

Traceability System Model for Quality Gelatin Raw Material of Cattle Hides

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Abstract. Several criteria must be accomplished within the provision of quality products in terms of the types of materials, the processing methods and effort to get it. Traceability system involves various parties that have different needs and goals in the process of supplying raw materials. Hence, there is a need for institutional systems engineering that can organize and manage the tracking process, the procurement of raw materials that guarantee the origin of gelatin raw materials, and facilitate the industry and customer to create a standardized quality of product. The purpose of the study formulates the institutional tracking models of gelatin raw material from cattle hide based on various criteria and assessment of the expert opinion. The methods used in this study were Interpretative structural modeling to formulate a representation of institutional tracking efficiently and analytical hierarchy process to determine the tracking strategy of industrial gelatin raw materials from cowhide. The results obtained from the study were some key elements of institutional tracking model for industrial gelatin raw materials from cowhide and the traceability strategies for industrial raw materials from cattle hide gelatin Indonesia.

Key Words: traceability, institutional model, cattle hide, gelatin

Introduction

The use of gelatin, which is very hefty, has caused the significant raising need for gelatin in for years. Insofar, Indonesia does not have small or medium-scale gelatin producing industry, thus the need for gelatin is always obtained through imports. The escalating demand of gelatin requires an increase in both quantity and quality of the product. Most national gelatin needs meats from importer originated from Japan, America, Argentina and France. Raw materials used to manufacture gelatin are pigskin, animal skin (leather tanning industry waste), and bone. In the United States, the main source of industrial pigskin gelatin is in a frozen state and processed in acid (GMIA, 2006). Economically, the dependence on imports heads to various consequences, among which are relatively expensive price of gelatin and the less reliable control of *halal* product. Therefore, the development of gelatin industry

in the country does not only contribute to national economic growth but also help the absorption of labor and provide added value to the byproducts from cattle slaughterhouses. Besides, gelatin industrial development can also reduce import dependence and import substitution as well as the availability of alternative *halal* gelatin products

The concept of *halal* can be observed from two perspectives (Che-Men, 2008), namely the perspective of religion as Muslim food laws so that consumers have the right to consume the food according to their beliefs, and that of industrial business opportunity. This brings the consequences to consumer protection and the guarantee of *halal* will increase the intangible value of products. In the context of the provision of *halal* quality products, several criteria must be accomplished in terms of the types of materials or substances, the processing methods and the effort to get it (Santoso, 2009). Gelatin products that will be studied are

those from cowhide. However, the products cannot be directly considered *halal* without going through the tracking process and *halal* standards prevailing in Indonesia, although the origin of products' raw materials does not infringe the requirements of *halal*. Tracing the raw materials of gelatin product requires an effective system to facilitate the users in getting information on the origin of raw materials and the process of handling these materials in every stage of the process from raw material to finished product. Tracing system (traceability system) involves various parties who have different needs and goals in the process of gelatin raw material supply. Hence, there is a need for institutional engineering systems that can organize and manage the tracing process and the procurement of raw materials to guarantee the origin of gelatin raw materials and facilitate the industry and the users of gelatin to create a standardization of product quality.

Research on the traceability of raw material products in relation to quality assurance has been done. Mousavi and Sarhadi (2002) examined the traceability and track system in the meat industry providing certainty to identify the origin of raw materials by providing web-based information systems and using RFID and barcodes. Rabade and Alfaro (2006) developed a model of connectedness buyers with suppliers in implementing the tracking system in the horticulture industry in particular vegetable products using a variety of factors that influence the success of the tracking system. Kehagia et al. (2007) examined the importance of tracking system model of consumer perceptions of buying a product. The study results are obtained and the factors that must exist in the information traceability system to increase sales of meat products are stated. Starbird and Amanor-Boadu (2007) reviewed the contract and the method of model selection criteria are the rules with the traceability quality product and raw materials

for product safety simulation using the allocation of costs. Rijswijk and Frewer (2008) examined the quality and connectivity-related food safety tracking system from the consumer side to make the decision to buy a product. Results obtained from these studies can be referred to the connection between quality and food safety that is related from the viewpoint of consumers. Starbird et al. (2008) examined a model to identify the minimum required level of traceability to detect fraudulent suppliers in providing products that are not safe to eat. Simulation model used to optimize the traceability cost incurred/incidence of fraud is carried out by a rogue supplier. Anir et al. (2008) studied the perceptions of consumers towards the use of kosher food tracing information system using RFID. Sagheer et al. (2009) examined a model of the development of food quality standardization system in developing countries to be able to compete with the global standardization of interpretative structural modeling (ISM) method to obtain the essential elements and its role in developing food standards in India.

Materials and Methods

This research examined the institutional system of cattle hide raw materials to be used for the production of gelatin in order to ensure that the origin of raw materials has been obtained through treatment that meets the requirements for *halal* certification. Research was conducted at the tanning industry to see the leather treatment process resulting from the tanning industry was then used as raw material for gelatin industry. In this case, the desired data were the raw material potential, the availability of raw materials, the leather production process, and the skin and the distributors and suppliers of cattle hide in leather tannery industry. Then the study continued to examine the supplier of leather tanning industry at slaughterhouses and collected cattle hide at the village, district and

provincial levels. The desired data from this study were the data distribution and the number of available sector in regional slaughterhouses; slaughterhouses process the data in the related RPH; the perpetrator of slaughterhouses data; and the data link between a slaughterhouse and a collector distributor of leather or leather. It also studied the institutional from the distributor and collector current skin as well as coverage for every skin collector in a certain region.

Then the study continued to examine all the stakeholders of the raw material supply from cowhide and the tanning industry. The review was used to gather data constraints and to detect potential conflicts of each stakeholder in relation to the handling of cowhide which observed the origin of raw materials and the connectedness among actors. Further analysis of each perpetrator of raw material supply with the *Halal* requirement on the critical factors and quality improvement and farmer incomes by the formation of an institutional supply of raw materials are certified. This analysis was done by involving several experts competent in their field (academics and practitioners) to obtain a model of effective and efficient institutional systems.

The study was conducted through several steps designed to produce a conceptual model of the institutional supply of raw materials agro-industrial gelatin. The stages of research can be seen in Figure 1.

Results and Discussion

To model the institutional quality assurance of supply of gelatin industrial raw materials used Interpretative structural modeling (ISM) methods. These methods assess the form of linkage between elements and sub-elements in developing the gelatine industry. Elements analyzed are related institutions in developing quality assurance systems for gelatin industrial raw material supplies, activity needs to be done in a quality assurance system, possible changes

in the system, objectives and constraints in the system and measurement to assess the success of the system. Sub-elements of each element is analyzed and described according to the needs and formulation of the problem. In the ISM method, users are given the freedom to determine the number and name of the sub-elements for each element studied. Iterative process conducted to determine the hierarchy and classification of each sub-element.

Structuring element of the institutional system of quality assurance for industrial raw material supplies gelatin using structure modeling approach interpretative techniques (ISM). Structuring process is based on the results of several expert consultations from several parties involved in the development of agro gelatin. The parties involved in the analysis of the institutional structure of the ISM are experts from universities, experts from the gelatin industry, experts of quality certification agencies and experts from research and development institutions are doing research gelatin, as well as experts from the tanning industry. System elements that were examined in this study were: 1) elements of the program objectives, 2) elements of the main constraints of the program, 3) elements of the measure for success of the program, 4) possible changes in the program, 5) element of the main activities that need to be done in the program and 6) elements of the institutional actors.

The elements of program objectives in a quality assurance system for industrial raw material supply based on the results of the study gelatin consist of 13 sub-elements namely: T1) Obtain certainty the origin and quality assurance of raw materials, T2) Increasing consumer confidence, T3) Improving the quality of raw materials and products, T4) Simplifies the management of standardization of the halal label, T5) To facilitate tracing the origin of raw materials, T6) To realize a sustainable agro-industry gelatin, T7) Increasing public awareness about the importance of

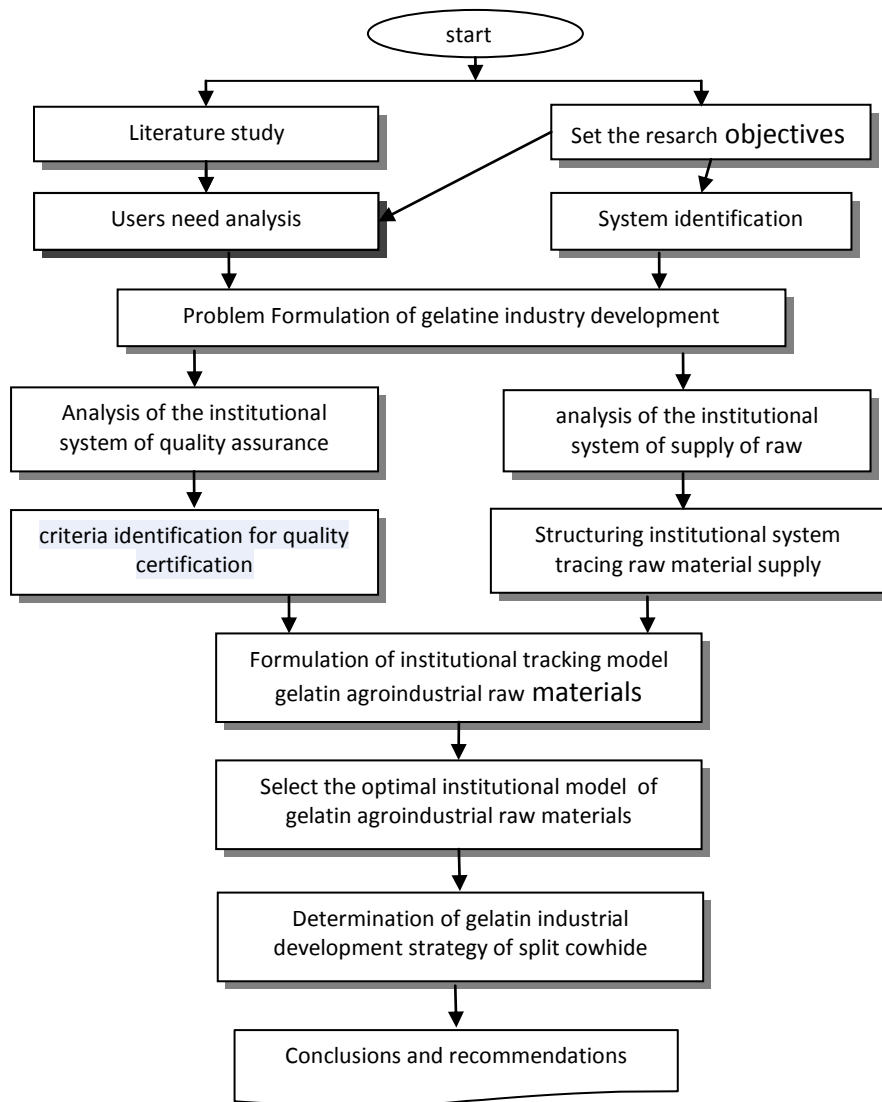


Figure 1. Research methodology

product quality, T8) Increase the price of the product with quality assurance, T9) To promote local economic activities , T10) Increasing interest of investors in agro-industry gelatin, T11) of quality information easily accessible to the public, T12) Businesspeople emphasizes quality in every business, T13) Standards of quality into the culture for each raw material suppliers.

Constraint element in a program of quality assurance systems for industrial raw material supplies gelatin based on the results of the study consist of 15 sub-elements: H1) Weak institutional quality assurance systems that exist, H2) Lack of guidance on the principals of

supply of raw materials, H3) Lack of quality control at each level perpetrators, H4) Lack of coordination between related parties, H5) Location origin of raw materials which have different characteristics, H6) Cultural society that has not been promoting the value of product quality, H7) Suppliers of raw materials spread in some areas, H8) Quality control is not carried out continuously, H9) Regulation of regional investment is less support, H10) inconsistent governmental policies, H11) Source of raw materials that are not detected in origin, H12) There are supplying raw material suppliers are seasonal, H13) Information that has not been quality transparent and widely spread in

the community, H14) public awareness about the quality of which is still lacking, H15) Employers benefit from more emphasis on improving quality.

Elements of the measure for success program in quality assurance systems for industrial raw material supply based on the results of the study gelatin consist of 13 sub-elements are: U1) Increased investor interest in the gelatin industry in the tanning industry, U2) Increased number of new jobs in the gelatin industry, U3) The increase in local income, U4) Facilitate access to raw material quality information products, U5) Ease of access to information the origin of raw material products, U6) Facilitate the process of manufacture of halal quality label, U7) Increased agro-industry revenues cowhide, U8) Increased diversification of leather products cows, U9) Increased number of credits channeled in the agro-industry, U10) Ensuring the quality of raw materials and gelatine products, U11) Awareness of the importance of improved product quality, U12) product prices stable, and U13) The inclusion of products in global trade.

Elements of a possible change in program quality assurance system for industrial raw material supply based on the results of the study gelatin consist of 14 sub-elements are: P1) Supply of raw material tracking information system products, P2) Facilitate access to information on the origin of raw material products, P3) Quality audits can be done faster, P4) quality certification can be managed more easily, P5) Quality assurance can be made on each network principal raw material supply, P6) Every entrepreneur is required to enforce quality standardization system, P7) Quality control can be performed more easily, Q8) The price of the product is guaranteed stable, P9) Consumer confidence increased, P10) The standardization of quality kosher become a habit that does not need imposed, P11) public awareness about the importance of quality

increases, P12) Labelling quality standardization could be done more quickly, P13) Strengthening institutional quality assurance , Q14) the ability to compete in world trade (global markets).

Elements of the main activities that need to be done in a quality assurance program for industrial raw material supply based on the results of the study gelatin consist of 15 sub-elements are: A1) Create a raw material tracking information system, A2) Making regulations of central government / local, which requires the standardization of quality kosher, A3) Provision of an independent agency that oversees the standardization of quality kosher, A4) Provision of facilities and infrastructure for the improvement of product quality, A5) Provision of education and training institutions to improve the quality of products, A6) Provision of technical service quality standardization institutions, A7) Empowerment of community actors in the supply of raw materials improved quality, A8) Involving research institutes and universities in the implementation of quality standards, A9) Survey of quality control and enforcement of quality standards, A10) Involving consumers in the implementation of institutional quality standardization, A11) The provision of incentives towards the implementation of quality products for entrepreneurs, A12) Implementation of standard labeling quality and product origin, A13) quality controls were tightened, A14) Dissemination of information on the quality of society, A15) civilizing quality standards for every entrepreneur.

Elements of institutional stakeholders in the quality assurance system for industrial raw material supply based on the results of studies gelatin consist of 12 sub-elements namely: L1) Group of cattle, L2) wholesale beef, L3) slaughter house, L4) Collector cattle hide, L5) Traders cowhide, L6) Central Government/ regions, L7) Financial Institutions and Banks, L8) leather tanning industry, L9) Industrial gelatin,

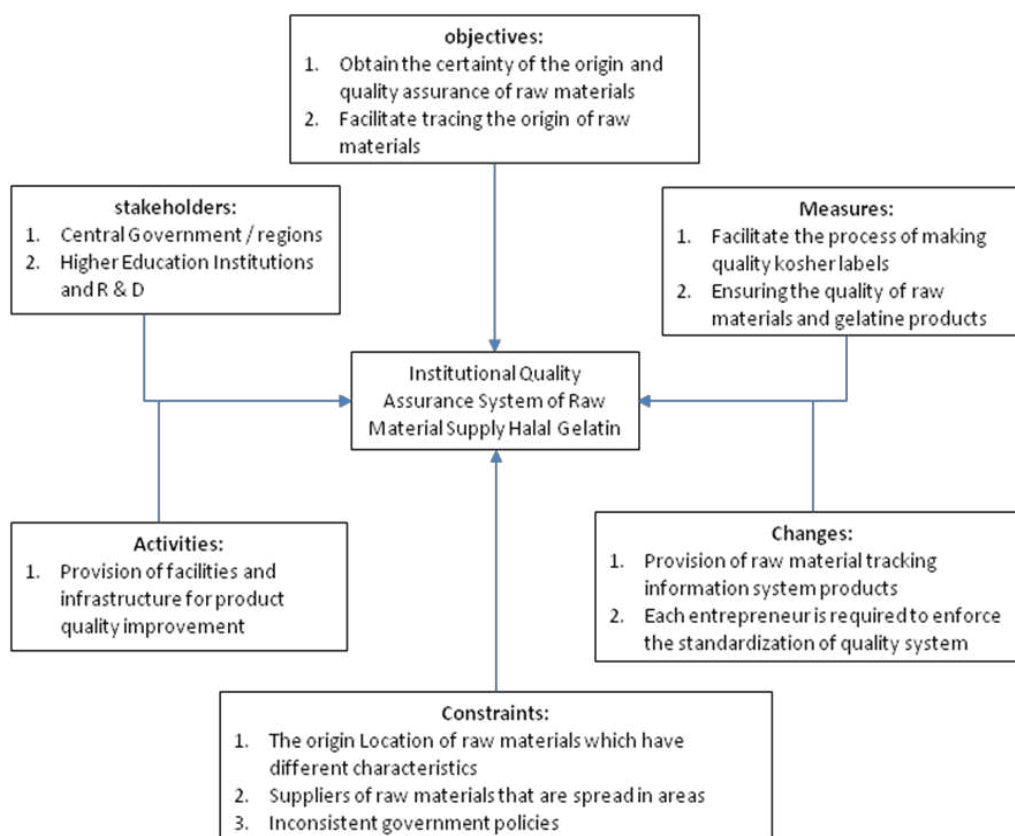


Figure 2. Structure key elements of institutional quality assurance system

L10) and the Higher Education Research and Development Institute, L11) Industrial users gelatin, L12) Consumer.

Structuring the results of all elements of the institutional system of quality assurance of raw material supply industry has been able to identify all the gelatin sub-key elements of each element of the system under study. The structure of the linkages between the elements along with the key sub-elements can be explained by Figure 2.

The illustration above shows that the structuring element of the institutional system of quality assurance of supply to get a key goal of obtaining certainty the origin and quality assurance of raw materials and also to simplify tracing the origin of raw materials, with a measure of the success of programs simplify the process of making kosher label and a guaranteed quality of raw material quality and gelatin products. In order to achieve these objectives, the provision of necessary facilities

and infrastructure activities for the improvement of product quality with possible changes in the program is the provision of search information system of raw materials and every entrepreneur is required to enforce quality standardization system. Some of the obstacles that need to be considered for the success of this system is the location of origin of raw materials which have different characteristics, raw material suppliers that are spread in some areas and inconsistent government policies, therefore we need strong institutional support with the availability of local regulations/center consistent and the role of government in supporting the implementation of standardized quality raw materials and products and support from universities and research institutions as facilitators enactment of raw material quality assurance process.

Based on the results of in-depth review with some experts in the selection of development

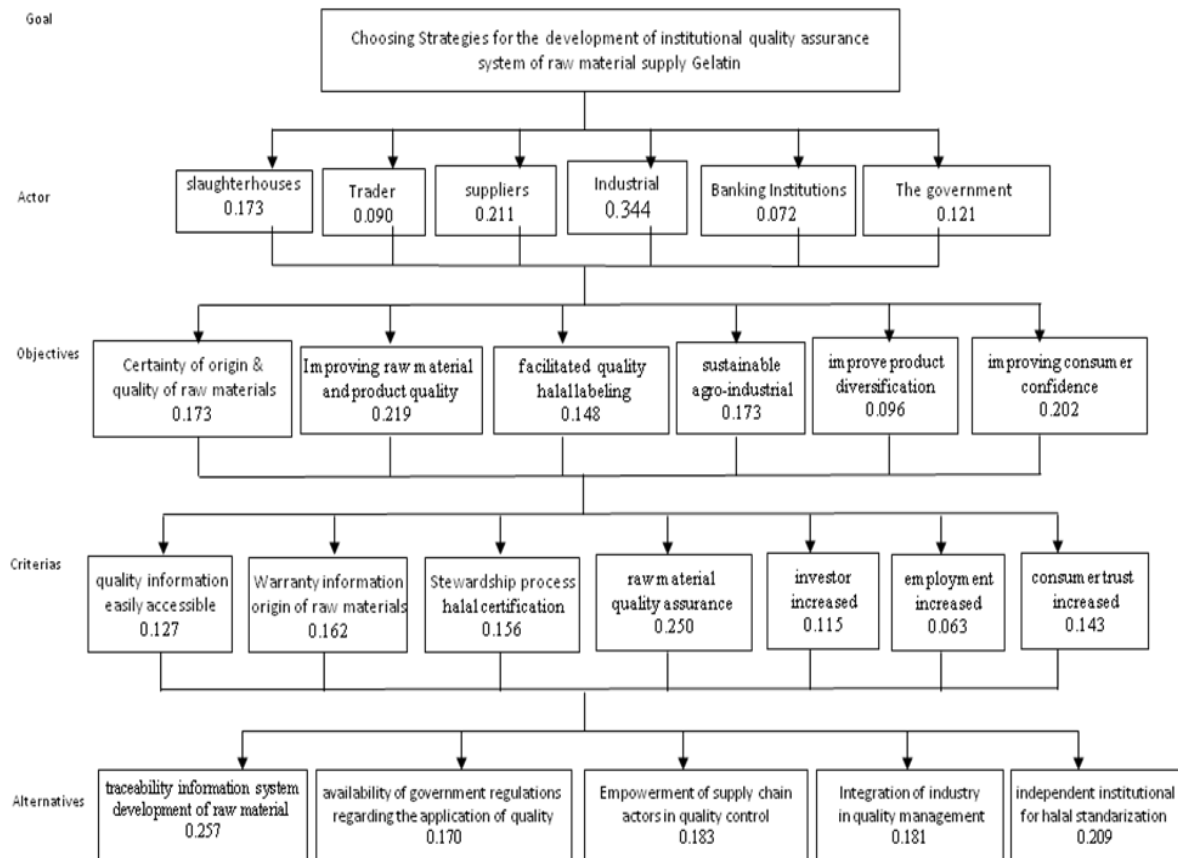


Figure 3. Hierarchical structure of the development strategy of institutional quality assurance system of raw material supply gelatin

strategies of institutional quality assurance system of raw materials derived gelatin hierarchical structure model of the development of institutional quality assurance of raw material supply gelatin. Hierarchical structure has five levels of the first level is the focus of the study is the selection strategy of developing quality assurance system of raw material supply, then the second level is the actor of the system that are stakeholders involved in the development of the gelatine industry. The third level is a goal aimed to election strategy of development of quality assurance system of raw material supply of gelatin. The fourth level is a criterion that is the criteria to be considered in choosing a strategy, and the fifth level is an alternative strategy to be selected in the gelatin industry development in aspects of institutional quality assurance system of raw material supply.

From figure 3 represents that the alternative strategy with the highest score is the search for information system development strategy of raw material with a value of 0.257, followed by a strategy independent of institutional quality assurance processes kosher, and strategies for the empowerment of actors in the supply chain of quality control with the weight value of each amounted to 0.209 and 0.183. At the same time as the strategy of upstream-downstream integration of the industry in quality management and central lawmaking strategies/areas of application of quality kosher have a low enough value weights are respectively 0.181 and 0.170.

The highest weights of the actors as stakeholders in the development of institutional quality assurance system is the industry's supply of gelatin with a value of 0.344, followed by an agent or supplier of raw

materials and slaughterhouse (slaughter house) with a weighting value of each amounting to 0.211 and 0.173. While weight value of local governments, traders and banking institutions ranked last with consecutive values of 0.121, 0.090 and 0.072.

Goal of developing the institutional system of quality assurance of supply that has the highest weigh improves the quality of raw materials and products with a value of 0.219, followed by a goal to increase customer value by weighting the value of 0.202. The purpose of certainty within the origin of raw materials and quality assurance has the same value with the aim of creating a sustainable agro-industry with 0.173 weight value. Meanwhile, the intentions are facilitating the management of quality Halal products and enhancing diversification of weighted ranks last with consecutive values of 0.148 and 0.096.

Despite the fact that the highest criteria weights on the criteria of quality assurance products and raw materials are followed by the criteria of the origin of the information assurance of raw materials with a value of 0.250 and 0.162. Criteria process of quality certification of halal, the criteria of increasing consumer confidence, and criteria for quality information easily accessible ranked three, four and five with a weight value of each - each amounting to 0.156, 0.143 and 0.127. Besides, the criteria of increased investor interest and rising employment have the smallest weight values with consecutive values of 0.115 and 0.063.

Commencing to the above explanation, it could be concluded that the strategy of developing quality assurance system of raw material supply appropriate gelatin is developing information systems tracing the origin of raw materials with the main perpetrators of the gelatine industry with the main objective to improve the quality of raw materials and products can meet the criteria for

quality assurance of products and materials industrial raw gelatin.

Conclusions

The institutional model of gelatine industrial raw material supplies traceability from cowhide using Interpretative Structural Modeling (ISM) method can be summarized that the objective key elements are to obtain the certainty of the origin and quality assurance of raw materials and also to simplify tracking the origin of raw materials, with the measurement success of program is to simplify the process of making labels quality assurance and ensuring quality raw materials of gelatin product. In order to achieve these objectives the provision of necessary facilities and infrastructure activities for the improvement of product quality with possible changes in the program is the provision of traceability information system of raw materials and every entrepreneur is required to enforce quality standardization system. Some of the constranints that need to be considered for the success of this system are the location of origin of raw materials which have different characteristics, raw material suppliers that are spread in some areas and inconsistent government policies

Based on the results of the analysis strategy using Analytical Hierarchy Process (AHP) method, it can be concluded that the strategy of developing quality assurance system of raw material supply an appropriate gelatin is developing information systems tracing the origin of raw materials with the main perpetrators of the gelatine industry with the main objective to improve the quality of raw materials and products to meet criteria for quality assurance of products and industrial raw materials gelatin.

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