

# Toward A Conceptual Framework of *Piper retrofractum* Supply Chain Performance

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## Abstract

*Piper retrofractum* is a raw material of herbal medicine in Indonesia, especially in Madura. Marginal and small farmers have important rule in the herbs supply network. Synergy between stakeholders in the supply network build significant result in increasing supply network performance. This paper presents a conceptual framework of *Piper retrofractum* supply chain performance. Socio-technical system was applied to identify criteria of the supply network performance. Analyzing supply network performance requires better understanding and implementation of system approach. The initial conceptual framework provided in this paper could support stakeholders, including government in managing network and increasing benefit of *Piper retrofractum* for economic and social welfare.

## Keywords:

Conceptual framework, *Piper retrofractum*, supply network, performance

## 1. Introduction

The government of Indonesia is currently undergoing a significant development to increase conservation and need of natural resources in herbal medicine that is reflected in the agribusiness policy. Tight competition in the international market, need to deal with the long-term focus of development that should be directed towards increasing research capability and development. It is also important to build the synergy between farmers, entrepreneurs, and government of Indonesia through an optimum supply network performance. The success or the failure of agribusiness development in the future needs support of stakeholders in order to determine the task and function between them. Supply network management in herbal medicine industries has been implemented through the paternalistic system of supplier relation. Long-term relationship with suppliers has dominantly influenced in supply network performance. However, long-term relationships have lacks of information sharing, risk sharing, and activities sharing. Indonesian traditional medicines companies' state propagating policy of *Bapak-anak* (Father-Child) relations between firms, in which large firms help the small ones to strengthen the Indonesian economy (Mangestuti, Subehan, Widyawaruyanti A., Zaidi A.F.H, 2007).

Jamu is an indigenous herbal medicine of Indonesia. It is complex mixture of herbs and widely used throughout Indonesia, especially in Java and Madura islands. Maduranese Jamu, or *Jamu Madura* is one of the famous kinds of traditional medicine in Indonesia. Historically, Jamu Madura was secret traditional medicine for a Sultanate of Madura. After the end of royal period in 20<sup>th</sup> century, the secret ingredients of Jamu Madura become familiar among ordinary people and the herb is manufactured in companies and home industries (Mangestuti, Subehan, Widyawaruyanti A., Zaidi A.F.H, 2007). One of cultivation plant that has many benefits in Madura's herbal medicine raw material, is Cabe Jawa (*Piper retrofractum*). A high quality of herbal medicinal production made from Cabe Jawa could be obtained by an adequate supporting of provision upstream technology (Ruhnayat, Muljati, & Haryudin W., 2011). There has been a global increasing in the use of traditional medicine in both developed and developing countries in the last decade. Therefore certain forms of traditional medicine play an important role in health care and health sector reform globally (WHO, 2010).

Research reported in this paper aims to generate a conceptual framework of *Piper retrofractum* supply chain performance in marginal and small farmers. The framework adopted socio-technical system in defining operational criteria of performance.

## **2. Methodology**

Research presented in this paper implemented fixed and flexible research design (Robson C., 2011). Firstly, researcher investigated why the study is trying to achieve and the reason why it is being done. Secondly, review of literatures on resilience of supply network was conducted to identify contrast between theories and practices in the real world. Moreover, literature review was very important step to identify and determine the best research method, which could be used in this research. Thirdly, research question were established based on understanding of problem in the real world. Finally, a conceptual framework was generated to analyze a case study.

## **3. Supply network of *Piper retrofractum* in Marginal and small farmers**

One leading partner in the supply network need to take on the role of coordinator (Soroor, Tarokh, & Shemshadi, 2009). This is a traditional role of the project management team. While upstream supply network partners are often well considered and their reaction and impact is well thought through, small downstream supply network partners are frequently poorly consulted and engaged with for joint problem solving so that avoidable delays and costs are incurred because of problem with planning, logistics and production. A framework that will be able to manage changes that might occur when implementing IT projects to improve supply network performance with effective involvement of stakeholders was proposed (Zhao, Wang, Cheng, Yang, & Huang, 2010). The proposed framework uses a deeper perspective and existing models to provide an integrated supply network decision-making process that enables stakeholders and decision-makers to make joint decisions based on the value added by stakeholders when implementing the occurred changes. It is important to note that in any decision-making process there are different levels of participation for different stakeholders, depending on their stake, power, and knowledge. Stakeholders with high stakes in the collaborative process, even if they lack any power or knowledge can add legitimacy and community acceptance. Stakeholders with power, that is mandate or resources, can increase the viability of the process. Stakeholders with lower stake, power and knowledge can be involved through feedback.

Figure 1 provides an overview of *Piper retrofractum* supply network, including flows of activities and the stakeholders involved. Thousands of marginal and small farmers in Madura, grow the herb for the herbal medicines industry. Traders buy from farmers and sell them to industries. The supply network channels flows from marginal and small farmers of *Piper retrofractum* to the collectors before being distributed and sold in markets or industries.

There is a long network between farmers and end-users. The supply networks are depended on availability of raw material and customer needs. Personal relationship, in some cases family ties are an important basis of the relations between the agents in the supply channels (Rademakers, 1998).

The agents involved in the supply networks of *Piper retrofractum* could be identified as follows:

- a. Marginal and small farmers  
Farmers are growing selected species of herbal medicine, harvesting and marketing the raw material of herbal medicine. The herbs were harvested, and then stored in warehouse. The farmers clean, screen, wash leaves and stems. Any unnecessary parts are removed prior to drying. Cleaning is often done by hand. Then, the herbs were sorted pieces by size, since different size and quality of herbs determine different price and markets.
- b. Local Traders  
Local traders are people or organization who buy the herbs from farmers. Different kind of procurement and payment methods arrangements are applied at this level.
- c. Major Traders  
Major traders are located in the major markets at city and buy the herbs from the local traders. They are well organized and often have their own storage facilities, as an indicator how lucrative the trader. They supply the herbs to industries, wholesaler, and exporters.
- d. Exporters  
Wholesale dealers and major agents are also exporters.

- e. Industries  
The industries can be classified into the small, Medium and large industries. They buy the herbs from major traders.
- f. Government (The Ministry of health and The Ministry of Agriculture of Republic of Indonesia)  
The government is involved in the development, protection, regulating and monitoring of the *Piper retrofractum* supply networks.
- g. The association of herbal medicine industries  
Association of traditional medicine companies, which support and organize Traditional medicine producers. It focuses its activities on Indonesian herbs and traditional medicines, and it supports SMEs and farmers of natural ingredients.
- h. Researchers Institution  
Support Traditional medicine stakeholders to develop better quality of raw material and product.
- i. Financial Institution  
Support the stakeholders to develop their business

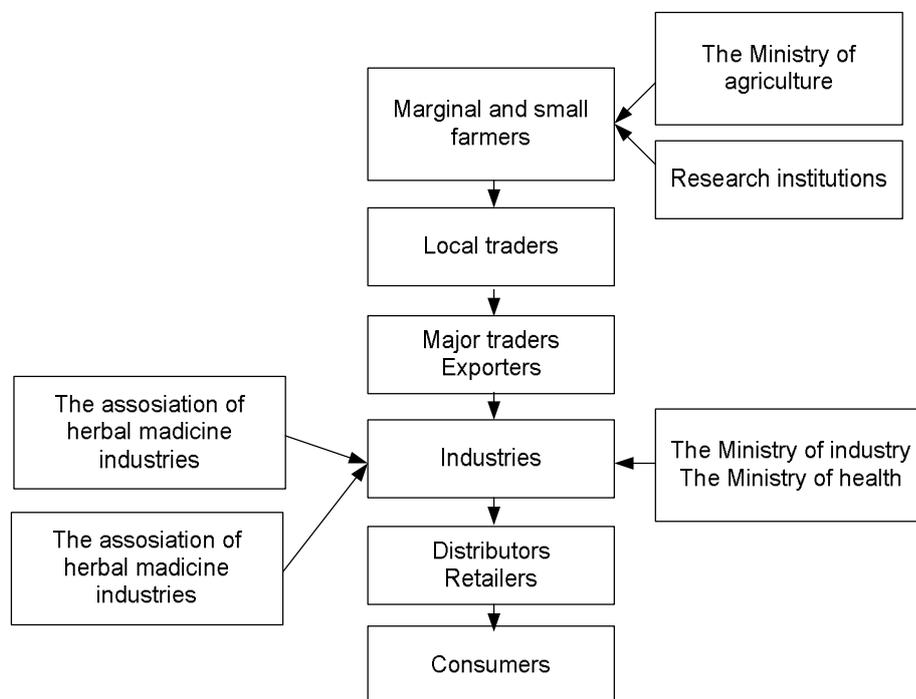


Figure 1. Supply network of *Piper retrofractum*

Personal relationship between stakeholders has a clear benefits for the *Piper retrofractum* supply networks. The system provides more certainty of supply than a spot-market relationship, while the prices for the herbs remain competitive because within the core-groups of farmers, stakeholders have to compete with each other. The traders of *Piper retrofractum* supply networks also in a better position to refuse herbs that appear to be of poor quality when delivered to them, because they can quickly switch to another farmers they know well.

The link between farmers and their customers, which are traders, independent distributors, and street-corner retailers are also long-term and straightforward in nature. The relationships last for years, but the level of co-operation is very low and information exchange is mainly concerned with prices, qualities and quantities. The marginal and small farmers are supported by the government and financial institution through short-term credits and by teaching them how to cultivate, harvest, store, and distribute *Piper retrofractum*.

#### 4. Substantial criteria of *Piper retrofractum* supply network performance

Stakeholder coordination, which is defined as supply network management, is considered as a main issue to sustain in this global era (Chang, Chiang, & Pai, 2012). Long-term relationships between stakeholders in supply network have substantial effects on organisation's performance (Prajogo & Olhager, 2012). Moreover, collaboration at the operational level will have a greater positive impact on the supply network performance (Eriksson, 2010) and mitigate potential risks (Vilko & Hallikas, 2012).

A supply network is a configuration of supply facilities geographically deployed in order to serve a customer base, so strategic supply network design decisions involve the determination of the number, location and mission of these facilities (Klibi & Martel, 2012). Many companies look to supply chain management as a tool for implementing continuous improvement (Gunasekaran A., Patel C., 2004).

Gunasekaran and Patel (Gunasekaran A., Patel C., 2004) proposed four criteria of supply chain performance; plan, source, make, and deliver. This paper introduces criteria of supply chain performance from socio-technical perspectives, and add two criteria, that are safety and environment. The two criteria were added from result of interview with industrial practitioners (Utami, 2016). Six perspectives of socio-technical system (Clegg et al., 2017; Davis, Challenger, Jayewardene, & Clegg, 2014): goal, people, procedure or method, technology, infrastructure, and culture used to identify main factors in *piper retrofractum* supply chain performance. Figure 2 presents translation of socio-technical perspective for performance criteria. The perspectives integrated with four factors of supply chain coordination. The four factors are information sharing, coordination between two or more actors, explicitly cope with uncertainty, explicitly consider inter-functional conflict. The operational definition of supply chain performance criteria were collaborated with seven supply chain factors (Sanberg, 2007) : process, information sharing, planning and logistics activities, supply network orientation, logistics activities, barriers and effect.

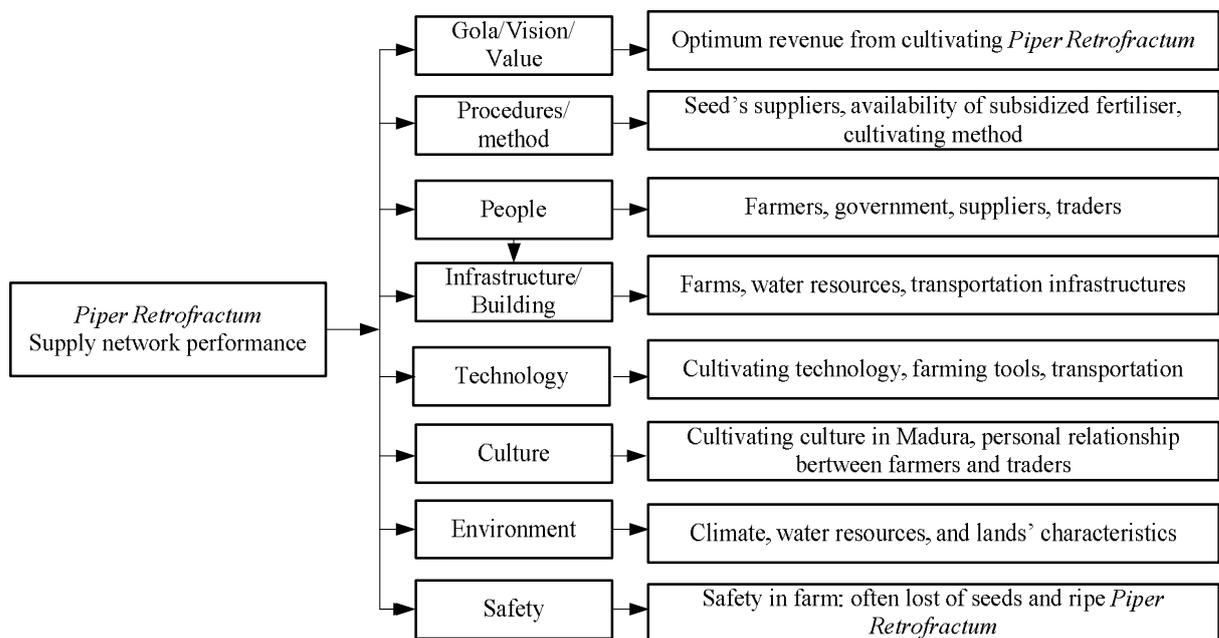


Figure 2. Translation of socio-technical perspective for performance criterias.

Table 1 describes operational definition of *piper retrofractum* supply network performance. The criteria were identified to analyze constraints in supply network that prevent the industries from fulfilling the customer's needs, develop nature of the long-term relationships that exist between stakeholders, identified capacities for change, and evaluate the potential for improvement of supply network. However, industries can improve their supply network performance after they have been identified the constraint (Thomas, Venkateswaran, Singh, & Krishnamoorthy,

2013). In addition, the constraints would then be the areas that the research institution and policy makers could focus on in order to assist industry development with the greatest potential for improving the supply networks' profitability.

Table 1. Operational definition of performance criterias

<b>Criteria</b>	<b>Definition</b>
Goal/vision/value	Supply network collaboration result in positive effect directly to either cost reduction or service improvements
Procedure/method	Planning and Logistics activities should be collaborate among supply network members. Joining planning in collaborative arrangement should be consider to integrate solution, defining and describing process among the supply network members
People	Coordination between two or more actors facilitates their responsibility interdependence represented by shares workflow that links their individual processes.
Infrastrucure/building	Recommends that the participating actors will coordinate their related activities through information sharing and decision synchronization. Information sharing among the supply network members is an important prerequisite for collaboration and has a great impact on the performance in the supply network.
Technology	The transition towards a process view is the most important characteristics of supply network management.
Culture	Supply network coordination is carried out to explicitly consider inter-functional conflict
Environment	Assumes that coordination between two or more actors helps them cope with various uncertainties along the supply network.
Safety	Two main categories of barriers for collaboration are related to technology and human beings

Industries or organizations serve the needs of stakeholders by ensuring that their expectations and needs are realized. Therefore Industries or organizations that does not meet expectations of influential stakeholders is not likely to be regarded as successful, even if it remains within the original time, budget and scope. Effective decision makers require keen analytical and intuitive skills to identify high-impact and cumulative impact stakeholders and work with them to understand their expectations to achieve goal. These activities are managing a process that maximizes stakeholders positive input and minimize any potential detrimental impact. In order to define and get potential value that brought by solution, stakeholders must be brought together in a joint process to define potential solution when seeking higher level of performance (Klassen & Vereecke, 2012).

## 5. Conclusion

The use of herbal medicine in both developed and developing countries has been increasing over the last decade. Therefore certain forms of herbal medicines play an important role in healthcare and global reform in the health sector (World Health Organization (WHO), 2010). The WHO estimates that over 80% of the world's population relies on herbal plant-based medicine for their primary health care needs and the trade will be up to US\$50 trillion by 2050 (Booker, Johnston, & Heinrich, 2012). Supply network has appropriate rule and stages in decision making process. However, it is important to analyze the performance of supply network implementation since each of components in supply network gives crucial effect in supply network decision making. The analyzing supply network performance requires better understanding and implementation of system approach in identifying, analyzing, controlling and improving problematic situation in development. Therefore, the application of socio-technical system in generating a conceptual framework of supply network performance in *piper retrofractum* especially from marginal and small framers has been in line with the current needs of the stakeholders and support government in policy arrangement.

## References

Booker, A., Johnston, D., & Heinrich, M., Value chains of herbal medicines- Research needs and key challenges in the context of ethnopharmacology, *Journal of Ethnopharmacology*, vol. 140, pp. 624–633, 2012

- Chang, C. W., Chiang, D. M., & Pai, F. Y., Cooperative strategy in supply chain networks. *Industrial Marketing Management*, vol. 41, no. 7, pp. 1114–1124, 2012
- Clegg, C. W., Robinson, M. A., Davis, M. C., Bolton, L. E., Pieniasek, R. L., & McKay, A. Applying organizational psychology as a design science : A method for predicting malfunctions in socio-technical systems ( PreMiSTS ), pp. 1–31, 2017
- Davis, M. C., Challenger, R., Jayewardene, D. N. W., & Clegg, C. W., Advancing socio-technical systems thinking: A call for bravery, *Applied Ergonomics*, vol. 45, no. 2, pp. 171–80, 2014
- Eriksson, P. E., Improving construction supply chain collaboration and performance: a lean construction pilot project, *Supply Chain Management: An International Journal*, vol. 15, no. 5, pp. 394–403, 2010
- Gunasekaran A., Patel C., M. G. R. E., A framework for supply chain performance measurement. *International Journal of Production Economics*, vol. 87, pp. 333–347, 2004
- Klassen, R. D., & Vereecke, A., Social issues in supply chains: Capabilities link responsibility, risk (opportunity), and performance, *International Journal of Production Economics*, vol. 140, no. 1, pp. 103–115, 2012
- Klibi, W., & Martel, A., Scenario-based Supply Chain Network risk modeling, *European Journal of Operational Research*, vol.223, no. 3, pp. 644–658, 2012
- Mangestuti, Subehan, Widyawaruyanti A., Zaidi A.F.H, A. S., Traditional Medicine of Madura Island in Indonesia, *Journal of Traditional Medicine*, 2007
- Prajogo, D., & Olhager, J., Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration, *International Journal of Production Economics*, vol. 135, no. 1, pp 514–522, 2012
- Rademakers, M. F. L., Market Organization in Indonesia : Javanese and Chinese Family Business in the Jamu Industry, *Organization Studies*, vol. 19, pp. 1005, 1998
- Robson C., *Real World Research*, 3<sup>rd</sup> Edition, Sussex, United Kingdom: John Willey and Sons Ltd., 2011
- Ruhnayat, A., Muljati, R. S., & Haryudin W., The Response of Javanese Productive Chillie to Fertilization in Sumenep Madura. *Buletin of Research on Spice and Medicinal Crops*, vol. 22, no. 2, pp. 136–146, 2011
- Sanberg, E., Logistics collaboration in supply chains : practice vs. Theory. *The International Journal of Logistics Management*, vol. 18, no. 2, pp. 274–293, 2007
- Soroor, J., Tarokh, M., & Shemshadi, A., Theoretical and practical study of supply chain Coordination. *Journal of Business & Industrial Marketing*, vol. 24, no. 2, pp. 131–142, 2009
- Thomas, A., Venkateswaran, J., Singh, G., & Krishnamoorthy, M., A resource constrained scheduling problem with multiple independent producers and a single linking constraint: A coal supply chain example. *European Journal of Operational Research*, vol. 236, issue 1, pp. 946-956, 2013
- Utami, I. D., *An Approach to the Assessment of Resilience in Indonesian Fertiliser Industry Supply Networks*. University of Leeds, 2016
- Vilko, J. P. P., & Hallikas, J. M., Risk assessment in multimodal supply chains. *International Journal of Production Economics*, vol. 140, no. 2, pp. 586–595, 2012
- World Health Organization (WHO), *National Policy on Traditional Medicine and Regulation of herbal medicine: Report of a WHO global survey*, 2010
- Zhao, Y., Wang, S., Cheng, T. C. E., Yang, X., & Huang, Z., Coordination of supply chains by option contracts: A cooperative game theory approach. *European Journal of Operational Research*, vol. 207, no. 2, pp. 668–675, 2010

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