Indicator of supply chain management performance in small households agro-industry

D D Putri¹,², D H Darwanto¹, S Hartono¹ and L R Waluyati¹

¹Doctoral Program in Faculty of Agriculture, Gadjah Mada University, Yogyakarta, Indonesia
²Department of Social Economic Agriculture, Faculty of Agriculture, Jenderal Soedirman University, Purwokerto, Central Java, Indonesia

E-mail: dindy.putri81@gmail.com

Abstract. This study aimed to analyze the effect of product, information, and money flow indicators on the supply chain management in small household’s agroindustry. This research was carried out in the brown sugar agroindustry at Yogyakarta Region. Determination of the location was done by the purposive method (center of brown sugar production). The samples were 150 respondents consisting of farmers, small household’s agroindustry, CPUs, collectors, production centers, and consumers. Data analysis using PLS-SEM consisted of two sub-models. The results showed that product flow, financial flow, and information flow are significant as supply chain management performance indicators. The product flow was ranked highest with a value of 3.76 from the Likert scale of 1-5. The supply of product from suppliers to consumers has been well integrated. However, there is a need to improve at central processing units (CPU) because there is still product accumulation. Information flow was ranked second, where communication between lines has been intertwined smoothly (3.74). To improve performance in this indicator, online communication is essential hence demand and supply data are quickly conveyed. The financial flow was ranked last (3.65). There are still funds that stop at the CPU level due to fluctuations in demand and supply.

1. Introduction

Supply chain management is the study of the efficiency and effectiveness of product flow, information flow, and financial flow that occur simultaneously so that it can unite all marketing parties at the same time. The implementation of supply chain management can integrate manufacturers, suppliers, retailers, and sellers efficiently so that the goods are distributed in the right amount at a minimum cost. A reliable logistics efficiency system is one of the implementations of good supply chain management [1].

Supply chain management is the solution to integrating a business process from the end customer through a major supplier that offers a product, service, and information that provides added value to consumers and stakeholders involved [2]. Supply chain management as an integrated approach aims to provide satisfaction to consumers through a continually developing process and partnership that supports the efficient flow of products and services from producers to consumers. Supply chain management is the integration of materials and service activities; conversion into semi-finished product and end products; and delivery to customers [3].
The elements of supply chain management that are interrelated with each other also related to supply chain management streams that must be managed, namely (1) product flow (the flow of goods from suppliers to consumers), (2) financial flow (the flow of money from consumers to suppliers), and (3) information flow (information flow from the supplier to the consumer or vice versa).

The concept of supply chain management is essential in the development of agroindustry at the household level. So far, research at the household agroindustry level has not been widely implemented. Agroindustry transforms raw materials from agricultural products including subsistence products into end products for consumers. This means that a country cannot fully use agronomic resources without developing agroindustry.

This study aimed to analyze the effect of the indicator of the flow of goods, information flow and money flow on the performance of the supply chain management of small households’ agroindustry.

2. Literature and hypothesis

2.1. Literature
Supply chain has a dynamic nature but involves three constant streams, namely information flow, product flow, and money flow. Meanwhile, the main objectives of the supply chain are to meet consumer needs and generate profits. Three streams in a supply chain include information flow (a two-way flow from supplier to consumer and vice versa), product flow (the stage of distributing a product from the supplier to the consumer's hand), and the money flow (the flow of funds from consumers to manufacturers or suppliers which then the funds will be used again in the production process) [4].

Supply chain management (SCM) aims to build a supplier value chain concentrated to maximize value for customers. The company that sets up and designs the supply chain can know the number of products ranging from sources of supply to the consumers quickly and cheaply. Supply chain management provides a very real contribution to the business strategy of a company [5, 6].

2.2. Research hypothesis
It was hypothesized that the product flow, financial flow, and information flow are significant as supply chain management performance indicators

3. Research methods
This research was carried out in the brown sugar agroindustry in Yogyakarta Special Region. Determination of the location was done by the purposive method, which was selected from the center of brown sugar production. The samples were 150 respondents consisting of farmers, small households’ agroindustry, CPUs, collectors, production centers and consumers/users. Analysis using PLS-SEM consisted of two sub-models. The first sub-model was a measurement model or often referred to as an outer model that shows how manifest variables represent variables to be measured [7, 8].

Outer Model

Outer models are often called outer relations or measurement models that explain how each indicator relates to its latent variables. Block with reflective indicators can be written as follows.

\[ X = \Lambda_\xi + \varepsilon_X \]
\[ Y = \Lambda_\eta\eta + \varepsilon_Y \]

Where x and y are indicators or manifest variables for exogenous latent variables (\( \xi \)) and endogenous latent variables (\( \eta \)), whereas \( \Lambda_\xi \) and \( \Lambda_\eta \) were the loading matrices that describe simple regression coefficients that connect the latent variables and indicators. Residuals are measured by \( \varepsilon_X \) and \( \varepsilon_Y \) can be interpreted as measurement errors or noise [9].

The formative model is the opposite of the reflective model where the formative model assumes that manifest variables affect latent variables. The direction of the causality relationship flows from the manifest variable to the latent variable. Blocks with formative indicators can be written as follows [10].
\[ \xi = \Pi \xi X_i + \delta \xi \]

\[ \eta = \Pi \eta Y_i + \varepsilon \eta \]

Where \( \xi, \eta, X \) and \( Y \) are the same as those used in the equation \( \Pi \) and \( \Pi \) are multiple regression coefficients of the latent variables on the indicator block, while \( \delta \) and \( \varepsilon \) are the residuals of the regression.

4. Results and discussions

3.1. Instrument validity and reliability test

This study used an instrument in the form of a questionnaire using a 5-choice Likert Scale answer from strongly disagree to strongly agree. Before the data from the questionnaire collection used for further analysis, it was necessary to test the validity and reliability of the instrument. Validity testing was done with a Pearson correlation, where the instrument is declared valid if the correlation value > 0.3. The results of the validity test were summarized in Table 1.

Table 1. Instrument validity test

| Variable | Indicator                  | Correlation | Result |
|----------|----------------------------|-------------|--------|
| SCMP     | Product Flow (PF)          | 0.640       | Valid  |
|          |                            | 0.584       | Valid  |
|          |                            | 0.607       | Valid  |
|          | Management Performances    | 0.468       | Valid  |
|          | Financial Flow (FF)        | 0.615       | Valid  |
|          |                            | 0.493       | Valid  |
|          | Information Flow (IF)      | 0.565       | Valid  |
|          |                            | 0.498       | Valid  |

Source: Developed from Primary Data, 2018

Table 1 shows that the correlation values of all statement items on the questionnaire for all indicators and items were larger than 0.3. Thus, it can be concluded that all items passed the validity test. Then, the reliability test was done on the instrument. The instrument is declared reliable if the Cronbach Alpha value > 0.6. The Alpha Cronbach result was 0.7. Thus, it can be concluded that the instrument passed the validity and reliability tests. The data obtained from the instrument (questionnaire) could be used for data analysis at the next stage.

Table 2. Descriptive analysis

| Indicator | Item | Likert Scale | Average | Average Indicator |
|-----------|------|--------------|---------|-------------------|
|           |      | 1 2 3 4 5    |         |                   |
| PF        | 1    | 0 2 50 88 10 | 3.71    | 3.76              |
|           | 2    | 0 2 45 86 17 | 3.79    |                   |
|           | 3    | 0 3 35 102 10| 3.79    |                   |
| FF        | 1    | 0 1 67 77 5  | 3.57    | 3.65              |
|           | 2    | 0 5 45 82 18 | 3.75    |                   |
|           | 3    | 0 3 50 96 1  | 3.63    |                   |
| IF        | 1    | 0 1 37 110 2 | 3.75    | 3.74              |
|           | 2    | 0 1 47 94 8  | 3.73    |                   |
|           | 3    | 0 1 40 105 4 | 3.75    |                   |

Source: Developed from Primary Data, 2018
As can be seen in Figure 1, the average (mean) of the three indicators was in the category of slightly high (average between 3.50 – 4.00). The product flow indicator had the highest average with a value of 3.76 (slightly high category) while the financial flow indicator had the lowest average value with a value of 3.65 (slightly high category). Overall, respondents perceived the supply chain performance management variables with an average of 3.72 (slightly high category). This indicates that the supply chain performance management in the respondents’ organization was in a slightly high category.

In the third part, the supply chain performance management variable was presented. This variable was measured by three indicators, namely product flow (PF), financial flow (FF), and information flow (IF). Table 2 and Figure 1 present the measurement model of supply chain management performance (SCMP) variable.

Table 3. Supply chain variable performance measurement model

| Indicator              | Outer loading | P-value | Result     |
|------------------------|---------------|---------|------------|
| Product Flow (PF)      | 0.738         | Fix effect | Significant |
| Financial Flow (FF)    | 0.518         | 0.000   | Significant |
| Information Flow (IF)  | 0.682         | 0.000   | Significant |

The first indicator on the measurement of supply chain management performance variable is product flow (PF), obtained by the outer loading of 0.738, and the indicator is declared fix (set). Thus, the product flow (PF) indicator was significant to measure the supply chain management performance. The high and low value of supply chain performance can be determined by the high and low value of product flow.
The second indicator on the measurement of supply chain management performance variable is the financial flow (FF) with the outer loading of 0.518 and the P-value of 0.000 < 0.05 (significant). Thus, the financial flow indicator (FF) was significant to measure the supply chain management performance (SCMP). The high and low value of supply chain management performance can be determined by the high and low value of financial flow (FF).

The third indicator on the measurement of supply chain management performance variable is the information flow (IF) with the outer loading of 0.682 and the P-value of 0.000 < 0.05 (significant). Thus, the information flow indicator (IF) is significant to measure the supply chain management performance. The high and low value of supply chain management performance can be determined by the high and low value of information flow (IF).

The three indicators of product flow (PF), financial flow (FF), and information flow (IF) are significant to measure the supply chain management performance (SCMP). The highest outer loading coefficient was obtained by the product flow (PF), which is the strongest indicator of supply chain management performance (SCMP). It means that the supply chain management performance (SCMP) can be mainly seen from the high indication of product flow (PF). The variables of supply chain management performance (SCMP) in descending order of their strength are product flow (PF), information flow (IF), and financial flow (FF). The result of this study is in accordance with the research of [11, 12].

5. Conclusion

The results show that product flow, financial flow, and information flow are significant as supply chain management performance indicators. The product flow in the brown sugar agro-industry was ranked highest with a value of 3.76 from a scale of 1-5. This is because the supply of product from suppliers to consumers has been well integrated. However, there is a need to improve at central processing units (CPU) because there is still an accumulation of product there. Information flow was ranked second, where communication between lines has been intertwined smoothly with a score of 3.74. To improve performance in this indicator, online communication is essential so that demand and supply data are quickly conveyed to all lines. The financial flow was ranked last with a score of 3.65. This is because there are still funds that stop at the CPU level due to fluctuations in demand and supply.

References
[1] Dunne A J 2001 Supply Chain Management: Fad, Panacea or Opportunity? Australian Agribusiness Perspectives (Melbourne: Melbourne University) p 48
[2] Lambert D M and Enz M G 2017 Issues in Supply Chain management: Progress and Potential Industrial Marketing Management 62 16
[3] Heizer J and Barry R 2010 Management Operation 9th Edition (Jakarta: Salemba Empat)
[4] Chopra S Meindl P 2007 Supply Chain Management, Strategy Planning and Operation (Third Edition (New Jersey: Pearson Prentice Hall)
[5] Moberg C R and Cutler B D Gross, A and Speh T W 2002 International Journal of Physical Distribution and Logistics Management 329–770
[6] Narasimhan R and Kim S W 2002 Journal of Operation Management 20 323
[7] Ghozali I and Latan 2015 Partial Least Squares:Konsep, Teknik dan Aplikasi Smart PLS 3.0 untuk penelitian Empiris (Semarang: Badan Penerbit Universitas Diponegoro)
[8] Ghozali I 2014 Structural Equation Modeling Metode Alienatif dengan Partial Least Squares (PLS) 4th Edition (Semarang: Badan Penerbit Universitas Diponegoro)
[9] Hair J F 2011 J. Mark Theory Pract 19 139–152
[10] Hair J F, Black W C, Babin B J and Anderson R E 2010 Multivariate Data Analysis 7th edition New Jersey Prentice Hall
[11] Mentzer J T, Keebler J S, Dewitt W, Min S, Nix N W, Smith C D and Zacharia Z G 2001 Journal of Business Logistics 22 1–25
[12] Miguel P L, De Sauza and Brito L 2011 Journal of Operations and Supply Chain Management 4 56–70