Chapter 5

Conclusions

5.1 Conclusions

This research was carried out under the premise of the vigorous development of the coffee industry in Chiang Mai. The purpose of this research is to design a traceability data structure in the coffee supply chain. This research can be divided into 4 information level: stakeholder level, process level, activity level and critical knowledge level. As shown in Figure 5.1.

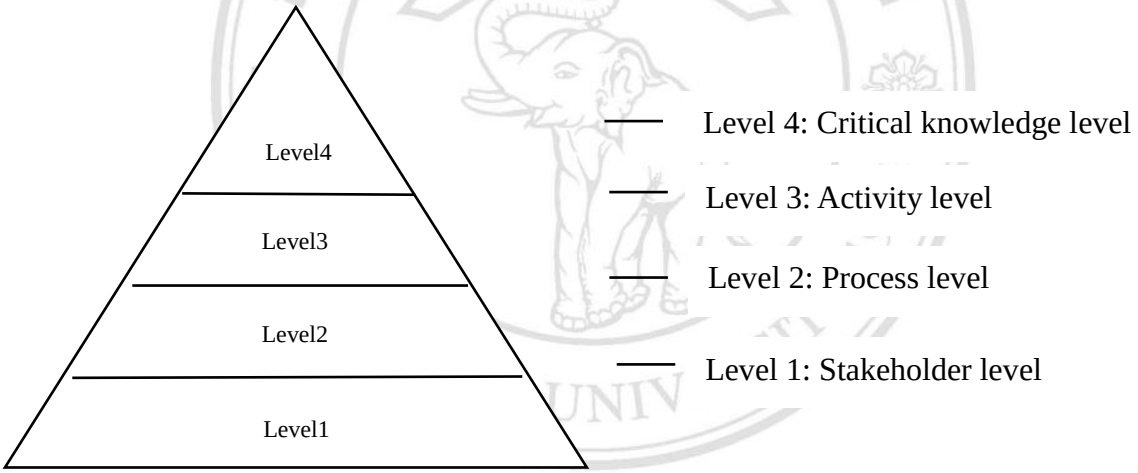

Figure 5.1 Four information levels

From Figure 5.1, the first level is the stakeholder level. The stakeholder is the farmer, community enterprise, coffee roaster, wholesale, and coffee drinker. The second level is the process level. A total of 8 processes, take care seedling and post-harvest management, harvesting, collect coffee cherries, processing, milling, roasting, storage and consumption. The third level is the activity level. There are 12 activities, coffee seeding selection, breeding, cultivate, hand pick, transportation, wet processing, dry processing, semi processing, milling, cupping test, store roasting bean and store green bean. The fourth level is the critical knowledge level. A total of 10 critical knowledge is involved.

In addition, the traceability information is an important part of designing knowledge dictionary and databases. There are 14 traceability information in this research. The details of each group are shown in Table 5.1.

Table 5.1 shows that the traceability information collected in the coffee supply chain is concentrated on three stakeholders: farmer, community enterprises and coffee roaster, while wholesalers and coffee drinker have no traceability information. The amount of traceability information of each stakeholders is shown in Figure 5.2.

Table 5.1 The details of each group in the coffee supply chain

Stakeholder	Farmer		Community enterprise/Processor				Coffee Roaster	Wholesaler	Coffee drinker
Product	Breeder seed	Coffee cherries			Parchment coffee	Coffee bean	Roasted coffee	Packaging	Cup of coffee
Process	Take care seedling and post-harvest management	Harvesting	Collect coffee cherries	Processing	Milling		Roasting	Storage	Consumption
Activity	Coffee seeding selection	Hand pick	Transportation	Wet processing	Milling		Cupping test	Store green bean	
	Breeding			Dry processing			Store roasting bean		
	Cultivate			Semi processing					
Traceability information	The name of farmer		Group name				Cupping score		
	The name of species								
	Cultivation/Village name						Roasting date		
	General information								
	Average temperature		Target group				Batch number		
	Humidity								
	Location GPS						Profile		
	Mean sea level								

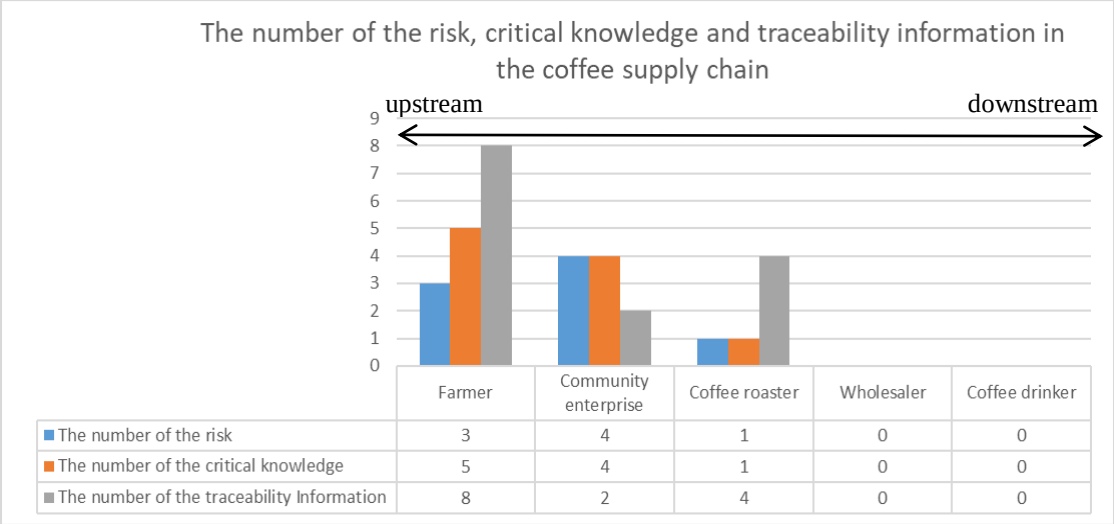

Figure 5.2 The number of the risk, critical knowledge and traceability information in the coffee supply chain

From the Figure 5.2, farmer involves the most quantity of the risk, critical knowledge and traceability information in the coffee supply chain; the second most owner is community enterprise; and the third owner is coffee roaster. Wholesalers and coffee drinker do not have risk, critical knowledge and traceability information. Because these two stakeholders are located downstream of the coffee supply chain. Especially, whether coffee drinker can enjoy high quality coffee depends on upstream activities.

It means that the more quality and well management from upstream, the better taste of downstream coffee drinking. Therefore, farmer and community enterprise should concentrate on the quality of coffee, especially farmer who provides the origin coffee quality. When developing traceability data structures, traceability information should come from three stakeholders: farmer, community enterprise and coffee roaster.

5.2 Discussions

The discussion part mainly discusses the inspiration of traceability in the coffee supply chain. Coffee is a high-value crop in the world, but coffee is easily damaged by natural and operation factors. According to the first research question, what are the core processes in the coffee supply chain? The researcher can answer this question based on five core processes:

1. The first process is the cultivating process. The cultivating process is a process with the highest risk and the most number of traceability information. Therefore, farmers must consider their activities from planting to cultivating process, which provided the coffee to be in quality.

2. The second process is the harvesting process. Farmers are responsible for harvesting the ripe coffee cherries.

3. The third process is the processing process. In this research, community enterprises have a responsibility to process coffee bean. The quality of coffee will be affected by the wrong operation.

4. The fourth process is the roasting process. The cupping score can be used to define the uniqueness of coffee quality. Moreover, all the processes will affect the cupping score. Additionally, this is a very important step with the high risk, because of the consideration of commercial confidentiality, it is difficult to trace and disclose the cupping score.

5. The final process is consumption. After above processes, coffee bean became a cup of coffee. Customer can buy and enjoy the coffee product.

According to the second research question, how to analyze traceability information in the coffee supply? The objective of this research is developing a traceability data structure in the coffee supply chain. As the research focuses on coffee quality perspective. The researcher use knowledge management theory and knowledge map, risk analysis and Pareto principle as tools in this research. The process of developing a traceability data structures is as follows:

1. The researcher starts with the scoping of the coffee supply chain.

2. Then, interviews experts and analyze the relationship along the stakeholder, product processes, and activities in the coffee supply chain.

3. After that, the researcher keeps in touch with experts, and uses risk analysis and Pareto principle to acquire critical risks,

4. Afterwards, the researcher analyzes critical knowledge from critical risk, and uses knowledge maps to represent critical knowledge.

5. Next, the researcher through interviews experts to verify critical knowledge and get traceability information.

6. Finally, the researcher uses traceability information to design a data dictionary and database.

During the research, the researcher found that using the risk analysis method is a reasonable way to quickly acquire risk priority. Meanwhile, during the designing data dictionary, the designer must consider that traceability information can be collected from the real coffee supply chain.

5.3 Research Limitation and Future Work

This researcher based on the theory of knowledge map and the tool of risk analysis to design the framework of traceability data structure. However, this research also has limitation. The research focus on Arabica coffee in northern Thailand. There are 2 factors that make this research have strong representativeness and limitation. First, the characteristics of Arabica coffee and the natural factors make Robusta coffee lack of reference during risk evaluation process. Second, the research just focuses on the coffee supply chain of Thailand. It does not include export market. Because export will involve more stakeholders, suppliers, standards, it will be more complicated.

In the future, traceability data structures can develop to be traceability database system, these knowledge and information can be classified and stored in database, it is easy to apply. Besides, database and intelligent technology combine together, which can be used in real case or coffee industry to trace information of coffee products.