CHAPTER 2

Theoretical Concepts and Literature Reviews

This chapter represents the main theoretical concepts used for setting the conceptual framework and methodologies in this dissertation which are separated into five sections such as cluster development concepts, cluster supply chain concepts, green supply chain concepts, value sharing concepts, and competitiveness concepts. In addition, the rest of the section in this chapter reviews the effective tools and techniques of previous studies for developing and applying as research methodologies.

2.1 Cluster development concept

The cluster development in agricultural aspect is the new approach increasingly used by academicians, researchers and developers, especially for community economic development (Zhao and Liu, 2011). Many researchers have brought the concept of agricultural industrial cluster for improving competitiveness and creating the competitive advantage and agricultural production capacities of the farmers (Song and Chen, 2005 cited in: Zhao and Liu, 2011) through the competitive based collaboration of stakeholders in the cluster. The actors in cluster consist of the firm or industry, government agencies, related communities (such as academic institutions, etc.), financial institutions, and institutions for collaboration. These five groups will be located on the same area and are linked together. (Sövell et al., 2003)

For cluster development, the fundamental factors of the business environment took into account the macroeconomic factors such as the regulations and cultures in the area, geographical position, institutions, legal framework, and macroeconomic variables (Sövell et al., 2003) and microeconomic factors such as the demand, infrastructure, relevant and supporting industries, and market. The basic models have widely used the following: diamond model (Porter, 1990, 1998; Brown, 2000; Carrie, 2000; Sövell et al., 2003), Grounding, Enterprises and Markets (GEM) model (Padmore and Gibson, 1998;

Li and Zhou, 2006; Shang and Wang, 2011), and Cluster initiative performance model (CIPM) (Sövell et al., 2003). The strengths of the diamond model is the analysis of overall business environments, whereas CIPM makes the importance of the collaboration for technology and environmental purposes representing the policies that have an influence on the cluster development through the objectives and establishment, as well as paying attention to the growth of the cluster. However, both models are the qualitative tools that are not suitable for analyzing the complex cluster systems. On the other hand, the GEM model uses mathematical analysis as a tool and systemically shows the structure diagram of production system. There are three indicators in the GEM model consisting of a grounding indicator representing supply determinants (such as resources and infrastructure), enterprise indicator representing structural determinants (such as suppliers and related industries, and firm structures, strategies and rivalry), and markets indicator displaying demand determinants (such as local markets and accessibility to external markets).

Thus, the analysis of conditions and environmental determinants before a cluster development in the coffee supply chain of highland farmers applies the techniques of the GEM model.

2.2 Cluster supply chain concept

Cluster supply chain is the concept integrating the concepts of supply chain management and cluster development together which involves a supply chain network systems where there are different organizations belonging to the same industry in the specific agglomeration location (Yan and Wang, 2009). In the present, the cluster supply chain has been used as a tool for gaining a competitive advantage. This concept plays an important role in enhancing the competitiveness of production units in the cluster (Yan and Wang, 2009; Xue et al., 2009).

The key success factor of cluster supply chain development is the collaboration of all units in the supply chain. This process is concerned with two or more partners that closely work together in planning and implementing to achieve the main goals and mutual benefits. The collaboration consists of information sharing (Manthou et al., 2004; Simatupang and Sridharan, 2005), joint decision (Stank et al., 2001; Simatupang and

Sridharan, 2005; Cao and Zhang, 2011), resource sharing (Sheu et al., 2006), joint logistics process (Cao and Zhang, 2011), and joint knowledge creation (Cao and Zhang, 2011). Simatupang and Sridharan (2002); Barratt (2004) and Mangan et al. (2008) had separated the collaboration in supply chain to the horizontal collaboration with at least two partners in the same level of supply chain, such as farmers' collaboration, etc., and the vertical collaboration with at least two partners in the different levels of supply chain, such as the collaboration between farmers and distributors, etc. Whereas Xue et al. (2009) had classified the collaboration in three types including the vertical collaboration which is the directly joint action among the firms in each hierarchy, the pooled horizontal collaboration which takes place when each firm in a cluster separates entirely and has an indirect relationship, and a reciprocal horizontal collaboration which is the most complex in association and continues the relationship between the parties.

This research integrates the concept of cluster supply chain concerning with the network of supply chains and the principle of the horizontal and vertical collaboration for establishing the farmer cluster, focusing on teamwork, and enhancing the competitiveness.

2.3 Green supply chain concept

Nowadays, the environmental concerns are important issues affecting the economy and the ecology. Most firms have given attention to the practices with regards to environment by using green supply chain management as a tool. This brings about a good image of being environmentally friendly, increasing profits, and enhancing competitive advantage (Sarkis, 2003; Rao and Holt, 2005; Srivastava, 2007). Green supply chain stresses on the processes concerning with environmental awareness, collaboration networks from suppliers to final consumers, and taking into account the environmental impacts that may occur at various stages such as production, transportation, and waste disposal, etc. (Green et al., 1996; Srivastava, 2007).

Green supply chain management is divided into six models that include (1) green designs associating with the design activities for the minimum environmental impact over the life of the product (Sarkis, 1998; Walton et al., 1998; Hervani et al., 2005; Zhu et al., 2007; Eltayeba et al., 2011; Ying and Zhou, 2012), (2) green procurement involving

activities that aim to purchase materials which has environmental performance and the characteristics of reused ability, recycling and no harmful substances (Walton et al.,1998; Hervani et al., 2005; Ying and Zhou, 2012), (3) green production and processing (Ying and Zhou, 2012), (4) green logistics (Ying and Zhou, 2012; Andic, 2012), (5) Green recycling (Ying and Zhou, 2012), and (6) waste disposal (Andic, 2012).

Consequently, the application of green supply chain concept focuses on green production, green waste disposal and green transportation because these processes bring about the highest proportion of the greenhouse gas emissions. Moreover, under the theses models, the farmers are able to easily change their practices to being seen more as environmentally friendly.

2.4 Value sharing concept

The concept of value sharing has been discussed for decades in views of sharing between business units and employees in the form of financial expenditure, and the sharing among individuals (Wagner and Lindemann, 2008). However, the value sharing that is created from the partnership between the organizations has been given a lack of attention (Jap, 2001).

However, in the present, the value sharing resulted from the coordination between organizations that have begun to be used in many fields of research and development that are widespread (Wagner and Johnson, 2004; de Lurdes Veludo et al., 2006; Schurr, 2007; Wagner and Lindemann, 2008). The goal of coordination is the higher value creation arising from a cooperative that have been compared with an individual operation (Dyer and Singh, 1998; Walter et al., 2001).

In the development process of supply chain system consisting of many actors having different operations and complex network, the necessary and benefitting tool is the coordination for creating added value in the supply chain. The popular approach for coordinating is value sharing contracts such as profit sharing, revenue sharing, etc. (Hou, Zeng, and Zhao, 2009; van der Rhee et al., 2010; Krishnan and Winter, 2011). These contracts are designed for improving the efficiency of all relevant actors with the means of supply chain performance optimization (van der Rhee et al., 2010).

The nature of value sharing contracts are separated in two forms consisting of pairwise contracts that are controlled by the value sharing between two actors which are adjacent to each partner in the supply chain between suppliers and farmers, farmers and retailer, and so on (Giannoccaro and Pontrandolfo, 2004; Cachon and Lariviere, 2005; van der Rhee et al., 2010). In this case, the seller will sell his products with a wholesale price, ω, to the buyer and get the value proportion, $(1 - \phi)$, from the buyer (Cai et al., 2011). However, some contracts may not occur from an agreement between the buyer and seller but they engage from the promise of all parties in the supply chain. This form of contract is called 'spanning contracts' which cover the entire value share. Spanning contracts resulted from one unit in the supply chain playing the role as the leader to negotiate an agreement on sharing the revenue with other units at once and with a single contract (van der Rhee et al., 2010).

This research applies the concept of 'revenue sharing with pairwise contracts' between the farmers and the assemblers, and between the assemblers and RPF for analyzing the value sharing to the farmers resulting from the cluster supply chain.

2.5 Competitiveness concept

In general, the competitiveness is divided in three levels, namely, firm level, industrial level, and national level. This research focuses on the firm level which is the farmers. The competitiveness of firm is the ability to supply products being more effective and efficient than competitors without discrimination or subsidies. From a traditional view, the competitiveness of firms focuses on the production cost and the ability to transfer the lowest prices of products to the highly competitive markets (Lau et al., 2009).

The theoretical frameworks used to analyze the competitiveness of firms in supply chain are classified to three main groups of methods consisting of (1) the qualitative method such as SWOT analysis (Chou et al., 2003; Shinnoa et al., 2006), diamond model (Porter, 1990; Rugman and Verbeke, 1993; Moon et al., 1998; Clancy et al., 2001), five competitive forces model (Porter, 1990; Song et al., 2002), and value chain analysis (Stabell and Fjeldstad, 1998; Zhang et al., 2009), (2) the quantitative method such as the weighted sum (Oral, 1993; IMD, 2004; Zhang et al., 2009), and (3) the pool of qualitative and quantitative methods such as competitiveness index (Fischer and Schornberg, 2007;

Zhang et al., 2009). The advantages of the qualitative tools are on giving insights on the competitive strengths, weaknesses, opportunities, obstacles, bargaining power, understanding the operation and competitive strategies of the industry, dependence, and mutual support. However, these tools have their weaknesses on the inability to show the size of competitiveness and the impacts on competitiveness in mathematical aspect whereas the quantitative tool displays the opposite ways.

Accordingly, this research chooses the 'competitiveness index', integrating the quantitative and qualitative tools, for assessing the farmers' competitiveness.

2.6 Literature reviews

In this section, the reviews of the documents and related researches are represented in four issues such as the related researches on the conditions and environmental factors before developing a cluster with the GEM model, the related works on cluster supply chain optimization, the related researches on revenue sharing in supply chain, and the related researches on competitiveness index.

2.6.1 Related researches on the conditions and environmental factors before developing cluster with GEM model

Although GEM model is not used highly, recent studies on the cluster development, can be applied to various fields, such as the analysis of regional industrial cluster of Padmore and Gibson (1998), the study of industrial engineering of Li and Zhou (2006), the study of biomass energy industry in the northern of China of Shang and Wang (2011), etc. This section shows the summary of the indicators used in the model separated in grounding, enterprises, and markets perspectives (shown in Table 2.1).

Table 2.1 Summary of indicators used in the GEM model

Authors	Grounding dimension	
	Resources	Infrastructures
Padmore and Gibson (1998)	• Natural resources • Geographical location • Financial capital • Technology	• Infrastructures • Business support • Regulations • Government policy • Business environment

Table 2.1 (Continued)

Authors	Grounding dimension	
	Resources	Infrastructures
Li and Zhou (2006)	• Location • Technology • Capital • Human resources	• Transportation • Communications • Business environment • Industrial policy • Related agencies • Research Institutions
Shang and Wang (2011)	• National resources • Capital resources • Human resources • Technique resources • Information resources	• Infrastructures • Professional equipmen • Government policy • Services of industrial associations • Technology level • Research environment • Business environment • Ecological environment
Authors	Enterprise dimension	
	Supplier and related industries	Firm structures, strategies and rivalry
Padmore and Gibson (1998)	• Variety, quality, cost and expertise of local suppliers • Buyer and seller relationships • Number and quality of the relevant agencies • Relationship of the entities involved in the cluster.	• Number and quality of firms • Rate of birth and death • Ownership • Financial strengths • Concentration • Competitive strategies and growth
Li and Zhou (2006)	• Strength suppliers • Cooperation with Supplier • Strength of related firm • Cooperation with related firms	• Unanimous in group • Competition in cluster • Property structure • Managers' ability • Product competitiveness • strength of competitors • competition out the cluster

Table 2.1 (Continued)

Authors	Enterprise dimension	
	Supplier and related industries	Firm structures, strategies and rivalry
Shang and Wang (2011)	• Number of suppliers and strength • Supporting industries and departments • Professional level of relevant industry • The exchange and cooperation between enterprises	• Ownership structure • Governance structure • The strategy and developmental planning • Innovation and developmental planning • Entrepreneurship • Healthy competition within the region
Authors	Markets dimension	
	Local markets	External markets
Padmore and Gibson (1998)	• Scale of local market • Local market share • Growth and opportunity • Buyer boundary • Specific demand • Willingness to pay	• Distances to external markets • Scale and growth rate • External market share • Final consumers • Entry to external markets
Li and Zhou (2006)	• Scale of local market • Local market share • Perfect of local market • Prospect of local market	• Distance to external markets • Scale of external markets • Share of external markets • Prospect of external markets • Barriers to external markets
Shang and Wang (2011)	• Prospects for the domestic market • The share of total domestic market • Credibility building • Evaluation of biomass energy	• The share of international market of biomass energy • Prospects of biomass energy in international market • The barriers to enter the international market

2.6.2 Related researches on cluster supply chain optimization

Although the collaborations in both intra supply chain and between supply chains to form the cluster supply chain play important role in the competitiveness improvement of firms in the cluster, the networks difficultly occurred in the complex supply chain (Yan and Wang, 2009; Xue et al., 2009). Thus, the analysis of cluster supply chain optimization is the effective tool for making the decisions that involve planning and operation of firms. However, the complexity of the relationships between the different units in the supply chain causes uncertainty in decision making and has some impacts on the supply chain performance (Peidro et al., 2009a). Causes of uncertainty includes demand (Petrovic, 2001; Liu and Kao, 2004; Wang and Shu, 2005; Tarabi and Hassini, 2008; Peidro et al., 2009a, 2010), supply (Petrovic, 2001; Liu and Kao, 2004; Peidro et al., 2009a, 2010), cost (Liu and Kao, 2004; Tarabi and Hassini, 2008), time (Petrovic, 2001; Wang and Shu, 2005; Tarabi and Hassini, 2008), and process (Peidro et al., 2009a, 2010).

Giannoccaro and Pontrandolfo (2001) has classified the model used in the researches on supply chain performance under uncertainty situation in three types such as (1) Analytical models, namely, Stochastic programming (SP), Game theory, Linear programming (LP), etc., (2) the model based on artificial intelligence, namely, Multi-agent system (MS), fuzzy linear programming (FLP), Fuzzy multi-objective programming (FMLP), Fuzzy goal programming (FGP), Genetic algorithm, etc., and (3) simulation models, namely, simulation system changes. Whereas Shanthikumar and Sargent (1983), Gnoni et al. (2003) and Peidro et al. (2009a, 2009b) have expressed the hybrid models that was mixed between analysis modelling and simulations for the study of complex production planning such as Stochastic dynamic programming (SDP), Mixed integer linear programming (MILP), Fuzzy mixed integer linear programming (FMILP), etc.

Due to the characteristics of data involving the operations in the Arabica coffee supply chain being mixed between the real data and binary data, integer (0, 1), there is a lot of ambiguity occurring when trying to configure out for the real information. To alleviate the situation, this research chooses the fuzzy mixed integer linear programming (FMILP) model for planning the input procurement, production, and distribution of the Arabica coffee farmers, the assemblers, and the processor under the uncertainty of costs.

2.6.3 Related researches on revenue sharing in supply chain

Most related researches and studies on revenue sharing contracts have shown that the revenue would be shared between two parties in the different level in the supply chain such as contracts between suppliers and retailers (Cachon, 2001; Gerchak and Wang, 2004; Chauhan and Proth, 2005; Qin and Yang, 2008), contracts between suppliers and buyers (van der Veen and Venugopal, 2005), and between firm and retailers (Yao et al., 2008; Yang and Zhao, 2011). The model mostly used in various related researches is started by defining a simple profit model in the absence of revenue sharing agreement and extending to the model with revenue sharing contract by adding a parameter concerning the ratio of revenue sharing between the parties (Cachon, 2001, Giannoccaro and Pontrandolfo, 2004). Numerical examples are used to present the results by adjusting the parameters for the best results. The summary of the related researches about revenue sharing in supply chain is shown in Table 2.2.

Table 2.2 Summary of the related researches about revenue sharing in supply chain

Authors	Contract parties	Research models	Method for receiving the best results
Cachon (2001)	one supplier and one retailer	Profit model explained with two contracts parameters such as wholesale price and proportion of revenue sharing	No empirical results but presenting the models
Gerchak and Wang (2004)	various suppliers and one retailer or assemble	Profit model under random demand explained with two contracts parameters such as wholesale price and proportion of revenue sharing. The scenarios are separated to three models such as centralization, revenue sharing contract, and wholesale contracts	No empirical results but presenting the models

Table 2.2 (Continued)

Authors	Contract parties	Research models	Method for receiving the best results
Giannoccaro and Pontrandolfo (2004)	one retailer one distributer and one producer	Profit model with revenue sharing contracts explained with three parameters such as wholesale price, proportion of revenue sharing between retailer and distributor, and distributer and producer and determine three types of contracts, namely, case of no contracts, case of revenue sharing contracts, and systematically equations	Numerical examples by adjusting the parameters for the best results
Chauhan and Proth (2005)	one supplier one retailer	Profit model consists of revenue and cost of product purchasing, inventory cost and demand backlogs cost	Gradient method for calculating profit maximization
van der Veen and Venugopal (2005)	one supplier one buyer	Simple profit models for three scenarios such as 1) independently, 2) having the partners in supply chain, and 3) revenue sharing contracts	Numerical examples by adjusting the parameters for the best results
Qin and Yang (2008)	one supplier one retailer	Stackelberg game for setting the problem models and then scenario for switching two players playing the role as the game leader	Stochastic programming
Yao et al. (2008)	one producer and various retailers	Expected profit model under random demand and determine two scenarios such as 1) only price contracts and 2) revenue sharing contracts	Define constant value of parameters and use Mathematica 4 for calculating the best results

Table 2.2 (Continued)

Authors	Contract parties	Research models	Method for receiving the best results
Cai et al. (2011)	various suppliers with collaboration and one retailer	Profit model revenue sharing contracts explained with 2 parameters such as wholesale price and proportion of revenue sharing and determine 2 types of contracts, namely, centralization, and revenue sharing contracts	Numerical examples by adjusting the parameters for the best results

This research selects the three levels for revenue sharing contracts between the farmers and assemblers, assemblers and processors, and extending the traditional supply chain to the cluster.

2.6.4 Related researches on competitiveness index

To create the competitiveness index, the indicators used to set the index are different depended on the concepts and based models that are referred of each study. For example, Fischer and Schornberg (2007) have created the competitiveness index based on the performance of the economy in various dimensions to study the competitiveness of meat processing and beverage industry in the EU. Thus, the important factors consist of profitability, productivity, and growth. Whereas Zangoueinezhad et al. (2011) have created the competitiveness index based on SCOR model and used Fuzzy MCDM as a tool for evaluating. Therefore, the indicators include trust, flexibility, cost, and asset, etc. The summary of indicators for creating the competitiveness index expresses in Table 2.3.

The review of the literatures shows that most of the studies have focused on the business indicators. Therefore, in this research, the competitiveness index is created on the basis models of the SCOR.

Table 2.3 Summary of indicators for creating the competitiveness index

Authors	Concept / fundamental view for creating index	Indicators	Sub-indicators
Fischer and Schornberg (2007)	Multidimensional economic performance	Profitability	• Turnover ratio
		Productivity	• Ratio of value added per hired labors
		Growth	• Changes in the value of production
Qi et al. (2007)	Game theory	Data performance	• Quality of supply chain partners • Conditions of information technology • Depth of the information sharing
		Strategy performance	• Performance in management • The quick response • Marketing performance •The power of supply
		Returns	• Market share • The proximity of supply chain partners
Han and Lu (2008)	Environmental competitiveness and AHP model	Technology	• The ability to acquire technology • Potential of technological innovation •The ability to use technology
		production	•The ability to production control • The ability to product control
		marketing	•packaging •Cultural thinking •Product

Table 2.3 (Continued)

Authors	Concept / fundamental view for creating index	Indicators	Sub-indicators
Lui et al. (2009)	Overall supply chain operations and Fuzzy logic	Quickness of supply chain	●Lead time of new products ●Flexibility in volume ●Flexibility in delivery ●Production period
		Coordination in supply chain	● The rate of production and demand ●The rate of production sales ●The rate of delivery on time ●The level of information sharing
		consumers	●The rate of complaint ●The rate of satisfation ●The rate of product royalty ●The rate of repeat purchases
		Level of supply chain management	●The properties of the product ●Inventory Turnover ●cost ●To comply with the order
		Competitiveness of firms	●Forces ●Profitability ●Market share ●Level of information
Zangoueinezhad et al. (2011)		Trust	● Efficiency in the Delivery ● The rate of compliance ● Delays and integrity of the compliance order
		Flexibility	● The duration of the response of the supply chain ● Flexibility of production

Table 2.3 (Continued)

Authors	Concept / fundamental view for creating index	Indicators	Sub-indicators
Zangoueinezhad et al. (2011) (Continue)	SCOR model and Fuzzy MCDM	Cost	•The total cost of logistics •The cost of returning goods •Value added productivity
		Asset	•Current Ratio • Number of days to keep inventory •Return on asset
Lee et al. (2001)	Value chain	Cost	•Production cost •The cost of post-production
		Quality	•Design Quality •Quality standards
		services	•Quickness of delivery •Trust in the delivery
		Flexibility	• The flexibility of the new product •Customization •Flexibility in product ingredients

2.7 Summary

The theoretical concepts used for creating the conceptual framework and applied for defining the research methodology can be summarized as follow:

1) **Cluster development concept**: The cluster development in agricultural aspect is the new approach for improving competitiveness and creating the competitive advantage and agricultural production capacities of the farmers through the competitive based collaboration of stakeholders in the cluster. The actors in cluster consist of the firm or industry, government agencies, related communities (such as academic institutions, etc.), financial institutions, and institutions for collaboration. For cluster development, the fundamental factors

of the business environment such as the macroeconomic factors and microeconomic factors are took into account. Consequently, in this research, the conditions and environmental determinants before the cluster development in the coffee supply chain of highland farmers are initially analyzed.

2) **Cluster supply chain concept**: Cluster supply chain is the concept integrating the concepts of supply chain management and cluster development together which involves a supply chain network systems where there are different organizations belonging to the same industry in the specific agglomeration location. This research integrates the concept of cluster supply chain concerning with the network of supply chains and the principle of the horizontal and vertical collaboration for establishing the farmer cluster, focusing on teamwork, and enhancing the competitiveness.

3) **Green supply chain concept**: Green supply chain stresses on the processes concerning with environmental awareness, collaboration networks from suppliers to final consumers, and taking into account the environmental impacts that may occur at various stages such as production, transportation, and waste disposal, etc. The application of green supply chain concept in this research focuses on green production, green waste disposal and green transportation because these processes bring about the highest proportion of the greenhouse gas emissions. Moreover, under the theses models, the farmers are able to easily change their practices to being seen more as environmentally friendly.

4) **Value sharing concept**: The value sharing is resulted from the coordination between organizations. The goal of coordination is the higher value creation arising from the cooperative that have been compared with an individual operation This research applies the concept of 'revenue sharing with pairwise contracts' between the farmers and the assemblers, and between the assemblers and RPF for analyzing the value sharing to the farmers resulting from the cluster supply chain.

5) **Competitiveness concept**: The competitiveness of firm is the ability to supply products being more effective and efficient than competitors without

discrimination or subsidies. This research chooses the competitiveness index, integrating the quantitative and qualitative tools, for assessing the farmers' competitiveness.

Moreover, the literature reviews of the related studies bring about the methodologies applied for achieving the research objectives such as:

1) The techniques of the GEM model for analyzing the conditions and environmental determinants before the cluster development.
2) The fuzzy mixed integer linear programming (FMILP) model for evaluating the operational optimization.
3) The three levels for revenue sharing contracts between the farmers and the assemblers, as well as, the assemblers and the processors, and extending the traditional supply chain to the cluster.
4) The competitiveness index is created on the basis models of the SCOR.