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The influence of supply chain management to sugarcane farming performance in Madura

M Rum¹, D H Darwanto², S Hartono² and Masyhuri²

¹Ph. D Candidate in Agricultural Science at Universitas Gadjah Mada Yogyakarta

²Lecturer of Agribusiness Program, Universitas Gadjah Mada Yogyakarta

E-mail: me.arrumy@gmail.com

Abstract. This research aimed to analyze whether there is influence between the practice of supply chain management and farming activity on the sugarcane farming performance. Variable of supply chain management was measured using three indicators, namely supplier partnership, customer relationship, and information sharing. Variable of farming activity was measured with two indicators, namely the increasing of farming management and the mastering of planting technology. Meanwhile, the variable of farming performance was measured using two indicators, namely financial performance and operational performance. Data were collected using questionnaires. There were 41 farmers that are partners of *PT. Perkebunan Nusantara X* contributed as respondents in this study. The research location was in Madura, East Java. Method of analysis used in this study was structural equation modeling (SEM) using partial least square (PLS). The results show that there was a significant relationship between the practice of supply chain management and farming performance, and there was a significant relationship between farming activity and farming performance.

1. Introduction

The development of the sugar industry in Indonesia faces a variety of increasingly complex problems, including a decrease in production and productivity of sugarcane farming, sugar factory inefficiencies, and inappropriate farming policies that trigger imports. In the global market, sugarcane farming in Indonesia must compete with agribusiness companies both domestically and abroad. Farmers as providers of sugar cane raw materials for sugar companies, in order to obtain a high income, must produce high quality sugar cane, quickly deliver to the location of the sugar company with the lowest cost. This cannot only rely on farming efficiency, but the entire supply chain must be competitive. Understanding and practices of supply chain management (SCM) are important preconditions for winning global competition and increasing farmers' income [1]. With the increasing number of competitors, business organizations are expected to improve their internal and external performance [2, 3].

Supply chain management (SCM) has become a research topic in the past decade. Some researchers developed the concept of supply chain management to determine the effect of SCM practices on company performance, operational and supply chain performance [1,4,5,6,7,8]. Most scientific publications in international journals, mostly discuss the practice of SCM in companies in developed countries, the portion of SCM practice studies in developing countries is relatively small. Besides that, the company used as the object of research is a large-scale company. This study focused on small-scale



sugarcane farming managed by farmers in Madura, East Java, Indonesia. Sugarcane farming in Madura faces challenges to improve performance, so that it can compete and survive in today's competitive. This study aims to examine whether there is a significant influence between Supply Chain Management (PSCM) practices and farming activities (AKU) on sugarcane farming performance (KIU).

2. Research framework

Figure 1 presents the SCM framework developed in this study. As can be seen in **Figure 1**, SCM practices were expected to have an impact on farm performance directly and indirectly through farming activities. The SCM practice was conceptualized as three-dimensional construction, namely strategic partnerships, customer relationships, and information sharing.

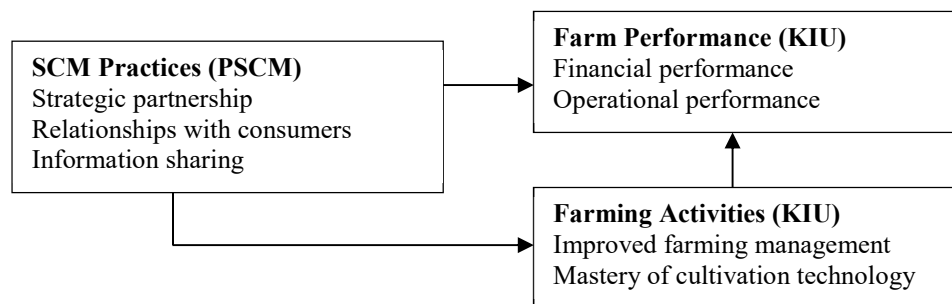


Figure 1. Research framework

2.1. SCM practices

Supply chain management (SCM) is one of the widely used business strategies in the business world today and has been the focus of academic attention in recent years [9]. The purpose of SCM is to achieve efficiency and minimize the use of overall costs, including storage costs, raw material costs, production costs, labor costs, transportation costs and product distribution to consumers by integrating various organizations including suppliers, manufacturers, distributors, retailers, and customers [10]. With the supply chain organization integration, an item can be produced or distributed in the right amount, the right location, and the right time to minimize costs and provide service satisfaction to consumers.

SCM practice is defined as a series of activities carried out within an organization to promote effective management of its supply chain [11]. Its reported that SCM practice is conceptualized as a five-dimensional construction consisting of strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing, and postponement. Identified SCM practices in the form of strategic supplier partnership, customer relationship, and level of information sharing. SCM practices have a close relationship with a company's competitive advantage in terms of price, quality, speed of delivery and products.

By partnering with suppliers, companies can work effectively and business risks can be shared with their business partners [12]. The purpose of Customer Relationship is to improve customer satisfaction. By establishing good relationships with customers, the company will have loyal customers. Information Sharing relates to the extent of coordination between members in the supply chain to share important information in terms of market conditions, competition, business strategies and information about customers [13].

2.2. Farming performance

Farming is one of the activities that organize agricultural production facilities and technology in a business regarding agriculture. Farming is an agricultural business process in the narrow sense that aims to produce an agricultural commodity. Farming is smallholder agriculture managed by farmers both individually and in groups by using resources efficiently and effectively in an agricultural business to obtain maximum results. These resources are land, labor, capital and management [14].

Farming can be interpreted as an agricultural business (agribusiness). Some experts argue that the measure of corporate performance that is often used in empirical research is financial performance, operational performance, and market-based performance [15]. This study uses financial performance indicators and operational performance to measure the performance of sugarcane farming in Madura, East Java.

2.2.1. Financial performance. Some experts use rates of return on sales, profitability, sales growth, improvements in work productivity, and improvements in production costs to measure financial performance [16]. Measures the performance of sugarcane farming with indicators of financial income and economic income [17]. Financial analysis is an analysis in which a project is viewed from an individual aspect, so that researchers do not need to see the impact of a project on the economy in a wider scope, while economic analysis of researchers sees a project in a broad scope [18]. To find out financial income, it can be known by calculating the difference between the total revenue of sugarcane farming and the total costs incurred by farmers. The price used to calculate financial profit is the actual price or price that applies to the location of the study [17]. Sugarcane farming revenue is derived from the output value of the production, which consists of the take of sugar and drops, which will then be summed and assessed as the total income of farmers. The feasibility of farming can be seen from the profitability and the ratio of total revenue compared to the total costs that have been incurred.

2.2.2. Operational performance. In addition to measuring company performance based on financial performance, it is also important to measure operational performance. This operational performance can be measured using quality measurements, marketing effectiveness, market share, new product launches, and customer satisfaction [19]. The indicator to assess the operational performance of sugarcane farming is productivity and yield [20]. Sugarcane farming in India by analyzing the growth and trends in area, production, productivity, and trade in sugarcane production using time series data from 1970 to 2015 [21].

3. Research methods

This study uses a quantitative paradigm. To test the hypothesis, Partial Least Square (PLS) analysis is used.

The following is the operational definition of each variable:

- 1) SCM is an approach used to achieve the integration of various companies (in this case sugarcane farming) that are more efficient, so that production is produced in the right amount, at the right time and at the right farming location with the aim of achieving minimum costs according to the production standards desired by the sugar company as a business partner.
- 2) Farming performance is the level of achievement in carrying out activities to achieve predetermined goals that can be assessed by comparing the achievements and targets or farm performance that is managed by several other farmers.
- 3) The farming referred to in this study is an activity of planning, organizing and implementing sugarcane cultivation with the use of resources (capital, human, machine, material and money).

The data used to test the hypothesis in this study is primary data in the form of respondents' answers distributed to farmers and farmer groups that apply SCM in Madura. The population of this study is all farmers who do sugarcane farming in a partnership pattern with PT Perkebunan Nusantara X Surabaya. The sampling technique used was purposive sampling with the sample criteria: sugarcane farmers in partnership, members of *Kelompok Tani Tebu Rakyat* (KPTR), and having a sugarcane farming experience of at least 5 years. Out of 150 questionnaires distributed, only 41 questionnaires were representative to be sampled.

The hypothesis in this study was tested by Partial Least Square (PLS) analysis, which uses the Warp PLS and Smart PLS applications. PLS analysis has two models, namely the outer model and the inner model. Outer model shows the specification of the relationship between variables with the indicator.

While the inner model shows the relationship specification between latent variables, namely between exogenous / independent variables with endogenous/dependent variables [22].

Based on the conceptual framework and theoretical studies, the research hypothesis can be formulated as follows:

- 1) SCM practice (PSCM) has a positive effect on sugarcane farming (KIU) performance in Madura.
- 2) Farming activities (AKU) have a positive effect on the performance of sugarcane farming (KIU) in Madura.

4. Results and discussions

4.1. Structural equation model (SEM)

The results of the analysis of the effect of supply chain management (PSCM) practices on performance obtained the path coefficient value of 0.27, meaning that there was a direct influence between PSCM on farm performance (KIU) and significant with $p < 0.01$ (**Figure 2**). The effect of PSCM on farming activities (AKU) obtained the path coefficient value of 0.52 means that there is a direct influence between PSCM on AKU and significant with $p < 0.01$ (**Figure 2**).

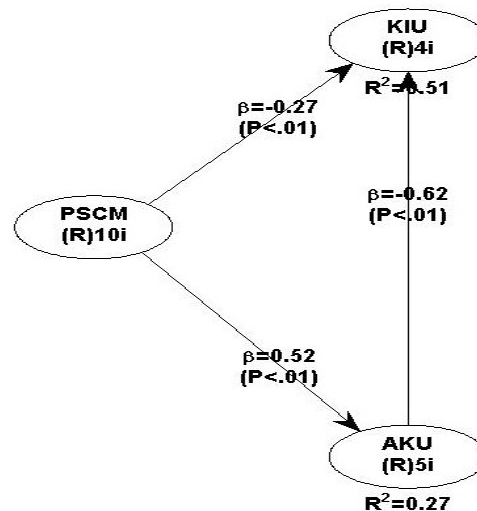


Figure 2. Basic model of structural equations

Farming activity (AKU) on farm performance (KIU) has a direct influence with the path coefficient value of 0.62, therefore farming activities have a direct effect on farm performance and are significant with $p < 0.01$ (**Figure 2**). **Figure 3** is model of structural equation which explains the relationship between variables.

4.2. Goodness of fit criteria

The test results of the Goodness of Fit model are as follows:

- 1) P-values for average path coefficient (APC) and average R-square (ARS) must be below 0.05 to be considered significant. Moreover, average block VIF (AVIF) as a multicollinearity indicator must be smaller than 5. The results show that the APC value was 0.470 and the ARS value was 0.390, which indicates that the goodness of fit model was fulfilled. The AVIF value was 1.026 that met the criteria for multicollinearity indicators.
- 2) The path coefficient of the effect of AKU on PSCM is significant, Likewise, the path coefficient of the influence of AKU on KIU's performance is significant. This is because the p-value is < 0.001 .
- 3) Estimation results show that the effect size of PSCM's influence on KIU of 0.099 was the magnitude of the contribution of PSCM influence on KIU without involving other variables, which was classified in the "weak" category. Meanwhile, the effect size of PSCM's influence on ME was 0.268.

The magnitude of the contribution of PSCM influence on AKU without involving other variables was classified in the “large” category (26%).

- 4) Based on the output of variable latent coefficients, the R-squared value for KIU was 0.513, which means that the KIU variable had an effect of 51.3% on the PSCM, while the remaining AKU variable affected 26.8% of the PSCM. The remaining 21.9% was influenced by the variable outside of the research model and its error. The results show that the composite reliability value > 0.70 and Cronbach's alpha > 0.60 , which indicates that all variable instruments were reliable.
- 5) Based on the output correlation among latent variables above, the discriminant validity for PSCM variables had been fulfilled as AVE root of 0.836 was greater than 0.476 and -0.119. Whereas the validity for the variable AKU had also been fulfilled with the value of 0.726, which was greater than 0.476 and -0.162. Similarly, the KIU variable had fulfilled the validity with the value of 0.865.

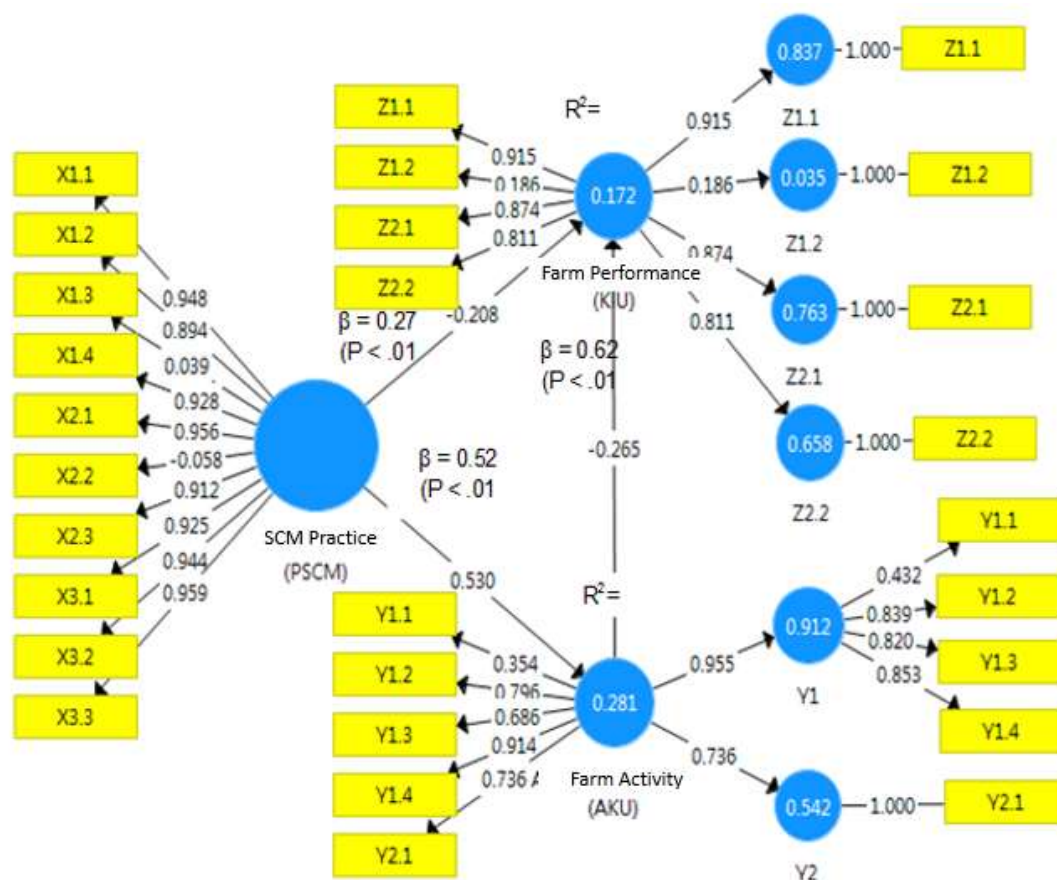


Figure 3. Complete structural equation model

4.3. Outer model

From **Table 1**, It can be explained as follows:

- 1) Strategic partnership, relations with consumers, and information sharing are very capable of influencing supply chain management (PSCM) practices because the level of relations is almost 100%.
- 2) Increased income, and reduced costs greatly affect farm performance (KIU) because the level of relations is almost 100%.
- 3) Productivity and yield greatly affect farming activities, because the level of relations is almost 100%.

Table 1. Outer model (Weights of Loading)

	AKU	KIU	PSCM	Y1	Y2	Z1.1	Z1.2	Z2.1	Z2.2
X1.1			-1.000						
X1.2			-1.000						
X1.3			-1.000						
X1.4			-1.000						
X2.1			-1.000						
X2.2			-1.000						
X2.3			-1.000						
X3.1			-1.000						
X3.2			-1.000						
X3.3			-1.000						
Y1.1				-1.000					
Y1.1	-1.000								
Y1.2				-1.000					
Y1.2	-1.000								
Y1.3				-1.000					
Y1.3	-1.000								
Y1.4				-1.000					
Y1.4	-1.000								
Y2.1					-1.000				
Y2.1	-1.000								
Z1.1						-1.000			
Z1.1		-1.000							
Z1.2							-1.000		
Z1.2		-1.000							
Z2.1								-1.000	
Z2.1		-1.000							
Z2.2									-1.000
Z2.2		-1.000							

Source: *Processed Primary Data*, 2018.

The explanation of the relationship between variables is as follows:

- 1) The variable X1.1 has a relation of 0.948 to PSCM
- 2) The variable X1.2 has a relation of 0.849 to PSCM
- 3) The variable X1.3 has a relation of 0.039 to PSCM
- 4) The variable X1.4 has a relation of 0.928 to PSCM
- 5) The variable X2.1 has a relation of 0.956 to PSCM
- 6) The variable X2.2 has a relation of 0.948 to PSCM
- 7) The variable X2.3 has a relation of 0.058 to PSCM
- 8) The variable X3.1 has a relation of 0.925 to PSCM
- 9) The variable X3.2 has a relation of 0.944 to PSCM
- 10) The variable X3.3 has a relation of 0.959 to PSCM
- 11) The variable Z1.1 has a relation of 0.837 to KIU
- 12) The variable Z1.2 has a relation of 0.186 to KIU
- 13) The variable Z2.1 has a relation of 0.874 to KIU
- 14) The variable Z2.2 has a relation of 0.811 to KIU
- 15) The variable Y1 has a relation of 0.955 to AKU
- 16) The variable Y2 has a relation of 0.736 to AKU
- 17) The variable Y1.1 has a relation of 0.432 to Y1
- 18) The variable Y1.2 has a relation of 0.839 to Y1
- 19) The variable Y1.3 has a relation of 0.820 to Y1
- 20) The variable Y1.4 has a relation of 0.853 to Y1

5. Conclusion

Based on the results of the calculation and testing of the hypothesis in the previous chapter, it can be concluded as follows there is a significant relationship between supply chain management practices and sugarcane farming performance. There is a significant relationship between farming activities and sugarcane farming performance.

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