

Building Framework of Supply Chain Vanilla Commodity in Indonesia:

Approach with SCOR 12.0

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Abstract—Vanilla commodities are food needs needed for complementary mixtures of food needs, so the stability of the vanilla food supply chain needs to be well developed in maintaining sustainable needs. The measurement study of this research is the organization of the Perhimpunan Petani Vanili Indonesia (PPVI) where the organization aims to develop and improve supply chains for farmer groups incorporated in organizations throughout Indonesia. The improvement in the performance of the supply chain organization focuses on the SCOR 12.0 approach and is processed through the analytical hierarchy process (AHP) with the development of KPIs in supply chain performance attributes. The results of the analysis show that the attributes of reliability, agility, and cost have the lowest valuation so that further development and identification is needed in improving the performance of the supply chain. The discussion and further implications of this research are designing lean agriculture development, improving quality management and developing operational, technical cost structures in the supply chain objects.

Keywords: SCOR 12.0, supply chain agriculture, AHP, vanilla commodity, buiding scenario supply chain

I. INTRODUCTION

Agriculture in the history of Indonesia is a tradition and culture that is prosperous to local people, through cultivating crops and then becoming food and distributing it according to economic law. According to data from the Badan Pusat Statistik Indonesia (BPS) in 2018, as many as 29.68% of Indonesia's population is in agriculture. One of the agricultural commodities that need to be developed is the spice category, namely vanilla.

The Indonesian vanilla commodity is the world's flagship known as Java Vanilla Beans, where the level reaches 2.75% compared to other vanilla export countries. The drying of the vanilla commodity is processed through the fermentation stage, starting from the long, wet pods to drying in accordance with the vanilla moisture content. The good water level is also influenced by the geographical location of cultivation, the best quality vanilla habitat is in the latitude zone 0-10 degrees, while Madagascar is at latitude 20 degrees south and Indonesia stretches 6 degrees north to 11 latitudes south. According to

FAO Statistics data, Indonesia's contribution to vanilla exports globally ranks second after Madagascar.

TABLE I. SUMMARY OF VANILLA COMMODITY GLOBAL EXPORTS BASED ON EXPORT SALES VALUE (IN THE CURRENTS OF USD 1000)

Export Country	2012	2013	2014	2015	2016
Madagascar	10653	44671	118249	208470	408349
Indonesia	5367	7279	8512	17718	70859
Mauritius	945	1301	4795	22376	49028
Germany	17417	27160	31459	37629	45433
France	20124	29677	32389	32913	44384

Perkumpulan Petani Vanili Indonesia (PPVI) is a vanilla commodity farming organization, especially in Indonesia, which aims to prosper local farmers and increase the Indonesian vanilla export market. Based on the study, researchers conducted a pre-survey with a questionnaire method of 67 respondents of farmer groups who were members of the PPVI and interviews with 1 speaker who had experience in processing vanilla commodities. According to Mr. Aden (source), the demand from the United States (USA) in one year reached 50 tons in a dry state (already processed) but the limited process and conditions of the supply chain were not ready to address the export demand. In addition, many farmers, especially in West Java, are still many farmers who treat vanilla crops that are not in accordance with the procedures (young harvest) so that the quality of vanilla decreases.

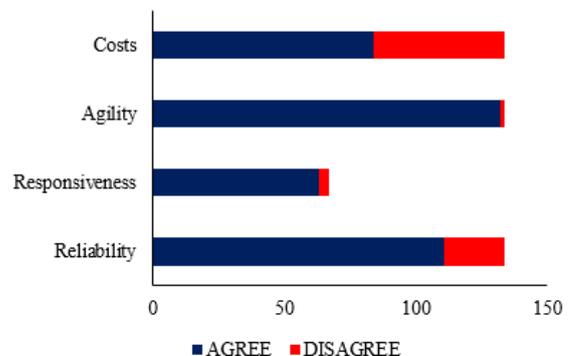


Fig. 1. Percentage of pre survey survey questionnaire.

While the results of the pre-survey through a questionnaire that was measured through variables related to the measurement of supply chain performance SCOR approach showed variables of reliability, responsiveness, and agility significantly positively reinforced to be presented in this study, while the cost variable showed a relatively positive cost operational and capital related to the cost variable in the supply chain according to the percentage picture. So the authors conclude that these variables are feasible and significant to be examined further in measuring supply chain performance with the SCOR approach. The researcher examined a number of previous studies relevant to the background of this research. The study was obtained from the study of [1-11]. This was done to strengthen the phenomenon in this study.

Based on the phenomena and research objectives that have been explained, the researcher formulates how the supply chain mechanism, how the results of the presentation of supply chain performance are presented and how the implications of the supply chain performance development decisions will be discussed in this study

II. LITERATURE REVIEW

A. Supply Chain Concepts

Supply chain management is planning the supply chain planning, implementation and control that aims to meet customer needs [7], while according to Wisner [12] supply chain is the idea of coordinating or integrating a number of goods and activities related to the unit supply chain to improve operational efficiency, quality and service to customers. Based on the above definition, the authors conclude that supply chain management is the process of identifying and developing from upstream to downstream so as to ensure that each flow in the supply chain is in accordance with customer demand, namely efficient, effective and flexible.

The supply chain work process has three types of flow, which become the production process cycle as well as the connecting chain of work processes that are integrated with each other. According to Arif [13], the three types of flow are material flow, information flow, and financial flow. Globally the background of the supply chain reflects activities that are interconnected with other elements. The main functions are the plan, sources, make, deliver, and return.

Members of the supply chain are actors related to the supply chain business process flow. In this study, the author identifies supply chain actors in the agribusiness industry, according to Chandrasekaran and Raghuram [14] actors in agribusiness supply chains include primary suppliers (input suppliers), agriculture (Farm), Processors and Retailers.

The supply chain balance is efficiency that supports the competitive strategy of the work unit field. In understanding how to improve supply chain performance, namely responsiveness, and achievement of efficiency, it is necessary to identify the functional drivers of supply chain performance. As referred to the drivers are facilities, inventory, transportation, resources, and financing [15].

B. SCOR 12.0 Approach Measurement Performance Supply Chain

The creation of competitive advantage and improving supply chain performance can be measured through one approach, namely Supply Chain Operation Reference (SCOR). The main objective of supply chain performance measurement is the SCOR approach is to improve service efficiency, supply chain flow, through new tools and technologies, besides this process helps in deciding, regulating and implementing the supply chain process efficiently and flexible [16].

Attributes of supply chain performance consist of reliability, responsiveness, agility, costs, asset management efficiency (assets). Attributes of reliability, responsiveness, agility, focus on customer demand and needs while costs, asset management efficiency (assets) focus on internal business needs, all groupings are incorporated into one performance attribute. Detailed definitions are presented in the table 2.

TABLE II. KPI ATTRIBUTE DEFINITION SUPPLY CHAIN PERFORMANCE MEASUREMENT

Performance Attributes (KPI)	Definition
Reliability	Expected supply chain task capability. This performance attribute focuses on the predictability of output in a process. The general metrics of this attribute include: timeliness, exact accuracy, and the right quality
Responsiveness	The speed at which supply chain tasks are carried out. Supply chain speed in providing products to customers. An example of a metric in this attribute is a cycle of speed in meeting consumer demand
Agility	Ability to respond to external influences, the ability to respond to market changes to obtain or maintain a competitive advantage. These performance attribute metrics include adaptability and risk values
Costs	Operational costs related to the supply chain. These costs are included in labor costs, raw material costs, management fees, and transportation costs. The general metrics in this performance attribute cover the cost of goods sold
Asset Management Efficiency (Assets)	The ability to use assets efficiently. An asset management strategy is reducing inventory and procurement vs. outsourcing. These performance attribute metrics include inventory routines and capability utilities

C. Van Der Vorst Supply Chain Theory

In this study, supply chain theory Van Der Vorst is the basis of the method theory of the agricultural supply chain framework developed by *Van Der Vorst*. The development phase of the agricultural supply chain framework with this approach needs to contribute to the supply chain by modeling and evaluating at each stage of the supply chain to evaluate the food supply chain scenario [17]. The aspect of the process chain of the supply chain model is based on the behavior of relevant supply chains and dynamic behavior. In this method, the supply chain framework can redesign variables in each business process to facilitate the formation of new business process structures, both content and scenario dynamics in the supply chain, where there are three elements that break down further supply chains, namely business processes, business entities, and system dynamics.

D. Analytical Hierarchy Process

Analytical Hierarchy Process (AHP) is decision making based on a numerical scale pairwise comparison that is used to show how important a factor is in relation to other factors, taking into account several criteria [11]. Based on research by Santos et al. [10] AHP is a supporting tool in sustainable development decision making, where this method is used as the manufacture of raw material, databases by correlating raw material assessments, developing standard supply chain sustainability metrics, sector-specific research on sustainability measures, investigating supply chain design, integrating green productivity, and social studies of philanthropic involvement.

III. RESEARCH METHODOLOGY

The location of the study was carried out in several academic environments, practitioners and several PPVI points. The time taken by this study is March-May 2019. The sampling method of this study is a saturated sample with a total of 7 speakers from academics and practitioners who are experienced in the supply chain sector of vanilla commodities. Data is processed through with expert choice 11.0 software in a hierarchical manner. The stages of analysis of this research are presented in the table 3.

TABLE III. DATA ANALYSIS STAGES

Stages of Analysis	Method Type	Method Description	Output Analysis
Supply Chain Analysis	Van der Vorst	As the identification of the integrated flow of actors in the supply chain object	General description of the supply chain object studied
Deep discussion	Brainstorming	As determined in-depth discussion through selected indicators in supply chain performance attributes	Supporting implications of development decisions and supply chain improvement strategies
Supply Chain Performance Measurement	SCOR-AHP	As a weighting measure of the performance of measured supply chain attributes	The level of assessment of each supply chain performance attribute analyzed

IV. RESULT ANALYSIS

A. Supply Chain Network Structure with the Van Der Vorst Approach

The structure of the supply chain network in this research is in the process of the Van Der Vors principle approach where

this framework is often used for mapping agricultural supply chains as well as the development framework of supply chain development scenarios. The results of the mapping with field studies and observation of supply chain frameworks of the research objects are shown in Fig 2.

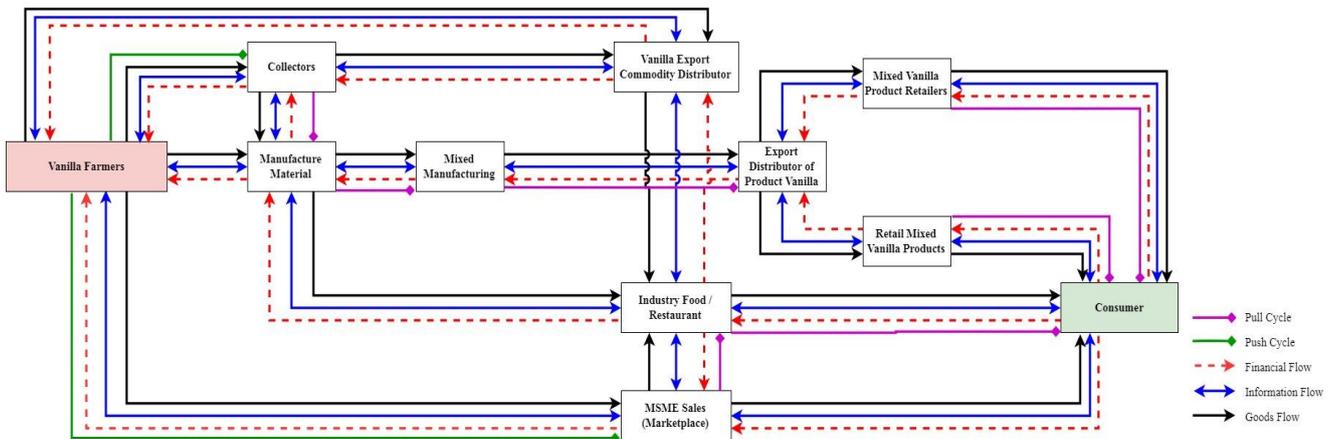


Fig. 2. Framework agriculture supply chain.

The mapping results of supply chain flows show the movement of vanilla commodity flow from vanilla farmers to consumers who are accompanied by financial flows, information, push cycles and pull cycles. The cycle as referred to is the routine flow of goods which is often supplied both by push demand and pull from the related supply chain actors.

The business process on vanilla commodities from the stage of the farmer to the next supply chain member is a push cycle while the consumer needs for vanilla processed products become a cycle of pulling goods. The whole process is moved by the supply chain principle, namely plan, make, deliver, source, and return. Vanilla products are commodities that are

processed with mixed materials which produce a variable product, both mixed for food and beverages, oil refineries, and other types of processed vanilla powder products.

B. Measurement Performance Supply Chain

The KPI component in measuring supply chain performance is obtained through the SCOR 12.0 approach while the data processing tool is processed through the AHP principle described in the previous section. Data was obtained primarily through a questionnaire with 7 experts in the supply chain (academics and practitioners). KPI, as referred to in this study, are supply chain performance attributes that are relevant

to the pre-survey results, namely reliability, responsiveness, agility, and costs. The collected data is processed by the AHP stage and a consistent test is conducted as the validity of the data analyzed in this study. The resulting consistency test results have been shown consistent and data is valid.

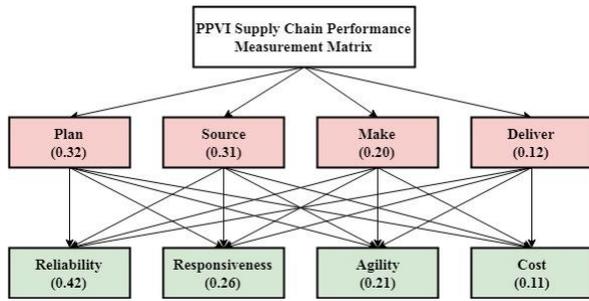


Fig. 3. Hierarchy of performance measurement.

Assessment is carried out in a hierarchical manner by considering the relationships and alternatives that are relevant to the KPI of supply chain performance attributes. The processed data shows that the business process planning weight of 0.32 is an important process compared to other business processes. The most important attribute of performance parameters is the quantity where it is worth 0.51, indicating that the increase in supply chain performance in PPVI can be improved the quality of control in the harvest process. While other performance attribute metrics are presented hierarchically in Figure 3.

C. Preparation of Group Discussions with the Brainstorming Approach

The in-depth discussion and discussion in this study is the brainstorming method approach. Focusing on the research of Al-Samarraie and Hurmuzan [18] where the findings are three dimensions that become a benchmark for thinking in managerial decision making, namely is traditional brainstorming (TBS), nominal brainstorming (NBS), and electronic brainstorming (EBS). This method is applied to support the decision making of supply chain experts (academics and practitioners) and deeper implications for the analysis of the development of the supply chain scenario framework in PPVI.

The discussion was conducted in two stages where the initial discussion was to explain the background of the problem while measuring the assessment of alternative indicators priorities, the second stage presented the results of measurements and more analysis in an effort to develop a supply chain development scenario framework. Implementation is done in a mixed manner but decision makers are more domain by way of electronic brainstorming (EBS), as a reference for decision making.

The discussion was held for one more month at the residence of each decision maker (academic and practitioner). Researchers schedule discussion interviews based on the principle of credibility testing in qualitative research, which is carried out under different conditions (reference sources, discussion schedule, and follow-up observation).

V. DISCUSSION REVIEW

A. First Discussion Phase

The discussion is structured in accordance with the preparation planning, which is done by forming discussion groups based on the categories and problems of the PPVI phenomenon. This process is held from May to June 2019 in various discussion places

Some opinions from experts who responded differently and perceived different responses. The pattern of supply chain flow that occurs in PPVI is a fair and normal distribution system, the supply chain business flow needs to also consider network design that benefits the marginal increase in the normal price chain without controlling the market unfairly. PPVI needs to also consider channel networks that have an effect on supply chain performance. Network design in the supply chain can also accelerate the process of flow and product cycle where the sensitivity of vanilla commodities has waste time. Some design of supply chain networks is formed as a continuation of the supply chain in order to avoid uncertainty in supplying commodities to other supply chain actors.

Besides that, effective collaboration design encourages improved supply chain performance, which strengthens information systems from various supply chain actors that are mutually integrated. Collaboration strengthens and enhances cooperation between sustainable supply chains.

B. Second Discussion Phase

At this phase of the phase, we discuss and review more deeply the presentation of supply chain performance measurement in PPVI. The analysis was carried out with literature studies from in-depth literature review after which we asked expert opinion for the development of a sustainable supply chain development scenario.

Our measurement results analyze how the continuity is deeper about the phenomena that we present in this study. Factors for production readiness, production processes and quality produced by some farmers are the problems, so we develop supply chain scenarios in the design of the production process. At the design stage of the production or harvesting process of vanilla commodities, we discussed with experts in horticulture in the spices group. As a result, we have obtained several methods to improve crop quality results that affect the quantity to be sold. We applied some of these methods and applied them to several vanilla farmer groups who are members of the PPVI organization, one of which we emphasized was the vanilla fermentation process which was collaborated with a drying machine that could regulate and control the quality of water in vanilla pods which would be processed.

Our interview discussion continued by identifying from other practitioners. This process is reviewed by practitioners who are often and know the conditions of the field, we take the resource person from one of the experienced PPVI members. As a result, the stages of the cultivation process need to be analyzed deeper so that it affects the quantity that will be produced, and how to process the content needed by vanilla

plants so that the resulting vanilla pods will produce significant results. This is in accordance with the percentage of performance measurement where the make dimension has the lowest value (0.20) so that it affects deliver (0.12) as well as the results of the performance KPI attribute where agility assessment needs to be emphasized where it gets a value of 0.21.

C. Visualization and Implications of Supply Chain Scenario Design

After we analyze with experts in the supply chain related to our phenomena, then it is visualized in the analysis of managerial implications. The scenario framework that we built based on interviews and discussions with several experts in the supply chain field we applied as a form of managerial decision analysis implications.

The form of implementation was implemented by one group of vanilla farmers who joined the PPVI organization, but the limited time of observation that proved the development of the supply chain framework development scenario that had been measured by us. But it does not rule out the possibility of the analysis we discussed resulting in the effectiveness of increasing the quantity that we have planned in this study.

VI. CONCLUSION

The geographical condition of Indonesia in the tropical climate category is the best quality in cultivating the commodity category of spices, one of which is vanilla. We plan to restore the glory of vanilla commodities amid the export market competition, therefore we build the supply chain performance that we measure in this study and we build a sustainable supply chain scenario development framework. Finally, the results of our measurement and discussion with several experts in the supply chain sector we developed several scenarios, as follows:

- Designing a supply chain network where we develop supply chain flows that are effective in supply chain performance towards supply chain actors.
- Supply chain performance collaboration design where we develop managerial information systems for actors in other supply chains.
- The design of a vanilla cultivation production system where our concept prioritizes the behavior of farmers to understand the harvest process until implementation, besides that, we also develop a framework for vanilla cultivation systems. In addition, we conceptualize the organic system for the nutritional needs of vanilla by concocting some organic ingredients to replace the sub-nutrients needed by vanilla plants.

Some of the limitations of this study are the time of observation. This research is in the form of qualitative so that it is developed quantitatively which answers in its entirety,

namely several scenarios to be developed in the next researcher.

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