share value more than the simulation decision. Result of this study shows that applying halal assurance certification results in the increasing operational cost variable and followed by significant increasing cash as well as the ability to be more sustained in the business. Besides, cash and operational cost variable show high impact on halal assurance. Therefore, SMI will be able to comprehensively understand their obligation to comply with the government regulation which stated that all products distributed within Indonesian territory are required to have halal certification, and by applying halal certification, SMI will achieve some advantages and SMI's sustainability will be assured.

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