

Foreword

As I set out to write this thesis report, there are two questions I assume the reader will have. These are: Why coffee?, and why Nepal? My answers to these questions are: Coffee because I like to drink it, and because coffee can provide a relatively stable source of income to smallholder farmers. Nepal, because I have lived and worked in this relatively small and landlocked country on the southern slopes of the great Himalayas for seven years and would like to see the country benefitting from the huge market for coffee worldwide. As I had studied Industrial Economics for three semesters already, the task at hand was to write a thesis on a subject related to the study. And since I live in Nepal, and is somewhat involved with coffee already, the choice of subject for the thesis was relatively easy.

The case for this thesis is the plans for investment in coffee production and export of coffee by two Norwegian investors. Their plans for an initial business research project coincided with the time frame allocated for my thesis work. This provided me with the opportunity to research my topic based on a real-world case which has, hopefully, also made my research useful both for the Norwegian investors and for the growing coffee industry in Nepal.

I am thankful to the representatives of the Norwegian investor group, Mr. Ådne Berge and Mr. Frank Dale for letting me use their project as a case and for letting me in on their deliberations in the initial business research phase. I will also take the opportunity to thank every individual in the Nepal coffee industry who have provided me with valuable insights and input for my work.

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Egil Hagen

Table of Contents

Foreword	i
Summary	iv
1. Setting the Scene	1
1.1 Nepal and Coffee	1
1.2 Supply Chains and Institutional Support Systems	7
1.3 My Research Project	9
2. Supply Chains and Institutional Support	11
2.1 Theory on Supply Chains	11
2.2 Theory on National Innovation Systems	18
2.3 A unified model of SCM and NIS	22
3. Experience from Selected Coffee Producing Countries	24
3.1 Guatemala	25
3.2 El Salvador	28
3.3 Colombia	31
3.4 Indonesia	33
3.5 India	34
3.6 Experience from other Countries – Summary	37
4. Coffee Production in Nepal	39
4.1 The Actors in the Nepal Coffee Sector	40
4.2 The Coffee Project	43
5. Quality of Coffee – How is it Achieved?	47
5.1 Coffee Basics	48
5.2 Quality of Coffee in General	49
5.3 High Quality Arabica Processing	51
5.4 Quality of the Roast	55
5.5 Quality of the Liquor	55
5.6 Sampling	57
5.7 Coffee Quality – Summary	58

6. Methodology	59
6.1 The Research Question	59
6.2 Collection of relevant theoretical information.....	59
6.3 Collection of Relevant Empirical Information	60
6.4 Discussion of the relevance of the methodology.....	61
7. Analysis and Discussion.....	63
7.1 Outline of this Chapter	63
7.2 What we can Learn from the Theory?	63
7.3 What we can learn from the empirical knowledge?	75
7.4 An effective and efficient Supply Chain for coffee.....	83
7.5 Necessary Infrastructure and Institutional Support	86
7.6 Practical set-up of the Coffee Project	88
7.7 Lessons for the Existing Nepal Coffee Industry.....	89
8. Conclusions and Recommendations.....	90
Literature:	95

Summary

The coffee industry in Nepal is young, and it is only since 2003 that export of washed Arabica coffee has commenced. The industry seems to be rather fragmented with several exporting companies competing to collect the relatively small output of the coffee production system. Two Norwegian investors are looking to promote coffee production for export from three hilly districts in eastern Nepal. There seems to be some recognition that coffee from Nepal can satisfy the quality criteria for specialty coffee. To make quality coffee from Nepal available to a larger market, there is a need to promote coffee growing in much larger areas and increase the processing capacity of quality coffee. This master thesis is about supply chains for coffee, the institutional framework necessary to support the growth and competitiveness of the coffee industry, and the plans to establish specialty coffee production for export from three districts in eastern Nepal. This has been formulated as a research question which forms the basis for the report: **What is the appropriate design of a supply chain and an institutional support system for production and export of green bean specialty coffee from three districts in eastern Nepal?**

Methodology

To analyse the research question, it has been split into three areas, namely:

1. Applying theory on supply chain design and management, innovation support systems, and experience of coffee production in Nepal and abroad, what are the features of an effective and efficient supply chain and institutional support system for a project aiming to produce and export specialty coffee from three districts in eastern Nepal?
2. How can the identified features be applied in the planning for the specific setup of organisational units, facilities, supporting services and rules to achieve a successful implementation of the coffee project by the two Norwegian parties?
3. How can the outcome of the study be applied in improving the present institutional support system of coffee production in Nepal?

To give an adequate answer to these questions, relevant theory on supply chain management and national innovation systems have been gathered and adopted to the context of the case. Furthermore, to try and draw on experience from other coffee producing countries, information about some of these countries, how they have organised their supply chain for

coffee, and what kind of institutional setup they have made to support their coffee industry have also been studied. Information about the present setup of the coffee industry and supporting infrastructure in Nepal has been reviewed for the purpose of studying what is functioning and what can be improved in the existing setup. Information about the coffee industry and the institutional support system has been obtained through meetings with officials of the private coffee companies as well as the government and non-government institutions involved with the industry. Finally, the process of how to make high quality Arabica coffee has been summarised.

Overview of the Applied Theory

Theory on supply chain management and institutional support systems have been reviewed to identify useful knowledge for the analysis of the research question. Supply chains include all parties involved in fulfilling a customer request, and include not only the manufacturers and suppliers, but also transporters, warehouses, retailers, and even the customers themselves. The primary purpose of any supply chain is to satisfy customer needs, and in the process, generate profit to be shared between the supply chain parties. An objective of a supply chain is to maximize the overall value generated. The value generated by a supply chain is the difference between what the final products is worth to the customer, and the costs incurred in the supply chain in fulfilling the customer's request. If the actual value of the end product is fully acknowledged by the end user, the selling price of the product will be equal to the value. A firm's competitive strategy defines, relative to its competitors, the set of customer needs that it seeks to satisfy through its products and services. For a company to be successful, its competitive strategy and supply chain strategy must fit together, and it must have the resources to set up a supply chain that actually gives as an output exactly what the competitive strategy specifies. In designing a supply chain a starting point is to focus on six drivers and analyse the supply chain features based on these drivers. These are three logistical drivers – facilities, inventory and transportation, and three cross-functional drivers – information, sourcing and pricing.

The theory on national innovations systems focuses on how institutions and their interactions influence economic growth in a country or for a national industry. Research has shown that the ability to learn determines the economic success of firms and industries, and also of regions and countries. The concept of the learning economy has developed which is based on the proposition that learning is an interactive, socially embedded process, and its efficiency

depends on the institutional setup which is also called the national innovation system. From the theory of national innovation systems we can learn that institutions matter for economic change. The definition chosen for this report says that a national innovation system is: The network of institutions in the public and private sectors, whose activities and interactions initiate, import, modify and diffuse new technologies. In addition a government's rules and regulations, tax regimes etc. will also be part of this system. One way of analysing the research question based on the concept of national innovation system theory is to study the institutions involved directly and indirectly with an industry and compare how these institutions are interacting among themselves and with the industry to create competitive advantage in one country over another. A unified model of studying the supply chain for coffee and the national system of innovation, would be to study the stages of the supply chain with the purpose of identifying how the different institutions will influence the stages.

Conclusions and recommendations

Starting with the features of an effective and efficient supply chain for specialty coffee in Nepal we should begin with the selection of project area. The area has to be of the right elevation for production of quality coffee which will be from above 1,000 metres to the maximum elevation where there will never be frost. In the selected districts in eastern Nepal, this would probably be up to around 1,800 metres. Higher grown coffee will normally give better quality, but also lower yields compared to coffee grown at lower elevations. Second, the right variety to grow is also an important choice. Some varieties give high yields, but not coffee of the best flavours, and these varieties can therefore be used to produce mainstream coffee with an economic use of the available land. Other varieties give less yield, but have the flavours and aromas that is associated with high-quality coffee. Even though the low yield varieties give less green beans per ha of land, it is these varieties the project should grow to make quality coffee. The selection of varieties in Nepal so far seems to be on the basis of availability at the time of plantation, and based on trial and error. Since coffee has been grown in Nepal for a considerable number of years now, there should be enough accumulated experience for a study of which varieties holds promise for production of high quality coffee in Nepal. For this, both biological and coffee expertise is necessary, and it is outside the scope of this report to answer what varieties should be grown. Another feature of the coffee production area is that there has to be abundant availability of water both for growing the coffee, as even short periods of draught will affect the quality negatively, and for wet-

processing, as plenty of clean water is a prerequisite for successful processing of high quality coffee.

Having chosen the production area and the varieties to grow, we now turn to the features of the collection and processing of the coffee up to the stage where the parchment coffee beans have reached the correct moisture level. The evidence indicates that the wet process is superior to the dry process in processing of high quality coffee. It is also important for the quality of the coffee that the processing is done shortly after harvesting. The processing of the harvested cherries should therefore happen in a location close to the production area, preferably in walking distance from the farms that are served by a certain processing centre. This will mean that a network of collection and processing centres will have to be established to serve every area where coffee production and collection is planned to take place.

After processing, the parchment beans must be transported to a warehouse awaiting shipment to the buyer. Depending on whether the shipment will be overland to Calcutta and thereafter by ship to the destination, or by air from the capital Kathmandu, the warehousing should be located on the way to the port of export. At the warehouse, the coffee will also be prepared for export by hulling (removing the skin around the bean), sorting and grading to produce the desired grades and qualities. Lastly, the whole supply chain will have to be coordinated from one point, and the discussion indicates that this focal point of the supply chain should be in the exporting company.

From the discussion in the report we can conclude that an institutional support system is important to facilitate the success of the coffee project and a sustainable growth in the coffee industry in Nepal, and that it does not seem to matter whether these institutions are under government control or in the private sector. The institutions necessary to support the coffee sector seem largely to be in place already, but there is evidence of lack of resources, especially in the government institutions for them to function in an optimal way. The coffee industry also seems to be well organised and already able to produce coffee of reasonably good quality. What seems to be lacking is a facility to test and taste the actual quality of the produced coffee. Such an institution is necessary to communicate and agree with potential buyers about the quality of the coffee and a reasonable price premium for that quality level. The innovation system should be a national system as there is too much distance to coffee

growing areas in other countries (India), and the government structure in Nepal is rather centralised after ten years of armed conflict.

The coffee project should study the above features of the supply chain and institutional support system closely in the implementation of the project. As the features indicate it is important to choose the production area and the variety of Arabica coffee with great care. The production area needs to be of the right altitude and with sufficient water supply to avoid draught for the coffee trees. In addition the variety grown will have to be of a kind that produces high-quality coffee, even though such varieties are also giving less yield per ha. In addition, the coffee project will have to consider establishing a wide network of collection and processing centres in the coffee growing areas to facilitate for walking distance between the individual farmers and the centres. During transportation the project must take care not to expose the coffee to strong smelling or tasting materials so the quality of the coffee is not reduced. Final processing of the coffee should happen on the way to the port of export and just before the shipment is made. The whole supply chain should be coordinated and managed from the exporting company, and this company consequently has to be allocated with resources and competency for this. The project would be well served by a laboratory for testing and tasting of coffee, and should make it a priority to partner with other institutions and companies in the coffee industry to try and establish such a laboratory as a common tool to improving the quality of Nepali coffee. Another scope of cooperation for the actors in the coffee industry would be to establish some kind of gentleman's agreement to avoid competing against each other in the world market. The size of the coffee industry in Nepal is small compared to the markets and it would be beneficial for all if the parties in Nepal tried to cooperate as much as possible.

The third question about how the present institutional support system could be improved is already answered in the previous paragraph. For clarity I will emphasize that the institution that seems to be missing in the system so far is a laboratory for testing and tasting of coffee in order to facilitate discussions with the buyers about quality and reasonable price premiums for the exported coffee. In addition to this some of the government institutions seem to be in lack of personnel and resources to function properly, and this should be a priority of the government to remedy. In general there is a need for training, education, research and development in the area of coffee production where the government institutions will be required to participate to make coffee production a national success for Nepal.

1. Setting the Scene

In this chapter Nepal as a country and coffee as a commodity will be introduced. The introduction will focus on information relevant to this research project and does not constitute a complete view of the topics described. Furthermore, this chapter contains a brief introduction to the theoretical basis on which the research project of this report is based, namely the topics of Supply Chain Management and National Innovation Systems.

1.1 Nepal and Coffee

Coffee has been grown in Nepal for many decades since it was introduced by a monk in Gulmi district in 1939 (Koirala et. al. 2005). Until 2002, however, all coffee was dry-processed (without the use of water and fermentation) and did not have a quality necessary to attract international buyers. As the washed process (use of fermentation and washing to remove the pulp) was introduced from 2003, the quality of the coffee has improved, and is now seen as coffee with potential for quality and good market prices.

The intention of this report is also to support the efforts of the growing Nepal coffee industry to enter the world market with good quality coffee. This requires a focus both on the design of the supply chain for coffee within the country, and also on the supporting national infrastructure and institutions. In addition a continuous and relentless focus on quality must be maintained throughout.

1.1.1 Introduction to Nepal

Nepal is a relatively small, landlocked country situated on the southern slopes of the Himalayan mountain range, landlocked between China (Tibet) to the north, and India to the south, at northern latitude of around 27 degrees. The predominant climate in the low altitude areas is subtropical, but due to huge variations in altitude from less than 200 meters in the south to more than 8000 meters in the north, the climate is varying a lot over relatively small distances; from jungles in the south (the Terai) to alpine climate in the north (the Himalayas). The total area of Nepal is 147,000 square kilometres, approximately one third of the area of Norway. The population of Nepal is close to 30 million, giving it a population density of more than 200 people per square kilometre (CIA 2008). A map of the country, also showing its location in the world, is shown in Figure 1.1.

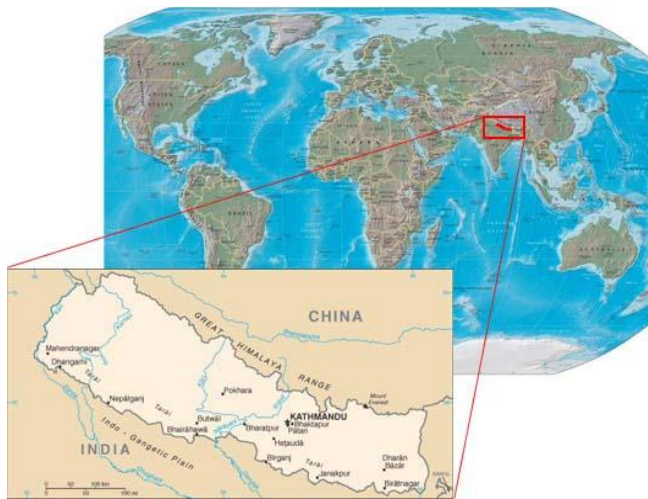


Figure 1.1 Nepal in the World, landlocked between India and China (Source: Google).

Nepal is among the poorest and least developed countries in the world with almost one-third of its population living below the poverty line. Agriculture is the mainstay of the economy, providing livelihood for three-fourths of the population and accounting for 38 % of the GDP. In Norway, for comparison, the agricultural sector employs 4 % of the workforce and contributes 2.4 % to the GDP. Industrial activity in Nepal mainly involves the processing of agricultural produce including jute, sugarcane, tobacco, and grain. Security concerns relating to the political conflict have led to a decrease in tourism, a key source of foreign exchange. Nepal has considerable scope for exploiting its potential in hydropower and tourism, areas of recent foreign investment interest. Prospects for foreign trade or investment in other sectors is poor because of the small size of the economy, its technological backwardness, its landlocked geographical location, and its susceptibility to natural disasters (CIA 2008).

Nepal has a GDP of little over 30 billion USD and a GDP growth rate of 2.5 %. This GDP corresponds to 1,100 USD per person (PPP). For comparison Norway, with a population of 4.7 million, has a GDP of 257 billion USD and a GDP growth rate of 4.9 %. The GDP per person in Norway (PPP) is 55,600 USD (CIA 2008). UNDP rank Nepal at 142nd place on its Human Development Index (0.534). The UNDP report gives Nepal a per capita (PPP) GDP of 1550 USD (UNDP 2008). Nepal has 47 airports out of which 10 has paved runways, 59 km of railways and 17,000 km of roads out of which 10,000 km are paved.

In this setting, creating employment for an abundant and underemployed workforce outside the cities is a priority task for which production of cash crops to increase the income of rural households is an important factor. Coffee represents such a cash crop together with

vegetables, fruits, etc. Coffee as a cash crop holds advantages over these other crops in the sense that it can be stored and transported over long distances and considerable time spans without losing its value as an end product for the consumers.

1.1.2 Introduction to Coffee

About 1.5 billion cups of coffee is consumed in the world every day. Coffee is a habit-forming stimulant, but is also strongly associated with relaxation and sociability. Besides alcohol it is the major beverage for public consumption, and as a drink it is welcomed into almost any situation from the car to the boardroom, from the breakfast table to the public park, consumed alone or in company. Coffee has been offered as an antipode to alcohol, and in recognition of a human need for joyfully mood-altering substances (Luttinger/Dicum 2006).

Coffee is said to have its origin in the highlands of Ethiopia, where the plant is indigenous. It was probably eaten as a food from between 575 and 850 C.E., and as a hot beverage from around 1000-1300 C.E. Coffee spread to the western civilisation through Arabia, and the Ottoman empire of Constantinople, and by the mid-sixteenth century there were special coffee houses for consumption of coffee around these areas. Even though coffee was consumed in Western Europe around this time, the monopoly of Arabia on its production and trade was broken only when several colonial powers started large scale production of coffee from the early 1700s. This was done by exploitation of local land and people through environmental degradation and slavery (Luttinger/Dicum 2006).

Coffee is produced from the fruits of the coffee plant. There are two variants of the coffee plants that are used for commercial coffee production, namely the Arabica and the Robusta. Coffee is produced by harvesting the ripe, crimson coloured beans, mechanically stripping off the pulp, cleaning and drying the parchments (a skin covering the green coffee bean), and finally mechanically removing the parchment to reveal the green bean. After the green beans reach their country of destination, the beans are usually blended with other beans before roasting, grinding, and packaging for presentation to the consumers (Luttinger/Dicum 2006).

Coffee has been one of the most valuable commodities for trade on the world markets for many years. In some years, when the prices have been high, it has even ranked the second most valuable traded commodity after crude oil. The total value of traded coffee was USD

5.6 billion in the coffee year 2000/01. Coffee is produced in more than 70 countries, and 45 of those produce over 97 % of the world production. For 9 countries the share of coffee export in the total export earnings exceeded 20 %, and for 24 countries it exceeded 5 %. The countries that are most dependent on coffee is Burundi (79 %), Ethiopia (64 %), Uganda (59 %), and Rwanda (56 %). The countries outside Africa that are most dependent on coffee export are the Central-American nations Nicaragua, El Salvador, Guatemala and Honduras with around 25 % of the total export value coming from coffee (ITC 2002).

An estimated number of 20 million rural families in tropical and sub-tropical countries around the globe depend on growing coffee for their living. If all the families benefitting from the value chain of coffee from crop to cup are included, the number will be much higher (Luttinger/Dicum 2006).

Table 1.1 gives some key figures of world production of coffee in recent years. The world production of coffee grew in the 1990s from around 90 million bags per year to an average of around 115 million bags after 2000. The annual variation is large, however, and is mostly due to variation in weather conditions in main growing areas. Around 60 % of the coffee is of the Arabica variant, and the remaining 40 % is Robusta.

Coffee year	World Production (bags of green beans)	Total World Production (green beans)
	Thousands of bags á 60 kg	Thousands of Metric tonnes
2001/2002	108,650	6,519
2002/2003	123,723	7,423
2003/2004	105,457	6,327
2004/2005	116,895	7,014
2005/2006	110,806	6,648
2006/2007	125,320	7,519
2007/2008	117,032	7,022

Table 1.1 World production of coffee from 2001/02 to 2007/08.

Source: International Coffee Organization (ICO 2008).

Similarly, to see the coffee sector of Nepal on the backdrop of the world market for coffee, Table 1.2 shows some key figures on coffee production in Nepal over the last years. The production of coffee in Nepal is barely noticeable compared with the world production (less

than 0.004 %), but the annual growth in production is impressive (average 30 % per year), and if this growth continues undisturbed, and quality issues are addressed continuously, it may grow into a considerable industry even within a decade.

Coffee year	Growers	Area	Nepal Production (dry cherry)	Nepal Production (green beans)
	No.	Ha	Metric tonnes	Metric tonnes
2000/2001	2,993	424	88.7	44.4
2001/2002	3,654	596	139.2	69.6
2002/2003	6,384	764	187.5	93.8
2003/2004	10,000	925	217.5	108.8
2004/2005	12,000	1,078	250	125
2005/2006	14,400	1,285	391	196
2006/2007	17,400	1,400	460	230
2007/2008	19,200	1,450	497	249

Table 1.2 The coffee sector in Nepal between coffee year 2000/01 and 2007/08.

Source: National Tea and Coffee Development Board (NTCDB 2007) and Winrock.

Even though Nepal is located to the north of the normal growing areas for coffee, which is mainly between the Tropic of Cancer (approximately 23 degrees northern latitude) and the Tropic of Capricorn (approximately 23 degrees southern latitude), it has climate and topology suitable for coffee growing. So far coffee growing in Nepal has been increasing steadily since its commercial start in the late seventies, but it does not yet have a significant importance for the economy of the country. In the world trade of coffee Nepal is not recognized as an exporter of coffee and it is not a member of the International Coffee Organisation (ICO). Speciality coffee originating in Nepal has received some attention for its quality among some buyers, but it has not yet been possible to export in large quantities due to limited production capacity.

The prices of coffee in the world markets are decided by the balance between supply and demand. For some years now there has been an imbalance in the sense that the production of coffee has been larger than the demand. As a result there has been a decline in the prices which has created financial hardship for exporting countries as well as individual coffee producers in those countries. Based on this fact it may not seem worthwhile to start new

coffee production now. However, much of the growth in coffee production over the last years has been in regions where the main coffee crop is of the Robusta variety which generally has lower quality and attracts lower prices than the Arabica variety. There will consequently still be a good market for quality coffee of the Arabica variety. In addition, there is willingness in the market to pay for higher quality beans of either variety, and this benefits the producers committed to maintaining consistently high quality. A producer, who is able to produce above average quality coffee on a regular basis every year, will be able to obtain prices well above average.

1.1.3 The Coffee Project

Two Norwegian parties, Viator AS and the NGO NHAM, are looking to start a project for coffee production for export from Nepal, and have received financial support from NORAD to carry out initial research in this regard. The two partners present themselves in the following way in the business plan (Berge & Dahle 2007):

- As a part of the Normisjon group, Viator represents the experience of more than 130 years of professional services in developing countries in Asia, Africa and South America. The main areas are in the educational, agricultural and health-service sectors. Also successful Micro Finance programmes are part of the operations. Normisjon/ Viator has been present in Nepal for more than 30 years, and the present activities are in health-service, education and handicraft (including export).
- During a period of almost 50 years the Norwegian Himal Asian Mission (NHAM) has been providing professional services to Nepal in many fields, like hydro power development, health and social welfare, technical education and many other fields on a non profit basis. NHAM is cooperating with other national and/or international organizations in their projects. NHAM is presently involved in education and hydropower projects in Nepal.

The initial phase of this project will run until May 2008, and is therefore coinciding with my thesis research period. With regards to the establishment of this project it is of interest to identify an optimal supply chain structure for coffee growing, processing, and export in Nepal. The targets of the coffee project are to produce and export quality coffee (specialty coffee) from Nepal and in so doing help develop the economy of the local project area. The coffee project has identified three districts in East Nepal, namely Okhaldhunga, Khotang and Solu Khumbu as suitable areas for the project. These districts are all located in Sagarmatha

Zone in the Eastern Development Region of Nepal, directly to the south of Mount Everest.

The location of the zone and districts in East Nepal is shown on the map in Figure 1.2.

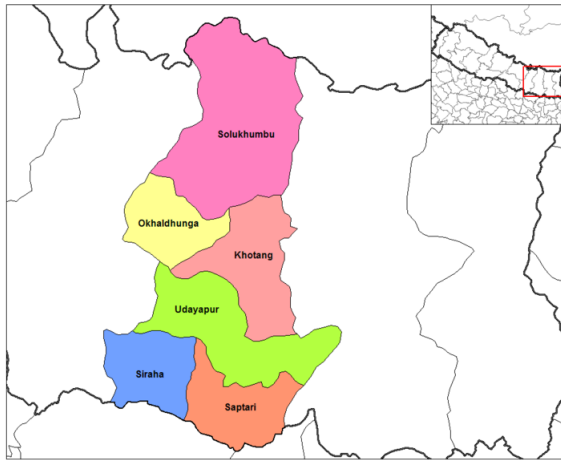


Figure 1.2 Sagarmatha Zone and Districts in East Nepal (source: Google).

The three districts are mostly without roads or any other form of surface transportation facilities except footpaths. Several airports have been built in the area, though, providing good communications for travellers to and from the capital. The capacity for transportation of goods is limited and the costs high relative to surface transportation. The district headquarter of Okhaldhunga district is connected to the main highway in the lowlands by a gravelled, fair-weather road. There is, however, no motorable bridge over the Dudh Kosi river, so all goods have to be transported across the river on a footbridge, and reloaded on trucks and buses on the other side.

1.2 Supply Chains and Institutional Support Systems

The target of the coffee project is to produce high quality coffee for export. To achieve this at a cost level that will allow the project to be profitable, the supply chain must be designed in such a way that the quality is maximized as the same time as the costs are kept under control. The theory on supply chain management offers research and experiences that may help the project in this regard. Similarly, to achieve the targets of the project it cannot operate in a vacuum. The infrastructure and institutions that the project will relate to must offer the best possible environment for the project to succeed. This environment is studied in the field of national innovation systems, and this theory shows that institutions matter for economic results.

1.2.1 Supply Chain Design

The definition of a supply chain can be very wide and general: A supply chain consists of all parties involved, directly and indirectly, in fulfilling a customer request. It includes not only the manufacturers and suppliers, but also transporters, warehouses, retailers, and even the customers themselves. And within each organisation, the supply chain includes all functions involved in receiving and filling a customer request. The concept of supply chain is therefore an alternative perspective of looking at and studying a business, a way focusing on certain aspects of the business while pursuing certain targets. A competitive strategy is an expression of customer needs that a company seeks to satisfy through its products and services. The supply chain of any product must be designed to give the desired output in accordance with the competitive strategy. For a company to be successful, its competitive strategy and supply chain strategy must fit together. This means that both the strategies have aligned goals, meaning that there is consistency between the customer priorities the competitive strategy hopes to satisfy and the supply chain capabilities that the supply chain strategy aims to build (Chopra/Meindl 2007).

1.2.2 Institutional Framework

The term National Innovation System emerged in the 1980s as a tool to understand the factors behind international competitiveness and economic development. The term offers a broader approach to understanding the effects of policy decisions on innovation and science. The focus on national systems makes sense since policies and institutions seem to influence innovation. Even though the term National Innovation System has roots in the 18th and 19th century economic thinking (Adam Smith and Friedrich List), the modern version of the innovation system concept was developed without reference to these early economic thinkers (Lundvall et al 2002). Another root of the concept of national innovation systems is from development economics and literature on developing countries as represented by e.g. Hirschman and Myrdal. Even though the modern version of national innovation systems was developed in rich countries, the interest of the concept is now growing in the less developed countries as well (Lundvall et al 2002). According to the theory of national innovation systems the innovation environment is important to achieve international success for Nepal's coffee industry. The national innovation system consists of institutions involved directly or indirectly with the coffee industry. An example of an institution involved directly is the policy maker for the sector, in this case the National Tea and Coffee Development Board. An

example of an institution indirectly involved is the authorities deciding the applicable tax regime for the coffee industry.

1.3 My Research Project

1.3.1 Research Questions:

In this research project I have set out to identify what kind of supply chain for coffee production that will be the most efficient in the present setting in Nepal. I will also try to identify the present national innovation system seen by the coffee industry in Nepal, and how this can be improved to achieve relative competitive advantage for the coffee industry of Nepal in the export markets. For this I have formulated the following research questions:

What is the appropriate design of a supply chain and an institutional support system for production and export of green bean specialty coffee from three districts in eastern Nepal?

This research question will be analysed focusing on the following aspects of it:

1. Applying theory on supply chain design and management, innovation support systems, and experience of coffee production in Nepal and abroad, what are the features of an effective and efficient supply chain and institutional support system for a project aiming to produce and export specialty coffee from three districts in eastern Nepal?
2. How can the identified features be applied in the planning for the specific setup of organisational units, facilities, supporting services and rules to achieve a successful implementation of the coffee project by the two Norwegian parties?
3. How can the outcome of the study be applied in improving the present institutional support system of coffee production in Nepal?

1.3.2 Methodology

The methodology used in this paper is literature review, and the application and discussion of the main points from the literature to a prospective project for coffee production in Nepal. A suitable model for the discussion is identified in the theoretical review. The methodology is further elaborated in a separate chapter after the theory reviews. In addition to the literature review of the theory on supply chains and national innovation systems, empirical information about the coffee industry in Nepal and in selected coffee producing countries has been collected. Empirical information about the coffee industry and the institutional support framework in Nepal has been obtained from meetings with main actors in the industry and government institutions as well as through their web pages and other public information.

Empirical information about the coffee industry in other coffee producing countries has been collected from open sources (internet) as well as scientific articles. A separate chapter has been devoted to the steps involved for the production of high quality Arabica coffee. The information for this has been collected from general literature on coffee production. Visits have been made to coffee growing areas in Nepal, where the steps of the supply chain and the processing methods have been studied hands-on. A field visit was also made to the targeted area of the coffee project.

1.3.3 Report Outline

In Chapter 2, relevant parts of the literature on supply chain design and management has been reviewed. The chapter also contains a review of some literature on National Innovation Systems. In Chapter 3, information about the coffee industry and supporting institutions in selected coffee producing countries have been collected and reviewed. Chapter 4 gives an overview of the existing coffee industry in Nepal as well as the plans of the coffee project for setting up new coffee production in eastern Nepal. Then follows, in Chapter 5 a description of the steps involved in the production of high quality Arabica coffee. In Chapter 6, an outline of the methodology used in the paper is given. In the last main chapter of this paper, Chapter 7, the selected theory and collected empirical knowledge are analysed to give possible answers to the research questions, which are then summarised in Chapter 8.

2. Supply Chains and Institutional Support

In this second chapter of the report the theoretical basis selected for analysing the research question will be outlined. The theoretical basis consists, on one hand on theory about supply chain management, and on the other hand on theory on national innovation systems.

2.1 Theory on Supply Chains

Selected literature about supply chain management has been reviewed for the purpose of identifying a relevant theoretical framework on supply chains in which the research questions can be answered. The bulk of the review on supply chains is from Sunil Chopra and Peter Meindl's book Supply Chain Management from 2007.

2.1.1 What are supply chains?

The definition of supply chains can be very wide and general. Chopra/Meindl (2007) start their book on Supply Chain Management by stating that;

a supply chain consists of all parties involved, directly and indirectly, in fulfilling a customer request.

It includes not only the manufacturers and suppliers, but also transporters, warehouses, retailers, and even the customers themselves. And within each organisation, the supply chain includes all functions involved in receiving and filling a customer request. This also includes new product development, marketing, operations, distribution, finance, and customer service. The concept of supply chain is consequently an alternative way of looking at and studying a business, a way of focusing on certain aspects of the business while pursuing certain targets. These aspects are the topics studied in the field of supply chain management, and the target is to make the supply chain as efficient as possible in fulfilling customers' requests. The study of supply chains demands a rather broad approach to the business of an organisation, and the field of supply chain management consequently will have to draw on theory from a wide range of topics, from economic theory, management, and organisational psychology, just to name a few.

The primary purpose of any supply chain is to satisfy customer needs, and in the process, generate profit to be shared between the supply chain parties. Information, funds, and products flow along both directions of the supply chain. The notion of a linear supply chain continuing from a starting point (raw material) to an end product is often false, as the supply chain often takes the form of supply networks or webs (Chopra/Meindl 2007). In addition to

the range of topics mentioned in the last paragraph, marketing theory and price theory is needed to understand the processes between the customers and the rest of the supply chain.

2.1.2 Supply chains vs. Value Chains

Some attention should be given to the difference between the concepts of supply chain and value chain as the two terms are often interchanged or used randomly. The term Supply Chain Management (SCM) was developed in the 1980s to express the need to integrate the key business processes, from end user through original suppliers. Original suppliers are those that provide products, services and information that add value for customers and other stakeholders. The basic idea behind SCM is that companies and corporations involve themselves in a supply chain by exchanging information regarding for instance market fluctuations and production capabilities.

The term value chain was popularised by Michael Porter in his groundbreaking book *Competitive Advantage* (Porter 1985) where he discussed how a firm can achieve and sustain competitive advantage over its competitors. He introduced the value chain as a general framework for thinking strategically about the activities involved in any business. It may be useful to look at some definitions to discern between the concepts of supply chains and value chains.

Collins (2005) defines that

a supply chain is the network of vertically related raw material and component suppliers, manufacturers, distributors, and customers for a product which collectively make up the value-added chain.

This definition indicates that the term supply chain comprises all the different parties involved, and the term value chain is used to describe the chain as a whole. Collins (2005) further defines that

the value-added chain is a chain of vertically linked activities which each add value in producing and distributing a product.

Depending on the nature of the product the value-added chain may involve a large number of vertically linked activities, or only a few.

Similarly, Chopra/Meindl (2007) uses the term supply chain to describe the parties involved in fulfilling a customer request, and the term value chain to describe the activities like; new product development, marketing and sales, operations, distribution and service. A generic value chain of a business will consist of the following steps: New product development, marketing and sales, operations, distribution, and service. In addition to the core processes,

certain processes are necessary to facilitate the functioning of the value chain. These are: Finance, accounting, information technology, and human resources. This is shown in Figure 2.1 below:

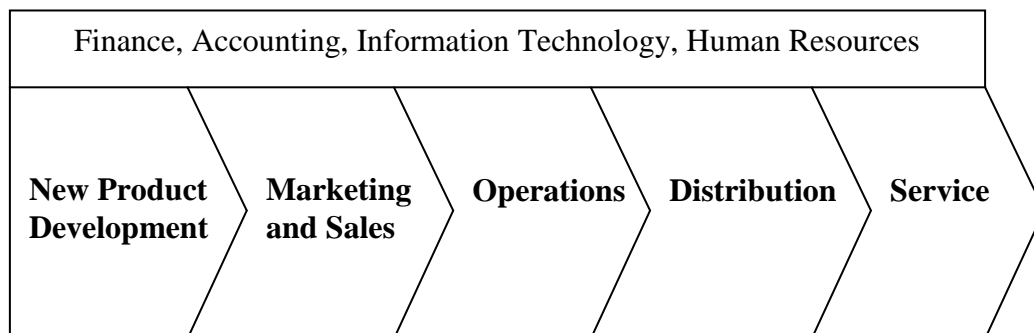


Figure 2.1. The General Value Chain of a Business (Chopra/Meindl 2007).

2.1.3 Objective of Supply Chains

The objective of a supply chain is to maximize the overall value generated. The value generated by a supply chain is the difference between what the final products is worth to the customer, and the costs incurred in the supply chain in fulfilling the customer's request. The value is strongly correlated with the profitability (or surplus) of the supply chain, which is the total profit to be shared across all supply chain stages and intermediaries (Chopra/Meindl 2007). The costs (and surplus) of the supply chain has to be borne by the final customer of the goods or services supplied. The source of revenue for the supply chain is the customer. Costs are incurred at all steps of the supply chain through the flow of information, products, and funds being transferred. Effective supply chain management involves the management of supply chain assets and products, information, and fund flows to maximize total supply chain profitability (Chopra/Meindl 2007). The management of the supply chain is done by making supply chain decisions about the strategy/design, planning and operation of the supply chain (Chopra/Meindl 2007). There is a close connection between design and management of supply chain flows and the success of a supply chain. In this paper the focus will be on the strategy/design phase of establishing a supply chain.

2.1.4 Two different Process views on Supply Chains

Chopra/Meindl (2007) describes two different process views of a supply chain; one being the cycle view and the other the push/pull view. In the cycle view a supply chain is divided into a series of cycles and these supply chain process cycles are performed at the interface of two successive stages. If the stages of a supply chain are termed supplier, manufacturer, distributor, retailer, and customer, such cycles may be procurement cycle, manufacturing

cycle, replenishment cycle, and customer order cycle. In each process cycle the following sub-processes may be relevant: Supplier stage markets products, buyer stage places order, supplier stage receives order, supplier stage supplies order, buyer stage receives supply and buyer returns reverse flows to supplier or third party. An advantage of the cycle view of the supply chain is that the processes involved and the owners of each process are clearly defined. Therefore this view is helpful in making operational decisions because it specifies the roles and responsibilities of each member of the supply chain and the desired outcome for each process.

In the push/pull view the processes in a supply chain are divided into two categories, pull or push, depending on whether they are executed in response to a customer order or in anticipation of customer orders. Pull processes are also called reactive processes because they react to customer demand, and push processes are also called speculative processes because they respond to speculated or forecasted rather than actual demand. As a supply chain is made up of both push and pull processes there will be a boundary between push and pull which is called the push/pull boundary. The view is very useful when considering strategic decisions relating to supply chain design. The focus in this paper will, consequently, be on the push/pull view of supply chains since it is the strategy and design that is discussed.

2.1.5 Supply Chain Macro Processes

Some macro processes can be identified for supply chains in firms. These are e.g. Customer Relationship Management (CRM), Internal Supply Chain Management (ISCM), and Supplier Relationship Management (SRM) (Chopra/Meindl 2007). These three macro processes manage the flow of information, products, and funds required to generate, receive and fulfil a customer request. Content of the supplier macro process can be sourcing, negotiation, buying, design collaboration and supply cooperation. The internal macro process contains strategic planning, demand planning, supply planning, fulfilment and field service. The customer macro process relates to market, price, sale, call centre and order management.

2.1.6 Competitive Strategy and Supply Chains

A firm's competitive strategy defines, relative to its competitors, the set of customer needs that it seeks to satisfy through its products and services. A firm's supply chain strategy includes a specification of the broad structure of the supply chain and what traditionally is called supplier strategy, operations strategy or logistics strategy. The value chain emphasizes the close relationship between the functional strategies within the company. For a company to be successful, its competitive strategy and supply chain strategy must fit together. This

means that both the strategies have aligned goals, meaning that there is consistency between the customer priorities the competitive strategy hopes to satisfy and the supply chain capabilities that the supply chain strategy aims to build (Chopra/Meindl 2007).

There may be wide variations in the competitive strategies of companies. Some may go price competition and seek to present their products at a lower cost than competing products. Others may compete in availability, making their products available at locations closer to customers than their competitors. A third option would be to present products with better quality than the competitors.

2.1.7 Strategic Fit

A firm's success or failure is closely linked with the following keys:

1. That the competitive strategy and the functional strategy (e.g. the supply chain strategy) fit together to form a coordinated overall strategy,
2. that the different functions in the firm structure their processes and resources to be able to execute these strategies, and
3. that the design of the overall supply chain and the role of each stage is aligned to support the supply chain strategy.

A company may fail either because of lack of strategic fit or because its overall supply chain design, processes and resources do not provide the capabilities to support the desired strategic fit (Chopra/Meindl 2007). An example would be a company that have designed an excellent competitive strategy but does not have control over the supply chain to present products that are in accordance with that competitive strategy to its customers.

Strategic fit between the supply chain strategy and the competitive strategy is achieved by focusing on three basic steps:

1. Understanding the customer and the supply chain uncertainty by analysing the customer needs for each targeted segment and the uncertainty the supply change faces in satisfying these needs,
2. Understanding the supply chain capabilities in terms of what the supply chain is designed to do well, and
3. Achieving strategic fit by restructuring the supply chain or altering the competitive strategy.

The demand uncertainty together with the supply uncertainty, make up the total uncertainty which can be mapped in an uncertainty spectrum ranging from predictable supply and demand to highly uncertain supply and demand.

The supply chain capabilities can be understood by analysing the responsiveness and efficiency of the supply chain and mapping this on a responsiveness spectrum ranging from highly efficient to highly responsive. The cost-responsiveness frontier defines the best achievable combinations of cost efficiency and responsiveness at any given time. A firm that is not on this frontier can improve both its responsiveness and its cost performance by moving towards the efficient frontier. The strategic fit can then be achieved by targeting high responsiveness for supply chains facing high uncertainty, and efficiency for a supply chain facing low uncertainty (Chopra/Meindl 2007).

The scope of strategic fit should be expanded to include the whole supply chain instead of focusing on a single firm or a single function. The competitive playing field has shifted from company versus company to supply chain versus supply chain, and the company's success may well be determined by another company in the supply chain. It is also important to be flexible enough to maintain strategic fit in a changing environment through partnering with supply chain stages that change over time (Chopra/Meindl 2007).

The key to achieving strategic fit is a company's ability to find a balance between responsiveness and efficiency that best matches the needs of its targeted consumers. Companies face many obstacles in seeking the balance between responsiveness and efficiency. Execution of the supply chain strategy, once it has been created, is also a challenge. All of this has led to supply chain management becoming a major factor in the success or failure of firms (Chopra/Meindl 2007).

2.1.8 Performance Drivers

There are six drivers that determine the performance of any supply chain (Chopra/Meindl 2007). These are three logistical drivers – facilities, inventory and transportation, and three cross-functional drivers – information, sourcing and pricing. To understand how a firm can improve its supply chain performance in terms of responsiveness and efficiency, we need to study and understand these drivers.

- **Facilities** are the actual physical locations in the supply chain network where products are stored, assembled or fabricated. The two major types of facilities are production sites and storage sites. In the case of coffee production the facilities will be farms, processing plants, warehouses and corporate office.

- **Inventory** includes all raw materials, work in progress, and finished goods within a supply chain. In our case inventory will mainly be green coffee beans in different stages of processing.

- **Transportation** means moving inventory from point to point in the supply chain. Transportation is a main theme in coffee production as Luttinger (2005) pointed out.
- **Information** consists of data and analyses concerning facilities, inventory, transportation, costs, prices, and customers throughout the supply chain. In the coffee case there would be a need to communicate special customer needs or taste preferences up through the supply chain.
- **Sourcing** is the choice of who will perform a particular supply chain activity such as production, storage, transportation, or the management of information. In our case there would be opportunities to utilise surplus processing capacity of other coffee producers instead of building up own capacity.
- **Pricing** determines how much a firm will charge for goods and services that it makes available in the supply chain. As there is a strong link between higher quality and higher prices in the market, pricing of the exported green beans are important in our case.

While logistical drivers remain important in the supply chain management, there is an increasing focus on the three cross-functional drivers.

2.1.9 Power and Supply Chain Relations

The different parties in a supply chain will often have different power over supply chain decisions. This will also reflect in how supply chain profit is being shared in the supply chain. Power in a supply chain can be earned by suppliers of specific input factors that are unique in some way or of superior performance and quality. A buyer of products in a supply chain may get power from controlling brands that give exclusive or dominant access to the customers of the end product. Competitive relations refer to the struggle for power between customers and suppliers. In many cases it may be beneficial for the parties to enter into more partner-based approaches. The partner-based relationship includes the building of trust, shared visions and commitment between customers and suppliers, which are seen as preconditions for more long-term cooperation and mutual adjustment of the partners' activities. As the SCM literature describes more or less implicitly customer – supplier relationships as fairly symmetrical and based on mutual trust and understanding, the so-called global production network literature introduces power relations as an important mechanism in analysing how such networks function (Isaksen and Kalsaas 2008).

2.1.10 Supply Chain Decisions – Model of Analysis

A visual framework for supply chain decision making including the six supply chain drivers is given in Figure 2.2 below. Most companies start with their competitive strategy and then decide what their supply chain strategy should be like, but the process can also work the other way round:

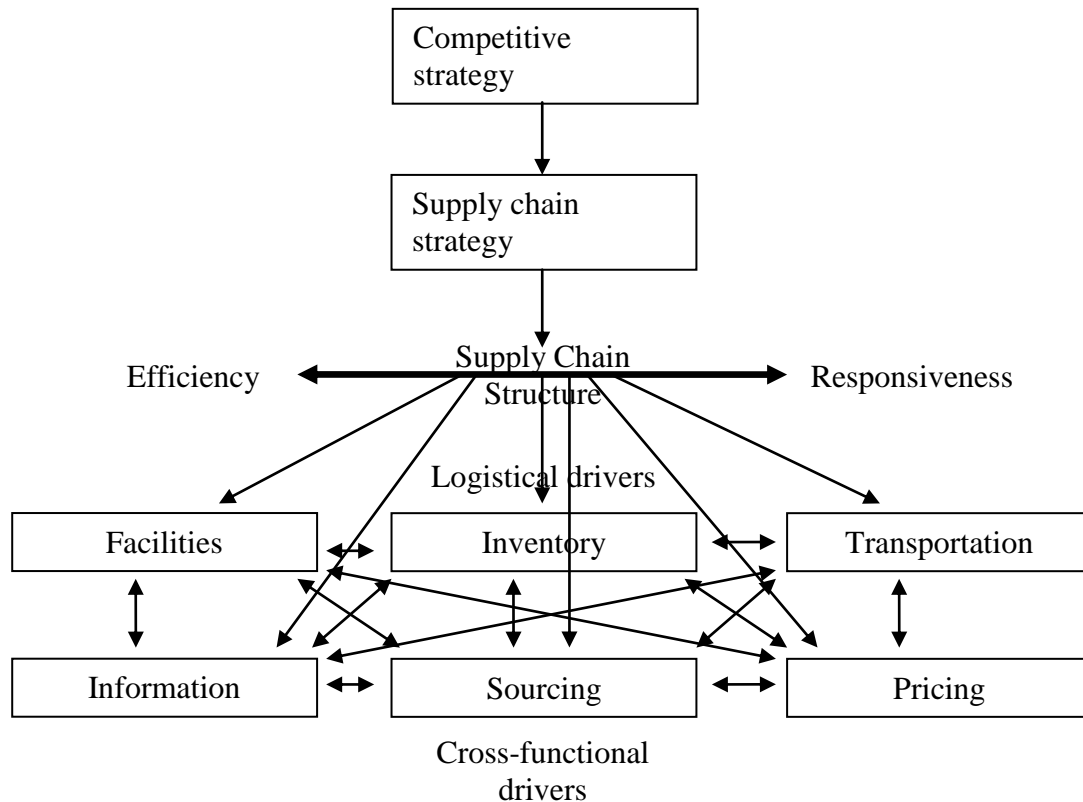


Figure 2.2. Supply Chain decision making framework (Chopra/Meindl 2007).

2.2 Theory on National Innovation Systems

The term National Innovation System emerged in the 1980s as a tool to understand the factors behind international competitiveness and economic development. The term offers a broader approach to understanding the effects of policy decisions on innovation and science. The focus on national systems makes sense in the context that policies and institutions seem to influence innovation. Even though the term National Innovation System have roots in the 18th and 19th century economic thinking (Adam Smith and Friedrich List), the modern version of the innovation system concept was developed without reference to these early economic thinkers (Lundvall et al 2002).

Research in industrialised countries has shown that the ability to learn determines the economic success not only of firms and industries but also of whole regions and countries. From these results the concept of the learning economy has developed which is based on the proposition that learning is an interactive, socially embedded process, and its efficiency

depends on the institutional setup which is also called the national innovation system (Ernst/Lundvall 2000).

2.2.1 Historical Roots of the Concept

One of the historical roots of national innovation systems goes back to Adam Smith who in 1776 published a book where he analysed the division of labour which included knowledge creation related to productive activities, but also the specialised services of scientists. Adam Smith did not, however, consider innovation and competence building as independent and systemic. Another root of National Innovation Systems goes to Friedrich List who in 1841 published a book where he analysed a wide set of national institutions as the national systems of production and learning. These included educational and training institutions, and networks for transportation of people and goods. List focused on the need to build national infrastructure and institutions, and he thereby challenged the “cosmopolitan” approach of Adam Smith. These historical roots of the concept of national innovation systems were described only after the modern version of the concept had been developed, and did not directly form the basis for the development (Lundvall et al 2002).

A third root of the concept of national innovation systems is from development economics and literature on developing countries as represented by e.g. Hirschman and Myrdal. Even though the modern version of national innovation systems were developed in the rich countries like US, UK, France and the Scandinavian countries and only as an academic tool to study science and technology policies, the interest of the concept is now growing in the less developed countries as well. An idea contributed from the literature on development economics are creative and systemic feedbacks between different economic activities, in the sense that institutions matter in economic change. This connection between institutions and economic change was accepted in less developed countries to a larger extent than for developed countries where the market was assumed to solve most problems. To apply the concept of national innovation systems to developing countries may therefore be regarded as re-export (Lundvall et al 2002). There is also the aspect that, in developing countries, what is an innovation for an indigenous firm may largely involve learning to produce a product or employ technology that has been employed for some time by firms in the highly industrialised countries (Nelson 1993).

2.2.2 Definitions of National Innovation Systems

A National System of Innovation has been defined in different ways by different people, showing that the concept has been developing in different directions. In OECD (1997) we find the following attempts at definitions of National Innovation Systems:

- *The network of institutions in the public and private sectors, whose activities and interactions initiate, import, modify and diffuse new technologies* (1987: Freeman).
- *The elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state* (1992: Lundvall).
- *A set of institutions whose interactions determine the innovative performance ... of national firms* (1993: Nelson).
- *The national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country* (1994: Patel and Pavitt).
- *That set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies* (1995: Metcalfe).

The common denominators of these definitions are concepts like institutions, interactions, relations and knowledge. Even though the different researchers use different words in their definitions, there are similarities as well. For the rest of this report I have chosen to focus on the definition by Freeman since it offers a simple model for studying institution in the private and public sectors in order to see what effect they have on technological and economic development, in this case on the competitiveness of the coffee industry.

The concept of national innovation system is many-faceted and it does not have a common accepted definition. This poses problems both in the application of the concept and in the further development of it. One reason for this may be that the concept of National Innovation Systems combines ideas from quite distinct areas of analysis like economic policy, economic interdependence, and economic change. This rather loose integration of elements into the concept of National Innovation Systems is important to recognise by its users (Lundvall et al 2002).

2.2.3 Spread of the Concept

A reason for the rapid spread of the concept of national innovation systems may be that it delivers a reasonable understanding and control of the factors behind international competitiveness and economic development. Another reason may be that the concept of national innovation system helps overcome some of the practical problems of specialisation among policy institutions and analysts, and has therefore been welcomed especially by those responsible for innovation and science policies in particular, but also by a wider community of scholars and policy makers focusing on economic growth and development (Lundvall et al 2002).

2.2.4 Relevance of the National Focus

The “national” part of the concept of national innovation systems deserves some attention. In a period of globalisation the nation state is said to lose its importance for economic development of a country. Most empirical studies of how far globalisation has undermined the national systems seem to indicate that the national level is important for some innovation activities. The national origin of multinational firms has an effect on the location of innovative activities. Newer concepts like Regional Systems of Innovation (Cooke, Maskell, Malmberg), Technological Systems (Carlsson, Jacobsson), and Sectoral Systems of Innovation (Breschi, Malerba), have sometimes been presented as alternatives to the national system approach. It has been argued that most interesting interactions in the context of modern innovation cross national borders and that the national level does not need to be taken as given unit for analysis. As long as nation states exist as political entities with their own agenda related to innovation, though, the national systems will be useful to work with. But the other analytical levels will also be legitimate in creating a realistic understanding of the working and constraints of national policies (Lundvall et al 2002). The nation state has responsibility for policies related to much of the innovation activities in a country, like higher education, research, taxation etc. In addition each country has specific ways of doing business which is important to stimulate cooperation and interactive learning.

2.2.5 National Innovation System – Model of Analysis

From the theory of National Innovation Systems we can learn that institutions matter for economic change. The definition offered by Freeman says that a National Innovation Systems is:

The network of institutions in the public and private sectors, whose activities and interactions initiate, import, modify and diffuse new technologies (Freeman (1987) in OECD (1997)).

One model of analysis based on the concept of national innovation system theory is then to study the institutions involved directly and indirectly with an industry and compare how these institutions are interacting among themselves and with the industry to create competitive advantage in one country over another. Studying how institutions are interacting in a country where a certain level of success has already been achieved for the coffee industry can help us realise how the institutional framework for coffee production in Nepal should be built up. In the next chapter the coffee industries in selected countries have been described together with the institutional and infrastructural systems of the countries. It will be of interest to study:

1. The government institutions and the role they play in the coffee industry
2. The role of Non-government organisations (NGOs)
3. The role of private-sector institutions
4. The Coffee production system in the country

2.3 A unified model of SCM and NIS

In this study the theories of supply chain management and national innovation systems have been chosen as the theoretical basis for the analysis. Together with the collected empirical knowledge which is presented in the subsequent chapters, this makes up the basis for the analyses which are used to arrive at tentative answers to the research question. We have already seen that the theory on supply chain management can be summarised as shown in Figure 1. The figure shows that six supply chain drivers are important in designing the supply chain in such a way that the desired balance between efficiency and responsiveness is achieved. This in turn will facilitate that the business will reach a strategic fit between its competitive strategy and its supply chain strategy, meaning that it will be able to supply to the customers the exact product features that the customer desires.

Further in this chapter, we have seen that the theory of national innovation systems describes private and public institutions as important to achieve learning organisations which subsequently lead to competitive organisations and economic growth. Within the theory of national innovation systems we can study which supporting institutions exist in a country or

and industry, and how these institutions interact to support an conducive environment for building competitive advantage.

When discussing the design of the supply chain it may also be fruitful to look at the larger context that the supply chain is supposed to function within. This larger context may be interpreted as the national innovation system for the particular industry that the supply chain belongs to. This may justify an attempt to unify the two theories into one model of analysis. To try and unify the theories of supply chain management and national innovation systems into one model of analysis for this report, we may ask on what stages of the supply chain there is a need for supporting institutions and indentify the input to the supply chain that this institution contributes. As a general framework this can be shown as in Figure 2.2 below.

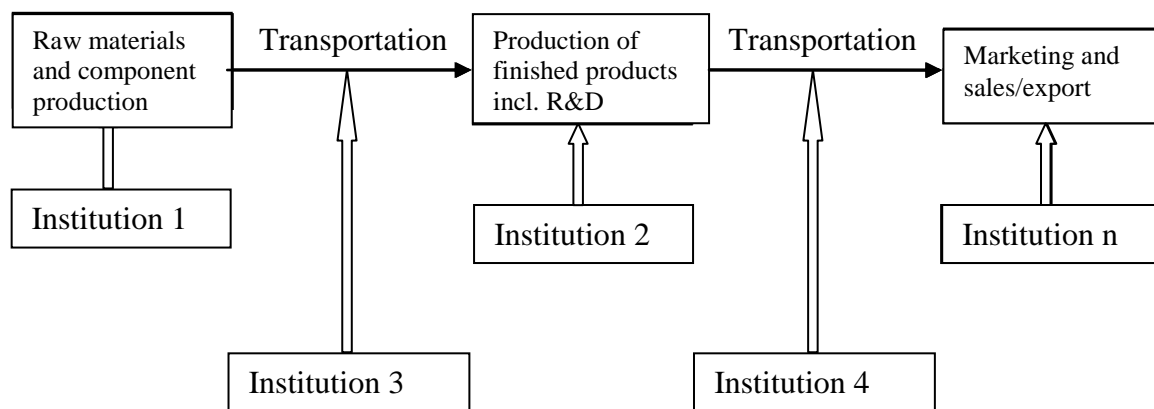


Figure 2.3 Unified model of SCM and NIS.

3. Experience from Selected Coffee Producing Countries

The analysis of an efficient supply chain for coffee in Nepal and the necessary supporting infrastructure and institutions can be carried out based on the theory presented in the last chapter. However, to make the analysis more practical in terms of the coffee industry, it may in addition be useful to study how these issues have been addressed in other countries with a strong and successful coffee industry. This may in turn give valuable information on how a well designed supply chain and supporting institutions for coffee production can be developed in Nepal. The countries in this chapter have been selected for this study due to very different reasons: Guatemala and Colombia are countries in Latin-America and South America renowned for their high quality Arabica coffees. Indonesia and El Salvador has been selected because of direct ties with the coffee industry in Nepal through conducted training programs and study visits. India has been selected for its cultural and administrative likeness to Nepal, and for its proximity as the neighbouring country to the south.

In Table 3.1 some basic information about the population, economy and infrastructure in each of the countries have been summarised. The table shows that all the selected coffee producing countries are relatively undeveloped as shown by the gross domestic product (GDP) per person in Purchasing Power Parity (PPP) and the Human Development Index. Colombia is the most developed among these, and India the least developed. In stating this it is important to remember that even though the average value per person in the country may be low, there may be huge differences in wealth distribution in the countries. The air transportation density factor and the surface transportation density factor are measures to try and capture the distribution of infrastructure in the countries. This is of importance to coffee production since transportation is an important feature of the supply chain for coffee.

Since 1990 there has been a wave of liberalisation in the commodity sector in general and also in the coffee sector of many countries. The coffee industry has in many countries moved from being a strongly government-regulated industry to being an industry that largely manage its own regulations and success.

Country	Population	Population density	GDP (PPP) (average value)	UNDP Human Development Index	Air transportation density	Surface transportation density
	Millions	Persons per square kilometre	USD per person	Place/Fraction	Airports per thousand square kilometre	Kilometres of roads, railways and waterways per square kilometre
Guatemala	13	120	5,000	118/0.689	3.7	0.15
El Salvador	7	330	5,200	103/0.735	3.1	0.55
Colombia	45	40	7,300	75/0.791	0.85	0.12
Indonesia	238	125	3,600	107/0.728	0.34	0.21
India	1,150	350	3,100	128/0.619	0.10	1.05
Nepal	30	200	1,300	142/0.534	0.32	0.12

Table 3.1 Comparison of Selected Coffee Producing Countries. Population, and Economic and Infrastructural Parameters. Source: CIA (2008) and UNDP (2008)

3.1 Guatemala

Guatemala is a relatively small country of 109 thousand square kilometres (two thirds the size of Nepal) in Central America to the south of Mexico, and with a population of around 13 million giving it a population density of 120 persons per square kilometre. It has coastline both to the Atlantic and the Pacific oceans and enjoys a tropical hot and humid climate and good rainfall throughout the year. The higher altitude areas are very suitable for coffee production and Guatemalan coffee is renowned for good quality. The agricultural sector accounts for around one fourth of the gross domestic product, two fifths of the export and employs half the labour force. Coffee, sugarcane and bananas are the main products.

Guatemala is also rich in oil and gas resources (CIA 2008).

Guatemala has 402 airports out of which 12 has paved runways, 890 km of railways and 14,000 km of roads. In addition Guatemala has 1,000 km of waterways. The GDP per capita (PPP) was 5,400 USD in 2007 (CIA 2008). UNDP rank Guatemala at 118th place on its Human Development Index (0.689), the lowest in Central America. The UNDP report gives Guatemala a per capita (PPP) GDP of 4568 USD (UNDP 2008).

Since the civil conflict came to an end in 1996 the economy has been strengthening but the decline in the world prices for coffee has forced the government to assist the coffee sector (ITC 2002). Although this is Central America's largest economy, 90 % of the population live below the poverty line. The extreme inequality in wealth and land distribution limits modernisation (Banks et al 2007).

3.1.1 Coffee Quality

Guatemala is almost exclusively producing the Arabica variant of coffee. The main coffee areas are spread over the southern part of the country where mountain ranges give ideal conditions for high-grown Arabica (ITC 2002). Most of the production is by high-quality, low-yielding varieties like Bourbon. Guatemalan coffee is consequently rated by many experts as one of the best in the world. There are also some distinct variations in taste between different regions (Banks et al 2007). Much of the Guatemalan coffee is sold on the standard world coffee market, known as the C market, whose average coffee quality is far lower than Guatemalan highland coffee. The C market price is currently less than the cost of production in Guatemala. Reaching the "specialty" or "gourmet" coffee market is a major goal of Central American coffee producers. The task of selling to the gourmet coffee market can be difficult, as there are at least two dozen major steps in the chain of production and processing that must be carried out flawlessly in order to sell to the specialty coffee market (Lotter 2003).

3.1.2 Coffee Production System

Coffee was introduced into Guatemala towards the end of the sixteenth century but its main use was first as a medicinal plant. The crop became a primary export for the country in the mid-nineteenth century as the result of a series of reforms brought about by successive liberal governments. However, early production was limited by poor roads and infrastructure. Coffee as a plantation crop was produced primarily by the European immigrants. Much of the prime land for coffee was occupied by Indian smallholders, and national policy gradually forced these farmers off their land and into labour agreements with large landholders. Smallholder farmers regained some control of land and entered coffee production in the land reforms of the 1950s, just at the point at which coffee production expanded throughout the Americas (Eakin et al 2005). During the decades of military rule and armed conflict since 1954, smallholder producers were largely marginalized from national production (Eakin et al 2005).

Coffee is now grown on 270,000 hectares of land and the average annual production is a little less than 5 million bags. Small farmers account for around 30 % of the production, the rest comes from medium and large size farms (ITC 2002). The use of large trees for shading coffee is a Guatemalan coffee-growing custom and is said to have been developed there. Coffee grown under the proper level of shade takes longer to develop, which favours the development of rich and complex flavours. Shade-grown coffee is one of the most environmentally benign crops in the world and is perhaps the ideal agro-forestry crop. Over 100 species of shade trees have been counted on a single Guatemalan coffee farm (Lotter 2003).

The coffee from Guatemala is exported several different exporters, both local companies and international. Friele, a major Norwegian coffee roaster, for instance buys their coffee the Swiss-owned Volcafe's subsidiary in Guatemala, Waelti-Schoenfeldt, from another swiss-owned company Ecom through their subsidiary in Guatemala, ExpoCafe, as well as directly from Fedecocagua, the federation of cooperatives.

3.1.3 Institutions

The coffee industry in Guatemala has always been free and competitive (ITC 2002). The coffee industry is well organised with ANACAFE, the Guatemalan National Coffee Association, a producers' association with more than 60,000 coffee producers as members, playing a major role. ANACAFE which is funded through export levies provide services to the growers, including a price protection mechanism by hedging through the New York futures market. ANACAFE was formed in 1960 with the objective of protecting the national economy in matters related to coffee production and export. Over the years, it has played an important role as an intermediary between farmers and policy-makers, as well as providing information and technical support to farmers.

Farmers in Guatemala have not traditionally turned to public sector institutions for support, but rather depended on the activities of local organizations and ANACAFE. After the end of the war in 1996, international NGOs and foreign bilateral aid agencies came to replace or complement the state as providers of services and development. In 2003, the central government worked with ANACAFE to design policies to help farmers address the crisis (lower prices), including the implementation of a national fund to support coffee growers. Crop diversification, the promotion of organic coffee through NGOs and the conversion of low-altitude coffee to other crops are all being emphasized in public policy. NGOs and other

grass-root organisations are also actively providing direct support to small growers to produce organic coffee and to access fair-trade markets, particularly in areas with high levels of poverty and where the legacy of Guatemala's armed conflict has led to a distrust of some public sector organizations. ANACAFE has continued to play an important technical role in advising national coffee production policy and in providing some agricultural services (Eakin et al 2005). ANACAFE has also established a laboratory facility for testing soils, plants and water for the coffee farmers.

Another important event in the coffee history of Guatemala in the 1960s was the development of a cooperative system of small producers. FEDECOCAGUA the Federation of Cooperatives of coffee from Guatemala, was founded in 1969 by 19 cooperatives with the goal of improving the life standards of the small farmers with their own efforts. FEDECOCAGUA supports the small producers with technical support in the harvest, financial and economical support, feasibility analysis, international relations of support, research and new markets (niche markets) with the goal of better prices for their coffee and the fight for the recognition of the rights of the small producers in the National Association of Coffee in Guatemala (Fedecocagua 2008).

3.2 El Salvador

El Salvador is situated in Central America to the south of Guatemala and Honduras. With a population of 7 million on an area of 21 thousand square kilometres it has a population density of 330 persons per square kilometre. El Salvador has a humid tropical climate along the coast and more temperate in the highlands. The agricultural sector accounts for 10 % of the GDP, and employs 19 % of the workforce. Coffee, sugar and corn are the most important agricultural products (CIA 2008).

El Salvador has 65 airports out of which 4 have paved runways, 560 km of railways and 11,000 km of roads. The GDP per capita (PPP) was 5,200 USD in 2007 (CIA 2008). UNDP rank El Salvador at 103rd place on its Human Development Index (0.735). The UNDP report gives El Salvador a per capita (PPP) GDP of 5255 USD (UNDP 2008).

El Salvador is poor, small, and densely populated with its infrastructure destroyed by 11 years of civil war. Situated on top of a seismic zone with 20 volcanoes El Salvador possesses no natural resources.

3.2.1 Coffee Quality

Although a small country, El Salvador is a major producer of high quality Arabica coffee. The civil unrest in the country has limited average output over the last years to 2.1 million bags per annum (ITC 2002). The Salvadorean Coffee Council (CSC) certifies the quality of both gourmet and organic coffee. It assigns coffee one of three quality standards depending on the altitude at which it is grown (central, high and strictly high). Although certified coffees, including “organic,” “Rainforest Alliance certified,” and “fair trade,” have appeared in the past several years, they make up less than 1 percent of overall exports (Blackman 2007). Salvador Coffee (brand name) is grown at relatively high altitudes and almost three-quarters of Salvadoran coffee exports are grown above 800 meters. (Banks et al 2007). Only Arabica coffee is produced and two thirds of this is Bourbon. Most coffee is grown under shade and provides an important part of the country’s forest cover (ITC 2002).

3.2.2 Coffee Production System

Coffee is the most significant agricultural crop in El Salvador. The bulk of production comes from estates but there are also tens of thousands of smallholder farmers. 86 % of the farmers produce less than 100 bags per year. There is also a considerable domestic market for coffee of 150 thousand bags every year. Coffee accounts for 24 % of revenues from export (ITC 2002).

Ninety-five percent of El Salvador’s coffee is shade grown. Coffee is planted on a total of 161,000 hectares comprising about 9 percent of El Salvador’s landmass. Although tree cover loss may be a problem in shade coffee areas in a number of Central American countries, it is particularly worrisome in El Salvador, the most densely populated country in the Americas and the most severely deforested. Less than 10 percent of the country’s natural forests survive, and a significant share of the remaining tree cover is associated with shade coffee (Blackman et al 2007).

Each year during the dry season, from November to March, coffee beans are harvested and brought to coffee processing facilities to be prepared for export. As part of this process, the outer pulp of the coffee bean is removed. In El Salvador, a wet removal process is generally used, and pulp is ultimately transported in water through viaducts to a storage area. Although viaduct water is reclaimed as much as possible, the pulp generally has a moisture content of 80 percent when it is placed in storage. The storage of this pulp represents an environmental problem through rotting and seepage polluted water, which is a general challenge to the coffee industry (Wu 1995).

The coffee export from El Salvador is mainly on private hands. In addition to the coffee exported directly by large producers, there are several private exporting companies like Unex, Exportadores Libby's and Borgonovo Pohl.

3.2.3 Institutions

The Salvadoran economy has been growing at a steady and moderate pace since the signing of peace accords in 1992, in an environment of improved investor confidence and increased private investment. Much of the improvement in El Salvador's economy is a result of free market policy initiatives by the government. One of the biggest challenges in El Salvador has been to manage the decline in the coffee sector, and to develop new growth sectors for a more diversified economy. The collapse of worldwide coffee prices has caused substantial reduction in coffee production and decreased rural employment. While as recently as 1988 coffee exports accounted for more than half of export earnings, in 2004 they were 7.0% (U.S. Department of State 2005).

In 1979 the government took control of the coffee industry and established the Instituto Nacional del Café, INCAFE, to manage the monopoly of the government in exporting coffee from El Salvador. This led to a struggle between the government and the coffee growers that lasted for a decade. INCAFE was then replaced by the Consejo Salvadoreño del Café, CSC, with considerably less power (Paige 2001).

The research and extension services for the coffee industry are conducted by the Fundación Salvadoreña para Investigaciones del Café (PROCAFE). Since 1991, Salvadorean coffee farmers have paid for agricultural extension services from PROCAFE indirectly through a levy on coffee exports. Project funding enabled each cooperative to hire and provide more intensive extension services to members by covering the costs of hiring an agronomist and buying a motorcycle. The agronomist offered advice on coffee seedling, propagation, pruning, crop diversification, and shade tree planting. PROCAFE trained the agronomist and provided assistance from specialists. The agronomists also served as loan officers. Project credit enabled farmers to adopt recommendations that were previously unattainable (Stosch & Hyman 2002).

EnterpriseWorks, an NGO, established a for-profit coffee export marketing company in El Salvador to benefit smallholder farmers throughout Central America and Mexico. The NGO provided the capital to start the company, Comercializadora Regional de Café, COMERCAFE. Pilot operations started in 1998. COMERCAFE broker green coffee exports, linking local producers with international buyers, helping in negotiations, preparing

paperwork for export, arranging shipping, and testing coffee quality. The coffee producers were also provided with market information through the company (Stosch & Hyman 2002).

3.3 Colombia

Colombia is located in the northern end of South America bordering Venezuela and Ecuador. With a population of around 45 million on an area of 1.1 million square kilometres the population density is 40 people per square kilometre. The Equator is crossing through Colombia and the country consequently has a tropical climate along the coasts, but a cooler climate suitable for coffee production in the higher altitude areas. Colombia has considerable oil and gas resources. The agricultural sector accounts for 12 % of the GDP and coffee is the most important agricultural product (CIA 2008).

Colombia has 934 airports out of which 103 has paved runways, 3,300 km of railways and 113,000 km of roads. In addition Colombia has 18,000 km of waterways. The GDP per capita (PPP) was 7,200 USD in 2007 (CIA 2008). UNDP rank Colombia at 75th place on its Human Development Index (0.791). The UNDP report gives Colombia a per capita (PPP) GDP of 7304 USD (UNDP 2008).

3.3.1 Coffee Quality

Colombia ranks as the third largest producer of coffee in the world, after Brazil and Vietnam, with a production volume of about 9 million bags per year. Colombia is by far the world's largest producer of washed Arabicas, and because of its large volume and spread in its harvesting period it is able to supply fresh green beans all year round. All coffee is wet-processed, mostly on-farm. 86 % of the tree park consists of high-yielding Caturra and Colombia varieties (ITC 2002).

The coffee growing areas of Colombia is earthquake prone and in the 1999 earthquake 65 % of the coffee infrastructure was damaged. Coffee is grown on altitudes from 800 to 1900 meters and is all hand-picked. Old Arabica varieties are slowly replaced by new varieties. Colombia also exports the largest volumes of soluble coffee in the world (Banks et al 2007). The Colombian Coffee Growers' Federation (FEDERACAFE) has had a highly successful marketing strategy in presenting Juan Valdez as the archetype coffee farmer who the coffee consumers can easily identify with (Niederhauser et al 2007).

3.3.2 Coffee Production System

The production system is largely based on smallholders with over 500,000 farms at altitudes ranging from 1300 to 1800 meters. The domestic consumption of coffee is considerable at around 1.5 million bags per year (ITC 2002).

In the 70s and 80s, roughly 300,000 Colombian farmers grew coffee, and 2 million Colombians were directly or indirectly related to the industry. But after the United States abandoned the negotiations on a revised International Coffee Agreement in 1989, a flood of cheap exports from other countries cut deeply into Colombia's coffee business. Then, in 1990, a structural adjustment loan from the International Monetary Fund (IMF), along with the economic reforms the IMF demanded, further disturbed Colombia's coffee industry. As Colombia privatized many public services, eliminated subsidies, raised interest rates, and dropped trade quotas and tariffs, Colombian imports grew and exports, such as coffee, dropped (Brittain 2006).

FEDERACAFE, the growers' federation, will guarantee a certain minimum price of coffee exported through it. In addition to FEDERACAFE, there are over 50 private shippers and 40 cooperatives involved in export of Colombian coffee.

3.3.3 Institutions

Colombia is a free market economy with major commercial and investment ties to the United States. Unlike many of its neighbouring countries, Colombia has not suffered any dramatic economic collapses. The government seeks to maintain prudent fiscal policies and has pursued tough economic reforms including tax, pension and budget reforms. The Colombian tax rates (both personal and corporate) are among the highest in Latin America. The sustained growth of the Colombian economy can be attributed to an increase in domestic security, the policies of keeping inflation low and maintaining a stable currency, petroleum price increases, and an increase in exports to neighbouring countries and the United States as a result of trade liberalisation (U.S. Department of State 2008).

The coffee industry is very well organised and FEDERACAFE, the National Federation of Coffee Growers of Colombia, has played a major role for decades. All export shipments are subject to FEDERACAFE quality control. Established in 1927, the FEDERACAFE is a non-profit and non-political cooperative that tries to stabilize the market for Colombian coffee and undertakes research, social assistance and promotion programs on behalf of the small, independent farmers. With the supervision of the Colombian government and supported by a tax on coffee exports, the Federation has succeeded in protecting the coffee farmers against

falling coffee prices. When prices fall below an established minimum, the Federation steps in and buys the crop, storing it in central locations and putting it on the world market in times of shortage. This guarantees the coffee farmer a steady income, yet allows him to sell his coffee on the open market when prices rise above the minimum (Federacafe 2008).

The research facility CENICAFE has been responsible for innovative advances in the field of pest and disease control as well as coffee processing (ITC 2002). Its mission is to generate appropriate, competitive and sustainable technologies for the coffee industry in Colombia (Cenicafe 2008).

3.4 Indonesia

Indonesia is located on several islands in the south-eastern part of Asia. With a population of 238 millions on an area of 1.9 million square kilometres it has a population density of 125 persons per square kilometre. Indonesia has a hot and humid tropical climate along the coast with more moderate temperatures in the highlands where coffee is grown. The agricultural sector accounts for 12 % of the GDP (CIA 2008).

Indonesia has 652 airports out of which 158 has paved runways, 6,500 km of railways and 370,000 km of roads. In addition Indonesia has 22,000 km of waterways. The GDP per capita (PPP) was 3,400 USD in 2007 (CIA 2008). UNDP rank Indonesia at 107th place on its Human Development Index (0.728). The UNDP report gives Indonesia a per capita (PPP) GDP of 3843 USD (UNDP 2008).

3.4.1 Coffee Quality

Indonesia overtook Cote d'Ivoire as the world's largest Robusta producer in the early 1980's only to be overtaken itself by Viet Nam in the mid 1990's. Only about 10 % of the total production of coffee is Arabica (ITC 2002). Almost 70 % of Indonesian coffee is grown on the island of Sumatra, the rest on Java, Sulawesi, and other smaller islands. Many of the Arabica coffees originating in Indonesia are renowned for their good flavours. Indonesia is also the source of the famous kopi luak coffee, which is first eaten by a weasel-like animal and recovered from the animal's droppings before processing (Banks et al 2007).

3.4.2 Coffee Production System

Smallholders account for over 90 % of the total production of coffee, scattered over many islands and huge geographical areas. The coffee from smallholders is going through several steps of intermediaries before being purchased by the exporters. Domestic consumption is considerable at about 1.6 million bags per year. Although important in the world of coffee,

coffee export is relatively insignificant to the Indonesian total export economy. Most of the produced coffees are naturals (dry processed), but on the island of Java an amount of washed Robustas are produced (ITC 2002).

Indonesia is now the world's fourth-largest producer of coffee; around 90% of its output consists of the Robusta variety. Output of coffee expanded from 157,000 tonnes in 1968 to an estimated 609,000 tonnes in 2002. The fall in international prices (particularly in 2001), coupled with the high cost of farm maintenance and fertiliser, have led farmers to abandoning coffee cultivation in recent years, causing the harvest to fall to an estimated 450,000-490,000 tonnes in the 2004/05 crop year. Typically, 85% of output is exported. The smallholders, farmers who own 2 ha or less each, have been steadily increasing the area planted from less than 322,000 ha in 1968 to more than 1.3 million ha by 2002. However, poor productivity remains a problem, and yields are commonly as low as 650 kg of dried green beans per ha. Around 30% of coffee trees are over 30 years old and no longer at peak productivity levels (EIU 2005).

3.4.3 Institutions

The trade of coffee in Indonesia is entirely free, and the plantations usually process and export the coffee themselves (ITC 2002). For the smaller producers a network of intermediaries trade the coffee which eventually end up in the hands of an exporting company in one of the many ports. In addition to the Indonesian government departments there are a national Indonesian Coffee and Cocoa Research Institute (ICCRI) in East Java which is a private institute operating under the Research Institute for Estate crops. 70 % of its annual income is from contract research and the balance is covered by the Association of Plantation Research Indonesia (APPI, for government estates), and the government (Neilson 2005). The Hasanuddin University in Makassar has involved in coffee development. There is also an Association of Indonesian Coffee Exporters (AICE) (Neilson 2007). The association which is a private initiative has 200 members active in export of coffee from Indonesia. It is promoting consumption of Indonesian coffee both domestically and abroad, is involved in upgrading the quality of the Indonesian coffee and in market intelligence (Sandee/Ibrahim 2002).

3.5 India

India is located in South Asia to the south of Nepal. It has a population of around 1.15 billion on an area of 3.3 million square kilometres giving it a population density of 350 persons per square kilometres. India is mainly located between 10 and 30 degrees northern latitude and

enjoys a variety of climates from tropical in the south to temperate and even alpine in the northern areas. Coffee production in India is concentrated in the south-western areas (CIA 2008).

India has 346 airports out of which 250 has paved runways, 63,000 km of railways and 3,400,000 km of roads. In addition India has 14,000 km of waterways. The GDP per capita (PPP) was 2,700 USD in 2007 (CIA 2008). UNDP rank India at 128th place on its Human Development Index (0.619). The UNDP report gives India a per capita (PPP) GDP of 3,452 USD (UNDP 2008).

3.5.1 Coffee Quality

India is the third largest Asian producer after Viet Nam and Indonesia. Robusta output account for around 60 % of the total (ITC 2002). Almost 40 % of India's coffee crop is Arabica. Most coffee is grown in three states in the south-west, namely Karnataka (Mysore), Tamil Nadu and Kerala. Most of the Arabica coffee is grown in Karnataka. India is also source of the "monsooned" coffees, stored in open warehouses on the west coast for six weeks to reproduce the flavours from the time when coffee was shipped to Europe by sail ships (Banks et al 2007). Indian coffee is generally considered to be a consistently good quality product with reliable grades and standards. The Indian Robusta is regarded to be one of the world's best. In addition, a smaller volume of gourmet specialty coffees, such as Monsooned Malabar, Mysore Nuggets and Kaapi Royale, is also exported (Neilson & Pritchard 2005).

3.5.2 Coffee Production System

Most of the coffee in India is shade grown. Smallholders account for about 60 % of the total production, and 98 % of the plantings are less than 10 hectares. Domestic consumption represents almost 1 million bags per year, but considering the large population there is potential for much more (ITC 2002).

Until the domestic coffee companies came along, India's 200,000-plus coffee growers largely depended on the volatile export market, where margins were thin and the risks immense. Even today, only about 25 per cent of India's total production of 300,000 tons per annum is consumed domestically, but in value terms, the Indian domestic market, at Rs 2,000 crore (500 million USD), now equals the export market (Balasubramanayam 2008).

From the perspective of Indian coffee producers, issues of environmental sustainability are vital. Coffee is seldom grown as a mono-crop in India, and intercropping with pepper, cardamom, citrus, areca nut and ginger is commonplace throughout all the major coffee

regions. Early pioneers insisted on the merits of a dense canopy of shade, and the practice of planting coffee in the under-storey of a three-tiered canopy, including an upper canopy of remnant rainforest trees, remains essentially unaltered today (Neilson & Pritchard 2005).

Coffee plantations, natural forest and groves constitute a more or less continuous habitat for some of India's larger wildlife species. It is difficult to overstate the ecological role played by these privately managed forest systems in a country where competition for space between people and wildlife is intense (Neilson & Pritchard 2005).

Indian coffee is exported directly by the producers and through private exporting companies.

3.5.3 Institutions

The Indian Coffee Board (ICB) is a statutory body under the Ministry of Commerce. Prior to 1993 the Indian coffee industry was heavily regulated by the Coffee Board, which strictly controlled all stages of the domestic supply chain. Only registered companies were permitted to process the coffee on behalf of the Board, which was responsible for exports. Over three seasons from 1993 until 1995, the Board oversaw a remarkable transformation towards a fully liberalised coffee market, and the role of the Board is now restricted to industry support and promotion functions only. It does, however, remain a critical institution in the Indian industry with a broad mandate for overseeing industry development (Neilson & Pritchard 2005).

India is the only producing country except Brazil to establish its own coffee futures market to help stabilise prices for producers, the Coffee Futures Exchange India Ltd (ITC 2002), but the operations were halted in 2005 due to low profitability.

Although the Indian coffee sector does not have the global profile of its Brazilian and Colombian counterparts, it is a significant contributor to the global coffee trade. In 2004, India was the fifth largest coffee-producing country, generating 291,000 tonnes of green coffee beans, two-thirds of it grown in Karnataka State (Neilson & Pritchard 2005).

Indian coffee producers have been steadfast critics of the 4C initiative (Common Code for the Coffee Community). Through their representative bodies, producers have lobbied the Indian Coffee Board to raise objections to the 4C at various fora. In essence, the Indian coffee industry has opposed the 4C on three grounds: ecological, economic, and social (Neilson & Pritchard 2005).

In the southern city of Bangalore a private coffee testing and cupping laboratory (Coffee Lab Pvt. Ltd.) has been established under the leadership of Ms. Menon, an engaged proponent of coffee production and quality in India.

3.6 Experience from other Countries – Summary

In Table 3.2 and 3.3 below the information about the coffee industry in each country and the role of the institutions supporting the coffee industry have been compared.

Country	Small holder Production	Coffee Production System	Market Access
Guatemala	30 %	Coffee grown mainly on medium and large size farms. Mostly shade grown Arabica of high-quality, low-yielding varieties. Processing mainly on the farms.	Good air transportation density. Export through private companies and FEDERACOCAGUA.
El Salvador	Bulk from estates	Coffee grown on large estates and by smallholders. Mostly shade grown Arabica of low yielding varieties. Viaducts used for transportation in coffee processing. Focus on reclaiming pulp as fertilizer.	Export directly from producers and through private exporting companies.
Colombia	Largely small-holder based	Coffee production largely based on smallholders. Older low yielding Arabica varieties are slowly being replaced with high yielding varieties. Success in international marketing through Juan Valdez.	FEDERACAFE will buy all coffee from growers and guarantee a minimum price. Many private companies also export coffee from Colombia.
Indonesia	>90 %	Coffee production is mainly smallholder based and only 10 % of production is Arabica. Problems with poor quality.	Export directly by larger estates and through intermediary trade to private exporting companies for smaller producers.
India	60 %	Coffee production is based on small farms of less than 10 ha. And 35 % is Arabica. Most of the coffee is shade grown. Focus on conservation of natural forests and habitats for birds and animals.	Export directly by the producers and through private exporting companies.

Table 3.2 Comparison of Selected Coffee Producing Countries.
Coffee Production System.

In Table 3.2 we can see that the share of smallholder production shows large variation between the countries, from the bulk of production coming from estates, like in El Salvador to more than 90 % smallholder production as in Indonesia. Further the table shows the production system for coffee in each country as well as how the coffee is exported from the countries.

In Table 3.3 we can see that there is a large variation also in how the institutional setup is made for support to the coffee industry. Some countries, like Guatemala and Colombia have a strong government involvement, and others like Indonesia and India have left most of the control of the coffee industry to private institutions. There seem to be some correlation between the national importance of the coffee industry and the national government's control over it.

Country	Role of Government Institutions	Role of Non Government Organisations	Role of Private Sector Institutions
Guatemala	Anacafe: A strong and independent public/private member organisation with over 60,000 producers as members	Several NGOs provide support to farmers. Fedecocagua support smallholders and speaks for them in Anacafe	na
El Salvador	CSC: Coordination of the coffee sector, quality certification	Procafe: Extension and support to coffee farmers	Comercafe: Marketing for export
Colombia	Federacafe: Stabilise the market and provides research, social support and promotion Cenicafe: Research facility	na	Exporters
Indonesia	Supporting reseach	na	ICCRI: Contract research for coffee and cocoa producers AICE: promotes consumption and supports exporters
India	ICB: Statutory body under Ministry of Commerce	na	CLPL: Independent coffee lab

Table 3.3 Comparison of Selected Coffee Producing Countries. Institutional Parametres.

In Table 3.4 an overview of the lessons from each country relevant to the coffee industry in Nepal is summarised.

Country	Lesson relevant to Nepal
Guatemala	Strong cooperation between the government and the private sector has resulted in a free and competitive coffee industry. Guatemalan still does not seem to achieve the price premiums that its coffee deserves.
El Salvador	Government and private sector involvement in production of quality coffee, the government involving on quality control of exported beans and the non-government sector supporting the coffee farmers. A private sector marketing company for export of coffee.
Colombia	The importance of domestic security, stable financial policies and strong marketing of the product.
Indonesia	That research and development is an important side of a developing coffee industry and that this can be done both by government and non-government institutions.
India	That the cultural conditions being quite similar to Nepal and consequently the institutional setup from India can more or less be copied in Nepal.

Table 3.4 Overview of Lessons Learnt from other Coffee Producing Countries.

4. Coffee Production in Nepal

In this chapter I will review the history of coffee production in Nepal and take a closer look at the plans of the Norwegian initiative for coffee production in East Nepal. One part of the detailed research question is to analyse how the conclusions of this report can help improve the present coffee industry in Nepal. To be able to analyse this question it is therefore necessary to know the present status of the coffee industry in Nepal. Similarly, to analyse the supply chain and institutional support system for the coffee projects we will need some information about the plans of the project.

Coffee growing in Nepal started in 1939 when a monk brought coffee seeds from Myanmar and planted them in the Anpchaure area of Gulmi district in the western part of Nepal. The coffee trees went unnoticed for three decades until 1975, at which time it had spread to a few farms in the area mostly without the farmers even realizing that it was coffee. After the coffee trees were rediscovered coffee spread to other districts as well, but mostly driven by curiosity rather than commercial motives. The first commercial coffee processing facility, the Nepal Coffee Company (NeCCo) was established in Butwal in 1983, and the processed coffee was sold in the domestic market, mostly to tourists. By 1990 the first coffee was exported from Nepal to the Netherlands, by the Salt Trading Corporation, but the trade was soon discontinued due to low volumes. In the late 1990's the Gulmi District Cooperative Federation exported a sizeable amount to Japan. By 2005 the production of coffee had spread to 23 districts on a commercial basis, and to even more for curiosity. An estimated number of 10,000 farmers were growing coffee trees. In most of the districts the coffee farmers had organised themselves into District Coffee Producers' Associations (DCPAs) with its central level federation Nepal Coffee Producers' Association (NCPA). More export destinations had been opened, and there were 4 major exporters of coffee. 6 companies were roasting and selling coffee for domestic consumption. The productivity of coffee production is low relative to other countries. Since coffee is mainly planted in marginal land without much external input, the output per ha is in average only 300 kg of green beans. For India, the average production per ha is 800 kg of green beans, and in Nicaragua the average is 1,800 kg. The yielding potential of Arabica is in the range of 1,500 to 3,000 kg per ha under good management systems (Koirala et al 2005).

This study is based on the present situation of coffee production in Nepal as well as the concrete plans of two Norwegian parties to promote a project for coffee production in Nepal. In this chapter the present institutional support systems for coffee production in Nepal will

also be described. The plans of the Norwegian Coffee Project (TCP) will also be outlined, as well as the infrastructural features of the proposed coffee growing area. This chapter is partly based on information from three papers by the same author, namely Hagen (2007a,b,c).

4.1 The Actors in the Nepal Coffee Sector

Several government agencies, INGOs, NGOs, associations and private companies are involved in the coffee sector in Nepal. In this chapter an introduction to these organisations will be given.

4.1.1 The Existing Coffee Industry in Nepal

At present there are 3 local companies active in both export of green beans as well as roasting for domestic consumption of coffee. The biggest among these is probably Highland Coffee Promotion Company Ltd. (HCPCL), a result of cooperation between three of Nepal's coffee entrepreneurs. The company was formed with the intention to integrate production, processing and marketing of coffee in order to bridge the gap between the farmers and the market. HCPCL has exported coffee to the United States for several years. The company has a strong focus on the quality of coffee and how quality can be achieved by the use of incentives to farmers and processing centres, as well as through education of people on all levels of the industry. Another company with some degree of success in setting up coffee production in Nepal is Plantec Coffee Estates Pvt. Ltd. which has its own coffee plantation in Rasuwa district, north-west of Kathmandu. The company has been exporting coffee, especially to Italy, for several years. A third coffee company is the Everest Coffee Pvt. Ltd with its production base in Kavre district east of Kathmandu. This company has succeeded at exporting coffee, especially to Japan, for several years. Last year the export amounted to 48 tons to four different buyers. A fourth company is Nepal Organic Coffee Products with its local brand Morning Fresh. Several other smaller companies are also involved with parts of the value chain for coffee, a newcomer being the Top of the World Coffee Pvt. Ltd. (TOW) targeting export to the North-American specialty coffee market.

4.1.2 The Supporting International and National NGOs

Three International non-governmental organisations are presently active in supporting the coffee industry in Nepal. These are Winrock International of USA, Helvetas of Switzerland, and Danida, the Danish development agency. These organisations have their own individual programmes, but are also cooperating in supporting the coffee industry. Winrock presents itself as a non-profit organisation working with people around the world to increase economic

opportunity, sustain natural resources, and protect the environment. It is based in Arkansas, in the United States, and has a global network of work in 65 countries in America, Africa and Asia. In Nepal, Winrock has programs running in the energy sector (renewable energy), and in agriculture, where their coffee program is a part. Helvetas is an INGO based in Switzerland and is active in around 20 countries. In Nepal it has worked since 1956. It is active in most districts in Nepal and provides support in three main sectors, namely rural infrastructure; agriculture, forestry and natural resources; and technical training and entrepreneur development. Helvetas has been providing support to the coffee sector through its Coffee Promotion Project (CoPP). Danida is the Danish parallel to the Norwegian Norad and is providing development aid to Nepal on behalf of the Danish government. In Nepal it is involved in many areas in addition to supporting coffee production.

An NGO involved in the coffee sector is People Awareness and Development Center (PADC) which is also a partner in the Tea and Coffee Global Development Alliance (TCGDA). The NGO is involved in the Danida programme of promoting coffee production in West Nepal. It has its headquarter in Kathmandu and a regional office in Tanahu district. PADC has with support from Danida implemented a four-year Women's participatory Sustainable Socio-economic Stretch Project with a strong coffee promotion component. The coffee promotion component has targeted 30 village development areas of Gorkha, Tanahu and Lamjung districts of the western hilly region of Nepal. The target is to expand coffee cultivation to 300 ha of land involving a total of 2,910 farmers, and distribution of 750,000 coffee plants.

The Tea and Coffee Global Development Alliance has been set up to promote rapid expansion of sustainable smallholder production of coffee in Nepal. The partners are Winrock International, Helvetas, Nepal Coffee Producers Association (NCPA), Highland Coffee Promotion Company Ltd. (HCPCL), Agro Enterprise Center (AEC) of FNCCI, the National Tea and Coffee Development Section (CTDS) of Department of Agriculture, and People Awareness and Development Center (PADC).

4.1.3 The Supporting Private Sector Institutions

In the private sector there are especially two institutions of importance for supporting the growing coffee industry in Nepal. These are the Nepal Coffee Producers Association (NCPA), which organises most of the coffee growers in Nepal, and the Agro Enterprise

Centre (AEC) which was established by FNCCI (Federation of Nepalese Chambers of Commerce and Industry) to support the private sector role in agriculture.

The Nepal Coffee Producers Association was established in 1998 and is the national federation of the District Coffee Producers' Associations, which organises the coffee farmers in each district and send representatives to its governing board. The District Coffee Producers' Associations are active in 11 districts and has 5,700 farmers as members. The organisation is a representative association of coffee farmers in Nepal and is dedicated to promote organic coffee farming with sustainable soil management. Farmer's groups and cooperatives are supported by NCPA to promote commercialisation of agriculture and rural employment through partnership with business organisations and development agencies.

The AEC was established in 1991 with finance from USAID to accelerate market driven, high value agriculture and forest based products and private-sector-led agricultural development in Nepal. It has worked to strengthen the role of the private sector in expanding markets for Nepali agricultural products and accelerate selection and adoption of production increasing technologies and value adding services suited to the needs of farmers, agro-entreprises and market opportunities.

4.1.4 The Supporting Government Institutions

The Government of Nepal (GoN) established the Nepal Tea and Coffee Development Board (NTCDB) in 1993 as a policy maker and national coordinator for the tea and coffee sectors. The intention was to develop solid rules and regulations for accomplishment and simplification of the cultivation and manufacturing of tea and coffee, production of high quality and quantity, implementing modern technology and marketing management for export and import. A coffee policy (2003) is already in effect, and the NTCDB is now working on making guidelines to make the policy operational. The coffee policy of 2003 recognises coffee as a source of income generation and highlights the importance of organic practices. The policy also foresees credit facilities and tax exemption for the coffee industry, as well as subsidies for irrigation facilities. A coffee development fund for research, development and market management involving the private sector under the supervision of NTCDB is also described (Koirala et al 2005).

The NTCDB has a wide mandate to study the coffee sector, do training and research programmes, coordinate the different agencies working in the sector and assist enterprises

involved in the sector. In addition the NTCDB can provide loans, seed, insecticides, chemical fertilisers and technical services to coffee farmers, as well as reallocate unused government-owned land to smallholders on lease for coffee production. Though the list of objectives and duties of the NTCDB is long and quite comprehensive, it is not to date known how much of this has been implemented in practice.

The Ministry of Agriculture has established the National Tea and Coffee Development Section (CTDS), under the Fruit Development Directorate of the Department of Agriculture, as a technical implementation unit for the tea and coffee sectors. It is the responsible government agency for the development of tea and coffee crop. The CTDS has extension work through District Agricultural Development Offices (DADO) in several tea and coffee producing districts. The Coffee Development Centre located in Apchaur in Gulmi district is responsible for research on coffee, as well as production and distribution of seeds and planting materials. In general the office seems to have very limited resources, both funds and personnel, to carry out its mandate in practice.

4.2 The Coffee Project

The coffee project is the case analysed in this report. The research question is formulated to apply the theory of supply chains and national innovation systems to the practical implementation of the coffee project within the context of Nepal. Some basic information about the coffee project to facilitate the analysis of the research question has been provided in this chapter, the bulk of the information gathered from the Business plan made for the projects as well as a feasibility study previously undertaken by Winrock International on behalf of the project.

In preparation for The Coffee Project, Viator AS had commissioned Winrock International to make a feasibility study for coffee production in the proposed districts (Koirala et al 2004).

The feasibility study shows that (Berge & Dahle 2007):

- Many areas in the highlands of eastern Nepal (800- 1500m altitude) are suitable for growing high quality coffee.
- There is a substantial motivation among farmers to convert parts of their land into coffee production.
- Coffee trees have been planted in the area for many years and the coffee plants are healthy and yield good quality cherries.

- The farmers in the districts have no knowledge about high quality coffee production, and they have limited market access. As a consequence, coffee production in eastern Nepal is suffering from poor yield, poor quality and poor market prices.
- Trained growing- and processing supervisors from western Nepal are available to carry out supervision work for this new projects in eastern Nepal.
- An economic project analysis based on existing export prices for Nepali coffee and conservative estimates for production and operating costs, show favourable return on the investment both on farm level as well as on processing and marketing level of the proposed project.

Based on this feasibility study the two Norwegian parties, Viator AS and NHAM have made a business plan for coffee production in Nepal (Berge & Dahle 2007). The parties have also received financial support from NORAD to carry out initial business research for the project.

4.2.1 Objectives of the Project

The targets of the coffee project are to produce and export quality coffee (specialty coffee) from Nepal and in so doing help develop the economy of the local project area. To achieve this target and make the project sustainable in the long run, the plan is to organise it as a business. The business idea of the project is to (Berge & Dahle 2007):

- Establish a private limited Company in Nepal for production and marketing of high quality coffee jointly owned by the coffee farmers and private investors demonstrating social concern.
- The purpose of the Company is to provide long term profitable business both for the growers and the private investors.

This business idea will be implemented through the following mission/strategy (Berge & Dahle 2007):

- To provide and implement means for up to 6000 families in the districts Solukhumbu, Okhaldhunga and Khotang to develop small coffee plantations on their own land or on community land made available by the Company.
- To plant coffee trees on a total of around 600 ha, out of which each farmer's plantation will cover in average 0.1 ha.
- To provide necessary infrastructures, i.e. institutions, nursery plantations and coffee processing equipment, to establish production units for high quality coffee in the three

districts and carry out necessary social mobilization and training of growers and production staff to initiate, develop and maintain a sustainable operation.

- To organize and develop growers' cooperatives in which the growers will be offered membership, and which will jointly with the Company own all processing units, securing good production prices to the farmers and enhancing common goals for the operation.
- To establish a centrally located business unit within the Company for testing, tasting, sorting, selecting and branding high quality coffee, and carry out local and international coffee promotion, marketing and sales.

At first, the project plans to buy quality coffee from existing producers in Nepal, manually sort out the excellent quality beans and re-sell to top segments of the international market under its own new specialty coffee brands. Gradually the company will initiate local production in remote areas.

4.2.2 The Project Organisation

The Coffee Project has made the following plan to implement the business plan (Berge & Dahle 2007):

- The first step in implementing the business plan will be to set up a Private Limited company in Kathmandu. The company will give priority to management and business development, market development and the employment and training of a Coffee Board for qualifying and selecting high quality coffee.
- The Company management will make cooperation with existing coffee production and coffee sales organizations in Nepal, building one or several new brands for high quality coffee from existing coffee producers to be resold on the international market.
- To secure supply of larger volumes of quality beans, the company will build a full growing and production organisation in Nepal.
- A project organisation will be established to develop the targeted plantations, processing units and operating infrastructure. During a 4-year development period, a permanent operating organisation will be implemented.
- During the plantation and processing-unit development phase the Company will take full responsibility for social mobilisation of farmers and provisions for necessary training, supervision, infrastructure, institutions and financial support to those involved.
- After the development phase the Company will concentrate its activities on marketing and sales, quality assurance and control of the whole coffee production chain, including the

operation of a central processing unit (curing, hauling and grading) for all coffee collected from the districts.

4.2.3 The Project Area

The coffee project has identified three districts in East Nepal, namely Okhaldhunga, Khotang and Solu Khumbu as suitable areas for the project. These districts are all located in Sagarmatha Zone in the Eastern Development Region of Nepal, directly to the south of Mount Everest. The feasibility study has verified that many parts of Solukhumbu, Okhaldhunga and Khotang districts have conditions favourable for specialty coffee production (Berge & Dahle 2007). The most suitable area for coffee growing is in the altitude range of 800 to 1,500 meters, and on north facing slopes. All three districts presently follow primitive agricultural methods with very low productivity (except apple in Solukhumbu and citrus in Okhaldhunga). Among the traditional crops, only potato holds some economic promise. If potato is not counted in the cereals category, all districts face food deficit.

Solukhumbu is a mountain district which also has the highest peak on earth within its area. It is a very sparsely populated district as most land surface is snow-laden. The district appears prosperous due to the tourism potential and the employment opportunities associated with it. However, the statistics show that nearly 36 percent of the households are poor. The poverty is more in the southern parts because of the agrarian conditions and the area being out of the main tourist tracks. These southern valleys have conditions and climate suitable for coffee production.

A large part of Okhaldhunga, a hilly district, has climate, altitude and other conditions suited to coffee production. This is the only district among the three which already has road connection to the rest of Nepal. This is also the district where coffee plantations are more widespread, although not yet in a commercial form.

Khotang is the poorest among the three districts and the most remote one. A large part of Khotang has settings conducive for coffee growing, which can be an ideal enterprise for poverty reduction.

In each of the districts there is at least one airport with regular flights to the Capital, in addition to several airstrips where smaller planes may land and take off. Apart from that the only modes of transportation in most of the areas is by foot on narrow paths in relatively steep terrain.

5. Quality of Coffee – How is it Achieved?

Everything from varietal selection, soil fertility, pest and disease management, harvesting, time from harvest to processing, plus a dozen major steps in processing from initial fermentation to final drying, storage, and transportation have to be spot-on in order to achieve a specialty coffee grade and get the top prices for the green beans (Lotter 2003). Knowing how to manage quality through all these steps is necessary to produce high quality coffee. Managing the steps involves both the knowledge of how to perform the steps, but also the tolerances involved. The consequences on final product quality of performance outside the limits of tolerance are also important aspects of this as even small variations may cause the coffee to drop below the quality standards for specialty coffee. This may seem like a challenge of careful planning and dedicated carry through, and in one way it is. At the same time coffee quality is also about emotions. There is a lot of room for subjectivity in coffee quality assessment, and the personal preferences of one buyer may differ from preferences of another. This is both a challenge and a window of opportunities as coffee from different regions and producers can show large inherent variations in performance. This calls for a targeting of coffee production and marketing towards the segments of market that would likely appreciate the features of the coffee produced from a specific area.

In this chapter the process of making good quality coffee will be described largely from an objective perspective. The bulk of the information in this chapter is selected from the publication: *Coffee - An Exporters Guide*, published by the International Trade Centre (ITC), the technical cooperation agency of the United Nations Conference on Trade and Development (UNCTAD) and the World Trade Organisation (WTO) (ITC 2002). The information from the *Exporter's Guide* has been complemented by the use of material from Luttinger/Dicum (2005) and Banks et al (2007).

The relevance of this chapter to the topic and research question of this report may not be obvious and a short explanation may be necessary. To achieve sustained high quality of coffee the design of the supply chain for coffee is central. And not only how the supply chain is organised, but also all the supporting institutions that make up the environment in which the supply chain is supposed to function. Without focusing on this total environment, it may be possible to create a few batches of good coffee through direct involvement and effort of dedicated coffee experts, but it may not be possible to sustain this quality in the long run.

This environment involves both government institutions providing a stable and favourable business environment for the coffee industry as well as other export oriented industries in the country, but also everything from reliable suppliers of goods and services needed for the coffee industry as well as necessary research and development work to make the coffee industry a true speciality in the industrial landscape of Nepal. As a basis to achieve this, the knowledge of how to produce quality coffee must be disseminated to all involved institutions and personnel in order to create a sufficient understanding of the standards involved and how each part of the environment can influence the quality positively or negatively through their actions, and even lack of actions.

In a simple model of the supply chain for coffee, the first party will be the farmer who plants and grows the coffee trees. The farmer will, of course, also need input from other parties to do this. These other parties may be suppliers of equipment that the farmer needs, like irrigation pipes etc, and it may also be providers of knowledge, seedlings, fertilisers etc., which the farmer will need to grow the coffee in a way that gives quality coffee as its product. These parties and institutions that support the farmer in growing coffee can be termed the institutional framework within which the farmer grows his coffee. The second step of the supply chain is the processing of the coffee which is normally done in dedicated processing centres where the coffee cherries are transformed to dried parchment coffee beans. Here also there is a need for knowledge and suppliers, as well as some financing mechanism to set up the centres. The third step in the simplified supply chain is the exporting company which may also be the coordinator of the whole supply chain. Here also there is a need for suppliers, knowledge about markets and marketing, as well as a favourable business environment to carry out the export business. For the purpose of this chapter this simplified supply chain and institutional support system model will be suffice to justify the descriptions of the steps to achieve quality coffee.

5.1 Coffee Basics

Coffee is a member of the genus *Coffea* of the Rubiaceae family, which includes over 500 genera and over 6,000 species. The genus *Coffea* itself consists of numerous species, but only two of them are of much economic importance, namely the *Coffea Arabica* and the *Coffea Robusta* (also known as *Coffea Canephora*). In this report the focus is on the Arabica type of coffee which in the 1960's made up for as much as 80 % of the world's production. This has reduced to around 60 % due to the rapid growth in Robusta production in countries like Brazil

and Viet Nam. The original strains of Arabica (e.g. Bourbon, Typica) generally produce good liquors with acidity and flavour, but they are susceptible to pests and diseases, and the yield is moderate. This has led to the development of a number of different varieties that show better tolerance and higher yield (e.g. Caturra, Colombia). Some purists consider that the newer varieties lack some of the qualities of the original varieties.

There are two main types of processing methods; the unwashed or dry process which produces naturals, and the washed or wet process which produces washed coffees. In the dry process the ripe coffee cherries are dried after which the mucilage is mechanically removed to produce the parchment bean. In the wet process the ripe cherries are pulped and fermented to remove the sticky, sugary coating called mucilage, and the beans are then washed and dried. In between these two methods there is a third method called semi-washed. In the semi-washed process the ripe cherries are pulped and then dried with some of the mucilage still adhering to the parchments. In all processes the parchment skin is later removed mechanically to produce the two green beans in each cherry.

5.2 Quality of Coffee in General

There are many different views on what quality coffee is. It can be said that the quality of a package of coffee comes from a combination of the botanical variety, topographical conditions, weather conditions, and the care taken during growing, harvesting, storage, export preparation and transport. Botanical variety and topographical conditions are constants for a certain established growing area and will therefore dominate the inherent character of a coffee. Weather conditions are variable and cannot be influenced, resulting in variation in quality from one season to another. The variables that can be influenced are related to growing, harvesting, storage, processing and transportation. As these variables involve interventions by human beings, the motivation of the people involved in the different steps is a key factor in making quality coffee as the end product. There is also a relation between cost and quality in the sense that the quality can be enhanced at several steps in the process by adding resources. Efforts to promote quality are normally rewarded by world market prices and buyer's premiums for better than average qualities.

5.2.1 Quality Criteria in Marketing

The basic quality criterion for coffee in marketing is that the coffee must be suitable for human consumption and this must be documented in a traceable and identifiable way all the way from producer to consumer (especially for export to EU countries). Second, the coffee

must be free from unrelated matters, live pests and moulds. These two criteria are related to the general acceptability of the coffee, and if the coffee does not fulfil these criteria it should not be traded. We will not focus any more on these two basic criteria in this report as they are expression of fundamental requirements for coffee trade which any exporter of coffee must master disregarding the quality standards he otherwise aims at for his coffee. This report is concentrating on the production of high quality Arabica coffee, and these criteria will have to be fulfilled even for the lowest qualities of traded coffee.

As a third criterion the coffee must fully conform to the contractual description or sample, and be of uniform quality throughout the entire shipment. For a serious committed producer and exporter the focus on quality cannot be overemphasised. It is only by strictly adhering to the contractual obligations and always supplying exactly what was sold that a solid reputation can be created. This is also a criterion that we will not discuss any further in this report, as it relates to the execution of business agreement between the exporting company and the buyer. The supply chain and institutional framework discussed in this report is limited to what happens within the country of Nepal. We will in the following assume the exporting company fulfils this criterion in all its dealings with potential and actual buyers. As a fourth criterion, the coffee must be clean in the cup and free from undesirable flavours. This criterion relates directly to the quality of the coffee which is what can be influenced through the supply chain and by the institutional setup. It is the fourth criteria that will be focused on in the rest of this chapter on the quality of coffee and how to achieve it.

5.2.2 Communicating about Quality

The problem with pursuing quality and communicating about quality is not just that the term itself is quite vague. First, the vast bulk of the exported coffee is of average quality, called mainstream coffee. The quality of coffee can broadly be ranked into four categories: Exemplary quality, high quality, mainstream quality, and undergrades or low grades. Out of these four, mainstream quality account for 85 – 90 % of world consumption. Secondly, the extra effort to produce higher quality coffee may not always be rewarded. Thirdly, there is also some trade in poor, below average quality coffee. There have been efforts from the International Coffee Organisation (ICO) to fix minimum export standards to remove the lowest quality coffees from the market altogether.

Communication about quality is further complicated when coffee is separated into Arabica and Robusta, and into wet and dry processed coffee, each with its own quality aspects. There is also the factor of whether the coffee will be sold as whole beans, roast and ground, or as

soluble coffee. Appearance, which is an important factor in judging coffee, may also be misleading as visually perfect beans may produce an unpleasant cup, and small beans (which are generally avoided) may produce an excellent cup.

There is a market for almost any kind of coffee, from expensive top quality to low price, poor quality coffee. There is consequently a place in the market for anyone who honour their contractual obligations and who adequately satisfies the market's quality expectations for the type of coffee they produce.

5.2.3 Quality in Production

Production and processing systems influence quality. When the exporters know the basic climate, soil and other agricultural factors in the growing areas they can adjust the processing techniques to get the best results. Even annual variations in climate can often be at least partly offset by processing adjustments. Some important considerations regarding quality effects of production practices are the choice of irrigation (rain fed or artificial), processing method (wet or dry), location in terms of soil and altitude, what variety to grow (low yield, high quality or high yield, low quality varieties), estate grown or smallholder grown, and harvesting method (successive picking of ripe cherries or tree stripping).

The final judge for the quality of the grower's coffee is the importer who pays a satisfactory price for a coffee on a sustained basis. Once the producer knows what the buyer takes into account when judging the coffee, he can relate to this in the entire production process and see where corrective and supportive action is needed. The first impression can make or break the coffee's prospects. Coffee importers do not necessarily have time to test every sample they receive, and the first impression of the coffee may decide if they will care to test it at all.

Targeting one's market will enable the exporter to use more resources in catching the interest of certain buyers.

5.3 High Quality Arabica Processing

Before targeting a market one should know one's own product, and know how it may fit into one of the niches that make up the world coffee market. There will always be variation in quality due to tree age, tree care, fertilisation, processing, maintenance and irrigation even within the same geographical area. When the differences are not too obvious it is possible to mix these coffees into a stable, reasonably even quality. When the differences are larger, any blend only becomes as good as its poorest components. By mixing all the coffee as it comes off the trees it is possible to make an acceptable, or even a good product, and mixing is often

the only way to obtain commercially viable quantities. The mixing must be done on an informed basis, though.

Standard quality coffee may sometimes be graded and sorted in an attempt to heighten the quality of the coffee but this will not make the product exceptional. So the target should be to present the best possible coffee quality to the markets that appreciate that particular combination of features. There is no inherently bad coffee, at least not as long as the coffee is on the tree. What happens to degrade quality from then onwards is nearly always caused by human interventions.

5.3.1 The Importance of Green Bean Appearance

The colour and evenness of the green bean means a lot to how its quality is judged. Good quality coffee should consist of compatible shape or style, colour and size. It is important that the coffee gives an impression of being reasonably even, especially for coffee that is to be retailed as roasted whole beans. Uneven green beans can also pose problems during roasting, and may give an uneven roast that does not appeal to consumers and tend to produce lower liquor quality than even roast. The colour of the green bean should be even and bright and should never be dull, spotted or faded. Deviation from even bright green colour is usually caused during the drying process.

5.3.2 Causes and Effects of Moisture content

Another important quality factor is the moisture content of the green beans. There is no exact standard ideal for all sorts of coffee, but 11 % is probably a good target. Coffee above 12.5 % moisture should never be exported. To achieve the exact level of moisture, properly calibrated moisture meters must be used, and these must be tested regularly. Under-drying causes loss of cup quality and may also cause mould, which may lead to mycotoxins in the coffee. Over-drying costs money, on one hand there will be a loss of weight and therefore loss of money; on the other hand there will be a loss of colour which translates directly into lower liquor quality.

When moisture drops below 10 %, aroma, acidity and freshness begin to fade away. At 8 % and below they have completely disappeared. Such quality loss due to over-drying cannot be reversed. Of these reasons, over-dried and under-dried coffee must not be mixed with correctly dried coffee. They are not compatible. The coffee may also continue to dry during storage and transportation. This can be especially problematic for land-locked countries where coffee must travel over long distances to the port of shipment.

5.3.3 Causes and Effects of Defects

In quality coffee there should not be obvious defects. Coffee containing black beans, obvious stinkers (beans giving off odour or bad flavour), water damaged beans and foreign matter stand no chance of being accepted by buyers. This is quite obvious and is recognised by all established exporters. There are other and less recognised appearance defects that may put off the buyer of specialty coffee and make him choose another supplier. One such defect is coated beans due to some of the silver skin (a thin whitish layer inside the parchment) adhering to the surface of some of the beans or to part of the surface of each individual bean. This may cause loss of green appearance. The silver skin also tends to burn off during roasting and the resultant chaff can cause problems. Coated beans are caused by drought and by trees over-bearing and the resulting coffee taste may not be impressive. Coatedness can also be caused by under-fermentation. Totally coated beans may originate from picking of unripe cherries. An experienced buyer will generally shield away from coffees that show signs of coatedness. Before establishing routines to remove the coating by polishing the beans it should be established whether the coatedness represent a problem for the quality of the coffee.

Polishing as such adds nothing to the coffee quality but may make it more saleable.

Another visual quality defect is ragged (or uneven) beans which may be caused by drought and gives the beans an uneven aspect. Too many ragged beans in the coffee suggests less than optimal quality. Lastly, there may be a problem of pulper-nipped beans as a result of incorrectly set pulpers. Pulper-nipped beans carry the risk of giving a fermented, foul or unclean cup and will usually not be accepted.

Insects and other pests can cause serious quality problems for coffee, and make otherwise good quality coffee taste ordinary and sometimes tainted. Most insect damage may be obvious to the eye but insects can also cause individual stinkers with dirty water penetrating an opening made by an insect and causing a chemical reaction inside. These beans may still look good on the outside, but their existence may degrade an entire consignment. Such damages can be controlled in the field, by good farm management. Damages to the coffee can also be offset in processing by floatation of cherries before pulping, and subsequent separation of parchments into lights and heavies in the washing and grading channel. If these measures have not been applied, the gravity table (a large metal table where beans are sorted by gravity according to weight) represents the best and cheapest option for eliminating damaged and light beans.

5.3.4 Green Bean Size Grading

Below-size and light beans in a consignment are a direct consequence of insufficient size and density separation, partly during primary processing but mostly during dry or export processing. Not only do too many smalls and lights spoil the coffee's green appearance, but large and small, or heavy and light beans also do not roast well together. There are strict limits to the proportion of smalls and lights roasters may tolerate in whole bean coffee.

Coffee is graded by size using rotating or shaking screens, replaceable metal sheets that have round holes in them that retain beans over a certain size and allow smaller beans to pass.

Screen sizes are expressed as numbers or by letters, or by descriptions. Nearly all coffee for export is graded to exclude the largest and smallest beans, as well as broken beans and other particles.

5.3.5 Green Bean Density Sorting

Lights, shells or ears, and brokens are all beans or parts of beans that are notably lighter in weight (i.e. less dense) than the average bean in a particular size grade. Lights usually have natural causes such as drought, stress, or picking of immature cherry. All of these result in misshapen, shrivelled and soft beans. The breaking up of beans during hulling and other processing actions (including over-drying) results in shells, ears, brokens, chips and so on.

Such beans and bits and pieces reduce the green appearance. They cause similar roasting problems as smalls in large bean grades, and they very definitely depress the cup quality.

Not only do light and broken beans reduce the flavour, acidity and body of a coffee, but they often also introduce a flattish, common or ordinary taste. Proper density separation is therefore of extreme importance, especially when the coffee beans to be dealt with are also somewhat uneven by nature.

Lights and brokens are removed pneumatically using strong airflows (catador), or by a fluidisation process (gravity table). Both separate coffees by density but catadors are usually less accurate than gravity tables.

5.3.6 Green Bean Manual Sorting

Bleached, mottled (spotted), whitish, and discoloured beans generally cannot be removed by size or density grading, but there is no place for them in quality coffee. Nearly all such beans are caused by moisture and drying problems, but discolouring can also be due to oxidization, contact with soil, metal, dirty water and so on. The only effective way to remove these beans is through manual sorting. Not only do such beans effectively ruin the coffee's green appearance but they also show up in the roast as softs or quakers (undeveloped beans), pales,

mottled beans and so on, and they definitely affect the cup quality. The buyer of quality coffees will not tolerate such beans. There are two general principles about sorting beans:

- Know your sorting capabilities: For advance samples sent to potential buyers, the level of sorting in the samples should reflect what realistically can be achieved during normal operations.
- Without a good working environment and decent lighting people cannot sort coffee efficiently and correctly.

5.4 Quality of the Roast

As with the green, first impressions are very important. A roast that is dull, uneven, open and/or soft (with ears or shells) immediately raises suspicion. Conversely, a bright or brilliant, even and solid roast is not just pleasing to the eye but also suggests good cupping potential. For the average consumer of whole bean roasted coffee the most obvious eye-catching aspect is probably the evenness. An even roast is therefore a prerequisite for almost any coffee to make it to the end consumer in whole bean form.

There are many potential causes of uneven roasts. They include: the picking of immature or droughted cherries; uneven fermentation, including the mixing of different batches of washed or semi-washed coffee which have not necessarily been fermented or washed to the same degree; too rapid or uneven drying; and insufficient separation of light beans during primary and export processing. Incomplete fermentation causes dull roasts, and when mixed with brighter roasting coffee this gives an aspect of general unevenness.

Measuring roast colour is important. The type of roast – light, medium or dark – has a definite bearing on quality. The darker a roast, the less pronounced the acidity and different flavour aspects (as well as defects) of the liquor, but the heavier the body. The lighter a roast, the more pronounced the acidity and flavour (and defects), but the lighter the body.

5.5 Quality of the Liquor

As mentioned before, first impressions are vitally important. If the green bean sample does not make it to the roasting room then the coffee will never be tasted. It is pointless therefore to send samples which do not demonstrate at least a minimal effort at creating a presentable product. In principle, there is no inherently bad coffee. If a coffee presents really poor quality, the cause can usually be traced to poor harvesting and post harvest processing, drying, storage and handling.

It is essential to maintain standards of cleanliness at all stages, especially in wet processing. If this is done, almost any coffee has the potential to show a presentable green with at least a

passable cup or liquor. How the potential buyer judges that liquor will depend on the type of coffee, and on how it matches their specific preferences and objectives. Without the ability to liquor one cannot be a successful exporter. A seller who cannot properly evaluate the quality of their own coffee also cannot value it against the price at which the competitors or other origins are selling. Without liquoring it is nearly impossible to judge whether one's asking price, for example, is too high or too low.

5.5.1 Clean Liquor

At the very minimum the liquor has to be clean. There should be no off-flavours or taints in the cup. The liquor must be reliable and constant: the coffee should liquor the same every time it is tasted. When making up a shipment it is no good tasting a single cup and thinking that the coffee is fine, when many buyers as a matter of course will taste five or ten cups over two or more individual roasts.

When the exporter is roasting the coffee, the type of roast the buyer prefers should be matched in the preparation. Sometimes a lighter roast may accentuate defective liquor aspects that darker roasts tend to hide. Specialty roasters in particular usually roast small batches and taste every batch. This means a coffee will be tasted many times over. If there is obvious variation this will be spotted. Bulk users of commercial grade coffee also sample very accurately and will easily spot uneven quality.

5.5.2 Serious Liquor Problems

There is a whole range of flavours, good and bad, whose impact on quality varies in importance depending on the type of coffee and on the type of buyer. But some flavours are unacceptable in any coffee to virtually all buyers, and especially in aspiring high quality coffee:

- Fermented or foul is a very objectionable taste, not unlike the odour of rotting coffee pulp. In its worst form this is due to over-fermentation, cherry left to rot in heaps or left in the processing unit, the use of polluted water or stung beans with pollutants entering them.
- Musty, mouldy or earthy is a very unpleasant coarse flavour caused by the storage of under-dried coffee, or the re-wetting of coffee after it has already been dried. This flavour also suggests potential mould problems.
- Very strong taints will also render a coffee virtually unusable. Contact with petrol is an example of this.

Most of these taste defects tend to intensify with ageing. The common thread linking them all is that they are not to be tolerated in reasonably decent coffee.

5.5.3 Less Serious Liquor Problems

The detection and description of less serious liquor problems are very subjective. What constitutes acceptable or unacceptable liquor depends on the individual buyer's judgment, so it is vital for the exporter to understand the buyer. The exporter may appreciate why the buyer takes certain coffees and not others by visiting them to taste different coffees together.

- Fruity or winey are good examples of less serious liquor problems because, within certain limits, such flavours can add something interesting to a coffee. But outside those limits the coffee may become fruity-sour and then sour, which is undesirable. Winey can move through oniony to onion, which is a step on the way to fermented.
- Ordinary, common or coarse tastes are strictly speaking not off-flavours. Just as there is a market for simple wines, so there is one for simple coffee. These flavour characteristics are usually caused by problems such as drought, serious stress or insect damage, or by processing or drying errors. Such liquors are therefore unlikely to find much favour in the quality market.
- A woody or aged taste is not unlike and is the direct result of the ageing of the coffee, usually accompanied by loss of colour. It is not at all uncommon to find woody tasting coffee at the retail end of the specialty business because it sometimes takes months before coffees are roasted. Poorly dried coffees age more quickly than do well prepared ones, and lose colour more rapidly as well.
- Grassy is a greenish taste that tends to obscure the liquor's finer aspects such as flavour or aroma. This taste is reminiscent of hay and is mostly found in early season coffee. Under-drying tends to accentuate grassiness.

5.6 Sampling

The golden rule of quality coffee is to do the best possible within one's capabilities. This means demonstrating first of all through the green bean appearance that a certain amount of care has gone into the coffee's preparation. Such care will automatically come through in the roast and in the liquor. If potential buyers do not see such signs of care in a green coffee sample they may discard it without even tasting it.

The liquor will always show a coffee's real character, however exciting or dull that may be, but at least the liquor should never show any of the obvious defects mentioned earlier. If it

does, the sample should not be sent to someone who is known to buy only quality. Apart from the rejection that will follow, any chance of future business will be ruined. When a sample is sent it must be fully representative of the actual coffee that will be shipped later.

5.7 Coffee Quality – Summary

This chapter has described how the quality of coffee can be influenced by numerous factors during growing, harvesting, transportation, processing and storage. This influence on the quality comes from parties in the supply chain and how they organise the different steps. Another influence comes from the supporting institutions like equipment and service providers, knowledge providers, financiers etc. The description of the steps of production from the farm to the port of export gives many indications as to what the supply chain for coffee for export from Nepal should look like, and what supporting institutions will be required to succeed in convincing the specialty coffee market about the quality of Nepali coffee. These indications will be discussed in chapter 7.

6. Methodology

In this chapter the methods of information gathering and analysis are presented and discussed. The methodology used in this paper is literature review, and the application and discussion of the main points from the literature to a prospective project for coffee production in Nepal.

6.1 The Research Question

The topic of this report is coffee production for export from Nepal. In consultations with my supervisor and the promoters of the Norwegian coffee project I decided to analyse coffee production in Nepal in relation to supply chain management and National Innovation System theory in order to answer the following research question, which I have already stated in Chapter 1 and will revisit here for the sake of continuity of this chapter:

- **What is the appropriate design of a supply chain and an institutional support system for production and export of green bean specialty coffee from three districts in eastern Nepal?**

This research questions have been reformulated into the following concrete tasks and questions on which I have based the collection of information and the analysis in this report:

1. Applying theory on supply chain design and management, innovation support systems, and experience of coffee production in Nepal and abroad, what are the features of an effective and efficient supply chain and institutional support system for a project aiming to produce and export specialty coffee from three districts in Eastern Nepal?
2. How can the identified features be applied in the planning for the specific setup of organisational units, facilities, supporting services and rules to achieve a successful implementation of the coffee project by the two Norwegian parties?
3. How can the outcome of the study be applied in improving the present institutional support system of coffee production in Nepal?

6.2 Collection of relevant theoretical information

To analyse these questions I have first studied and reviewed literature on supply chain management. One book (Chopra/Meindl 2007) has been the source of most of the general information on supply chains and design of supply chains. The source was chosen due to its authority among books on supply chains, its availability to me, and because it presents supply chain theory in a clear and systematic way, and provides a useful model for the further analysis. As only a general framework of supply chain theory has been needed for the analysis of the special case of the coffee supply chain, I have deemed that this source has been

sufficient. Information from a few articles discussing the coffee supply chain has been included in the discussion following this chapter.

Following this I have studied and reviewed literature on national innovation systems (NIS). I have mainly used literature that the Swedish professor Bengt-Åke Lundvall has written alone or in cooperation with other researchers as well as an OECD publication on NIS. In the same manner as for supply chain theory I have limited myself to this literature, knowing that this report is not a study of national innovation systems as such, but an application of the general model of understanding on a specific area of economic development, namely the coffee industry in Nepal.

6.3 Collection of Relevant Empirical Information

I have attempted to collect information about supply chains and institutional support systems for coffee from a selection of successful coffee producing countries. The scope and time frame set aside for working with this report have not allowed me to visit any of these countries during this period. The collection of information is therefore mainly based on review of a large volume of research articles and general articles published in magazines, as well as research reports published by international development organisations.

I have, over a period from September 2007 until April 2008, visited and revisited parties involved in coffee production in Nepal to get an overview of the existing industry and the governmental and non-governmental supporting institutions for the coffee industry. From most of these visits I have written notes which have been used in the summary of the existing coffee industry in Nepal as described in this report. I have visited twice the Nepal Tea and Coffee Development Board where I both times had discussions with the Executive Director, and twice to the Tea and Coffee Development Section of the Department of Agriculture where I have met and discussed coffee production with the Director. I have briefly met with the Joint Secretary of the Ministry of Agriculture as well as the Director General of the Department of Agriculture to introduce my work and request access to information relevant to my studies. In the private sector I have met with and held discussions with all major parties involved in production of coffee. The meetings have mainly been with the owners or board directors of the companies, whom I have found to be an engaged group of people dedicated to the business of coffee and production of quality coffee from Nepal. I have not had any special agenda for these meeting but have tried to repeat some of my visits when the first meetings did not provide the desired level of information about the party's activities. Several

visits have also been made to the Winrock coffee promotion office where I have received lots of relevant information as well as introduction to many of the people and offices involved in the coffee industry.

The plans of the Norwegian parties for establishing a project for production of specialty coffee from three hill districts in East Nepal have also been reviewed and summarised in this report mainly based on the business plan for the project, the feasibility study made by Winrock International, and meetings and discussions with the Norwegian representatives. To get a first hand impression of the geographical area selected for the coffee project, I spent 10 days in March 2008 trekking through the area from north to south.

It is not possible to discuss and analyse the process and supply chain of making quality coffee without a thorough knowledge of the steps and pitfalls in production of quality coffee.

Literature on what distinguishes quality coffee from mainstream coffee and the steps to producing quality coffee from the farm to the port of export have been reviewed to identify relevant information to the topic of this report. There has not been much literature available to me on this topic, so the bulk of information has been extracted from a single source, a publication by a UN organisation. Some of the information in this publication has been confirmed by other sources like Banks et al. (2007) and Luttinger/Dicum (2006), but the obvious weakness of basing the information mostly on a single source remains.

In addition to the empirically based information on production of quality coffee obtained from these sources, I have made two visits to a coffee growing area in West Nepal (Syangja) in October and December 2008. There, I got hands on experience in some of the steps involved in coffee processing from collection of ripe cherries, sorting these according to density and appearance, pulping, fermentation, and drying, as well as useful discussions with the manager of the processing centres on quality issues. I have also visited the HCPL central processing centre in Kathmandu and studied storage facility, the process of manual sorting, and roasting of coffee for the local market.

6.4 Discussion of the relevance of the methodology

The methodology for information collection and analysis outlined in this chapter represents the art of the possible within the time and resource limitations of this project. Not that several of the tasks could not have been done more efficiently, but the whole project is a part of a learning experience in writing a scientific report within the field of a social science. As my previous experience has been in the field of technology and management, the process of data

collection and analysis deviate quite a lot from the engineering and accounting methods I have been used to.

In a wider context, I can see that a broader review of theory both on the topics of supply chain management and national innovation systems would have been useful. A more thorough understanding of the supply chains for coffee and the institutional support frameworks in the other coffee producing countries would also have been useful, but I can hardly see how such information could have been made available without actually visiting the countries and studying this first hand. This could be an interesting task for further studies on this topic.

Some uncertainty may be related to the empirical information collected from the parties involved in the coffee industry in Nepal, government offices as well as private parties. Though I have attempted to confirm information by revisiting the parties and asking the same questions several times, there is a large scope for misinterpretation in this material. Some of this information I have been able to confirm by written materials obtained, but other information have to remain standing on its own. A way of compensating for this weakness would have been to circulate this report for comments to the visited parties before submitting it, but again the limitation of time has prevented me from doing this. The quality and practical use of this report may be increased in the future if the report is circulated and revised according to comments received. This will have to be done outside the scope of the master's thesis project that this report is written within.

7. Analysis and Discussion

In this chapter an analysis of the research question will be made based on the selected theory and empirical knowledge. The aim of the analysis is to attempt to give an adequate answer to the research questions:

- **What is the appropriate design of a supply chain and an institutional support system for production and export of green bean specialty coffee from three districts in eastern Nepal?**

7.1 Outline of this Chapter

To try and answer this research question, the following process will be followed: By applying the theory on supply chain design and management from Chapter 2.1, to the research question and the case project, I will extract relevant information to find the features of an effective and efficient supply chain for quality coffee production for export from Nepal. Then, by using the theory on national innovation systems from Chapter 2.2, I will similarly identify relevant ideas for designing an institutional support system for the case project. Having learnt from the theory what is necessary to design a supply chain and an institutional support system, I will turn to the empirical knowledge from other coffee producing countries, in Chapter 3, as well as from the existing coffee industry in Nepal, in Chapter 4, to select relevant experiences to answer the research question. Lastly, I will scrutinise the knowledge about production of quality Arabica coffee in Chapter 5 to find information that is useful to this task. After learning from and analysing what we can learn from the selected theoretical and empirical knowledge of the preceding chapters, I will analyse how the identified features can be applied in the planning for the specific setup of organisational units, facilities, supporting services and rules to achieve a successful implementation of the coffee project by the two Norwegian parties. Towards the end of this chapter I will analyse how the outcome of this study can be applied in improving the present institutional support system of coffee production in Nepal?

7.2 What we can Learn from the Theory?

In this chapter I will analyse what we can learn from the theory to design the supply chain for coffee in Nepal, and the institutional support system necessary to support the industry.

7.2.1 The Theory of Supply Chains

The topic of coffee production in Nepal will be analysed on the background of the selected theory on supply chains from Chapter 2.1.

We have seen from the theory that a supply chain consists of all parties involved in fulfilling a customer's request. This includes manufacturers and suppliers, transporters, warehouses, retailers and even the customers themselves. How can this be applied to the production of coffee and the concrete project to produce quality coffee from three districts in East Nepal? In the supply chain for coffee the farmers may be regarded as the starting point, but that may be challenged when we think about the various inputs the farmers will require to start production of coffee. The most obvious input would be the seedlings from which the coffee trees are grown. Another input would be materials and labour to make an irrigation system for the plantation. Yet another input is manure for the growing trees. So the supply chain for coffee production actually starts before the growing of coffee trees. The further supply chain may be outlined as this in its most simple form: Farmer, Transportation, Processing Centre, Transportation, and Exporter. There may be some variation in this simple supply chain, especially when intermediaries are involved in trade of the coffee between the farmers and the processing centres, and between the processing centre and the exporter. The processing centres and the exporters will need a variety of inputs to do their part in the supply chain. This may be machinery like pulping machines and hulling machines, and also more general inputs like fermentation containers and jute bags for storage and export.

The purpose of the supply chain is to generate profit to be shared among the parties making up the supply chain. In the coffee supply chain as in any supply chain, the parties may have different power over the decisions being made, and consequently also can take a different share of the profit as their own. Generally, the products and information are shipped from the farmer to the Exporter, and information and money is sent back through the supply chain to the farmer. The sharing of profit in the supply chain is also a function of the ownership structure in the supply chain. In the coffee project it is assumed that the exporting company will have an overall coordinator role for the whole supply chain, without necessarily having full ownership of all the stages. Especially on the farmer stage it is assumed to be most practical to base production on a smallholder model where the farmer himself owns and manages his own crop. On the processing stage, though, the company will need to have more control over the process and the quality, and this would indicate a shared ownership model. This may practically be a model where the majority is owned by local cooperatives of farmers, and a minority stake is taken by the exporting company. Even in the exporting company the farmers or their cooperatives may take an ownership stake, but in the coffee projects it is assumed that the company is initially owned solely by the Norwegian investors.

As there will be an asymmetrical access to information about markets and prices in the supply chain, the Exporter can easily force his terms and conditions on the other parties. It should be noted that unlike many other supply chains, the coffee supply chain may be rather linear, and does not take on the characteristics of a supply web. Especially in quality coffee production it is important for the traceability of the product to have such linearity. There would also be power at the farmer level, as the farmer can choose to sell his cherries to whomever he wants. This may be a good motivation for letting the farmers own parts of the processing stage of the supply chain. This may earn the supply chain enough loyalty from the farmers in order that they would actually choose to sell their cherries to their own processing centres (at least as long as alternative offers are not too attractive). The ownership structure of the supply chain will also affect how quality control can be implemented. To achieve necessary quality control from the exporting company's point of view, it should either have an ownership stake in the processing at the local level, or build a totally separate organisation for quality control that operates towards the farmers and the processing centres securing that the coffee purchased by the company is up to necessary standards.

The notion of the value chain may also be useful in the context of coffee. The concept of the value chain can also be used to study a supply chain in the sense that it can help us identify where value is added to the product and where activities are taking place without really adding any value to the customer. While the supply chain concept has its focus on the related parties, the notion of the value chain concentrates on activities. The value chain for coffee consequently focuses on the activities undertaken in producing quality coffee, and not the parties carrying out the activities. Identifying each activity, and analysing how each activity influences the value of the coffee, will be an important task for improving the supply chain for coffee and making it as efficient as possible. The actual analysis of the value chain which may be regarded to be outside the scope of this report, would be an interesting task to undertake at a later stage, and it would definitely be an important job to do for the exporting company.

The objective of the supply chain is to maximize the overall value generated. The difference between what the product is worth to the customer and the sum of the costs incurred in providing the product to the customer is the value generated. This value is strongly correlated to the supply chain profit mentioned above. All costs (including the surplus) have to be borne by the customer. The management of the supply chain is done by making supply chain

decisions about the strategy/design, planning, and operation of the supply chain. These objectives of the supply chain are also relevant in the supply chain for coffee. The overall value generated through the coffee supply chain is reflected in the value the coffee has to the buyer and will be reflected in the price (hopefully) he is willing to pay for the coffee. This buying price is the total amount available to cover all the costs incurred in bringing the coffee to the buyer, including the profit to be shared between the parties in the supply chain. As in all supply chains the price for the coffee may be distributed in a more or less fair way between the parties, in accordance with the power each of the parties have on the supply chain decisions. In the supply chain for coffee in Nepal, and for the coffee project specifically, the power would also be influenced by the ownership stake at each stage of the supply chain. As we discussed in the last paragraph, and ownership structure with farmers having full control of their own coffee production up to and including harvesting of ripe cherries, and the exporting company owned directly by the Norwegian investors, it remains to find the best possible ownership structure for processing centres. If the control of these centres remains with the farmers or their cooperatives, the power of the farmers will increase considerably. Then the farmers will have dried parchment beans available for sale from their own processing centres and can freely trade this coffee to whoever offers the best terms. On the other hand, if the exporting company takes full control of the processing centres, the farmers will lose power to the company, but at the same time gain easy market access for their ripe cherries, without having to care for the further processing of the coffee. In the coffee project it is assumed that the company will earn an amount of profit that it can chose to plough back into the local communities for development purposes. This may seem like a romantic way of thinking as there will surely be a fight for power in the supply chain, and the company may not be able to extract more profit from the supply chain than is needed for its own operations and growth. With the number of companies already involved with coffee trade and export in Nepal, it would be unrealistic to assume that no party will try and take advantage of unreasonable amounts of profit in the supply chain.

We saw that there are two different views on supply chains, the cycle view and the push/pull view as described in Chapter 2.1.4. The push/pull view being the more useful in making strategic decisions, we will concentrate on the that view here. As pull processes are executed in response to an actual customer demand, they are called reactive processes. The push processes are executed in anticipation or forecast of a customer demand, and is therefore called speculative processes. In the supply chain for coffee the farming, harvesting,

processing and transportation up to the port of export are basically push processes as they are regulated by the harvesting period and the capacity of the processing units. The actual export of the coffee is a pull process, though, as the coffee can be warehoused for some time at the port of export in anticipation of an acceptable offer from a buyer. Storing the coffee should be done only after the coffee has reached the stage of fully dried parchment coffee, as earlier in the supply chain storage of under-dried coffee may attract mould. After the parchment has been removed to reveal the green beans, the coffee should be shipped without delay to preserve the quality of the beans.

Customer Relationship Management (CRM), Internal Supply Chain Management (ISCM), and Supplier Relationship Management (SRM) are all macro-processes in the supply chain. They manage the flow of information, products, and funds required to generate, receive and fulfil a customer request. In the coffee supply chain the CRM process will take place between the Exporter and the overseas buyer. There will be SRM processes throughout the supply chain as the farmers, the processing units and the exporting company will be in need of supplies from external suppliers to go about their business. The most important process to manage the supply for coffee will be the ISCM process, to manage the coffee supply chain itself. It seems like a natural choice to allow for the management of the ISCM processes to be done by the exporting company itself. That is where the knowledge about the markets for the coffee will be, and it is the company which has the closest feeling of the quality standards and preferences that different buyers may have. The exporting company will also be the one unifying factor in the supply chain, as there will be several thousands of individual farmers, dozens of collection and processing centres, and probably many transporters involved in the coffee supply chain. All this comes together as the top of a pyramid into the single exporting company. The company will have to take responsibility for promoting coffee production from preferred varieties in suitable locations to achieve the necessary quality of the coffee. Further, the company will have to provide knowledge and equipment to the processing centres to make sure that these centres operate according to common processing rules and procedures. The transporters will also probably have to be taught about proper handling of the coffee as the beans are very susceptible to adopting taste and smell from their surroundings if exposed to strong sources. All of the factors indicate that it is the exporting company that should be managing the ISCM processes.

The competitive strategy of the company defines, relative to the competitors, the set of customer needs that it seeks to satisfy through its products and services. The competitive strategy of the coffee project is to deliver consistently high quality coffee to its customers based on a cost structure that allows financial freedom for the company to share profit with the farmers to develop the economy of the project area. This competitive strategy must be reflected in the decisions that make up the supply chain strategy of the project. The competitive strategy indicates that the supply chain must be designed in such a way as to facilitate the company to deliver consistently high quality coffee, and at the same time with a cost structure that allows the company to earn a profit large enough to share with the farmers and the processing units. So the distinguishing factor in the coffee project is that it aims at offering consistently higher quality than its competitors. And as providing this quality will actually cause the project to incur higher costs than its competitors, it also needs to make a more efficient supply chain than its competitors to be able to share profit with the local community where the coffee is grown. A question is then to identify who the competitors of the coffee project actually are. It may seem like these competitors are the other coffee exporting companies in Nepal, but such is probably not the case. Regarding the size of Nepal's coffee production in the short term, compared to the huge size of the world market, the competitors should rather be seen as coffee exporters in other producing countries who are targeting similar buyers and qualities of coffee. This view on competition will facilitate the producers and exporters in Nepal to cooperate on a lot of aspects of the industry, including technologies, training, market research, quality development etc. In return for this advantage the coffee companies should form some kind of gentleman's agreement to inform each other about niches and buyers that they have established business relations to, in order that they will not target the same buyers. As long as the industry in Nepal is small this can be a practical working arrangement to increase the value of the national coffee brand.

Then to the question of how to fit together the competitive strategy and the supply chain strategy to make the two strategies form a coordinated overall strategy. This is both an exercise of strategy formulation, but also of strategy execution as the different functions in the firm structure align their processes and resources to be able to execute the strategies. In addition, the different stages of the supply chain must be designed to support the supply chain strategy. In the case of the coffee project, the supply chain will be designed from scratch. This gives the advantage of making an exact match with the competitive strategy, and the opportunity to design both the supply chain itself and the supporting infrastructure with the

necessary capabilities. The strategic fit between the competitive strategy and the supply chain strategy is achieved by first focusing on the customer needs and the supply chain uncertainty in fulfilling the customer's needs. The customers of coffee are demanding high quality coffee and they are willing to pay a premium over and above the mainstream coffee prices to get this quality. The uncertainty in fulfilling this need is, as we have seen from the preceding chapters, quite substantial and involves both the coffee farmers, the processing, storage, transportation and final preparations for export. Managing this uncertainty is to a large extent possible, though. Secondly, to focus on the supply chain capabilities, i.e. what the supply chain is designed to do well and thirdly, to restructure the supply chain and/or altering the competitive strategy until the desired strategic fit is achieved. It is the competitive strategy that defines what quality of coffee the company targets to produce, and what customer segments are targeted with its product. If the coffee supply chain does not have the capability to consistently produce this kind of quality coffee, there will not be a strategic fit, and the company will not succeed in its competitive strategy. It is especially in terms of quality that the coffee supply chain will have to be carefully designed, but also in terms of efficiency, as the supply chain must not be allowed to incur unnecessary costs.

The key to achieving strategic fit is the company's ability to find a balance between responsiveness and efficiency. The relation between these two factors is that higher responsiveness generally cost more resources, and will affect the efficiency of the supply chain negatively. In the supply chain for high quality coffee there is not a lot of significance related to responsiveness in the short run, but rather on building the production capacity that matches the market demand in the long run. The supply chain should therefore be designed to achieve maximum efficiency to keep the costs down, and the supply chain strategy should at the same time focus on the production of sustained quality of the coffee. This is achieved by having primary focus on quality and the necessary activities involved in creating a high-quality product. The second focus has to be on costs. When the way to achieve desired quality is found, the processes have to be optimised with respect to costs without compromising on quality. For this the abovementioned analysis of the activities of the value chain can be of great help.

There are six supply chain drivers that can be used in the analysis of the supply chain design. These drivers are all interrelated and influence the balance between the responsiveness and efficiency of the supply chain. Three of these drivers are logistical drivers, namely Facilities,

Inventory and Transportation. The other three drivers are called cross-functional drivers and these are Information, Sourcing and Pricing. A model showing the six drivers and their relationship among themselves and to the efficiency – responsiveness balance is given in Figure 2.2. In the following paragraphs we will take a closer look at each of these drivers in the context of the supply chain for coffee.

Facilities are the physical locations in the supply chain network where products are stored, assembled or fabricated. In the coffee supply chain such facilities are farms, processing plants, warehouses and offices. A major task in designing the supply chain for the coffee project will be to find the optimum location for these facilities. This matters for the quality of the coffee because production of quality coffee requires plenty of clean water and personnel with the right personal and professional qualifications to maintain a high quality over the years. It also matters for the cost as the coffee loses weight as it is processed from ripe cherries to dried green beans, and the transportation of less processed coffee is more costly than transportation at later stages. This weighs towards locating the processing plants close to where the coffee cherries are grown. For the sake of quality the processing of the coffee should take place at a location where it would be possible to recruit and retain competent staff who would understand the quality standards and be willing to constantly work to improve the quality of the process. This would indicate location close to a population centre. The actual choice of location for the processing stage of the supply chain will have to be decided based on analysis of economic parameters that are not available in this study. Relatively strong evidence from other countries and the existing industry in Nepal points to the location of the processing in the area where the coffee cherries are being produced.

Inventory includes all raw materials, work in progress and finished products within the supply chain. In the coffee supply chain inventory is represented by coffee at different stages of processing. As mentioned above storage of coffee should not happen until the product has reached the stage of fully dried parchment beans. The inventory in the coffee supply chain is therefore to be counted as work in progress. Storage of inventory is a cost to the supply chain. The exporting company should therefore attempt to find buyers for the coffee so that the coffee can be shipped as soon as it comes through the processing stage of the supply chain. Any delay in shipping the coffee, and incurring extra costs for storage, must be justified by a corresponding increase in the price achieved for the coffee.

Transportation means moving inventory from one location to another in the supply chain. Transportation is a main theme in the supply chain of coffee, both within the country as is analysed in this report and after export from the country of origin. As mentioned above the transportation of coffee should ideally happen after the coffee has reached later stages of processing and drying, but this may not be possible due to other constraints like location of facilities. The discussion so far seems to indicate processing of the coffee up to the stage of dried parchment beans close to the location of the farms. The parchments beans can then be transported to the central storage facility for final preparation for export.

Information consists of data and analyses concerning facilities, inventory, transportation, costs, prices, and customers throughout the supply chain. In the coffee supply chain there would also be a need for two-way flow of information. The different stages of the supply chain would have to communicate its plans and forecasts to the exporting company which I have indicated would have a natural role of coordinating the whole supply chain. Based on this information the company will market the coffee to selected buyers and acquire market information necessary to fix the prices to the different stages of the supply chain. Special customer preferences received by the intelligence of the exporting company will also have to be communicated backwards in the supply chain so that the necessary adjustments in processing can be made. Special customer needs may also go all the way back to the farm level, and may require differentiation of the source of the product through the whole supply chain.

Sourcing is the choice of who will perform a particular supply chain activity such as production, storage, transportation, or the management of information. If there is free capacity in the facilities of other coffee producers it may make sense to utilise such capacity before increasing one's own capacity. This is also a matter of pricing. If the price of using free capacity at another coffee company is higher than the cost of establishing one's own capacity, it would be better to build one's own capacity. In the first years of the coffee project the intention is to buy the green beans from existing producers and process and market these under the project's own brand names. This would require cooperation with another coffee company beyond the utilization of free capacity and would imply that cooperation on a strategic level is entered into. The project would have to get access to the whole supply chain of the other company in order to influence and source specific qualities of beans towards its own customers. Such cooperation would have to involve benefits for both parties.

The last of the supply chain drivers is pricing. Prices for coffee in the world markets are influenced by a certain price level fixed for mainstream coffee based on the balance of supply and demand. Coffee perceived to be above average quality receives a premium from buyers which is fixed by testing of the coffee, and negotiations. In practice the export of coffee from Nepal will have to be based on long term relations with the buyers as the production capacity is low relative to other producing countries. This represents both a challenge and an opportunity as the buyer will know the product and be willing to buy again and again as long as the price is according to expectations. On the other hand it may be difficult to get a better price from the buyer as soon as a price level has been established. Another matter is pricing strategies in the supply chain itself. Without adequate credit facilities available the farmers will have to receive payment for the coffee at the time of delivery or not much later. The payment the company receives for the same coffee will come several weeks to months later, and this risk and cost will have to be borne by the company.

7.2.2 The Theory of National Innovation Systems

The concept of national innovation systems was introduced in the 1980s as a tool to understand the factors behind international competitiveness and economic development. In this chapter I will explore what we can learn from the theory of national innovation systems that can be useful in analysing the research question.

The theory states that the focus on national systems (as opposed to international) makes sense in the context that national policies and institutions seem to influence innovation. Is there a national system when it comes to coffee production? Though the empirical knowledge from other countries indicate that there is some cross border trade between some countries (e.g. Honduras to Guatemala), making these countries into a common exporting block towards the world market, the majority of evidence show that in coffee production and export each country has its own industry and national policies, and compete with the other coffee exporting countries on the world markets. When it comes to Nepal, the only other country that Nepal could have something in common with when it comes to national systems would be India. Even though Nepal and India are neighbouring countries, the existing coffee production in India take place in the south-west of the country, corresponding to the distance between Oslo and Rome. In that sense the coffee areas are not really neighbours and India as a federal state of partly independent states does not have a strong national policy for the

coffee sector but rather state level policies in the coffee producing states. Therefore, we may conclude that the national focus on policies and institutions may make sense in the case of coffee production in Nepal. Since a common innovation system for the coffee industries in Nepal and India seem to be difficult to realise, there is also the alternative of a more regional innovation system for the parts of Nepal. As coffee production so far has mainly been concentrated in western Nepal such an idea may make sense. Lately, though, there has also been coffee production established in eastern Nepal, and the project area for the coffee project has also been located in eastern Nepal. Looking at the situation of local government institutions after the ten-years of armed conflict in Nepal, there are hardly any institutions left in the local areas on which to build a support system for coffee production. Based on these considerations, it may be concluded that the innovation system for coffee in Nepal should be a national system.

We have seen that research in industrialised countries has shown that the ability to learn determines the economic success not only of firms and industries but also of whole regions and countries. The efficiency of learning, in the context of the concept of the learning economy where learning is seen as a socially embedded process, depends on the institutional setup which is also called national innovation systems. In the growing coffee industry in Nepal there is a need to learn in many different ways, both related to technologies and management, but also in marketing skills and knowledge about the world markets. The theory stipulates that this learning is dependent on the institutional setup in the country. My observation is that such learning in Nepal often in the past has happened in spite of rather than because of formal institutions. Often the establishment of new industries has come as a result of the initiative of a brave entrepreneur who has picked up an idea or trend from another country he has visited or lived in, and then wants to do the same when back in Nepal. In that sense the lack of strong institutions and policies in Nepal has paved the way for economic growth based on private initiatives. However, such an economic growth lacks a strong foundation and will remain rather isolated incidences rather than the broad based economic progress stemming from a well founded industry with a proper institutional support system. This can be clearly seen in some industries in Nepal. In the hydropower sector, where there has been a strong focus on building national competency and national supporting institutions from the very beginning, the industry has grown to a strength where hydropower developments from micro-hydro stations to hydroelectric plants up to 30 MW has been built with national financing and engineering.

There has recently been focus on the concept of national innovation systems in developing countries as the connection between institutions and economic change was accepted in less developed countries to a larger extent than for developed countries where the market was assumed to solve most problems. Based on this it would be meaningful to study what kind of institutions exist and how they interact to strengthen innovation and economic growth in the coffee industry. Such a study has been done for several other coffee producing countries and the result of this study is given in Chapter 3. We will come back to these results in a later chapter, but related to the theory's claim that institutions matter for economic growth, it has been observed that there are huge differences in the setup of institutions in the countries under study. The definition that was deemed to be most useful in the context of this report is that national innovation systems are the networks of institutions in the public and private sectors, whose activities and interactions initiate, import, modify and diffuse new technologies. Here technologies should be read not so much in a narrow technical sense, even though that is also part of the picture, but as knowledge about something, and how to do something. In this context this something is how to produce quality coffee in a sustained way, and how to bring this coffee to the buyers to attract a fair price-related-to-quality premium for the coffee. A reason for the rapid spread of the concept of national innovation systems may be that it delivers a reasonable understanding and control of the factors behind international competitiveness. This is exactly what we need to know to help make the Nepal coffee industry competitive compared to other coffee producing countries. Another reason may be that the concept has overcome some of the practical problems of specialisation in policy among policy institutions and analysts. This fact may be of less interest in this regards, but will be a main point if the coffee industry should be selected as an area of support for foreign missions and development organisations in Nepal. In this context we will not dwell more on this as it can be assumed that national institutions are established and managed by the national government and private parties in Nepal.

Let us then towards the end of this chapter discuss what kind of institutions will be relevant to support the coffee project and the general coffee industry in Nepal. First of all, there has to be some kind of government regulations for the coffee industry. On a basic level there will be a tax regime, and some kind of registration system for the parties involved in the coffee sector. These are rather standard for all countries and all sectors of the economy, and I will not dwell more on it here. Apart from these regulations the government can also assist the coffee sector

in many ways, by supporting education, training programs, research and development activities targeting the coffee sector as well as help facilitate contact with the coffee industry in other countries. In addition to this the government could also take initiative to make Nepal a member of the International Coffee Organisation (ICO), which will give Nepal access to the services provided from the UN organisation. The government could also assist the coffee sector by giving subsidies for establishment of coffee production. The private sector can partner with the government in some of these activities, as we have seen from the empirical knowledge from other coffee producing countries. Some tasks may be handled by the private sectors, perhaps in collaboration with the NGOs and INGOs already active with the coffee industry in Nepal. These activities could be related to the establishment of a national brand for coffee in Nepal, which would help the promotion and marketing of Nepali coffee in the markets. Lastly, we should not forget the need for stringent quality control of the coffee intended for export from Nepal. For this the establishment of a coffee testing and tasting laboratory would be needed. This laboratory, once set up with equipment and trained personnel, would probably be most efficiently run as a cooperation between the exporting companies themselves. As the prime function of the laboratory would be to establish a common understanding between seller and buyer of the quality of the coffee offered for sale, there is no need for making this laboratory independent of the industry itself.

7.3 What we can learn from the empirical knowledge?

In Chapter 3, some information about infrastructure, institutional setup and supply chain for the coffee industry in some coffee producing countries have been summarized. In this chapter we will discuss how this information may be useful in analysing the research question and strengthening the existing coffee industry in Nepal.

7.3.1 The Experience from other coffee producing countries

Even though the coffee sector in most countries traditionally have been under strong government regulation and control, a wave of liberalisation in the commodity sector since 1990 has also reduced the national governments' role in the global coffee industry. In some countries government control has been retained, especially through government involvement in producers' organisations as we see for instance in Guatemala and Colombia. In other countries like Indonesia and India we see that there is very little government regulation and control of the industry. This may already at this stage of the analysis permit us to make the conclusion that establishment of strong government control over the growing coffee industry in Nepal would be against the international trend both for the coffee industry and for other

industries. The government should rather concentrate on how it can support the coffee industry through favourable regulations, incentives and other support programs to encourage private initiatives in the coffee industry. This will be very much in line with the trend we already see in the coffee industry in Nepal. It is largely based on private initiatives, and the government institutions are slowly building up to support the industry.

With the time and resource limitations of my project it has not been possible to travel to the countries under study to meet people from the various government and non-government institutions to acquire first-hand information about the coffee industry. The information in this report is therefore exclusively collected from scientific articles, magazine articles as well as open internet sources. It has been a challenge to find comparable information from all the countries and the descriptions and level of detail will therefore vary between the countries. This has rendered the information less useful for this study compared to what comparable information from all the countries would have done. The information should therefore be read as suggestive rather than as fixed data about the coffee industry in the countries. It would be interesting at a later stage to acquire more detailed data from these and other coffee producing countries to try and conduct a more thorough analysis of this topic.

In Table 3.4 an overview of the lessons from each country relevant to the coffee industry in Nepal was summarised. The table is copied below for continuity of the arguments.

Country	Lesson relevant to Nepal
Guatemala	Strong cooperation between the government and the private sector has resulted in a free and competitive coffee industry. Guatemalan still does not seem to achieve the price premiums that its coffee deserves.
El Salvador	Government and private sector involvement in production of quality coffee, the government involving on quality control of exported beans and the non-government sector supporting the coffee farmers. A private sector marketing company for export of coffee.
Colombia	The importance of domestic security, stable financial policies and strong marketing of the product.
Indonesia	That research and development is an important side of a developing coffee industry and that this can be done both by government and non-government institutions.
India	That the cultural conditions being quite similar to Nepal and consequently the institutional setup from India can more or less be copied in Nepal.

Guatemala is a small country (two thirds the size of Nepal) and is Central America's largest economy. What can we learn from the information about the coffee industry in Guatemala? One main lesson from this is that though the country is said to produce one of the best coffees in the world it is not self evident that the quality automatically will result in high prices. It is not clear from the available material what the cause is for this, but there are some indications

that the coffee industry in Guatemala has not been able to transform itself in accordance with today's buyers' demands for certification and documentation. Another lesson may be that although there is a strong producers organisation in partnership with the government, this does not guarantee that the coffee industry is profitable, as the current prices is said to be lower than the world market prices. We can only hope that Guatemala will continue to grow high quality coffee and that the producers in time will be rewarded with a fair premium on the quality coffee.

El Salvador is another small country in Central America with a size of only one seventh of Nepal's territory. So what can we learn from El Salvador related to the research question and the growth and success of the coffee industry in Nepal? El Salvador is producing quality coffee just like Guatemala. El Salvador does not seem to have the parallel of ANACAFE as a strong institution speaking on behalf of the coffee industry. Rather there seems to be a combination of several governmental and non-governmental institutions that fill that role. Nothing is known here of the effect that has on the price premium that Salvadorian coffee earns in the market. El Salvador seems to be much like Nepal in many respects, and a closer study of the country's coffee industry may therefore be rewarding. Especially the presence of a private sector marketing company may be of interest to study closer.

Colombia is a much larger country than Guatemala and El Salvador. Situated in the northern end of South America it is 7.5 times larger than Nepal and with a 50 % higher population. Colombia has the highest per capita GDP among the countries studied in this report. Colombia is the third largest producer of coffee in the world, and by far the largest producer of washed Arabicas. So what can we learn from Colombia to analyse the research question and help improve the Nepal coffee industry? The most important lesson to learn from Colombia may be the importance of domestic security, stable financial policies and strong marketing of the products. Here there is much to improve in the context of Nepal as the civil war has just ended and the path to reconstruction of the country and its economy is just starting after the 2008 elections. The efficient marketing of Colombian coffee and building of a strong national brand for coffee is also something Nepal can learn from. The role of CENICAFE in research and development for the coffee industry seems like an exemplary case of a national support institution for the coffee sector.

Indonesia is a large country in South-East Asia 13 times larger than Nepal with a population 8 times larger than that of Nepal. Indonesia is the world's fourth largest producer of coffee and is situated on many islands and consequently has easy access to sea transportation from many ports. The learning from the Indonesian coffee industry based on the information available in Chapter 3.4 is mainly about the importance of research and development in the coffee industry, and that this is a task that can be undertaken either by the government or by private sector institutions.

India is Nepal's bigger brother in more than one way. Situated to the south of Nepal the country is 22 times larger than Nepal and with a population 38 times bigger. India consist of 35 administrative units (mainly states) tied together in a federal state. Coffee production in India is concentrated in three states in the south-western part of the country. India is the world's fifth largest producer of coffee. So what can Nepal learn from India in the organisational setup of the coffee industry? As the cultural setup of the two countries is largely similar, India would be the country from which Nepal has most to gain. Institutions and production methodology can to a large extent be copied from the Indian market. It should as soon as possible be established connection with the Indian coffee industry and government and non-governmental institution to try and develop a close relation.

There may seem to be as many ways of organising the coffee industry and support systems as there are countries in the selected group. Looking at the different ways the countries have organised the ownership, control and support for the coffee sectors in their countries, there seem to be no general trend that one solution is better than the other. The extremes are Indonesia with practically no government control, and Colombia where the government seems to control the coffee industry completely. Rather we should conclude that there is scope for variation and that one modality may be as good as the other. The differences we see may be just as much a result of national politics over the years. Two factors stand out as significant in all the countries studied, and that is the need for education, research and development in the field of coffee production, and the need for proper coffee testing and tasting facilities to support the industry.

7.3.2 The experience from the existing Coffee Industry in Nepal

Coffee production from a commercial perspective started in Nepal in the 1990s. Before 2003 all coffee was naturals (dry processed), but after its introduction in 2003, the wet process has

gained popularity and increased the quality of Nepali coffee. Nepal already have a number of private companies involved in collection, processing and export of coffee from Nepal, and also some government and non-government institutions have been developed to support the industry. We may ask how well these institutions are functioning and working together to support the industry, but the main thing is that the organisational setup seems to be in place to a large degree. A sustained quality level has been established on which the buyers are trusting and which earns the exporters in many cases a considerable premium over mainstream coffee. Some observations of the coffee industry in Nepal may indicate that the industry is small and fragmented, and that the exporters seem to be fighting over a relatively small output of coffee from farmers. This seems to put pressure on the price to farmers for the coffee which in turn makes the coffee industry only marginally profitable. The exception seems to be relatively small quantities of coffee which fetch a very high premium for quality. The government institutions involved with the coffee industry seems to be largely in lack of funds to do much support. There may also be a certain level of distrust between the private sector coffee companies and the government institutions. A few international organisations are involved in supporting the coffee industry and these seem to have some funds available both to support the industry at the farm and processing level, but also on the institutional level.

Nepal already has the government institutions that we have seen from other coffee producing countries. There is already a Coffee Development Board (NTCDB), and the Ministry of Agriculture have established its own extension work through the Coffee Development Section (NTCDS). A coffee policy is already in place, and coffee rules are underway to help make the coffee policy operational. In the non-government sector there are three INGOs and several NGOs already involved with coffee promotion, and in the private sector there are several companies involved in coffee collection and sales. Although the government institutions do not seem to have been provided with sufficient resources to function properly as support units for the industry yet, there are signs that the government will step up its efforts in supporting growth in coffee production in Nepal. What seems to be lacking are the two common factors from the study of the other coffee producing countries, namely the need for education, research and development in the field of coffee production, and the need for proper coffee testing facilities to support the industry. There also seems to be a need to build a more trusting relationship between the government institutions and the private sector to promote a national focus on succeeding with marketing of Nepali coffee to the international market.

7.3.3 The required focus on quality

Chapter 5 of this report gives an overview of the steps involved in producing high quality Arabica coffee and the opportunities and pitfalls at each step of the process. Using the coffee industry as a case study for designing a supply chain, quality and how quality is achieved is central. If we do not know how the taste of coffee in the consumers' cup is brought about, we cannot contribute much to innovation in the value chain of coffee. When we know the factors that affect taste, we can start manipulating the factors to achieve desired results.

Making quality coffee is not a straightforward task. There are many factors influencing the quality of the end product. And in the end coffee quality assessment is a subjective task, coloured by personal taste and regional preferences. Making quality coffee is in one way a straightforward process. Providing the coffee trees are of a variety that gives good taste and scent of the coffee, and providing that the coffee is processed in a hygienic and systematic way, the end product should come out as high quality coffee. On the other hand, the coffee will have some inherent qualities that will be appreciated by some and rejected by others. So knowing the coffee from a specific stock the marketing of it should be directed to certain regions and sections of the market.

Making quality coffee in Nepal should not be an impossible task to undertake. The soil and climate is said to be favourable for coffee production, and the relatively steep Himalayan foothills also offers the right heights for it. With the right organisation of the work and good supporting infrastructure and institutions, the coffee industry should have a fair chance of impressing the buyers. In addition the story behind the coffee, which is also a part of the quality of the end product, can be written on the background of hard working people living below some of the highest mountains in the world, the Himalayas.

The first step to producing quality coffee is to select suitable growing areas and which varieties of Arabica to promote. It is known that some varieties give better quality coffee than others. From the literature it also seems like the varieties giving better quality also are the varieties that give less yield per ha of plantation. This is a consideration in the financial planning of the project, and is a product of how much land is available for coffee production and the alternative use of that land. If quality matters more than the cost of production, the right choice would surely be to go for the high-quality, low-yielding varieties. It is outside the scope of this report to discuss which varieties would be suitable for Nepal. Since coffee

have been grown in Nepal for a considerable number of years, an expert with skills in coffee plant botany should be able to study the different locations and varieties planted, and then recommend what would be the more suitable in Nepal. This suitability is about quality and yield, but also about susceptibility to pests and diseases.

In principle, a choice has to be made between different processing methods, the dry process, semi-washed, or fully washed. From the literature it seems to be established that the washed Arabica coffees have better quality than dry processed coffees. There would still be room for variations within the washed processes, and this seems to be both a question of which process is most suitable for the coffees grown in Nepal, and also of the availability of clean water. Here it can be concluded that some form of washed process should be used, but leave it to later considerations the detailed elaboration of that process.

The basic criterion for the acceptability of coffee is that it must be suitable for human consumption and free from unrelated matters, live pests or moulds. To achieve this it is necessary to grow, harvest, process and store the coffee under hygienic conditions. It also seems to be important to take great care in the drying process and bring the coffee slowly to the right level of moisture and then keep it there until it is exported. This will be the responsibility of the processing centres to carry out, and the responsibility of the exporting company to make procedures for and check on. The coffee should neither be under-dried nor over-dried as both will have severe negative consequences on the coffee quality. An important success criterion for coffee export is to sell what you know you can deliver and then stick 100 % to the terms and conditions of the sales contract. The contract will be based on a description of the coffee or on a sample sent in advance. Coffee trade on the specialty market is done based on trust and long term relations. To achieve such trust and relations, the adherence to contractual obligations over several years is a necessity. The exporting company, which will handle the relations with the buyer, will have to be conscious about this from the start, and never cut any corners in the relation with potential or existing companies. The last of the four basic criteria is that the coffee must be clean in the cup and free from undesirable flavours. This is the criterion that speaks about the taste and scent of the coffee. The rest of this chapter will elaborate on this criterion.

85 – 90 % of all coffee on the world market is mainstream coffee of average quality.

Subtracting the really bad coffee that is traded, that leaves little more than 10 % of the traded

coffee as exemplary and high quality coffee. Communicating about the quality of coffee is complicated by the vagueness of the term. There is no single definition about what quality of coffee is. Experts would agree on many aspects of coffee quality, and will disagree on others. Coffee also comes in many types, Arabica and Robusta, wet and dry processed, as whole beans, roasted and ground. In India a coffee laboratory has been established to assist the coffee industry in questions of quality assessment and quality improvement. It may seem prudent to propose that such a laboratory should be established in Nepal as well. Talking about and trying to build quality coffee brands would otherwise be like shots in the dark. Also the marketing of the coffee would be simplified by having some in-country expertise and testing facility available. The domestic testing of a shipment of coffee can then be matched with the buyer's assessment of the same coffee, and an understanding of the quality aspects of Nepali coffee can be established on both sides. The establishment of a laboratory for testing and tasting of coffee should therefore be a priority task for the coffee project and the coffee industry.

High quality Arabica coffee processing is first about pulping, washing and drying of the coffee. This is normally done in dedicated processing centres which have the necessary machinery and equipment for this. This can also be done on the farm level, but a certain degree of centralising can be assumed to enhance the quality of the coffee, as both expertise and volume would make production of more even quality possible. The processing must be done under hygienic conditions, using clean water in the pulping, fermentation and washing. The drying must also be done meticulously, not too fast and not too slow, and to the correct moisture level. This process will be done at the collection and processing centres, where a considerable input of knowledge and training is necessary to sustain a high quality of the processing. The exporting company will also have to have a hand in this, if not with direct ownership, with supervision and control.

Throughout the process from harvesting to the final product of dried green beans, a sorting process should have focus. The first part is to harvest only ripe cherries, not overripe, and not unripe. This is a major step in the making of quality coffee as both overripe and unripe cherries have potential in them to influence the coffee quality negatively. Also cherries which are damaged by insects or in any other way deviating from the standard size and appearance should not be collected but rather disposed of right away at the farm level. After harvesting the ripe coffee cherries, the cherries should be put in a bucket of water to separate the floating

beans from the ones that sink. Floating cherries is an indication of lighter beans inside or even undeveloped beans. After this sorting process the cherries should be brought to the processing centre as soon as possible. The farmer will save himself cost and trouble if he discards these beans right away. If such beans reach the collection and processing centres, they will have to be sorted out before the farmer gets his pay and he has wasted the cost of transportation from the farm to the centre.

At the processing centre the cherries will be sent through a pulping machine to remove the outer skin and mucilage surrounding the parchment beans. Both in the pulping process and in the subsequent fermentation and washing of the coffee water will be added and it is of utmost importance that this water is clean and fresh. So the availability of plenty of clean water during the harvesting season is a major criterion for selection of location of the processing centres.

When the parchment beans have been dried to the correct level of moisture, they can be transported to the port of export for storage until a buyer has been found. Then the parchment and silver skin surrounding the green bean will be removed in what is called a hulling machine and the green bean of coffee is revealed. Now follows a thorough process of sorting the green beans according to size, density and appearance. The purpose of this is to supply the buyer with even sized beans which will make even roasting possible. A bean with lower density is a sign of problems with the bean and these will be discarded together with all beans that show deviating colours and shapes.

7.4 An effective and efficient Supply Chain for coffee

We have seen in Chapter 7.2.1 that a supply chain is made to generate profit for the involved parties as well as to optimise the overall value generated through the supply chain. In the context of coffee production we can understand the profit of the supply chain as the difference between what the buyer pays for the coffee and all the costs incurred throughout the supply chain in order to make the coffee available to the buyer. This profit will be shared between the parties of the supply chain in accordance with the existing rules for the supply chain (power balance). The overall value generated is related to the quality of coffee that is made available at the port of export. This may be the same as the price of the coffee if the exporter and buyer agree on the quality premium for the coffee, and this premium is in line with the objective premium for coffee of this specific quality. Of course, buyers may value the coffee

differently from such an objective premium, but for the sake of argument we should assume that such an objective quality assessment exists.

An effective supply chain for coffee will consistently produce as its output coffee of the quality targeted by the project. An efficient supply chain for coffee will produce this coffee at a minimum cost without wasting any resources on the way. What will this supply chain look like in practical terms?

The parties involved in the coffee supply chain are first of all the coffee farmers. Through various input from suppliers and extension work done by the company or someone acting on behalf of the company, the farmer will establish a plantation of coffee trees in accordance with the available land and conditions favourable to coffee growing. After three to four years the coffee trees will start bearing cherries. The cherries then need to be brought to a collection and processing centre to make the cherries into dried parchment coffee. There is a choice whether to have many collection and processing centres or to have fewer. In the first case the farmer will be able to bring the cherries to the centre himself and receive payment for the coffee right away. If the centres are farther away there will be a need for an intermediary link to purchase the coffee from the farmers and bring the coffee to the collection and processing centre. The intermediary link will represent a cost in the supply chain, but it will also offset the need for many collection and processing centres. What will be the most effective and efficient way of collecting the cherries from the farmers to the centres will have to be based on an economic calculation of least cost. On one hand costs are saved by establishing a minimum number of centres, and each centre can then handle more coffee in a season. On the other hand fewer centres will increase the transportation delay and cost from the farm to the centre, and it is very important that the cherries are processed fresh after harvesting. Introducing an intermediary between the farmer and the collection and processing centre will also possibly make the supply chain less effective. When the farmer brings the cherries directly to the centre himself there is a possibility of information exchange between the farmer and the experts at the centre about the quality of his cherries, informal talk about farming technology and so on. The farmer coming directly to the centre will also give him a better understanding of what happens to the beans after he has delivered them, and what he can do himself to deliver the best possible product to the processing centre. So all in all these factors should also be taken into consideration when deciding on the density of collection and processing centres related to the coffee growing area.

It may seem that the smallholder model best will fulfil the objective of the coffee project in producing quality coffee and at the same time contribute to economic development in the coffee growing area. An alternative would be that the company rents land from farmers or communities and establishes its own plantations. This would definitely give more control on quality of the coffee, but may fail to fulfil the second objective as the income for the farmers will only be to work on the company's plantations. So even though the idea of own plantations may make the supply chain both effective and efficient, it fails to fulfil the overall objective of the project and should consequently be discarded. An alternative way of establishing the coffee plantations based on smallholder production, would be to start by establishing some plantations to achieve a certain volume of production under the company's own quality control, and to introduce good farming practices to the farmers who will then slowly start planting their own trees and deliver coffee into the supply chain. This would probably make the supply chain more effective in the long run, as the company will have more control of the quality of the coffee.

The collection and processing centres will, after drying the parchment beans, ship the coffee to a warehouse at the port of export or on the way towards it. It may not be clear yet where the port of export is, and there are at least two alternatives each with its own advantages and disadvantages. One alternative is to export the coffee by air through Kathmandu. This offers the advantage of quick transportation from Nepal to buyers anywhere in the world. The disadvantage is that air freight cost is around 30 % higher than the other alternative, namely overland transportation to Calcutta and transportation by boat to the port nearest to the buyer's location. Whether to use boat or air transportation will be a choice the exporting company can make in principle for each shipment. The choice of the port of export will, however, have influence on the design of the supply chain. As the project area is located in East Nepal, transporting the parchment beans to Kathmandu before shipping them overland to Calcutta would represent an extra cost which would make the supply chain less efficient. The coffee that is intended for shipment through Calcutta should consequently not be shipped to Kathmandu first, but rather be stored close to the project area, or somewhere on the road between the project area and Calcutta. For the sake of this discussion, the uncertainty regarding port of export may lead to a conclusion that the dried parchment beans should be stored in a warehouse close to the project area until it is known through which port of export the coffee will be exported. Shipment through Calcutta would imply that the project will not

have any scope of cooperation with other coffee producers in utilising free capacity in their supply chains as there are no other producers at present close to that area.

To deal with policy makers, other institutions in the coffee industry, and the international buyers, it may be concluded that there should be a centrally located exporting company in the capital Kathmandu. I would at this point be prudent to conclude that all the activities and processes of the supply chain should be managed from the central exporting office, as this will be the place where the competency for such coordination is available, and the exporting office is the contact point with the buyers who are the most important providers of information about how the supply chain needs to perform. In the coffee project the exporting company will be owned solely by the Norwegian investors.

Two important lessons to be learned from the study of supply chains are that:

1. There is no supply chain strategy that is always right, and
2. There is a right supply chain strategy for a given competitive strategy

The discussion in this chapter seems to indicate that the supply chain for coffee in Nepal consist of three main parts, the farm, the collection and processing centres, and the exporting company. Between these three parties there is a need for transportation as they are localised in different places. Transportation between the farm and the processing centre should probably be undertaken by the farmer himself, as this will facilitate exchange of information and knowledge about coffee quality and farm practice between the experts at the centre and each individual farmer. Transportation from the centres to the location of the exporting company, assuming that the port of export is Kathmandu, will be overland by truck. This can be done by the exporting company itself or by hired transport entrepreneurs. There is some uncertainty as for the number and density of collection and processing centres required, and this will be left to the financial optimisation that the project will have to make. There is some indication, though, that location in walking distance from the farms will facilitate exchange of knowledge that will be beneficial for the operation of the supply chain.

7.5 Necessary Infrastructure and Institutional Support

In Chapter 7.2.2 it was concluded that the focus on national policies and institutions make sense for the coffee industry in Nepal due to its relative long distance from other coffee producing areas, the closest being in South-West India.

Research shows that the ability to learn may determine the economic success of firms, industries, regions and countries. The efficiency of learning is dependent on the institutional setup called national innovation system. Based on this it would be helpful to study which institutions exist in a certain region or industry, and how these institutions interact to strengthen innovation and economic growth. The empirical knowledge collected about institutions in other coffee producing countries may be helpful in this regard.

The general trend in some coffee producing countries since the 1990s has been that the national governments have adopted a more hands-off policy and let the private sector take the main responsibility for the development of the coffee industry. Such a development has already been seen in Nepal as well, and there is no information indicating that this trend should be reversed in Nepal. The government should limit itself to making national policies and favourable regulations encouraging the private sector to grow.

Different experiences have been extracted from the study of other coffee producing countries. From Guatemala we have seen how a strong cooperation between the government and the private sector has resulted in a free and competitive coffee industry. However, the Guatemalan coffee still does not seem to achieve the price premiums that its coffee deserves. In El Salvador we have also seen both the government and private sector involvement in production of quality coffee, the government involving on quality control of exported beans and the non-government sector supporting the coffee farmers. El Salvador also has a private sector marketing company for export of coffee. From the Colombian experience we have seen the importance of domestic security, stable financial policies and strong marketing of the product. In Indonesia we saw that research and development is an important side of a developing coffee industry and that this can be done both by government and non-government institutions. In India we found that the cultural conditions being quite similar to Nepal and consequently the institutional setup from India can more or less be copied in Nepal. Especially the presence of a private sector coffee testing and tasting laboratory was noted.

Even though the coffee industry in Nepal may be small and fragmented, there is still a few lessons learned that can help in the further development. Even though the government and non-government institutions to a large extent seem to be present already, there seems to be a lack of funds and resources for these institutions to function properly. A certain level of distrust between the private sector and the government has also been noted. The government

institutions could be instrumental in setting up training and extension work towards the farmers as well as assist in facilitating establishment of research and development activities in the coffee sector.

7.6 Practical set-up of the Coffee Project

The coffee project promoted by two Norwegian parties has proposed to set up coffee production in three districts in East Nepal with the target of exporting specialty coffee from Nepal and at the same time help uplift the economy and living conditions of the people of the project area. In addition they have proposed to establish a Kathmandu based marketing and sales company to export the coffee to potential buyers.

The collected information and analyses of this report indicates that the coffee should as far as possible be processed to dried parchment beans as close as possible to the growing area. This would indicate a network of collection and processing centres within reasonable walking distance of the plantations in order that the farmer may transport the harvested ripe coffee cherries to the centres as soon as they have been harvested. After pulping, fermentation and washing of the coffee, it may be transported to a roadside location for collection before being transported to a warehouse for storage until a buyer has been found and a shipment date has been fixed.

The central marketing and sales company has meanwhile sent out representative samples of the coffee to potential buyers and attempted to reach an agreement on price and quantity with the buyers. After such agreement has been reached the coffee should be processed by hulling and sorting to achieve the specified grading and level of defects.

The information collected for this report seems to indicate that the existence of a laboratory for testing and tasting of the coffee is a necessary prerequisite for success in the high quality coffee market. It may consequently be concluded that such a laboratory should be established, preferably in cooperation with an existing laboratory elsewhere.

To strengthen the coffee industry in Nepal and facility success for the coffee project, the government of Nepal will have to provide adequate resources to the government institutions already in existence.

7.7 Lessons for the Existing Nepal Coffee Industry

The present coffee industry in Nepal may seem small and fragmented and there seem to be little interaction between the government and non-government institutions involved. A few international NGOs have involved themselves with the coffee industry and have made some resources available. They also seem to have provided some coordination between companies in the private sector as well as between institutions in the government and non-government sectors. So we may conclude that the existing industry has the best opportunities to succeed in making coffee a national brand of Nepal.

The existing coffee companies in Nepal seem to be fighting over a rather limited output from the coffee growing areas. This has led to prices for the coffee to the farmers much higher than in other coffee producing countries. An important task for all involved would therefore be to facilitate for a sharp increase in the production of quality coffee in order to create a balance between the produced coffee and the demand for Nepali coffee in the market.

As a need to establish an independent coffee laboratory has been identified, it may be a challenge for the whole industry together with government and non-government institutions to bring about the formation of such a laboratory.

8. Conclusions and Recommendations

This report has been about a case project for coffee production in Nepal seen in the light of the theory on supply chain management and national innovation systems. To answer the research question which is given both in Chapter 1 and Chapter 6, three areas have been studied. These are:

1. Applying theory on supply chain design and management, innovation support systems, and experience of coffee production in Nepal and abroad, what are the features of an effective and efficient supply chain and institutional support system for a project aiming to produce and export specialty coffee from three districts in eastern Nepal?
2. How can the identified features be applied in the planning for the specific setup of organisational units, facilities, supporting services and rules to achieve a successful implementation of the coffee project by the two Norwegian parties?
3. How can the outcome of the study be applied in improving the present institutional support system of coffee production in Nepal?

Starting with the features of an effective and efficient supply chain for specialty coffee in Nepal we have to begin with the selection of project area. The area has to be the right elevation for production of quality coffee which will be from around 1,000 metres to the maximum elevation where there will never be frost. In the selected districts in eastern Nepal, this would be up to around 1,800 metres. Higher grown coffee will normally give better quality, but also lower yields compared to lower elevations. Second, the right variety to grow is also an important choice. Some varieties are giving high yields, but not the best of flavours, and these varieties should therefore only be used to produce mainstream coffee with an economic use of the available land. Other varieties give less yield, but have the flavours and aromas that is associated with high-quality coffee. Even though the low yield varieties give less green beans per ha of land, it is these varieties the project should grow to make quality coffee. The selection of varieties in Nepal so far seems to be on the basis of what has been available at the time of plantation and based on trial and error. Since coffee has been grown in Nepal for a considerable number of years now, there should be enough experience for a study of which varieties holds promise for production of high quality coffee in Nepal. For this, both biological and coffee expertise is necessary, and it is outside the scope of this report to answer what varieties should be grown. Another feature of the coffee production area is that there has to be abundant availability of water both for growing the coffee, as even

short periods of draught will affect the quality negatively, and for wet-processing, as plenty of clean water is a prerequisite for successful processing of high quality coffee.

Having chosen the production area and the varieties to grow, we now turn to the features of the collection and processing of the coffee up to the stage where the parchment coffee beans have reached the correct moisture level. The evidence indicates that the wet process is superior to the dry process in processing of high quality coffee. It is also important for the quality of the coffee that the processing is done shortly after harvesting. The processing of the harvested cherries should therefore happen in a location close to the production area, preferably in walking distance from the farms that are served by a certain processing centre. This will mean that a network of collection and processing centres will have to be established to serve every area where coffee production and collection is planned to take place.

After processing, the parchment beans must be transported to a warehouse awaiting shipment to the buyer. Depending on whether the shipment will be overland to Calcutta and thereafter by ship to the destination, or by air from the capital Kathmandu, the warehousing should be located on the way to the port of export. At the warehouse, the coffee will also be prepared for export by hulling (removing the skin around the bean), sorting and grading to produce the desired grades and qualities. The whole supply chain will have to be coordinated from one point, and the discussion indicates that this focal point of the supply chain should be in the exporting company. Literature on the steps to produce high quality Arabica coffee has been reviewed. If these steps are followed rigorously, there is a good possibility that the produced coffee will be of high quality. There are also many pitfalls found which will reduce the quality of the coffee through the stages of the processing. If the coffee harvested from the trees are of good quality, the minimum requirement for the processing and handling of the coffee should be to preserve the inherent quality of the coffee all the way to the buyer.

The general model for study and analysis of the supply chains and institutional support systems can now, based on the discussion, be rewritten as a model for coffee production. To do this we will give more specific names to the different stages of the supply chain. An attempt to draw such a model for the coffee industry is shown in Figure 8.1 below. Neither the steps of the supply chain, nor the list of involved institutions are comprehensive. The details of the supply chain and the institutional support system are given in the discussion above.

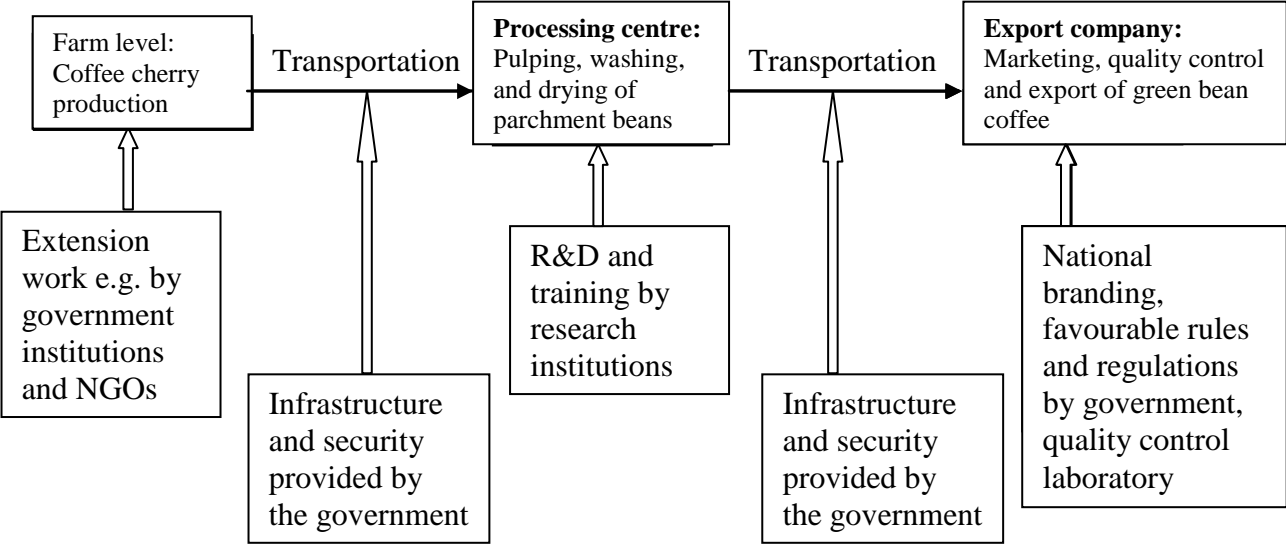


Figure 8.1 Steps of the Coffee Supply Chain and Examples of Supporting Institutions.

From the discussion in the previous chapters of this report we can conclude that an institutional support system is important to facilitate the success of the coffee project and a sustainable growth in the coffee industry in Nepal, and that it does not seem to matter whether these institutions are in the government control or in the private sector. The institutions necessary to support the coffee sector seem largely to be in place already, but there is evidence of lack of resources, especially in the government institutions for them to function in an optimal way. The coffee industry also seems to be well organised and able to produce coffee of reasonably good quality. What seems to be lacking is a facility to test and taste the actual quality of the produced coffee. Such an institution is necessary to communicate and agree with potential buyers about the quality of the coffee and a reasonable price premium for that quality level. The innovation system should be a national system as there is too much distance to coffee growing areas in other countries (India), and the government structure in Nepal is rather centralised after ten years of armed conflict.

The coffee project should study the above features of the supply chain and institutional support system closely in the implementation of the project. As the features indicate it is important to choose the production area and the variety of Arabica coffee with great care. The production area needs to be of the right altitude and with sufficient water supply to avoid

draught for the coffee trees. In addition the variety grown will have to be of a kind that produces high-quality coffee, even though such varieties are also giving less yield per ha. In addition, the coffee project will have to consider establishing a wide network of collection and processing centres in the coffee growing areas to facilitate for walking distance between the individual farmers and the centres. During transportation the project must take care not to expose the coffee to strong smelling or tasting materials so the quality of the coffee is not reduced. Final processing of the coffee should happen on the way to the port of export and just before the shipment should be made. The whole supply chain should be coordinated and managed from the exporting company, and this company consequently have to be allocated with resources and competency for this. The project would be well served by a laboratory for testing and tasting of coffee, and should make it a priority to partner with other institutions and companies in the coffee industry to try and establish such a laboratory. Another scope of cooperation for the actors in the coffee industry would be to establish some kind of gentleman's agreement to avoid competing against each other in the market. The size of the coffee industry in Nepal is small compared to the world markets and it would be better if the parties in Nepal tried to cooperate as much as possible.

The third question about how the present institutional support system could be improved is already answered in the previous paragraph. For clarity I will emphasize that the institution that seems to be missing in the system so far is a laboratory for testing and tasting of coffee in order to facilitate educated discussions with the buyers about quality and reasonable price premiums for the exported coffee. In addition to this some of the government institutions seem to be in lack of personnel and resources to function properly, and this should be a priority of the government to remedy. In general there is a need for training, education, research and development in the area of coffee production where these institutions will be required to participate to make coffee production a national success for Nepal.

The analysis of the research question in this master thesis project was based on selected theory of supply chain management as well as theory of national innovation systems. These theories have proved to be helpful in the analysis of the research question. Some empirical knowledge about experience from other coffee production countries and about the production of high quality coffee has also been reviewed and discussed. This empirical knowledge has complemented the theoretical knowledge in the analysis. All in all, the selected basis for the

analysis as well as the models summarising the theories, seem to have been relevant in the endeavour to find possible answers to the research question.

During the work with this research project, some areas of further research have surfaced. As these areas have been judged to lie outside the scope of this project, further discussion on the areas have been avoided in this report. These are:

- Identification of varieties of *Coffea Arabica* that is most suitable for coffee production in Nepal. This would include identification of the varieties presently grown in Nepal and how they have adapted to the conditions in Nepal. There may also be a need for differentiation between areas and elevations, as there is indication that some varieties that grow well in lower altitudes, may not be the most suitable for higher altitude farming.
- The comparative study of supply chains and supporting institution for coffee in other coffee producing countries have only scratched the surface of the knowledge potentially available from such a study. Further study in this field would involve study visits to each individual country and interviews with key players of the industry and supporting institutions of each country.
- A third area of further study would be a close analysis of the activities of the value chain for coffee and how this could be optimised to achieve the most efficient processes for production of quality coffee in Nepal. Such a study would probably also benefit from studying experience from other coffee producing countries.

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