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Performance Analysis of the Soybean Agroindustry Supply Chain

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ABSTRACT

Soybean is one of the primary commodities of food after rice and corn. Soybean in Indonesia is one of the strategic food crops. The problem of local soybean supply chain compared to the important soybean chain is the supply of local soybeans involving many parties in soybeans. The number of distribution channels for the supply of local soybeans is also a trend for changes in price variations. More effective than efficient and efficient supply chains in local soybeans. The objectives of this study are (1) to identify conditions and protection in the soybean supply chain; (2) Analyzing the performance of the soybean agroindustry supply chain. To analyze the investment supply chain using the Food Supply Chain Network (FSCN), SCOR-AHP is used to analyze supply chain performance. The structure of soybean agroindustry supply chain in Cianjur Regency involves farmer, breeder, collector, Indonesian Tofu and Tempe Producers Cooperatives (KOPTI), agro-industry, local traders and inter-regional traders. The results of the calculation of the valuation of the market at the farmer level are 85,325%, traders are 92,926%, and agroindustry is 87,004%.

***Keywords*--** Soybean Agroindustry, Food Supply Chain Network, Supply Chain

I. INTRODUCTION

Soybean is one of the primary food commodities after rice and corn. This commodity has various uses, namely as a source of raw materials in the food industry rich in vegetable protein and as a source of raw materials in the animal feed industry. Aside from being a source of vegetable protein, soybeans are also a source of fat, minerals, and vitamins and can be processed into various foods such as tofu, tempeh, sauce, soy sauce and soy juice [19]. Tofu and tempeh are the daily menus of the community in general in Indonesia, which makes soybeans have an essential role [15]. Soybean consumption by the Indonesian people is sure to continue to grow along with population growth, per capita income and public awareness of food nutrition [1].

National soybean production until 2016 amounted to 887 540 tons. This amount is still lacking to meet the consumption needs of soybeans in Indonesia. Currently still waiting for imported soybeans. The demand for soybeans in 2016 in Indonesia is around 2.4 million tons, in this case, local soybeans only meet about 30% of the total domestic market, the rest of which is obtained from soybeans which are needed from the critical [13].

Demand for soybean needs continues to increase, but the rate of increase in demand is not followed by the availability of sufficient soybean supplies. Such conditions cause an imbalance between national soybean production and consumption so that imports remain high. The price of imported soybeans at the consumer level is cheaper, namely Rp. 6 800 per kilogram when compared to the amount of local soybean which reaches Rp. 9 200 per kilogram [7]. This is because the local soybean supply chain involves many parties in it, while the supply chain for imported soybeans only consists of some actors in distributing soybeans to consumers. The number of local soybean supply chain distribution channels is also the cause of price variations. It is thus resulting in less effective and efficient supply chains in domestic soybeans [2].

Good supply chain management can bring supply chain members at optimal and efficient levels to increase profits. Conversely, if it is not managed correctly, it can bring losses such as high logistics costs, information management costs and reduced production capacity [5]. The supply chain is a system that is interrelated with one another. The concept of the supply chain is how to deliver goods or services to consumers effectively and efficiently. Supply chain management must be well managed to improve competitive advantage and create a competitive advantage because competition in the business world is increasingly high [9].

Supply chains have a purpose in fulfilling consumer orders, to find out whether supply chain objectives are running well or not can be done by measuring supply chain performance. All supply chain actors determine the good or bad of a supply chain performance. Measure supply chain performance as a process that quantifies efficient and effective action. This supply chain performance measurement needs to be done to find out how effective supply chain performance is [11]. The purpose of this study is to identify the conditions and mechanisms in the soybean supply chain and analyze the performance of the soybean agroindustry supply chain.

II. RESEARCH METHODOLOGY

Place and Time of Research

Data collection and information activities related to soybean supply chain research were carried out in four sub-districts located in Cianjur District, namely Ciranjang, Haurwangi, Bojongpicung, and Sukaluyu. Expert interview activities were carried out at the Cianjur District Agricultural Service, Cianjur Regency Industry and Trade Office, Seed Agriculture Supervision and Certification Center located in Bojongpicung District, Agricultural Extension Center in the four sub-districts and on the Bogor Agricultural University campus. The data processing and writing of the Thesis is carried out in the Darmaga campus of the Bogor Agricultural University. Research activities are carried out during August - November 2018.

Sampling Technique

The sampling technique is done in three ways, namely: field observation, interview, expert opinion.

1. Field observation, namely by looking directly at the operational activities of management and the activities of the actors involved in the soybean agroindustry supply chain. Data collection through field observations was carried out by purposive sampling method. This means that the selection of respondents or research locations is based on ease of access to data, information, and location of research. Cianjur as one of the centers of soybean production in West Java.

2. Interviews and discussions, to directly obtain information from soybean agroindustry supply chain actors and confirm the results found in the study.

3. Expert opinion is data collected directly from experts through measuring instruments in the form of questionnaires or direct interviews. The experts involved in this study consisted of practitioners and academics. Data collection through expert opinion is done by purposive sampling method. This means that the data obtained is a result of intuition, experience, and expert knowledge. Experts involved in this study were selected through purposive sampling, namely experts who have knowledge and experience on the object of research and are willing to give opinions and judgments on the stated aspects.

Steps of Research

The steps of research carried out include literature studies, expert studies, field studies, formulation problems, supply chain searches, and supply chain performance measurement. Stages of research regarding problem-solving using systems [8]. The steps of the research can be seen in Figure 1.

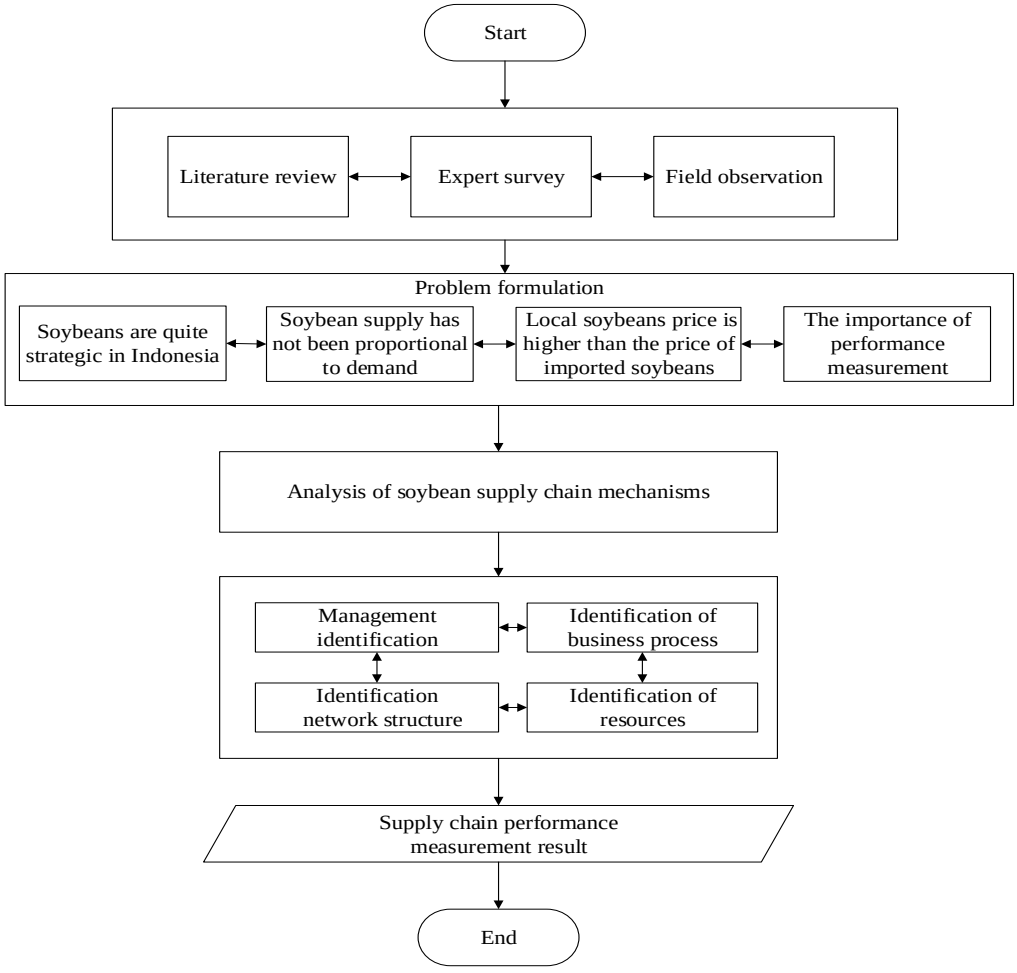

Figure 1 Research steps

III. DATA ANALYSIS PROCEDURE

Identify the Soybean Supply Chain Mechanism

The soybean agroindustry supply chain is described and analyzed using the identification of four supply chain elements. There are four elements used to analyze the soybean supply chain utilizing the Food Supply Chain Network (FSCN) approach. The four interrelated supply chain elements are elements of structure, business processes, management, and supply chain resources [18].

Supply Chain Performance Measurement

Stages of performance measurement are carried out based on the SCOR model. This model is based on five different management processes, namely planning, production, supply, distribution and return. The five processes form the upper level of the SCOR model. Each process is then decomposed to a lower level [3]. Performance measurement in complex business processes requires a performance measurement metrics[4]. In each business process, the performance measurement metrics has different interests (weights)[12]. The business process includes level one which includes planning, procurement, cultivation, production, and delivery. Level 2 includes quality, added value, and productivity. Level 3 includes reliability, responsiveness, agility, and cost. Level 4 includes order fulfillment, delivery performance, conformity of quality standards, order fulfillment cycle, the flexibility of the top supply chain, adjustment of the supply chain, and total supply chain costs. Development of weighting hierarchy through expert opinion and synthesized using Analytical Hierarchy Process (AHP) and the assistance of Expert Choice software11. The measurement of soybean agroindustry supply chain performance in this study was carried out by comparing the actual performance metrics values with benchmarks then multiplying them by AHP weighting. Benchmark data can be obtained based on the target expected by the business unit to produce the best supply chain member performance. The results of performance measurement are then useful for classifying the value of the performance standards listed in Table 1.

Tabel 1Classification of performance standard values.

Performance value	Criteria
95-100	Excellent
90-94	Above Average
80-89	Average
70-79	Below Average
60-79	Poor
<60	Unacceptable

Source: Monczka *et al.* (2011)

IV. RESULTS AND DISCUSSION

Soybean Agroindustry Supply Chain Structure

The soybean agroindustry supply chain involves several members who have different functions. The supply chain members involved include farmers as soybean suppliers and producers, traders of collectors as distributors, and agro-industry that play a role in product processing. There are three types of flow, namely product flow that flows from upstream to downstream, second is the financial flow that emanates from downstream to upstream, and the flow of information that flows from upstream to downstream and from downstream to upstream [17].

The structure of the soybean agro-industry supply chain network in Cianjur Regency has the complexity of the members involved including farmers, breeders, collectors, Indonesian Tofu and Tempe Producers Cooperatives (KOPTI), agro-industry, local traders and inter-regional traders. The supply chain structure in Figure 2 illustrates the general structure of soybean agroindustry supply chains from farmers to end consumers.

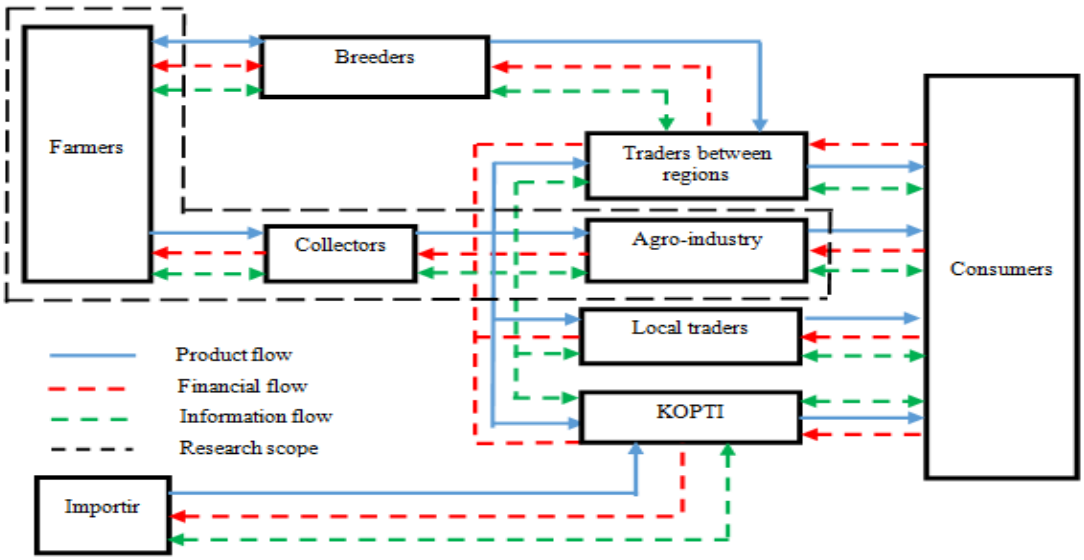

Figure 2.Soybean agroindustry supply chain structure in Cianjur district

The chain structure is translated into several flow structures in soybean commodities, including:

Stucture 1: Farmers - breeders - traders between regions - consumers

Structure 2: Farmers - breeders - farmers

Structure 3: Farmers - collectors - local traders - consumers

Structure 4: Farmers - collectors - traders between regions - consumers

Structure 5: Farmers - collectors - agro-industry - consumers

Structure 6: Farmers - collectors - KOPTI - agro-industry - consumers

Structure 7: Importer - KOPTI - agro-industry - consumers

Soybean supply chain flow starts from farmers selling out their produce to collectors and collectors carry out post-harvest activities such as skin separation with seeds, drying, cleaning and sorting to be selected as seeds or as raw material for making tempeh. The last activity carried out by collectors was weighing, packaging and selling to Tempe producers. Tempe craftsmen process soybeans into tempeh then sell their products to the nearest markets. Transportation used to buy and sell products from soybean agroindustry supply chain agents in Cianjur Regency generally still uses motorized vehicles or on foot.

The soybean agroindustry supply chain mechanism in Cianjur Regency is still traditional because farmers as producers have not yet had an agreement or contract regarding the sale of their products to other supply chain actors. Farmers have not gotten a good bargaining position. The welfare of farmers has not been fully guaranteed because they have not yet obtained the assurance of purchasing their crops and information on product quality specifications and the selling price of products received by farmers is still limited. The product sale and purchase system between farmers and collectors and collectors with Tempe producers only relies on trust.

Supply Chain Performance Measurement

1. Weighting Supply Chain Performance Metrics

The weighting of the SCOR-AHP structure that was successfully synthesized from experts using the Expert Choice software 11 is shown in Figure 4. The weighting results indicate that planning with a value of 0.424 is the most critical business process compared to other business processes. Planning on soybean cultivation is important because the whole process of soybean cultivation will run well if well designed as well as the selection of superior seeds and scheduling of soybean planting at the right time. The value of performance parameters is obtained with a value of 0.238, added value 0.397, the productivity of 0.365. Based on the results of an expert assessment that added value is a significant action in the soybean agroindustry supply chain. The transformation process in the soybean agro-industry supply chain into processed products is essential to do. Tofu and tempeh are prepared products from soybeans, demand for tofu and tempeh in Indonesia continues to increase every year due to population growth [13]. Soybeans still dominate the Indonesian people, especially on Java island as food processing materials such as tofu, tempeh and soy sauce [14].

The result of weighting performance attributes, costs have the highest value of 0.286, this indicates that the cost factor is one of the determinants of the soybean agroindustry supply chain running well or not. Based on research in the field in soybean farming, the cost component is the most dominant. Expenditures related to labor costs are more issued components. States that in cultivating soybeans labor costs absorb more than fifty percent of expenditures, especially during planting and harvesting activities [6]. On the results of weighting the performance metrics, it is known that the total supply chain costs have the highest value of 0.286 followed by 0.220 order fulfillment cycles, supply chain flexibility above 0.142, quality standard conformity 0.128, supply chain adjustments above 0.120, 0.056 delivery performance, and 0.048 order fulfillment. Weighting results can be seen in Figure 3.

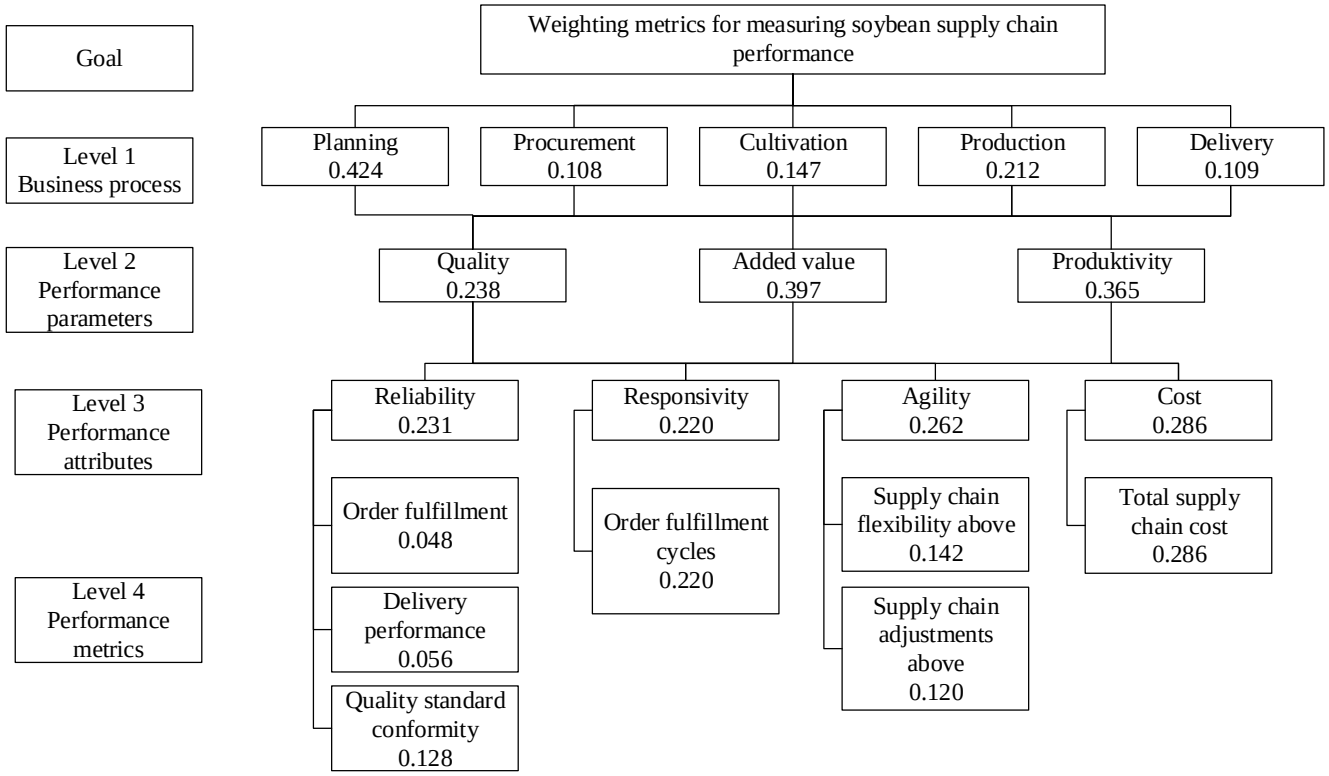

Figure 3. Hierarchy and results of weighting metrics measuring supply chain performance

2. Supply Chain Performance Measurement Results

Measurement of supply chain performance using the SCOR method is carried out by evaluating performance attributes in the supply chain. Each performance attribute has one or more performance metrics which are indicators. The selection of metrics is adjusted to the conditions in the field and the objectives to be achieved [16]. The measurement of soybean supply chain performance is carried out by comparing the actual performance metric value with the benchmark then multiplying it by the AHP weight. benchmark data can be obtained based on the target expected by the business unit to produce the best supply chain member performance. Performance measurement results are then useful for classifying standard performance values.

The results of the calculation of the performance value are known that supply chain performance at the farmer level is 87.18%, traders are 86.20%, and agroindustry is 83.65%. Based on the classification of Monckza et al. (2011) the performance values of farmers, collectors, and agro-industry are included in the average category. The results of the soybean agroindustry supply chain performance assessment conducted at the level of farmers, collectors and agro-industry can be seen in Table 2.

Table 2. Soybean agroindustry supply chain performance value

Atribut Kinerja	**Metrics Kinerja**	**% Nilai Metrics Kinerja**		
		Farmers	**Collectors**	**Agro-industry**
Reliability	Order fulfillment	6.50	4.80	4.80
	Delivery performance	7.58	5.60	5.60
	Compliance with quality standards	17.34	6.40	9.60
Responsiveness	Order fulfillment cycle	24.74	17.60	22.00
Agility	Top supply chain flexibility	-	14.20	14.20
	Top supply chain adjustments	-	9.00	6.00
Cost	Total supply chain costs	31.00	28.60	21.45
Total Information		87.18 Average	86.20 Average	83.65 Average

V. CONCLUSION

The supply chain structure of soybean agroindustry in Cianjur Regency has members involving farmers, collectors, and agro-industry Processing soybeans. The relationship between the soybean agroindustry supply chain in Cianjur is still traditional because farmers as producers do not have relationships or contracts related to the sale of their products to other supply chain entrepreneurs. The results of the research related to supply chain analysis of agroindustry, investment, collectors, and agro-industry are included in the average category.

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