International Journal of Engineering & Technology, 7 (4.4) (2018) 42-45

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Supply Chain Design of Potato Commodity in Wonosobo Regency, Central Java - Indonesia

Haryadi Sarjono,Lim Sanny,Ina Melati

[1]*Bina Nusantara University, Indonesia*
**Corresponding author E-mail:haryadi_s@binus.edu *lsanny@binus.edu , imelati@binus.edu*

Abstract

Today, the demand for horticultural commodities is relatively high, making these commodities more important in the growing Indonesian economy. One of the horticultural commodities is the potato (Solanum tuberosum). Potatoes are widely used as ingredients in the light meal industry such as potato chips. Restaurants and fast food industry also use potatoes as the ingredients. Wonosobo regency is one of the areas in Java producing a lot of potatoes and the majority of the population work as farmers. The purpose of this research is to find out the network design of potato supply chain in Wonosobo regency in order to design a more effective and efficient one. This research uses the descriptive qualitative method and the processes of collecting data are observation, interview, and documentation. The results suggest that the current supply chain design of potatoes is from farmers, middlemen, retailers, and consumers. An alternative network design proposed is the farmers should channel the lower quality potatoes directly to the retailers. While another alternative is, for the good quality potatoes, the farmers should sell them to cooperative for export.

Keywords:Design, Supply Chain, Potato, Export, Wonosobo regency, Indonesia.

1. Introduction

Presently, the demand for horticultural commodities is relatively high, making these commodities more important in the growing Indonesian economy. This importance surely cannot be separated from the regions producing the commodities, one of them is the potato-producing region. Talking about potato producer, one of the centers is Wonosobo regency, Central Java.

Table 1:. Potato Production and Harvest Area in Wonosobo Regency

Year	Harvested Area (Hectare)	Production (Quintal)
2010	3,187	481,661
2011	3,088	467,977
2012	3,190	473,905
2013	3,263	494,405
2014	3,560	563,462
2015	3,431	531,817

Source: Agriculture and Fishery Department of Wonosobo Regency (2017)

In the supply chain, the farmers are in the first stage of the agricultural commodities who have been concerned only with the production system. For the distribution of the agricultural commodities such as potatoes, most of the farmers in Wonosobo regency sell potatoes directly to the middlemen since the farmers and the middlemen have established a long-term cooperation. The design of supply chain networks that has not been well patterned which results in the price difference between farmers and middlemen until the retailers, so most of the farmers only enjoy a relatively small profit.

Potatoes (Solanum Tuberosum) are included in nutrient-rich foods and can now be regarded the substitute of rice as the staple food. According to Sailah, Illah (1999:1), some of the benefits of potatoes are:

1. The diversification of non-rice foods with high nutrition,
2. Fast cash crop for farmers,
3. Non-oil export commodities,
4. Basic ingredients of food and textile industry,
5. One of the ingredients of fast-food products in big cities.

Table 2:. Production of Potatoes by Sub-district in Wonosobo regency (2015)

Sub-district	Harvested Area (Hectare)	Production (Quintal)
Kepil	1	110
Sapuran	20	2,802
Kalikajar	97	14,238
Garung	460	79,174
Kejajar	2,853	435,493
Total	3,431	531,817

Source: Agriculture and Fishery Department of Wonosobo Regency (2017)

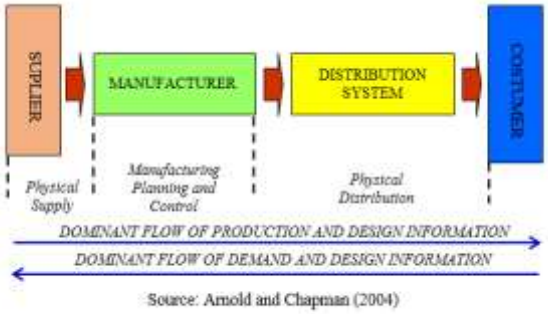
In the supply chain process, network design is one of the important activities to be done because the decision making in a network design will have a very significant impact. The structure of the supply chain will be determined by the decision of the network design in establishing a performance. A well-integrated supply chain will increase the overall values generated by the networks. The decisions of supply chain network design include the assignment of facility role, processing location, storage, and transportation related to the facilities, capacity allocation, and market. This research is aimed at identifying the network design of the supply chain of potatoes in Wonosobo regency, Central Java. It is expected that a more efficient and effective network design of the supply chain will be obtained.

Copyright © 2018Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

2. Literature Review

The success of a profit-oriented (commercial) supply chain will be judged on the basis of the supply chain's ability to generate profits. This is called as a supply chain profitability. Supply chain profitability is the total profit that will be shared across the stages involved in the supply chain (Choppra and Meindl, 2004). The higher the supply chain profitability is, the more successful the supply chain becomes. Therefore, the success of the supply chain must be measured by its supply chain profitability rather than by the individual profit at each stage.

According to Chopra and Meindl (2004), the end users are the only source of income for all members involved in a supply chain. A consumer who buys the end product of a supply chain will deliver a positive cash flow to the supply chain. The entire cash flows in the supply chain are simply the money-exchange activities taking place within and between every stage involved in the supply chain. Each stage is owned and managed by different owners. So, a good management of information flow, products, and money is the key to supply chain success and this is called supply chain management. Supply chain management serves to maximize supply chain profitability as a whole. Based on the supply chain concept, there are three stages in the material flow. The raw materials are distributed to the manufacturers forming a physical supply system. The manufacturers process the raw materials and the finished products are distributed to end consumers forming a physical distribution system.



Source: Arnold and Chapman (2004)

Figure 1. The material Flow

Meanwhile, according to Levy, Kaminsky et al (2000), the supply chain management is a tool consisting of approaches used to make efficient the suppliers, manufacturers, distributors, and retailers as a whole. So, the finished products are produced and distributed correctly, in the right place, and at the right time. This is all done to minimize the costs of the overall system and to keep satisfying the service level as expected by the customers.

According to Elliot, Barry (2012:31), the model of seven principles of SCM are as follows:

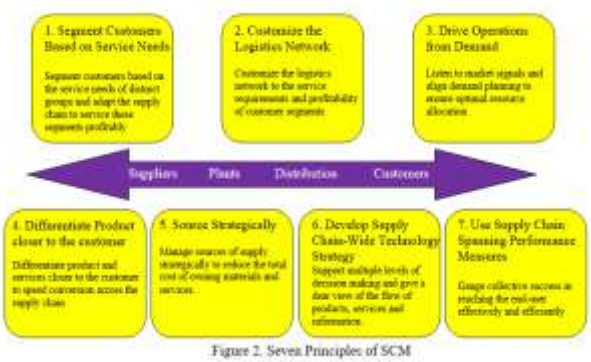


Figure 2. Seven Principles of SCM

Some operational definitions used are as follows:

- Supply Chain Management is a business strategy system that coordinates primary and secondary activities from upstream to downstream, creating a competitive advantage. Supply chain management deals with the interaction between suppliers, manufacturers (companies), consumers and members in other supply chains.
- The supplier is a business partner providing primary production facilities consisting of feed, medicines, vaccines, and disinfectants.
- Customer or consumer is a business partner who becomes a buyer of products produced by the company for resale to consumers.
- Marketing is the process of planning and executing thinking, pricing, promotion, ideas and distribution of goods and services to create exchanges and meet consumer needs.
- Marketing margin is the price difference between what consumers pay and the final price received by farmers

3. Research Methodology

This research is a qualitative descriptive research with the recording procedure to explain the conditions of the research object encountered in the field. Qualitative descriptive research is a research method used to examine the condition of natural objects where the researchers are the key instruments. The data collection techniques are mixed and the data analysis is inductive. The results of a qualitative research are emphasized more on the meaning than the generalization. In qualitative research, the sample taken is called informant. The research informants are the persons who really know or the actors directly involved in the research problems. The purpose of sampling is to explore the information that will be the basis and design as well as theories that arise. The research subjects that have been reflected in the research focus are deliberately determined. The informants provide various information needed during the research process. The research informants are the persons who provide information about the situation and the condition of the research background (Moleong 2007: 97).

Data is an important part of a research because the essence of research is the data retrieval that will be interpreted. The main data sources of a qualitative research are words and actions, and the rest is additional data or documents. The data needed is the primary data, i.e. the information derived from the informants studied both in the form of words and actions. The secondary data is obtained from various sources such as government reports, books, and articles. For data collection, there are 3 (three) process activities undertaken in this research, namely the process getting in, getting along, and logging the data.

1. *Getting In.* In accordance with Moleong's opinion (Eman 2012: 12), it is found that the legitimacy of informants stems from the researcher's overall ability to convey an acceptable and trustworthy presence. In an effort to enter the research site or getting in, we used both the formal and informal approaches. Thus, the process of '*getting in'* generally ran smoothly, including when we tried to be close to the leaders and staff of the Agriculture and Fishery Department of Wonosobo Regency.
2. *Getting along.* According to Moleong (Eman 2012; 12), building trust with respondents is the key to achieving accuracy and comprehensiveness. In accordance with that opinion, we tried to make a warm personal relationship with the research subject. In this process, we tried to get more in-

formation and capture the meaning of the essence of the information obtained.

3. *Logging the data*. After both processes have been implemented, we immediately performed the data collection. To obtain the data, we used the following data collection techniques; interviews, observation and field documentation.

4. Findings and Discussion

General portrayal of Wonosobo Regency

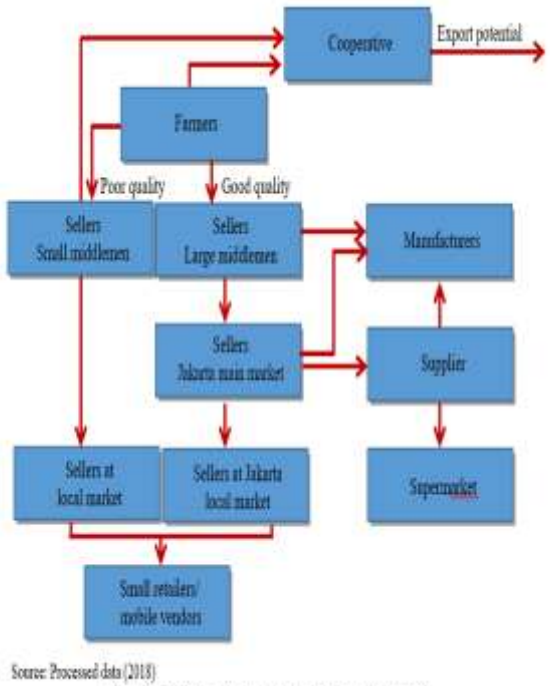
Wonosobo regency is located 120 km from the capital of Central Java (Semarang) and 520 km from the capital city of Jakarta. Wonosobo regency is 250 - 2,225 meters above sea level with dominantly between 500-1,000 meters above sea level (50% of the entire area). This characterizes Wonosobo regency as a plateau with a spatial position located in the middle of Java Island and between the northern coast line and southern coastal line. It has an area of 98,468 hectares (984.68 km^2) or 3.03 % of the area of Central Java with the composition of rice field of 18,696.68 hectares (18.99%), dry land of 55,140.80 hectares (55.99%), state-owned forests of 18,909.72 hectares (19.20%), state-owned and private plantation of 2,764.51 hectares (2,80, %) and other areas of 2,964.07 hectares (3,01%).

Table 3. Production of Potatoes by Subdistrict in Wonosobo regency (2015)

Subdistrict	Harvested Area (Hectare)	Production (Quintal)
Kepil	1	110
Sapuran	20	2,802
Kalikajar	97	14,238
Garung	460	79,174
Kejajar	2,853	435,493
Total	3,431	531,817

Source: Agriculture and Fishery Department of Wonosobo Regency (2017)

Wonosobo regency has fifteen subdistricts, but only five of them produce potatoes. With an area of 2,853 hectares, the Kejajar sub - district is the largest potato producer. In 2015, the potato production of Kejajar sub-district reached 435,493 quintals.



Source: Processed data (2018)

Figure 3. Flow Design of potato supply chain in Wonosobo (2018)

The supply chain of potato in Wonosobo regency is seen from every member or institution in the relationship structure who has a role to engage in the product flow, financial flow, and information flow down to the final consumer. The actors involved in the supply chain network consist of farmers, middlemen, retailers, and consumers.

The review of potato supply chain conducted in this study is based on three segments of the supply chain:

1. Supply chain related to farmers.

The centers for potato production have always been selling the potatoes to well-known middlemen for years, so farmers seem to have no choice but to sell the potatoes to them. Thus, the supply chain is influenced by the surrounding environmental factors. Almost all farmers have been cooperating with the middlemen for years. As an example, for purchasing the seeds of plants and fertilizers, the farmers usually borrow the money from the middlemen. Besides, the farmers also borrow the money for fulfilling their daily needs. Such supply chain should be shortened, for example by establishing cooperatives.

2. Supply Chain in process and marketing channel

In this aspect, marketing channel is very long, that is, from the farmers to the middlemen at the village level, regency level and between regencies, between provinces, and between islands. Finally, the products go to the supermarket. Sometimes, the farmers directly market their potatoes to the manufacturers, especially for good quality potatoes. Because there are a lot of parties involved in the supply chain, the margin may vary.

3. Supply Chain at the processing and marketing level

At this level, the farmers averagely do not understand how to properly process the potatoes so the potatoes are not only sold directly, but they are processed. For marketing the potatoes, the farmers just sell them to the middlemen. Therefore, there is a need for establishing an institution for marketing the potatoes such as a cooperative which will be able to bring together the two parties, namely the farmers who have export quality potatoes and the middlemen abroad. This marketing process can be done via the internet. The local farmers still produce the potatoes using traditional methods focusing on the quantity of harvest per hectare. Whereas, the overseas buyers or middlemen are more concerned with the quality of the potatoes. Thus, the supply chain at this level will be different from the farmer level or marketing channel. At this level, an integral and inseparable process among the three levels is required. This study will make intact all levels as illustrated in the picture above

5. Conclusion

An alternative design of supply chain network is by minimizing the role of middlemen because completely eliminating their role is impossible. So far, farmers, both large and small ones sell their potatoes to the middlemen so that their profit is small. It is suggested that the farmers form a potato cooperative, aiming at providing counseling and coaching in terms of knowledge, technology, and funding. The poor quality potatoes can be directly sold to the middlemen, but the good ones should be sold to the cooperative in the hope that later the potatoes can be exported. So, the farmers' income will increase. It is also recommended for the farmers to sell the poor quality potatoes directly in traditional markets in the municipality or in Semarang city because the price of potatoes in the market outside of Wonosobo can reach IDR 12,000 / Kg. Whereas the selling price at large middlemen is around IDR 9,000 / Kg and at small middlemen is between IDR 8,000-8,500 / Kg. The design of a recommended potato supply chain network can be an alternative for creating sustainability of farmers and buyers so that the consumers can meet their needs for

potato. Thus, it can create an effective and efficient supply chain benefiting all parties involved in the supply chain.

The forthcoming research in potato supply chain may compare Wonosobo regency with other centers of potato production in Java Island such as Malang regency. It is known that farmers in Malang regency earn more profit than farmers in Wonosobo because they have advantages in terms of lower seed price and fertilizer and higher selling price. Thus, a new policy can be proposed to the Department of Agriculture and Fisheries, Wonosobo regency.

Acknowledgments

The research is funded entirely by the Higher Education Grant, Ministry of Research, Technology and Higher Education, Republic of Indonesia.

References

[1] Chopra S, Sodhi MS., Managing risk to avoid supply chain breakdown, MIT Sloan Management Review, 2004.
[2] Chopra S; Meindl, P., Supply Chain Management: Strategy, Planning, and Operations, New Jersey: Prentice Hall, 2001.
[3] Deep A, Dani S., Managing Global Food Supply Chain Risks: A Scenario Planning Perspective, POMS 20th Annual Conference.Orlando, Florida, POMS Abstract Number: 011-0371, 2009.
[4] Diaz LC, Hansel JE., Making Risk sharing models work with farmers, agribusinesses and financial institutions. International Conference on Rural Finance Research: Moving Results into Policies and Practice. FAO. Rome. Italy, Pp. 1-55, 2007.
[5] Deblitz, Claus; Kristedi, Teddy; Hadi, Prajogo U; Triastono, Joko; Puspadi, Ketut; Nasrullah, Benchmarking the beef Supply Chain in Eastern Indonesia – Final Report, Australian Centre for International Agricurtural Research (ACIAR), Cambera ACT 2601, Australia, 2011.
[6] Jaffee S, Siegel P, Andrews C., Rapid agricultural supply chain risk assessment: Conceptual framework and guidelines for application. Commodity Risk Management Group Report. ARD World Bank, 2008.
[7] Norrman A, Lindroth R., Categorization of supply chain risk and risk management.In Brindley, C. (Ed.) Supply Chain Risk. Hampshire, England:Ashgate Publishing Ltd, 2004.
[8] Pujawan, I Nyoman; Mahendrawathi ER., Supply Chain Management, Edisi Kedua, penerbit Guna Widya, Surabaya, 2010.
[9] Rusastra, I.W; Wahyuning K.S.; Sri Wahyuni; Yana Supriyatna, Analisis Kelembagaan Kemitraan Rantai Pasok Komoditas Peternakan.Pusat Analisis Ekonomi dan Kebijakan Pertanian.Badan Penelitian dan Pengembangan Peertanian. Departemen Pertanian. Jakarta, 2006.
[10] Sailah, Illah, Kajian Pasar Kentang, Laporan Akhir, Kerjasama antara Canadian Cooperative Association dengan Jurusan Teknologi Industri Pertanian (TIN) Fakultas Teknologi Pertanian Institut Pertanian Bogor, 1998/1999.
[11] Tawaf, Rochadi; Setiadi, Rachmat; Firmansyah, Cecep, (2010), The role of feedlot businessin beef Supply Chains in West Java Indonesia, Lucrări Ştiinţifice - Vol. 55, Seria Zootehnie, Universitatea de Ştiinţe Agricole şi Medicină Veterinară Iaşi, 2010.
[12] Cavinato JL., Supply chain logistics risk: from the back room to the board room. Int J Physical Distribution & Logistic Management 34(5): (2004), 383-387.
[13] Chapman P, Christopher M, Juttner U, Peck H, Wilding R., Identifying and managing supply-chain vulnerability. Logistics & transport focus: J Institute of Logistics and Transport4: (2002), 59-64.
[14] Christopher M, Peck H., Building the Resilient Supply Chain.Int J Logistics Management, 15: (2004), 1 - 13.
[15] Elliot, Barry, The Seven Principles of Supply Chain Management, Journal of Supply Chain Management: Research and Practice, Assumption University of Thailand, 2012.
[16] Hallikas J, Virolainen VM, Tuominen M., Risk analysis and assessment in network environment: A dyadic case study. Int J Production Economics78: (2002), 45-55.
[17] Hallikas JI, Karvonen U, Pulkkinen VM, Virolainen, Tuomine M., Risk management processes in supplier networks, Int J Production Economics. 90: (2004), 47-58.
[18] Harland C, Brenchley R, Walker H., Risk in supply networks. J Purchasing & Supply Management.1(1): (2003), 51–62.
[19] Jüttner U, Peck H, Christopher M., Supply chain risk management: outlining an agenda for future research. Int J Logistics : Research & Applications. 6 (4): (2003), 197-210.
[20] Karningsih PD, Kayis B, Kara S., Development of knowledge based system for supply chain risk identification in multi-site & multi-partners global manufacturing supply chain. Proc. of the 13th Asia Pacific Management Conference, Australia. (2007), pp 466-471.
[21] Lee TYS., Supply Chain Risk Management. Int J Information and Decision Sciences. 1(1): (2008), 98–114.
[22] Li J, Hong SJ., Towards a New Model of Supply Chain Risk Management: the Cross-Functional Process Mapping Approach. Int J Electronic Customer Relationship Management. 1(1): (2007), 91–107.