Master's degree thesis

LOG950 Logistics

Title: Flexibility as a means of achieving reliability:the case of perishables supply chain from Ghana to the international market.

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Number of pages included the first page: 115

Molde, May 2009

Molde University College

Publication agreement

Title: Flexibility as a means of achieving reliability: the case of perishables supply chain from Ghana to the international market.

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Subject code: LOG 950

ECTS credits: 30

Year: 2009

Supervisor: Svein Bråthen

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Acknowledgement

We wish to express our utmost gratitude to the Almighty God for His abundant Love and Grace.

Our heartfelt thanks go to our supervisor Svein Bråthen for his insightful guidance both in choosing our topic and throughout the writing process.

To my beautiful daughter Kenni: I appreciate the endurance and sacrifices you had to make to enable me complete my course.
To my brother Emma: I owe you a debt of loyalty I can never pay. Without you, I would have been an illiterate.
To my niece Claudia: Thank you for your support and encouragements.

- Dinah -

To my beloved parents: I thank you for your endless efforts, support and patience which have greatly contributed to who I am today. There is no way I can pay you back, but I wish you long lives to do the same for my siblings.
To the University of Dar-es-Salaam and Norwegian government: I thank you for sponsoring my studies.
To my precious daughter Whitney: I thank you for the sacrifices you had to make to enhance my academic life. I promise to do the same for you.

- Winnie -

We also want to thank the Ghana Export Promotion Council, the farmers and all the exporting companies for the information they provided us during the data collection. A deep appreciate to Mr. William Dosoo for his time, support, encouragement and company throughout the period of data collection.

Our sincere thanks to our friends and all who made it possible for us to come this far; not only for the thesis, but throughout our academic lives.

Abstract

Trade liberalisation policies and technological advancements embraced by many countries, has made it possible and easier for countries to trade beyond national boundaries. Despite the opportunities one expects countries to reap from these developments, developing countries are however challenged by the conditions of their transport infrastructure; especially when the product involved is time-critical in nature. Such conditions of transport infrastructure may pose some challenges in the attainability of delivery reliability. In this light, this study takes a look at the need to introduce flexibility as a critical element in addressing transportation challenges.

ACRONYMS

Acronym **Meaning**

ACP.....African-Caribbean-Pacific countries

EU.....European Union

FAOSTAT.....Food and Agriculture Organization of the United Nations

GCNet……Ghana Community Network Services Limited

GDP……...Growth Domestic Product

GEPC…….Ghana Export Promotion Council

GPHA.....Ghana Ports and Harbours Authority

IMF…….International Monetary Fund

JIT……..Just-in-time

MCA……..Millennium Challenge Account

MD2……...Maya Gold

MOFA……....Ministry of Food and Agriculture

PPRS……..Plan Protection and Regulations Services

R&D……...Research and Development

SAP……....Structural Adjustment Program

SPEG……..Sea Pineapple Exporters of Ghana

SWOT……Strengths, Weaknesses, Opportunities and Threats

TEUs……..Twenty-feet Equivalent Units

UNCTAD……..United Nations Conference on Trade and Development

USDA……....United States Department of Agriculture

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1. INTRODUCTION

The increase in doing business with the international world has called for a critical look at the transportation system of developing countries, especially where perishables are concerned. Long (2003, 3) indicates that "transportation is the central issue of logistics" and that transportation consists of physical movements and storage. This results from the fact that there are some storage functions during the physical movement of goods. The time critical nature of perishables requires a complementary role by the two functions to achieve reliability. This study will therefore look at the factors in transportation where flexibility can be introduced to enhance transportation reliability. Hence the focus of the study is based on the perishables supply chain from Ghana into the international market.

In the light of this, our main research question is: Flexibility as a means of achieving reliability.

1.1 Overview of Ghana's Economic Activities

Agriculture has been the backbone of Ghana's economy over the years and currently accounts for about 40% of the GDP. The agricultural sector employs 55% of the working population (World Bank, 2007). The growth in this sector tends to be at the same pace as growth in the rest of the economy. Agriculture production is mainly characterized by large magnitude of small scale operators and very small large scale operators. About 90% of the farms sizes are less than two hectares and are mainly driven by women using labour intensive technology in farming and harvesting activities (MOFA, 2007). The large scale farms mainly produce cocoa, oil palm, pineapples, rubber and coconut. Agriculture production is generally dependent on rainfall which varies between 800 and 2400 mm, annually. As at 1999, it was estimated that only about 6,000 farms had access to some form of irrigation (MOFA, 2007).

1.1.1 Overview of Ghana's Export Activities

Ghana's export trade of agricultural products comprises of traditional and non-traditional commodities. In the 1980s, a greater percentage of exports were in the traditional commodity category, dominated by cocoa, gold, cassava and timber. Non-

traditional exports commodities include cola nuts, horticultural (mainly perishables) products and fishing. Currently, horticultural has become one of the fast growing sectors in Ghana's export trade resulting in some to be elevated to traditional export products. In the last five years, it has experienced a growth rate of 7% and has the potential to grow even further. Already, horticultural exports account for about 40% of non-traditional agricultural exports (International Trade Centre UNCTAD, 2007). Export growth has been dependent on the success of very few horticultural products, mainly pineapples, bananas and yams, which account for 85% of horticultural export. Though the growth trend has been largely due to the efforts of the private sector, other factors could also be cited.

Firstly, the economy could no longer be sustained solely on the main traditional commodities as their performances had declined; therefore government had to diversify the export base (http://www.lei.dlo.nl/wever/docs/nota/Ghana.pdf). In 1992, this prompted the Ghana Export Promotion Council, to come out with plans of increasing non-traditional exports by 1997. The council intended doing this through increasing market research, trade fairs and exhibitions, and training programmes for various actors. The second reason for the growth of export of perishables can be attributed to Ghana's trade liberalization policies which have made it possible to expand trade with the international world in the past decade. Takane (2004) observed that the increase in perishable export is attributed to Ghana's adoption of the Structural Adjustment Program (SAP) and other policy changes towards trade liberalization. Thirdly, there is growing demand for fresh fruits and vegetables by European consumers, especially during the winters. Due to improved technology such as irrigation schemes and modern farming techniques, Ghana has been able to take advantage of the European customers' growing demand. This is because, the use of modern technology has improved farming activities and doubled production output beyond the demands of the local markets; moving Ghana into being a food-surplus country. (Tetteh, 2006).

These factors together with the government initiatives to encourage non-traditional commodities export, have greatly contributed towards a positive trend of export growth. This has been clearly depicted in the figures below.

Table 1: Total and Non-Traditional Exports

Indicator	Exports of Goods	Total Non-Traditional Exports	Total Non-Traditional Exports (% of total export)
Source	Bank of Ghana (BOG)	Trade and Investment Programme/ Bank of Ghana	Calculated by authors
1990	897		
1991	998	63	6.3 %
1992	986	68	6.9 %
1993	1064	71	6.7 %
1994	1238	119	9.6 %
1995	1431	180	12.6 %
1996	1570	227	14.4 %
1997	1490	300	20.1 %
1998	2091	n.a	-
1999	2006	n.a	-
2000	1963	n.a	-
2001	1867	418	22.4 %
2002	2015	n.a	-
2003	2562	400	15.6 %
2004	2705	452	16.7 %
2005	2802	489	17.5 %
2006	3727	678	18.2 %
2007	4172	1056	25.3 %
2008 (e)	5618	1454	25.9 %

Source: USAID (2008)

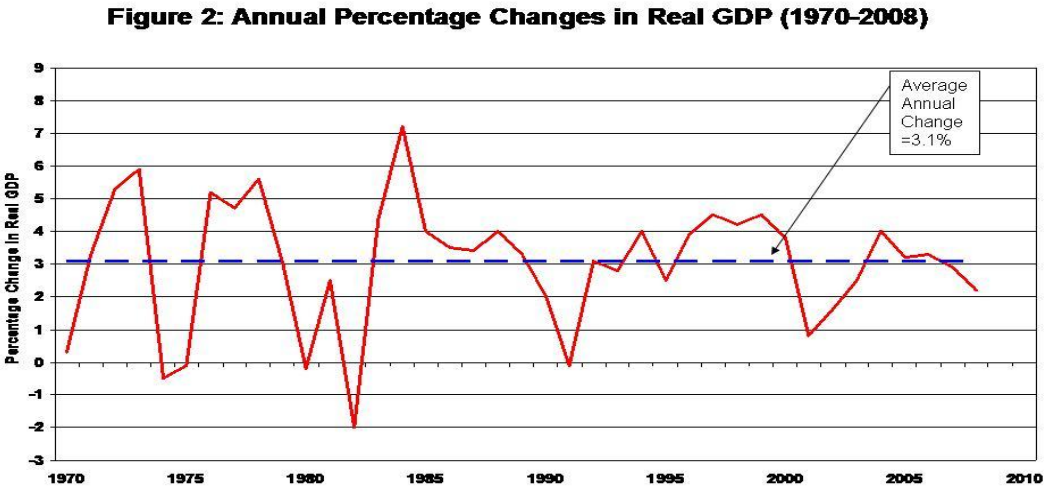
The table above shows the trend of total exports of both traditional and non-traditional commodities, whose figures are indicated in export of goods column. Total Non-Traditional exports column indicates the total export figures of non-traditional commodities out of total export figures in export of goods column. As the total exports increase, non-traditional commodities exports (as a percentage of the total export) increase simultaneously.

Figure 1: Graphical depiction of Ghana's Export trend

Source: USAID (2008)

From the export statistics data by Bank of Ghana, given in table 1 above, the overall growth of exports has been depicted by figure 1 in four phases. Stagnation (1990-1993), robust growth (1993-1998), stagnation (1998-2002) and a very rapid growth (2002-2008). According to this source, overall exports performance has grown by 17% over this period. The pattern depicted in figure 1 is a fair reflection of the trend in the global business cycle (1990 – 2008) as captured in figure 2 below.

Figure 2: Global business cycle



Source: Worldbank.org

Comparing figure 1 and 2, it reveals that Ghana's export volume to a large extent is dependent on global economic growth trends. Stagnation phase in Ghana's export activities during 1990-1993 was induced by the global economic downturn (trough) in 1990 which to a greater extent reduced global demand for Ghanaian export commodities. While the peak period during 1993-1994 and 1998 in the global business cycle stimulated demand for Ghana's exports, the 2001 trough negatively impacted the export trend as well. Furthermore, positive global economic trend during 2002-2004 (peak period) and 2006-mid 2007(recovery period) significantly increased Ghana's export volume from 2002-2008. On the other hand, a steep and deep downturn as the 2001 in the global economic resulted in a long period of stagnation (3-5 years) rather than a fall in exportation activities. Consequently, it can then be said that the demand for perishables is affected by consumers' income levels.

As at 2007, the most prominent export partners of Ghana were the Netherlands (11%), UK (9%), France (6.2%), USA (5.9%), Germany (4.6%) and Belgium (4.4%) (CIA World Fact book, 2008). The rest are some Asian countries and inter-regional trade with other African countries.

1.2 Perishables Exportation from Ghana

As stated in section 1.1.1, export of perishables from Ghana to international market has been increasing since 1980s. This period has been associated with series of liberalisation policies adopted under SAP. In addition, all non-traditional exporters were exempted from export duties and were even eligible to claim a corporate tax rebate (Takane, 2004). This increased incentive for non-traditional exporters, contributed largely to the increased volume of perishable exports.

Perishables are goods that will deteriorate over a given period of time, or if exposed to extreme temperature, humidity or other environmental conditions (http://www.icao.int/ DevelopmentForum). Perishable exports from Ghana consists of a wide range of products with short life cycle, however, the main ones are pineapples, bananas, mangoes and yams. Pineapples are Ghana's biggest horticultural export and considered as one of the successful alternatives to timber, gold and cocoa which have

traditionally provided most of Ghana's income. Bananas constitute about 13 percent of horticultural exports.

Table 2: Value of fruits and vegetable exports for the years 2001-2006 ('000 USD)

Product	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Vegetables and fruits	61,298	80,106	123,071	151,355	147,961	141,983
Pineapples	*36,202*	*49,567*	*69,859*	*82,309*	*71,152*	*61,888*
Banana/Plantains	*2,830*	*3,134*	*1,305*	*2,580*	*4,606*	*28,357*

Source: MOFA (2007)

The drop in the value of pineapple exports in 2005 was as a result of the shift from the production of Smooth Cayenne variety to the MD2 variety in which Ghana had efficiency problems at the introductory stages. The sudden increase in the banana export volume in 2006 is due to political instability and severe drought in Ivory Coast which was Ghana's key competitor. The drought resulted in about 50% decline in Ivory Coast's exports (Danielou and Ravry, 2005). This is because one of the prominent banana exporters had to relocate to Ghana. Another reason is that African-Caribbean-Pacific (ACP) countries were given import duty free preferences that allowed them to export 775,000 tons of bananas to the EU market. This offer was expected to come to an end by December 2007 (International Trade Centre UNCTAD, 2007). However, UNCTAD (2008) reported that the offer still exists because the market prefers banana from ACP countries and is able to absorb any volume supplied by them. Efforts to get figures for 2007 and 2008 proved futile; however SPEG estimated an increase in the exportation of both pineapples and banana due to the acreage expansion in production activities by Golden Exotics which is the largest producer of both products in Ghana (Danielou and Ravry, 2005).

In 2005, Ghana produced 3.9 million tonnes of yams and exported about 12 000 tonnes, making it the largest exporter in Africa (FAOSTAT) whiles in 2004; it was the third largest exporter in the world.

Table 3: Volume of yams exports for the years 2001-2006 (in 1000 tonnes)

	2001	2002	2003	2004	2005	2006
Yams	2.2	10.6	13.0	14.5	12	na

Source: FAOSTAT: World Bank- web site
NB: It was not possible to obtain current figures.

There have been government initiatives to promote mango exportation by encouraging farmers to produce the product on large scale bases. Training is given to farmers on proper ways of mango cultivation, whereas export tax reduction for mangoes motivates exporters to engage more in this business. However since the efforts towards promotion of mango exportation have been recently introduced (2007), Ghana Export Promotion Council has not yet published statistical data on the volume and value of mango exported to international market.

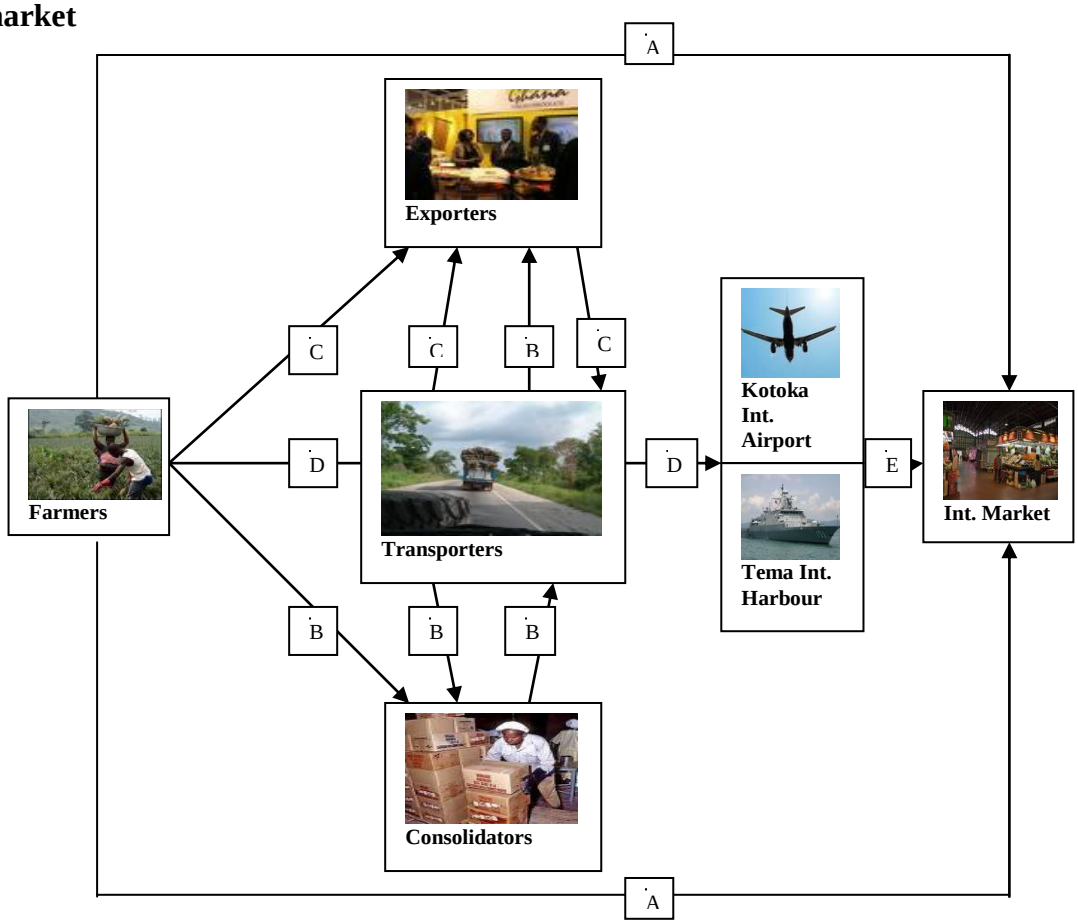
Major importing countries of Ghanaian perishables (pineapples, banana, mango and yams) are Belgium, USA, Switzerland, France, Italy, Luxembourg, Netherlands, UK and Libya. The EU is the main destination for Ghana's fruits and vegetables; it is considered one of the highest-priced markets for fresh fruits and vegetables in the world. When dealing with individual product and country, in recent years USA has been leading in importing pineapples from Ghana followed by Belgium, France, Italy and Germany. According to United States Department of Agriculture (USDA, 2005), out of 71.21 thousand tonnes of pineapples produced in Ghana, export to US was 49.20 thousand tonnes in 2005. UN COMTRADE reported Germany to be the leading importer of banana by 2004 followed by UK, France, Netherlands, Italy and Belgium. This has been so because of strong involvement of leading supermarket chains to satisfy the increasing demand of banana.

1.3 The physical flow of perishables from Ghana to international market

Physical movement of perishables is in two main phases: namely inland and international phases. Inland phase consist of all transportation activities occurring within the national boundaries usually from the farms to the main ports (Kotoka International Airport or Tema Harbour). Production of perishables is characterised by

large, medium and small scale operations depending on the financial status of the farm operator. This implies that inland transportation takes place in various forms as depicted by figure 3 below.

Figure 3: Transportation chain of fresh Perishables from Ghana to international market



Picture source: images.google.com
Diagram: self made by authors

Route 1: A (i.e. Farm – Port)

A large scale farmer, who is financially sound, usually performs exporting activities through vertical integration of production and export (Example is Golden Exotics Limited). Since this farmer produces in large volume/quantity, he needs to transport the produce quickly to the port for refrigeration to avoid quality damage. Long- term contract between farmer-exporter and transporting company is necessary to move the produce from the farm directly to the port using this route as shown in the figure 3. Therefore, all packaging activities of the produce are done at the farm.

Small and medium scale farmers usually have to deal with commercial consolidators/exporters who arrange for pick-ups of the produce from the farm after the harvest. In this case the following routes are used.

Route 2: B – B – B – C – D

This route is used when the consolidator is different from the exporter and when the road to the farm is impassable by trucks. This implies the farmer has to hire labour to head-load (human porterage) or use three-wheeled pushcarts to cart produce to the roadside for trucking company to pick up or to consolidator's shed for packaging. This is because the exporter/consolidator will not like to bear the extra cost that will be charged by the transport company. The consolidator then will use the transport company's truck to cart the goods to the exporter. After the exporter has inspected and satisfied with the goods, the transport company then conveys the cargo to the port.

Route 3: D – B – B – D

This is where the road to the farm is good and farmer is not involved in movement of the produce. In this case the consolidator transports produce from the farm to his consolidation centre then sends the goods to the exporter at the port using a trucking company. Here, the inspection of the products is at the port. The exporter is then only responsible for export documentations.

Route 4: B – B – D

This is when the road from the farm is bad. In this case this route will be used instead of route 3 described above. Here the farmer is responsible in moving the goods to the consolidator.

Route 5: D – B – B – B – C – D

In this instance, the road is good from the farm so the consolidator carts the goods from the farm to his consolidation centre, and then transports to the exporter's facility. The exporter then is responsible for conveying the goods to the port by contracting a transport company.

Route 6. C- C – D

This is where the exporter is the same as the consolidator. In this scenario, the road from the farm is bad so the farmer is responsible of moving the produce through manual labour to the exporter's facility. The exporter then does packaging and transporting to the port by means of hired trucks.

Route 7: D – C – C – D

Here, the road is good so the farmer is not involved in the movement of the cargo. The exporter arranges for transportation from the farm to his facility and then to the port.

Route 8: D – D

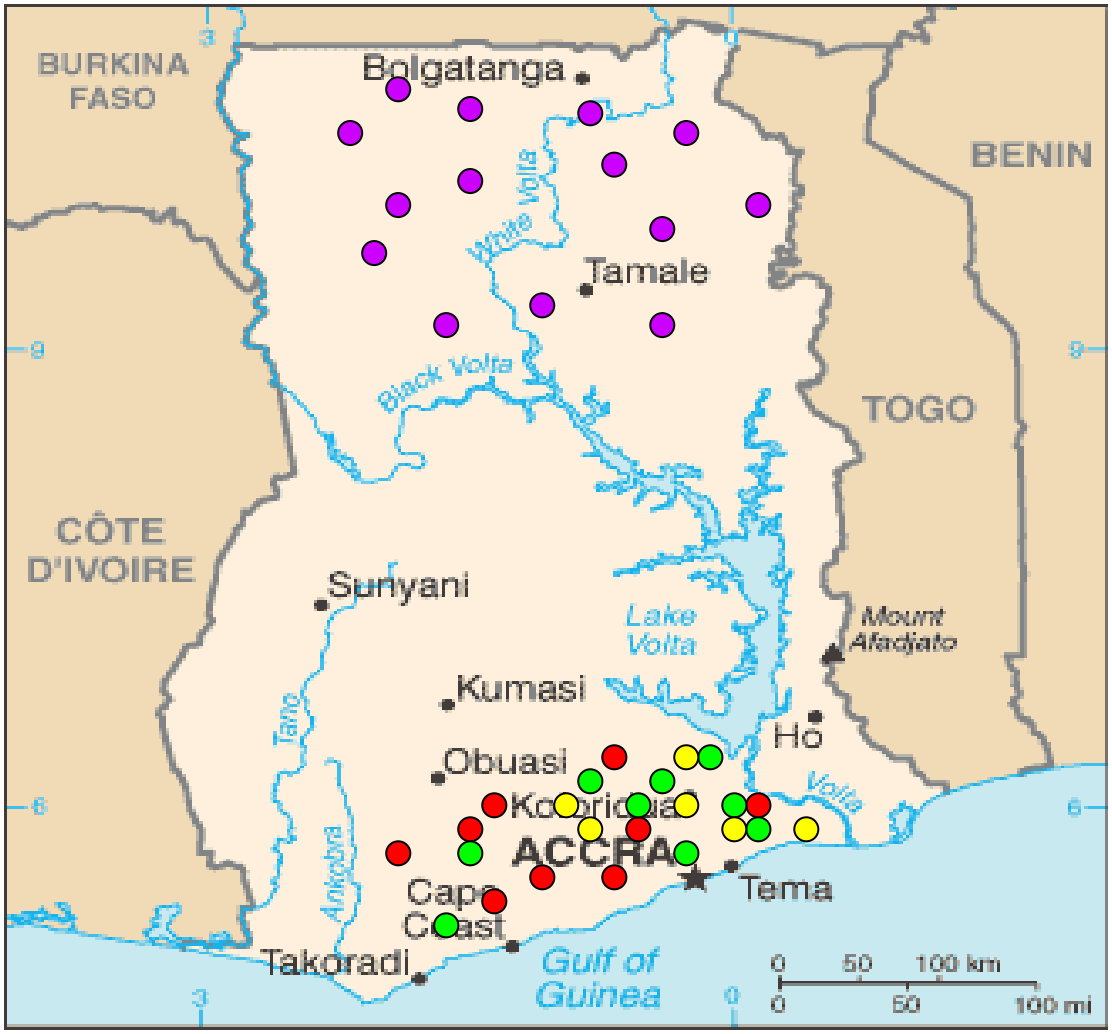
The farmer is not involved in movement of the product. Packaging is done on the farm at the expense of the exporter/consolidator who then contracts the transport company to pick the cargo directly to port.

Despite the poor road conditions, inland transportation is dominated by trucking industry because road is the only means of transport available leading to the areas of perishables production. Even though trucking is the only means, transport rates have not been unnecessarily high due to the strong competition caused by oversupply of second-hand trucks by private operators.

International phase includes all transport activities taking place from the ports to the international market, depicted by route 9 (E) in figure 3 above. In this phase transportation is dominated by seaway through Tema port and airway through Kotoka International Airport. The choice of transportation mode by the exporter is dependent of various factors which are examined in section 5.2 (table 7). Dole boat is the shipping company available to transport Ghana's perishable to various international destinations. For the air transport, KLM and Ghana Airways are largely used.

The type of the route used coupled with road conditions may have some influences on risks and responsibility sharing among perishables supply chain actors. These issues are discussed extensively in analysis section 5.5.2.1 and 5.5.3.

1.3.1 Regional Distribution of perishables production for export



Key:

- Mango
- Pineapple
- Banana
- Yams

The map depicts the main regions where perishables are produced. These are the Central (Cape Coast), Eastern (Koforidua) and the Northern Regions (comprising of Tamale, Bolgatanga and Wa). It is evident from the map that the regions where most of the perishables are produced are very close to the ports, with the exception of yams. The type of product grown in a region is however largely dependent on the climatic and soil conditions. For example, Brong Ahafo (Sunyani) and Ashanti

(Kumasi) regions' climatic conditions and soil fertility composition are favourable for cocoa production while the Central and Eastern Regions are very good for pineapple, banana and mango in terms of climate and soil composition hence large volumes of these products are grown in these regions for export purposes. Climatic conditions in the north favours yams production on larger scale bases because the region is mostly dry and yams can survive the drought condition.

The flexibility and risks aspects associated with production and storage of the produce by supply chain actors under seasonality conditions are discussed in the analysis section 5.1.1.

1.4 Transport Infrastructure

As pertains in most developing countries, Ghana is no exception when it comes to transportation infrastructure.

Road

Ghana's road network in general is woefully inadequate, especially in areas where perishables are produced. Major highways especially those linking the Tema port are congested and poorly maintained. Most of the roads leading to food producing areas are in very deplorable states. Some of these roads have not seen any form of maintenance since the initial construction several decades ago. This results in very large pot-holes, making it impossible for trucks to travel. The poor conditions also contribute not only to increase in the travel time on these roads, but also increase transport costs and reduce reliability. Furthermore, the road conditions increase the cost of maintaining trucks that travel these roads with the worst scenario being frequent accidents.

The commercial trucking industry is highly deregulated, therefore government involvement is limited to travelling time and vehicle loading. Anyone with a vehicle can operate it commercially. The only requirements are initial registration and two annual road worthiness tests. Transport rates are regulated by the Ministry of Transport but are not legally binding (Pedersen, 2001). This is due to the fact that, transport rates also depend on other factors such as negotiation power, fuel price, relational norms such as attending the same church or former classmate, and

associations among others. In addition, even though there is free entry, the industry is characterised by oligopolistic practices made up of few, big transport operators who have been in this business for so long. These operators tend to hold more power and influence, acting as entry barrier for small operators to survive in this market.

Moreover, there is a general lack of feeder roads over which agricultural products can be transported. Even with this limited number, their conditions are nothing to write home about. Pedersen (2001) indicates that the length of trunk and secondary roads have been increasing over the years. This is however not the case for feeder roads which have been stable with just about 22,000 km as at 1994, and that only 3700 km of feeder roads are "maintainable". Even though governments have made some investments in road infrastructure, investments are not enough to contain the extent of the deterioration.

Photograph 1: An example of road and trucks conditions in Ghana
Source: image.google.com

The absence of good road infrastructure could be a result of the frequent changes in governments. This implies that, there may be changes in road policies which may be conflicting with each other.

The transport indicators database issued by the Ministry of Transport and the Ghana Statistical Service in 2008, indicated that as at 2007, only 35% of roads in Ghana were in good condition, with 37% and 28% classified to be fair and poor respectively. Besides the poor road infrastructure, most of the trucks are old, insufficient and poorly maintained.

Water transport

The means of water transport is through the Volta Lake. Traffic on this route has however not been consistent due to the fact that the water level on the lake has been falling to a level where part of the lake has not been navigable. With this, ferries are unable to reach landing bridges. One of the areas where yams for instance are produced is in this region where the lake is the only means of transportation, but because of the problem stated above, the transport risk increases, which then reduces reliability.

Railway

Rail lines are not well developed to reach the regions where perishables are produced. However a well developed rail system will have the potential to effectively open up the hinterland of the country. This will in turn facilitate moving of produce to and from the farm regions to the ports, as this will act as the cheapest mode. The under-development of railroad had resulted in its loosing the competition to the trucking industry.

Ports facilities

Ghana has only two ports, situated in Tema and Takoradi. Tema is the bigger of the two and is the principal import and export port of containerised goods. Takoradi is the main port of bulk goods (Rønnevik, 2009). In terms of tonnage throughput, Tema handles about two and a half times larger than Takoradi. It is referred to as a traffic junction due to the fact that it is faced with capacity and efficiency problems. This problem is further aggravated as it handles cargo not only for Ghana but also to and from the hinterland of the neighbouring landlocked countries of Burkina Faso, Mali and Niger (Ghana Chamber of Commerce, 2007). In addition, investment in port development and material handling in the Tema port is insufficient creating congestions and bottlenecks in traffic flow. Pedersen (2001) however explained that

congestion is due to the fact that, there are only few deep berths which are not enough to contain the increasing size and number of ships that call at the port. The result of this is queuing up of vessels for deep berths and also reshuffling between berths. There is also lack of coordination between the port and land transport (i.e. road and railway).

Photograph 2: Container Traffics at Tema Port
Source: Ghana Chamber of Commerce

Air

Ghana has only one international airport (Kotoka International Airport). Export cargo consists mainly of pineapples and other fruits (like citrus, papaya and guava) and vegetables. Only about half of the exports go on specialized cargo flights with the other half going on passenger flights. This means export freight is heavily dependent on the size of passenger traffic. Air Ghana is the main organizer and facilitator for chartering flights for non-traditional exports.

Until mid 1990s, most fresh pineapples were transported to the international market by air. However, the formation of Sea Freight Pineapple Exporters of Ghana (SPEG) in the mid 1990s resulted in sea transport replacing air transport as depicted in table 4 below. This is so because SPEG has been actively involved in organising two weekly departures from Tema harbour to various international destinations.

Table 4: Volume of pineapple exports by sea and by air (tons)

Pineapple	**1997**	**2002**	**2004**
Air	12,000	6,000	20,000
Sea	15,000	40,000	48,000

Source: Danielou and Ravry, 2005

As at 2004, SPEG shipped about 48,000 tonnes corresponding to about 71% of total pineapple export. Even though efforts to get current figures proved futile, transport by sea is expected to grow further due to the EU initiatives to discourage air-freighted cargo under the environmental campaign of reducing carbon emission into the air (Air freighted Green Paper, 2007).

From the above presentation, it is evident that perishables exportation has potential to grow even further. This is due to the fact that the global demand for perishables like pineapple, banana and mango is still growing (UNCTAD, 2008). For Ghana to be able to effectively satisfy that international demand, reliability is the key requirement that needs to be put in place so as to prolong the short shelf lives of products at the market. On the other hand, the present conditions of transport infrastructure in Ghana may pose some challenges in the attainability of delivery reliability. In this light, there is a need to introduce flexibility as a critical element in addressing transportation challenges. With the help of literature review and findings from the field, this issue is extensively dealt with and some helpful recommendations on how to improve the performance of this supply chain are provided in subsequent chapters.

2. THEORY AND LITERATURE REVIEW

The main focus of this chapter is to review previous research works from various scholar journals, books, thesis, among others. For the purpose of this study, literature concerning supply chain flexibility (both internal and external), supply chain risks, power and dependency as well as transportation issues in developing countries, will be extensively reviewed. In addition SWOT analysis framework will be considered.

2.1 Supply Chain Flexibility

In the past few years there has been sudden interest in supply chain flexibility. Though there have been some studies on flexibility, most researchers agree that there is still more to be explored. Lummus, Duclos and Vokurka (2003), contend that very little has been done with respect to definition of flexibility components and identification of the characteristics. In addition, they highlighted the main reasons for the need to understand supply chain flexibility. Koste and Malhotra (1999) argued that performance should be assessed based on the absence or presence of flexibility in the supply chain. They explained that, each supply chain focuses on a certain dimension of flexibility, depending on the competitive priorities of the supply chain.

The visibility of supply chain flexibility depends on the nature and type of supply chain; which implies that there is a close relationship between the supply chain flexibility and its topology (Rao and Wadhwa, 2002). The design of the supply chain contributes in determining its flexibility and the ease to which it can be configured (Stevenson and Spring, 2007). This has given rise to some studies in the area. Flexibility is perceived with respect to chain actors' capabilities to promptness and the degree to which they can adjust to speed, destination and volumes (Lummus, Duclos and Vokurka, 2003). As they noted, it is necessary to focus on core activities in order to maximise the speed of response to changes.

Zhang, Vondermbse and Lim (2006) view flexibility to be the ability to meet a wide range of customer expectations without disruptions, excessive costs or decrease in performance. According to Vickery, Calantone and Droge (1999), there is supply chain flexibility only when those flexibilities have impacts on the final customer in terms of adding value from the customer's perspective. For such flexibilities to have

impact on the customer there should be shared responsibility among actors along the chain; be it internal or external (Rao and Wadhwa, 2002). In their view, flexibility is where the supply chain has the ability to restructure the system quickly without extra costs. Thus flexibility becomes the means through which the supply chain is able to withstand and counteracts disruption risks. With perishables transportation, such disruptions could be in the form of heavy rainfalls, inaccessible or collapse of a bridge, political instability, rail or trucking/labour strikes and bankruptcy.

Das and Abdel-Malek (2003) on the other hand, view flexibility based on the durability of relationships with respect to changing conditions. In our view, the time critical nature of perishables necessitates the adoption of Stevenson and Spring's (2007) suggestion of viewing flexibility beyond the individual members, to viewing flexibility from the supply chain perspective as a whole. Rao and Wadhwa (2002) affirm the existence of flexibility in both internal and external chains, but emphasised that the existence of flexibility may tend to increase the control complexity as well as information and decision flow. This is because a set of products that flows through these two chains is associated with a process that comprises a sequence of process steps that require one or more resources to be completed and consume certain time and cost to ascertain value to the product. Flexibility becomes an inherent property of a chain when there is a number of links with the right connectivity. Fisher (1997) pointed out that the nature of a product's demand should determine the way of devising an effective supply chain strategy. Thus for perishables with very short product life cycle, it is necessary to have a flexible supply chain, which will be market responsive.

2.1.1 Internal flexibility (for individual actors)

Known as manufacturing flexibility, Ndubisi; Jantan; Hing; and Ayub, (2005); Lummus, Duclos and Vokurka, (2003), describe internal flexibility to reflect an organisation's ability to effectively adapt and/or respond to changes or cope with environmental uncertainties that add value in the customer's eyes. According to them, internal flexibility concentrates on flexibility within a single firm and it is recognised as a component of marketing and R&D strategies as well as one element of business strategy, with certain dimensions impacting growth and financial performance of the firm.

On the other hand, a firm's flexibility is based on the internal resources (i.e. flexible technology, labour and infrastructure), that can be used to achieve different types of internal flexibility (Reichhart and Holweg, 2007). Various types of internal flexibility have been reported by different researchers, with each of them focusing on particular elements. For a perishables supply chain, we consider volume, (Ndubisi et al 2005, Reichhart and Holweg, 2007), labour, routing, delivery and market flexibilities (Lummus et al 2003) to be important elements which require close coordination between actors to prevent out-of-stock conditions for produce that may suddenly be in high demand.

To increase flexibility, every company should periodically redesign its supply chain based on its objectives and changes in the business environment (Garber and Sarkar, 2007). They further argued that, a good network design optimizes supply chain costs by taking into consideration of all related factors including geographical locations, costs, capacity and utilization, throughput, facility characteristics, mobility of assets and taxes. It also accounts for decisions about opening or closing warehouses and plants and determine the most appropriate transportation modes and distribution channels. Their argument supported Clarke's (2005) idea that, companies should design the supply chain from the customer backwards and optimise responsiveness to customer demand.

In addition, Fassoula (2006), suggests that, firms must re-invent themselves in a way that can allow them to continuously adapt to different market requirements and compete successfully. Garber and Sarkar (2007) advised that, firms should create more flexible supplier relationships to assure changes in production capacity in case a new product sells faster or slower than expected. For instance, capacity increases to accommodate peak-season build-ups.

2.1.2 External flexibility (for the entire supply chain)

It is difficult for a company to survive in isolation of its business partners in the network of value chain which encompasses the entire production activities of a product life cycle (Lau and Lee, 2000). Therefore, it is useful to extend the idea of flexibility from a manufacturing domain (internal chains) to the entire supply chain

domain (external chains) (Rao and Wadhwa, 2002). Proposed by Lummus, Duclos and Vokurka (2003), external flexibility is the flexibility of the entire supply chain resulting from the flexible components at each node of the supply chain and their interrelationships. This proposition has been supported by Reichhart and Holweg (2007), stating that, flexibility will differ at different nodes in the system in which, when taken together contribute to the entire supply chain's responsiveness to achieve competitive advantage, such as speed of delivery.

Supply chain flexibility should be examined from an integrative, customer-oriented perspective (Lummus, Duclos and Vokurka, 2003). It is from this point of view, that these authors reviewed five types of external flexibility namely product, volume, new product, distribution, and responsiveness flexibilities. In our view volume and responsiveness flexibilities are the most important for perishables supply chain. These flexibilities help supply chain actors to adjust capacity in order to meet changes in customer quantities and quickly respond to targeted market needs.

Reichhart and Holweg (2007) claimed that, there are factors that require supply chain responsiveness (i.e. external requirements) followed by the factors that enable responsiveness (i.e. internal determinants). According to them, external requirements arise from four main areas which are: demand uncertainty, demand variability, product variety and lead-time compression. When there is reliable information about demand there is no need to be responsive, however, the need for responsiveness arises mainly from uncertainty and variability that stem from volume and/or product mix changes in the customer demand signal. Time-based competition increases the need to be responsive because the supply chain is given less time to respond to new orders or changes in existing ones.

Reichhart and Holweg (2007) mentioned a number of internal requirements which contribute to the enhancement of responsiveness in a supply chain as the one under study (perishable supply chain). Among these are; improving demand anticipation and P:D ratio (i.e. Production time versus Demand time ratio) in which actors should be able to identify if the products offered can be forecasted more accurately. Also, actors should be able to position the decoupling point close to the end-customer which will lead to shortening of the lead time. Additionally, time delays can be minimized by

creating transparency or visibility of both demand and capacity information through a closer integration among supply chain partners. Lastly, fostering spatial integration between channel partners to enhance trust and commitment, labour relation as well as synergy and spatial proximity to reduce transportation lead times and costs supported by dedicated infrastructure such as storage facility.

The supply chain must have the ability to detect changes when they have occurred, be it planned or unplanned, and respond in a near-real-time manner so as to fulfil the end customer needs (Adams, 2008). In effect, demand and supply fluctuations can only be tackled cost-effectively if actors are able to construct adaptable and aligned supply chain (Lee, 2004). Storey, Emberson and Reade, (2005) believe this can be achieved by full exploitation of information technology through inter-organisational collaboration and co-operation. Moreover, Lee (2004) argues that, aligned supply chain creates incentives for better performance which can be obtained by redefining the terms of channel members' relationships so that firms share risks, costs and rewards equitably.

For the purpose of our analysis, flexibility will be assessed in a wide range of areas mainly based on the six components of supply chain flexibility proposed by Duclos, Lummus and Vokurka (2001) which include flexibility in the market and information systems. In addition, flexibility will also be viewed based on other flexibility elements such as volume/quantity flexibility (Basok and Anupindi, 1997; Tsay, 1999), routing flexibility, transport modes flexibility, access flexibility and responsiveness to the target market (Rao and Wadhwa, 2002) as well as collaboration issues among perishables supply chain members among others.

This will imply exploring the types of flexibilities that exist in the supply chain of perishables flow and flexibility options that need to be introduced at and between the various nodes to minimize the challenges in the current transportation system. This will entail flexibilities that will add value to the produce either as individual responsibility of a chain member or as shared responsibility of two or more actors of the supply chain (Rao and Wadhwa, 2002). This also means that internal elements of flexibility will be linked to the entire supply chain flexibility. This stems from Lummus, Duclos and Vokurka, (2003) who emphasised on the point that, flexibility

requires both internal flexibility at each node and flexibility between supply chain members. They further argued that, by being flexible, the various members of the supply chain should see some improvement in performance. Therefore this study will investigate to see if this is true for members in the chain of the flow of perishables. It will also explore if some elements of flexibility in the transportation of perishables are more critical or may have greater impact on chain performance than other types of flexibility options as proposed by Slack (1987).

Summary: Important flexibility elements to be used in the thesis

Internal flexibility: identification of flexibility elements that result within the supply chain. These elements are initiated by individual supply chain actors, for example product flexibility, supply flexibility among others.

External flexibility: looks at flexibility of the entire supply chain resulting from the flexible components at each node of the supply chain and their interrelationships, for example transport modes flexibility, quality and capacity.

Factors that enhance flexibility: these could be reliable information about demand; closer integration among supply chain partners; and sharing of risks, costs and rewards equitably among supply chain members.

2.2 Supply Chain Risks

Even the most sophisticated supply chain cannot be said to be risk-proof nor adequately prepared to handle unexpected risks and disruptions when they occur. The time critical nature of perishables, coupled with the numerous insurmountable challenges of developing countries demand that risks and disruptions are taken into consideration when viewing the flow of perishables. The nature of the product makes it impossible for chain members to have the same kind of freedom other supply chains may have (Sandvik, 2008). Manuj and Mentzer (2008) stated that the physical transport of goods involves long transit times which are characterized by risks and uncertainties. However, Ritchie and Brindley (2007) identified that, individual supply chains and members within the supply chain may experience different levels of exposure to such risks, in terms of potential consequences and likelihood depending on the nature of the supply chain and its members.

There are many definitions of risk, depending on their specific application and their situational context (Husdal, 2008). Manuj and Mentzer (2008, 135) define risk to be 'a chance of danger, damage, loss, injury or any other undesired consequences'. Lowrence (1980) perceives risks in terms of probability and severity of adverse effects. Disruptions, as noted by Craighead et al (2007, 132), 'are unplanned and unanticipated events that disrupt the smooth flow of goods'. Supply chain risks are either internal or external (Hausker, 2003), known as endogenous or exogenous respectively (Ritchie and Brindley, 2007). Endogenous risks are the ones occurring within the channel such as failure to integrate all the functions in a supply chain and are perceived to be manageable or avoidable, while exogenous risks are those that impose from the situation outside the supply network such as natural disaster, political risks and are perceived to be unavoidable as well as difficult to manage.

Supply chain risks can also be frequent or infrequent; short-term or long term; and cause problems for the affected organization(s) ranging from minor to serious (Chopra and Sodhi, 2004). These problems or consequences are mainly classified as either quantitative or qualitative (Svensson, 2002). Quantitative losses create lack of materials for downstream activities in the supply chain caused by unexpected conditions such as bad weather (Svensson, 2000), for example; lost sales due to stock-outs and breakdowns or delays in transport (Manuj and Mentzer, 2008). Qualitative consequences lead to deficiencies in components and materials in supply chain (Svensson, 2000), such as termination of a business relationship (Manuj and Mentzer, 2008). Though there may be some positive aspects of risks, most researchers have focused on the negative side. It is therefore important to stress that, consequences are not only negative and that the essence of risk taking is the potential opportunity to produce positive outcomes (Ritchie and Brindley, 2007).

The sources of supply chain risks are many, as different links of a supply chain are exposed to different types of risks (Faisal, Banwet and Shankar, 2006). This view supports Hausker (2003)'s claim that supply chain risk as a disruption can arise from many sources and sometimes without warning. Sources of supply chain risks can be atomistic or holistic (Svensson, 2000). Atomistic sources of risk signify that a selected and limited part of the supply chain is required in order to assess risk (Svensson, 2002). This type of risk sources is therefore suitable for low-value products as in the case of perishables. Holistic sources of risk on the other hand calls for an overall

analysis of the supply chain (Svensson, 2002). Understanding risk sources, as argued by various researchers, helps actors to determine various types of supply chain risks that organisations and entire supply networks are exposed to.

Supply chain risks can be seen as internal or external to the focal firm, and be seen as internal or external to the supply chain (Husdal, 2008). Supply chain risks internal to the focal firm can be recognised as organisational risks; those that are external to the focal firm and internal to the supply chain can be termed as network risks; while those that are external to the supply chain are known as environmental risks. Referring to Manuj and Mentzer (2008), organisational risks could be lack of formal procedure, lack of quality control system (procedure risks); bureaucracy, lack of authority, misunderstanding (communication risks); and lack of formal education such as lack of training and unskilled labour (knowledge risks).

Furthermore, Husdal (2008) supporting Manuj and Mentzer (2008)'s argument, identified network (supply chain) risks, among others, to be disruption of supplies (supply risks); failure or breakdown of operations, changes in technology (operational risks); variations in demand (demand risks); and theft as well as infrastructure breakdown (security risks). Husdal (2008) also found that, environmental risks may be economic shifts, recession, labour costs, customs (macro risks); actions and sanctions of governments, shifts in legislation (policy risks); uncertainty about competitors' moves and actions (competition risks); and, lack of capital or technology (resource risks). Most researchers argued that, it is better to understand various types of supply chain risks because most of these risks are overlapping and do not exist in isolation (Manuj and Mentzer, 2008), moreover they differently affect the strategic decision making level and performance (Ritchie and Brindley, 2007) of the channel member as well as the entire supply chain.

The key drivers or determinants of supply chin risks have been identified and configured by different authors in different ways. For example, Ritchie and Brindley (2007) presented five risk drivers namely external environment, industry specific, supply chain configuration, partner specific and node specific. Risk drivers associated with the external environment are those to which all organizations and supply chains are exposed to, to some degree. For instance, changes in the global economy or in the political environment. Industry specific risk drivers are generated within the particular

industry or sector as a consequence of the strategic decisions of the organization. Examples are new product or market development. Supply chain configuration risk drivers are associated with the number of nodes within the chain and their relative importance and influence as related to resource base and dependence on critical factors. Partner specific risk drivers arise from performance of specific partners within the chain in relation to such factors as; financial solvency, quality standards and inadequate information systems. Node specific risk drivers are related to the elements within the individual organization as a result of the organization's failure to respond to demands of others in the supply chain. Examples of node specific risk drivers may be ill equipped or poorly trained staff, inadequate management control and ineffective communications.

2.2.1 Risk Management

Risk management means keeping an increasingly complex process moving at the lowest total cost and without compromising the quality or customer satisfaction (Hausker, 2003). Risk management strategies include information sharing, collaborative relationships and trust, joint training and development programs, joint pro-active assessment and planning exercises (Faisal, Banwet and Shankar, 2006; Ritchie and Brindley, 2007; Miller, 1992; Saad and Kleindorfer, 2005; Cucchilla and Gastaldi, 2005); developing risk management awareness, knowledge and skills (Ritchie and Brindley, 2007; Faisal, Banwet and Shankar, 2006); as well as alignment of incentives and proper revenue sharing arrangement such that, the value and benefits generated are maximized and shared fairly (Faisal, Banwet and Shankar, 2006; Saad and Kleindorfer, 2005). Miller (1992) has summarized these strategies into two major categories known as financial and strategic risk management. Financial risk management includes purchasing insurance and buying and selling financial instrument. Strategic risk management includes non-financial strategies such as cooperation, collaboration, information sharing and so on.

An effective program of supply chain risk management is an ongoing process of assessment, intervention and fallback planning (Faisal, Banwet and Shankar, 2006) Identified by Cucchilla and Gastaldi (2005) there are major steps in risk management process. Firstly, to analyze the supply chain concentrating on the structure of the network, key measures and respondability inside the supply chain. Secondly, to

identify the most important risk sources both internal or external to the channel member and internal or external to the entire supply chain. Thirdly, to examine the subsequent risk in terms of likelihood of occurrence, stage in life cycle, exposure, likely triggers and losses. Fourthly, to manage risk through risk position and risk scenario by conducting preliminary analysis of risks and their damages within the network. Lastly, implementation and mitigation of the supply chain risk management strategy.

Since all risks can not be avoided (Manuj and Mentzer, 2008), it is important to plan ahead for the situations where harmful risks are likely to occur. Furthermore, it should be recognized that all steps in risk management process are interactive and interdependent; therefore there should be a constant flow of information between different steps. There are motives for perishables supply chain to manage or reduce risks as identified by Amit and Wernerfelt (1990). These could be reducing the probability of bankruptcy and effects of uncertainty.

It has been noted by various researchers that, the least disruption can result in immediate loss of sales and inability to meet customer satisfaction. Sandvik (2008) suggested that it is important to identify the type and number of risks, where such disruptions will have the gravest impact on the supply chain and find means of mitigating as well as means of improving the robustness of the supply chain. Hendricks and Singhal (2003) stressed that failure to effectively manage risk can be very costly, whiles Hood and Young (2005) pointed out that organisations can go out of business as a result of failure to adopt effective risk management strategies. The consequences of failure to manage risk effectively goes beyond financial loss, and extends to reduction in product quality, damage to equipment, and loss of reputation in the eyes of customers (Khan and Burns, 2007). Thus, understanding the potential impacts of such risks can help actors to manage the supply chain more effectively and gain advantage in a competitive marketplace (Hausker, 2003).

Not all risks affect all supply chains; therefore it is important to identify the risks to which a supply chain is more vulnerable for proper attention to be given to such risks (Manuj and Mentzer 2008). With transportation of perishables, certain types of risks are more likely to be prominent. Some of the risks are product rejection risks, driver

shortage, power curtailment, information flow disruptions, trust, natural disasters, labour strikes, government policies, oil price increase, criminal acts like thefts and opportunism. These risks and disruptions are discussed as pertains to the perishable supply chain. We will also try to explore the extent to which flexibility can be a mitigating element against some of these risks and disruptions.

Summary: Important risk elements to be used in the thesis

Internal risks: identification of the sources of risks that originate within the boundaries of supply chain actors. These risks can be avoided or controlled by the actors, for example labour strikes.

External risks: identification of the sources of risks that can not be avoided or controlled by the supply chain actors, example weather conditions.

Risk management strategies: recommendation of supply chain strategies that can address both internal and external supply chain risks, example supply chain actors' cooperation.

2.3 Power and Dependency

Power has received much attention in recent literature (Caniels and Gelderman, 2007) as it is considered to play a significant role in the supply chain integration (Maloni and Benton, 2000). The most popular definition of power addressed by El-Ansary and Stern (1972, 47) '… is the ability of a channel member to control the decision variables in the marketing strategy of another member in a given channel at a different level of distribution'. For this control to qualify as power, it should be different from the influenced member's original level of control over his own marketing strategy (El-Ansary and Stern, 1972). Gaski (1984); Hunt and Nevin, (1986); Maloni and Benton (2000); and P. Berthon et al (2003); agreed with El-Ansary and Stern (1972)'s power definition as the ability of one firm (the source) to influence the intentions and actions of another (the target). In fact, this definition has its root from Emerson (1962)'s proposition that, the power of actor A over actor B is the amount of resistance on the part B which can be potentially overcome by A.

The power of any given channel member is derived from the sources or bases available to him at any given time (Hunt and Nevin, 1986). Of the many possible sources of power; five are more prominent. These are reward, legitimate, referent, expert and coercive (El-Ansary and Stern 1972, Lusch 1986, Diamantopoulos 1987, and Maloni and Benton, 2000). According to them, reward power refers to the ability of the channel member to mediate rewards to another member. Legitimate power occurs when a channel member believes that another member retains natural right to influence. Referent power is the one in which a channel member values identification with another member. Expert power occurs when one channel member has access to knowledge and skills desired by another member. Coercive power refers to the ability of the channel member to mete out punishment to another member.

Power can be used on various occasions, including the development of operational linkage, providing channel training (Berthon, Pitt, Ewing, and Bakkeland, 2003), developing customer and channel information systems, and developing discount system (Caniels and Gelderman, 2007), which may be relevant to the buyer-seller relationships. Since power may influence the inter-firm relationships that derive supply chain integration (Maloni and Benton, 2000), it is therefore important to consider the dependence of the two parties of the relationship (El-Ansary and Robicheaux, 1974). As suggested by Emerson (1962), the power of A over B is equal to, and based upon, the dependence of B upon A, meaning that, the buyer's dependence on the supplier is a source of power for the supplier, and vice versa (Caniels and Gelderman, 2007). Berthon et al (2003) argued that, power is obtained through possession of resources (assets, attributes and conditions) within a relationship that are valued by the other party which in turn create channel member's dependence, indebtedness or allegiance to another.

Defined by Kumar, Scheer and Steenkamp (1995), a firm's dependence on a partner is the firm's need to maintain a relationship with the partner to achieve its goals. This supports Emerson (1962, 32)'s proposition that, 'the dependence of one actor over another actor is directly proportional to actor's motivational investment in goals mediated by another; and inversely proportional to the availability of those goals to the actor outside that particular relationship'. Dickson (1983); Diamantopoulos (1987); proposed that, it makes more sense to define the power of one firm over

another as a function of relative dependence or interdependence. Kumar, Scheer and Steenkamp (1995), used the term interdependence asymmetry to refer to relative dependence as the difference between two partner's levels of dependence in which the most independent partner dominates the exchange. Interdependence exists when two partners are equally dependent on each other where as, both are faced with high exit barriers and the risk of retaliation is often considered as being too high (Caniels and Gelderman, 2007).

There are various means by which a channel member may become dependent; Heide and John (1988) summarized them into four categories. First, a firm is considered to be dependent on the supplier when that supplier provides a larger fraction of its business (financial magnitude of the exchanged resources). Second, dependence emerges when a firm is dealing with the best supplier such that the outcomes associated with that supplier are higher than those available with other suppliers. Third, dependence arises when fewer alternative sources of exchange are available to the focal firm. Fourth, a firm becomes dependent when difficulty is involved in replacing the incumbent exchange partner (switching costs incurred when replacing a trading partner).

Power and dependency are generally considered to be important concepts in understanding buyer-seller relationship (Caniels and Gelderman, 2007). From this point of view, Maloni and Benton (2000) postulated that, the significance and expansive effects of power and dependence on inter-firm relationships hold direct implications for the supply chain. A high level of interdependence is an indicator for a strong, cooperative long-term relationship characterized by mutual trust and mutual commitment (Kumar, Scheer and Steenkamp, 1995). A close and lasting cooperation between supplier and buyer will lead to improvements in quality, delivery reliability, lead times and cost reduction (Caniels and Gelderman, 2007). Kumar, Scheer and Steenkamp (1995) and Maloni and Benton (2000), found empirical evidence that, a strong buyer-seller relationship leads to high performance of the entire supply chain. This could be in the form of high level of commitment, cooperation, trust and conflict resolution.

In contrast, Kumar, Scheer and Steenkamp (1995), claimed that, firms in asymmetric relationships have high motivation to engage in conflict. This is because the relatively powerful firm has less motivation to avoid conflict and the relatively dependent firm is more likely to engage in pre-emptive strike against the powerful firm's domination when it expects to be exploited. In addition, Caniels and Gelderman, (2005), argued that, buyer-seller relationships that are characterised by asymmetric interdependence lead to unproductive partnerships such that, in the long term the position of the weaker party will be eroded too much and the partnership will be destroyed. In terms of sources of power, Gaski, (1984) supported Lusch (1986) and Hunt and Nevin (1986)'s findings that, non-coercive sources of power increase satisfaction, while coercive sources of power reduce satisfaction within the marketing channel. Lusch (1986) reported that non-coercive sources of power reduce inter-channel conflict while coercive sources will tend to increase conflict because of the punishment associated with them.

Various researchers have proposed several ways in which the consequences associated with asymmetric interdependence can be mitigated. Diamantopoulos (1987) believed that, the firm enjoying a power advantage may choose to share control with the less powerful firm in a more or less equitable manner to foster a democratic relationship. Heide and John (1992) supported by Joshi (1998) proposed that, for a strong buyer facing a large number of small suppliers, relational norms can serve as a governance mechanism against opportunistic behavior especially when transaction-specific assets are involved. Modifying Emerson (1962)'s ideas, Kumar, Scheer and Steenkamp (1995), suggested that, relatively dependent firms should work to increase their partner's dependence by increasing their value to the partners or by reducing the partner's alternatives. However, according to Heide and John (1988), firms in symmetric relationship should not relax, instead they should continuously take necessary initiatives to maintain that balanced relationship.

Power is the major means available to achieve coordination and cooperation among channel members (Berthon et al, 2003). Therefore, it is critically important to examine the power and dependence positions of buyers and sellers (Caniels and Gelderman, 2005) to be able to establish various favourable supply chain strategies. Since power indirectly influences supply chain performance, those power holders that

create more effective, integrated supply chain will be able to position the chain better and subsequently benefit both themselves and their partners (Maloni and Benton, 2000). For the purpose of this study, it is therefore necessary to assess Power-Dependency relationships between perishable supply chain partners (farmers, transport companies, exporters), in order to find out how power distribution in this supply chain influences transportation issues from Ghana to international market.

Summary: Important power/dependency elements to be used in the thesis

Sources of power or dependence: identification of variables that give power to some actors over others. For example, possession of critical resources e.g. information, financial status and nature of the product. In other ways these variables are sources of dependency to other actors in supply chain.

Strategies to minimize inter-firm relationship power-gap: these can be, for example, through collaboration initiatives between actors or a powerful actor can choose to share control with the dependent actor.

2.4 Swot Analysis

SWOT analysis is a framework or methodology developed to enable business entities identify their strengths, weaknesses, opportunities and threats that can shape their decision making process. (Faculty for the Engaged Campus, 2008; Anonymous, 2008). SWOT analysis as a strategic method involves specifying the objective of particular supply chain or its members independently and identifying the external and internal factors that are favorable and unfavorable to achieving that objective.

In essence, SWOT analysis helps the decision makers to determine whether the objective is attained given the strengths, opportunities, weaknesses and threats of that particular supply chain. In relation to our study these issues will be discussed as follows:

Strengths – (to build upon, enhance). This will take a look at what is going well in the present transportation system, such as government supports and other incentives schemes.

Weaknesses – (to reduce, overcome). These are factors which tend to inhibit the quality of work. (DeSilets and Dickerson, 2008). What could be improved? Elements here could range from number of ports and storage facilities, their locations, quality of infrastructure, road and port congestions, high level of financial risks, low capitalization, lack of new entrants, over reliance on labour intensive activities, weak mechanisms for collaborations of chain members, limited awareness and appreciation of technology. (Chen and Shih, 2004).

Opportunities – (to exploit and take advantage of). These are factors that in the future may give the supply chain the potential to grow and improve upon the current challenges. In this study we shall take a look at issues like flexible loan schemes, abolishing of export quotas, and reduction of tariffs by government, technology advancement in terms of transportation, storage and communication; globalization and elimination of trade barriers, new markets and the possibility of global networking.

Threats – (to overcome, bypass). Threat is considered to be a 'trend or event that, if it were to continue to occur, would have significant consequences' (DeSilets and Dickerson, 2008, pp 197) in the system or on a supply chain. This could range from increasing fuel prices, global economy/recession, new entrants, weather effects, and seasonality of produce, legislation, and competition from neighbouring countries who also engage in exportation of perishables. Is the global demand for perishables shrinking?

Analyzing the supply chain for transporting perishables from area of produce (Ghana) to the international market the SWOT analysis may specify this chain's objective to be reliability. According to this objective, it means that due to the critical nature of the perishables which is characterized by short life product cycle, shorter lead time is needed to ship the product to the market as fresh as possible to capture customer satisfaction. Shorter lead time, in turn, may be attained through the presence of flexibility in this particular supply chain.

2.5 Review of Transport Infrastructure in Developing Countries

Transportation (both physical movement and storage) as a vital element in achieving flexibility in the entire supply chain, poses huge supply chain challenges in most developing countries. This has been the major issue for the inland transportation as reported by various researchers who have conducted some studies in developing countries concerning logistics challenges facing most supply chains. Larsen (1983), in his study proposed that the ability of supply chain actors to reduce marginal and total transport costs significantly depends on the presence of efficient transport infrastructure within a country. For instance good road infrastructure results in high frequency of transporting activities, hence reduction of total cost per tonnage. In his view, bad roads motivate transport operators to overload in order to benefit from economies of scale which may have negative effects of the vehicles and lifespan of the roads.

Zubrod, Tasiaux and Beebe (1996) who conducted a study in various Asian countries, revealed that, developing and carrying out logistics strategies in Asia face big challenges, one of them being a limit to port, road and rail infrastructure across the region. According to them, rail transport faces lengthy delays in moving products to market, especially away from major coastal cities. In addition, distribution channels in most Asian countries are inefficient and when combined with poor transport infrastructure, it becomes a challenge to logistics managers and third party logistics operators in the region. Salin and Nayga, (2003) contended that, national pricing which is controlled by the government prohibits third party operators from adjusting their margins to accommodate higher distribution expenses.

McCalla, Slack and Comtois (2004) in their study concerning contemporary containerization in East Asia, revealed the lapses in land transportation networks. These are evident in various forms in terms of poorly developed roads, to the extent that the densities of paved roads are less than $1km/km^2$. They also contended there is very little penetration of the inland areas by containers due to under-develop conditions of inland hinterlands. The lack of roads and railways, coupled with narrow nature and long coastline, hampers the inland movement of containers. Moreover, they argued that, laws and regulations in these countries make it difficult for

transportation companies to operate and even customs clearance can be slow and unpredictable.

A similar study conducted by Rehber and Turhan (2002) in Turkey in the agricultural sector confirmed the constraints most developing countries are exposed to. These are in the form of lack of technical know-how on production methods, lack of storage and processing facilities, poor logistics and lack of information. In addition, they stated that, farmers in developing countries need some financial and technical supports to be able to access production techniques to meet required standards and get desired results. Unfortunately, government support and policies are inefficient.

From their study conducted in the Caribbean region, Wresch and Fraser (2006) reported that, technology in developing countries is very far behind developed countries making it difficult to transport goods in and out of those countries. These are also complex and stringent customs regulations within these countries, which make it difficult to take advantage of a globalised economy. More specifically, they highlighted some of these to be expensive couriers, custom delays plus increased vigilance of U.S customs officials since September 11 attacks as large logistical challenges companies face in these countries.

Using Bangladesh as example, Razzaque (1997) identified numerous challenges for logistics in developing countries. Some of them are: lack of warehousing facilities, poor information technology, poor and inadequate transportation infrastructure, bureaucratic inefficiency and corruption, poor port and related facilities, outmoded production and distribution systems as well as inefficient third-party transportation. Islam, Dinwoodie and Roe (2005) who also conducted a study in this country observed the same challenges and found that despite the increase in cargo volumes for export and import, investment in ports, equipments and facilities, as well as inland terminals and transport networks is lagging behind. In their view, this situation presents the greatest barrier to an efficient and integrated transport system.

For several countries in Africa, weak logistics systems appear to be common phenomenon (Razzaque, 1997). Msimangira (1993) reported that poor, underdeveloped and unreliable means of communication and transportation cannot

support effective use of JIT system in Tanzania. Dadzie (1998) added that, the problem of designing a transport network suitable for modern Ghana owes its origin to the sub-optimally designed and poorly maintained existing transport network and poor loading-unloading facilities of the Ghanaian ports. Cilliers and Nagel (1994) pointed out that, Africa as a continent consists largely of developing nations where relatively underdeveloped infrastructure is to be expected. In Sub-Saharan Africa, only 15% of the roads are paved thereby making shipping slow and expensive because of poor physical infrastructure (Okoli and Mbaika, 2003). Furthermore, major public transport infrastructures are stressed by age, limited capacity and congestion (Dadzie, 1998).

The above mentioned shortcomings in one way or the other increase the cost of operating and managing the supply chain (Larsen, 1983). This in turn reduces the reliability of most supply chains in developing countries to a greater extent (Razzaque, 1997). Therefore, it is important to identify the source of these problems for solutions to be found. Islam, Dinwoodie and Roe (2005) and Dadzie (1998), argued that, the logistics shortcomings could arise from the fact that many ports, terminals and rail services are offered by government bodies incurring financial losses which leads to insufficient investment in infrastructure. Olsson (2004) maintained that transport infrastructure problems have been aggravated by unclear regulations, anticompetitive behaviour, weak corporate governance, institutional shortcomings and corruption. Slow progress in public-private initiatives plus lack of expertise and training for implementation of modern methods of logistics management (Razzaque, 1997), have also been cited as causes to logistics problems. In addition, low creditworthiness, poor access to long-term funds due to weak capital market, political instability, lack of coordination and absence of an allocation system prevent efficient transportation network (Olsson, 2004).

Various suggestions have been put forward by several researchers with regards to how the logistics shortcomings in developing countries could be mitigated or minimised. Razzaque (1997); Msimangira (1993); Islam, Dinwoodie and Roe (2005), recommended that, instead of viewing transportation infrastructure and port facilities development as the responsibility of the government, there is a need to recognise private sector participation. The government may plan a joint venture (Zubrod,

Tasiaux and Beebe, 1996; Smyrlis, 2005) or enter into partnership (McCalla, Slack and Comtois, 2004) with local enterprises and/or foreign institutions to invest heavily in new transport infrastructure as well as modifying the existing logistics system.

Furthermore, a closer relationship between chain partners with long-term commitment would help to mitigate some logistics challenges (Salin and Nayga, 2003). Example, transport price negotiations between partners and government may have positive impact on the availability of high quality infrastructure. Razzaque (1997) emphasised the importance of education and training to logisticians by the academicians and researchers who have to undertake studies to obtain knowledge in determining the gap between the existing and required transport system. He also suggested that, cooperation between nations could be useful by sharing their experiences and expertise which could be beneficial to policy makers and the whole process of developing transport network.

Since Ghana is in Africa where many developing countries are situated (Cilliers and Nagel, 1994), we believe that the challenges posed by transportation towards efficient logistics for perishables supply chain heighted above in different countries will be no different from what pertains in Ghana. In this light, we will try to investigate the major sources of transportation challenges and analyse how supply chain flexibility can be a mitigating factor to those challenges so as to achieve reliability. We will also provide necessary recommendations according to the literature review and findings from the field.

2.6 Theoretical Model

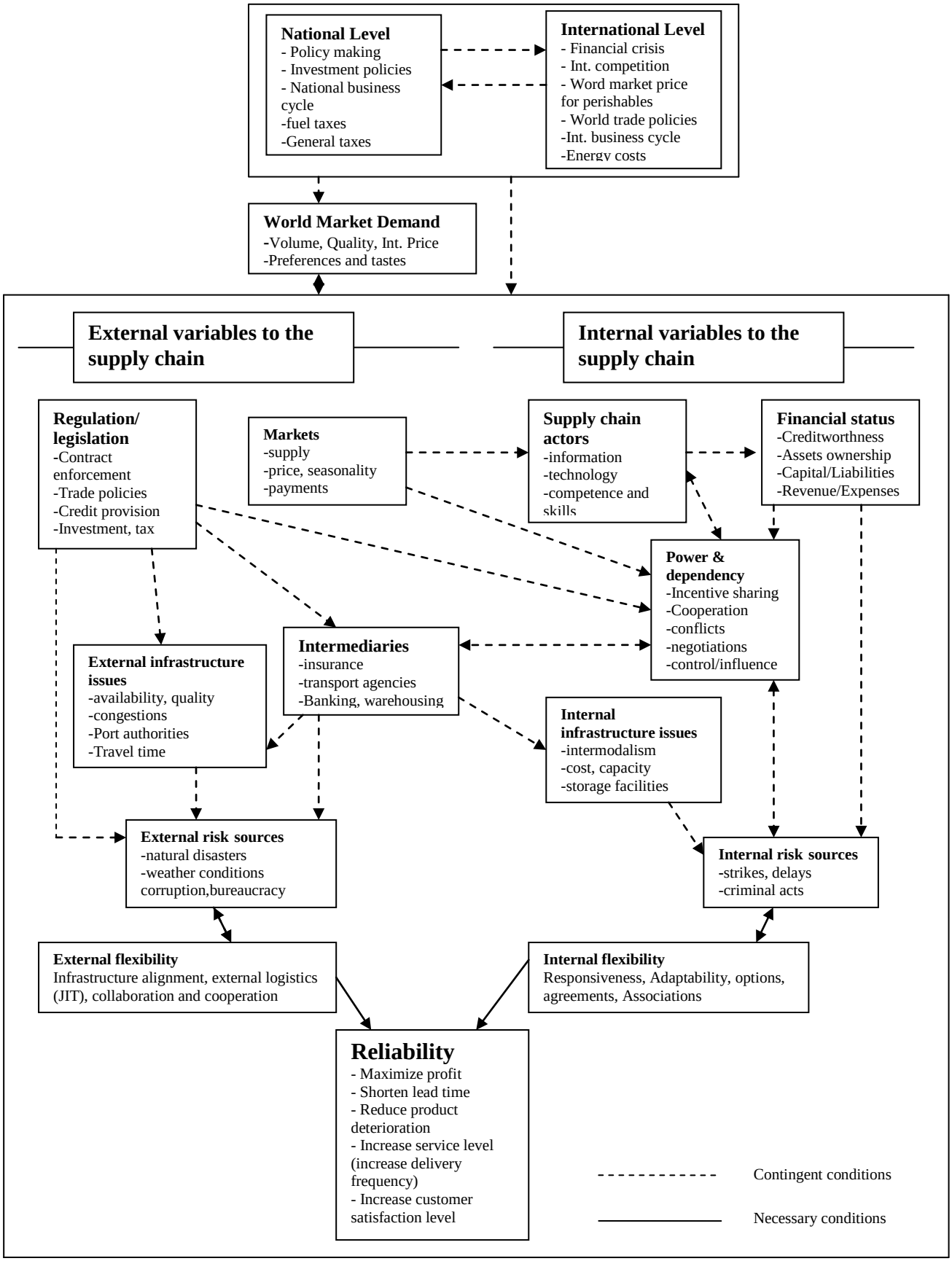


Figure 4: Flexibility in interacting factors leading to achievement of reliability in perishables supply chain

Credit: Adapted from Bråthen (2001)'s model on demand for transport infrastructure services.

From the literature review, the best strategy to understand the supply chain is to start with determining the nature of the product in question. Perishables are characterised by short product life cycle with fairly predictable demand and seasonal production. This critical condition for perishables calls for shorter lead time from the area of production to the area of consumption which may require more delivery responsiveness to prevent product deterioration. On the other hand, responsiveness requires that the supply chain is flexible enough to cope with dynamic trends and environmental changes.

Therefore, based on the above view, supply chain flexibility is the main focus of this study as the main determinant of reliability. This is due to the fact that the demand and supply for perishables can be affected by various uncertainties such as weather conditions, transport breakdowns, high prices of farming tools, rising fuel prices among others. In addition, transporting perishables from Ghana to the international market calls for global supply chain that may face longer lead times, which in turn may affect delivery performance of this supply chain as well as customer satisfaction. Therefore according to Manuj and Menzer (2008), flexibility must be a key component of this supply chain in order to achieve reliability. This is because it plays a facilitating role in the coordination process and provides a unique ability to help firms manage the high levels of environmental and operating uncertainty inherent in international operations.

Figure 4 shows critical factors that need to be considered for supply chain flexibility to be achieved. This will in turn act as a mitigating factor in reducing transportation challenges facing the global supply chain for perishables. There are two processes described in this theoretical model. First process marked by dotted/broken lines (contingent relation) describes how various variables interact and how they affect and influence each other. The second process involving the solid lines (necessary condition); illustrate the necessary interacting variables to achieve reliability in the perishables supply chain.

In the first process, there is an interaction of variables in the national and international levels. These are external factors to the market affecting the demand and supply. For

instance major trends in the international level, like the current financial crisis and recession can have impact at the national level in terms of low world market demand of products. This may in turn discourage local actors in participating in the international market. World market demand on the other hand, has the greatest influence on the variables within the entire supply chain. Similarly, these variables determine the ability and capability of the supply chain actor in responding to the market demand.

In this supply chain, government enacts regulations and legislations with regards to issues like tax and trade policies, contracts, credit policies and investment. These may tend to reduce or increase power or dependency of some actors and risks in the supply chain. The extent of the use of power by an actor may pose risks to some other actors of the supply chain. The source of risk can as well arise from the availability and quality of infrastructure, financial status of actors and activities of intermediaries among others. Infrastructure provision is influenced by government policies; however intermediaries, like pressure from transport operators, could also play an important role in its improvement. With respect to market, seasonality of produce could give more power to some actors in terms of negotiation powers whereas price fluctuations may pose risk to farmers.

These variables have been categorised into two groups namely; internal and external variables to the supply chain. Some of the variables such as supply chain risks and infrastructure contain elements of both categories. From this point of view, it is necessary to identify the elements that fall under internal category and those that are candidates of external category for such variables, as it has been shown in the model. This process is very important because each category of variables may have different flexibility elements and therefore may require unique attention or consideration towards attaining supply chain reliability.

In the model, internal variables have been identified to be power/dependence, supply chain actors, financial status, internal risk sources like strikes, and internal infrastructure issues such as storage facilities. These variables are categorised as internal because they are within the reach and control of the actors in this supply chain, in such a way that, supply chain actors are able to address them either

individually or in collaboration depending on the nature of the variable. For example, when there is labour strike in harvesting, farmers can plan for alternative labour arrangements.

The main external variable identified is regulations/legislation with a broad impact affecting both external and internal variables. External risk sources, external infrastructure issues, markets and intermediaries are the other variables under external category. These variables have been classified as such because they originate from sources that are outside the control of supply chain actors. To address them, supply chain actors need assistance from external sources. For instance, to address the road traffic conditions due to poor quality, the exporter can team up with the transport operators to put pressure on the government in infrastructure development.

In process two, to attain reliability, factors under each of the variables in the model should have a strong link to flexibility and risk. Proper risk management enhances flexibility and vice versa, hence the strong link as demonstrated in the model. This implies that logistical challenges associated with transporting perishables from Ghana to the international market will be greatly reduced if not completely eliminated. Expected result is reliability realised through increased delivery frequency, shorter lead time, increased customer satisfaction and maximised supply chain profitability among others.

We argue that, this model is positive since it tries to address causes and effects of the challenges that could face the logistic systems of perishables supply chain given its critical product nature and short life cycle. The model further assesses how flexibility will be a mitigating factor to the challenges and also how it will improve the overall performance of individual actors as well as the entire supply chain. We agree with most researchers that more work has to be done concerning supply chain flexibility; therefore with the aid of our findings from the field, we shall examine extensively flexibility issues within this perishables supply chain in subsequent chapters through a number of propositions under section 2.7.

2.7 PROPOSITIONS

Motivated by the research question, literature review and theoretical model, we therefore propose the following:

P1: The size of farmer or exporter determines the extent of flexibility present in the supply chain.

P2: The presence of flexibility in the supply chain is influenced by availability and quality of transportation infrastructure.

P3: Regulations have negative impacts on flexibility.

P4: There is a positive relation between supply chain risk and supply chain flexibility.

P5: Each level in the supply chain is exposed to unique or different types of supply chain risks.

P6: Differences in power structure have a positive influence on supply chain risks.

P7: Reduction of power-gap enhances flexibility.

P8: Possession of resources (information, education, and funds) has a positive association with power.

P9: Cooperation within each member group in the supply chain and/or between groups improves reliability.

3. RESEARCH METHODOLOGY

The focus of the study is based on sampling of four perishable export products considered to be among the highest performing in the non-traditional export sector in Ghana. The study employed the combination of both survey and single case-embedded design approach suggested by Yin (2003) carried out by means of interviews and questionnaires. He proposed three rationales for using a single case study approach. According to his suggestion, the major reason for using a single case design in our study is based on the fact that we are focusing on a unique case (Yin, 2003) of introducing flexibility into perishables chain in developing countries. The uniqueness of this study arises from the backdrop that a careful review of literature has not revealed that studies of this nature have been carried out. In addition, perishables have unique and extreme characteristics that require a different approach in their flow.

To be able to capture comprehensively these characteristics, it is necessary to employ an embedded case design, whereby attention is given to major subunits. Embedded units can be selected either through sampling or cluster techniques (Yin, 2003). We however selected the units through sampling of the actors we considered to be the most prominent in the supply chain. Our decision to use embedded is also because the subunits could clearly be identified (farmers, exporters and government agencies) whose activities were extensively examined. Using subunits enabled us to focus on the core issues of our study. To eliminate the short comings (deviation from the core study) associated with the embedded case study design, the supply chain a whole was assessed by considering other units (banks, transporting agencies, insurance) as well. Consideration of major subunits and all other units in this perishables supply chain gave us a broader picture and insights into the case study.

This research approach enabled us to get comprehensive qualitative information and some quantitative data, from targeted respondents who are our unit of analysis. The single case study approach also helped us focus on and understand contemporary events with regards to practical processes of single supply chain flexibility for short life cycle products.

3.1 Data collection

In order to be able to have access to a wide range of information, data collection involved both primary and secondary sources as enumerated below.

3.1.1 Secondary data

Secondary data include previous studies and documented sources. These consist mainly of scholarly journals, thesis, books, documents and reports from World Bank, Ministry of Food and Agriculture (MOFA) in Ghana, United Nations, National Bureau of Statistics, CIA Fact book, newspapers and other website sources.

3.1.2 Primary data

Primary sources include information collected from the field through direct observation by visiting the sites, administering of questionnaires and interview guides to the actors namely Ghana Export Promotion Council, exporters and farmers. Samples are attached as appendices at the end of this document.

3.1.2.1 Ghana Export Promotion Council (GEPC)

The study considered the GEPC due to the fact that it is the main government agency which links the government and the other actors in the perishables supply chain. We wanted to find out the extent of its involvement in exporting activities with perishables. With the help of an interview guide there was a detailed interview with the Research Director of the Council.

3.1.2.2 Exporters

The study considered only firms located in Accra, the capital of Ghana where the international ports are located. The decision to limit the study to firms located in Accra is due to time constraint and also to limit the logistical problems we foresaw to be associated with a nation-wide survey. In addition almost all of the firms engaging in perishables exporting activities are located in Accra. For these same reasons, we limited our study to only four non-traditional exporters: pineapples, yams, bananas and mangoes.

The population considered here comprised of firms listed in the Federation of Association of Ghanaian Exporters' (FAGE) Directory classified to be active

exporters of non-traditional export commodities. Churchill and Lacobucci (2002) however, pointed out that there are limitations in the form of inflexibility, incompleteness and out-of-datedness associated with the use of directories. To avoid or minimize these problems, we verified and edited the list from the Ghana Export Promotion Council.

For this group, we used questionnaire which consisted of both structured and unstructured. The structured parts presented respondents with sets of fixed choices from which they were just required to tick which ones were applicable to them. The unstructured parts with open-ended questions sought to encourage respondents to share as much information as possible.

Questionnaires were administered to ten firms considered to be very active in any of our products of interest. However responses were received from only seven companies after several telephone calls and personal visits as follow-ups. Two of these companies were kind enough to grant interviews instead which enabled us to obtain more information beyond the content of the questionnaires. One of them even invited us to the port to have a first hand knowledge of their port activities (plugging points at the port for their refer containers). Three companies contacted refused to participate in the study, with the reason that they were either not interested in the study or the officer responsible for that area was not available.

3.1.2.3 Farmers

Having identified the regions of production, an initial visit was made to the farms. This took several days because the farms are located in three regions. In each region, farms are scattered, some with very long distances between them. The good thing was that once we were able to locate one farmer, he led us to another, this chain continued until we were able to locate quiet a sizeable number. Since each of them had different personal schedules, it was difficult arranging for a fixed date for interview, but they were understanding and agreed on fixed dates.

With the aid of interview guides, group interviews were conducted in the local languages to three different groups of perishables farmers (pineapples, banana and mango) on their farms or an agreed location. Each interview group consisted of between six to twelve farmers. The different kinds of perishables were located in

different regions/parts of the country; hence different languages were used in the interview. There were instances where we had to use interpreters since we did not understand the local languages spoken in some of the farming communities.

There was also a visit and a one-on-one interview with the largest banana farm in the country. This farm has about 1200 employees with subsidiaries in other parts of Africa such as Ivory Coast and Cameroun. Unlike the other small farms, the volume of export of this farm gives them the edge/competitive advantage to do the exporting themselves. We spent the whole day on the farm observing their activities from harvesting, transporting to washing sheds, sorting/selection, packaging, labelling and loading onto refrigerated trucks. With permission from the farm manager, we could talk to and interact with supervisors and workers in each of their departments which gave us in-depth understanding of their operations.

3.2 Direct observation

Besides information from the secondary and primary sources, a lot was also learnt through direct observations. Visits to the farms gave insights on issues like road conditions, sizes of the farms, distances from the farms, the extent and differences in operations of small scale and large scale farmers, workforce and loading sheds.

Visits to the offices of exporting firms revealed that over 90% of them are located near the ports of export, creating a cluster of exporters especially near the airport.

Visits to the ports gave a first hand knowledge on issues with regards to congestions, distance to the ports and availability and conditions of storage facilities.

3.3 Limitations

We designed our questionnaires based on extensive review of issues raised in the literature of our study and issues we perceived to be important. We did not have any prior interviews or discussions with any of the actors in the three different categories due to time limitation and distance problems. Hence there was no pre-testing of our questionnaires to ensure that issues of concern are addressed extensively. Ability of this would have ensured clarity and validity of the questions raised, as suggested by Ndubisi, Jantan, Hing and Ayub (2005).

It was not possible for us to employ telephone interviews and e-mail surveys due to business culture prevailing in Africa. This is because respondents perceive this to mean that the researcher is either not serious or disrespectful. In addition, most businesses do not have the culture of reading e-mails on daily basis. The few who read will even ignore or delete such a request or survey.

Almost all the companies that responded complained about the length of the questionnaires. Some also stated that, the questionnaires solicited too much information than they were willing to reveal. This resulted in some of the questions being left with no responses.

One interesting discovery is that most of these exporters did not state the percentage share in value of their export, to them that was an internal business issue that they were not comfortable sharing with an outsider.

4. THE STRUCTURE AND MAPPING OF PERISHABLES SUPPLY CHAIN

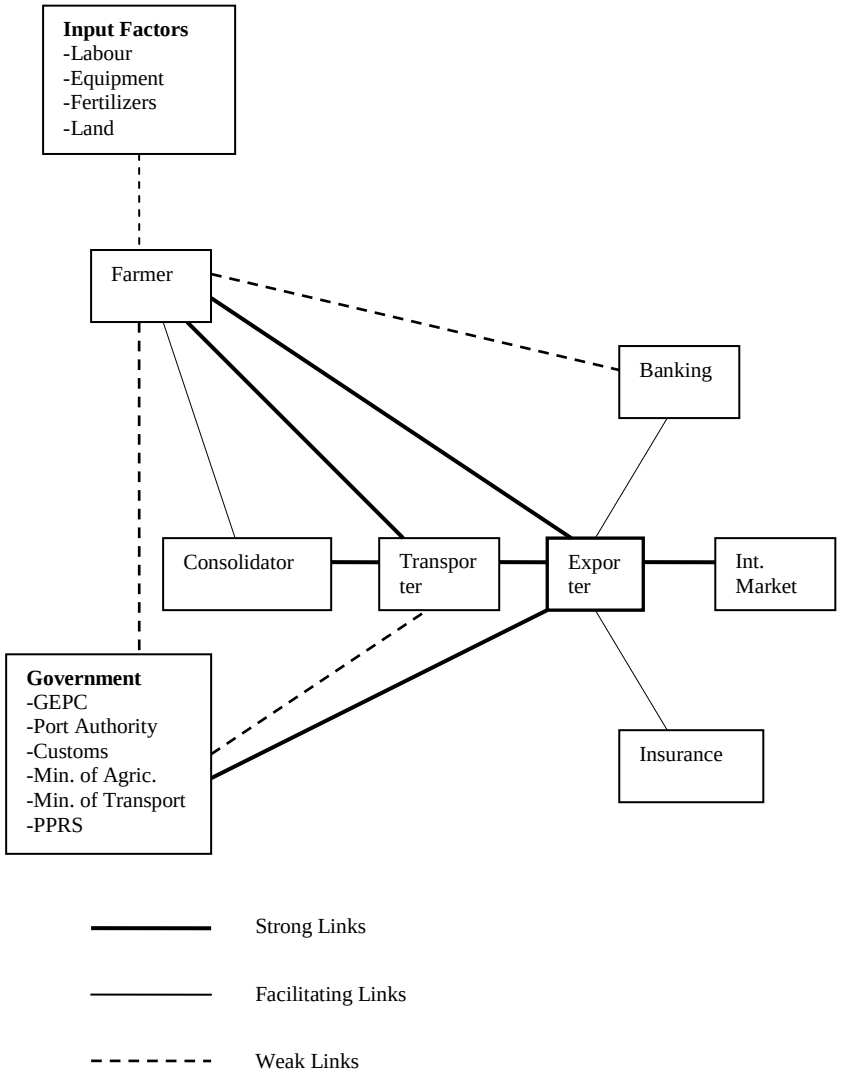


Figure 5: Hypothetical structure of perishables supply chain

Based on the literature review and findings from the field, we conceptualise the structure of perishables supply chain to be as captured in figure 5 above. In this structure, we consider the exporter to be the focal firm (refer to 4.2).

The strong links show high interacting degree between supply chain actors. This interaction could be portrayed by collaboration or vertical integration. These are crucial links that demand active involvement of actors at such nodes. For instance, the strong link between exporter and government indicate the need for frequent

interactions to create favourable conditions for the smooth flow of goods. This is done through collaboration with various government agencies like GEPC, Ministry of Agriculture, Ministry of Transport, Customs, PPRS and Port Authorities.

The facilitating links signify low degree of interaction between supply chain actors. These are links that enhance performance of the supply chain. Since these links only play a supporting role, their absence will not hinder the existence of perishable flow.

The weak links depict very minimal or no interaction between supply chain actors, as in the case between farmer and banks.

4.1 Farmers' position and function

In the perishables supply chain, farmers are the main suppliers of export products. The main perishables produced by the farmers are yams, pineapples, mangoes, and banana. With the exception of mangoes; yam, banana and pineapple can be produced and supplied throughout the year, with each of them having different peak seasons (see table 6).

Farmers are classified into three different categories namely small, medium and large scale farmers. These categories have an influence on the responsibilities undertaken by the farmer in this supply chain. Generally farmers are not responsible for the physical movement of the product from the farms, except in certain conditions discussed under section 1.3.

A large scale farmer who is financially sound to perform exporting activities, will usually integrate farming and exporting and therefore use the information from international market in his daily farming operations. Thus, small and medium scale farmers need to collaborate with commercial exporters so as to get that information.

Large scale banana farms produce 50,000 tons per season on the average; however there is no data on the volume produced by small and medium scale farmers. A small scale mango farmer however produces 220-250 tons per season.

4.2 Exporters' position and function

In this supply chain of perishables, exporters play the role of serving as the major link between the farmers in Ghana and the customer in the international market. The exporter represents a large number of small and medium scale farmers who due to the low literacy level depend on the exporter for goods movement and necessary information, concerning the international market like quality, preferences and price among others. The end-user at the international market also needs a representative (usually the exporter) at the country of production so as to ensure the smooth flow of the produce.

Exporters are as well classified in to small, medium and large scale categories. These classifications together with the use of consolidator usually define the responsibilities of the exporter. Large scale exporters, who transport large volume of cargo to international market (example firm 2 in table 5), most often collaborate with the consolidators for services such as consolidating of produce, packaging, labelling and storage. This enables the exporters to concentrate on customs and documentation as well as international transport arrangement. Transport arrangements are made by the exporter because they assume ownership of the cargo at the farm. Secondly, they know their financial status and the kind of transport service they can afford. They normally enter into long term contract with one or two transporting operators for transport arrangements from the farm to the port in the inland phase. Small and medium scale operators usually perform consolidating activities either at the farm or at their sheds. This could be so due to the fact that the volume that they transport is small to medium compared to the large exporter. They use short term or spot contracting with transporting company for transport arrangements to move produce from the farms/sheds to the port.

Table 5: Summary of exporting activities

	Firm 1	**Firm 2**	**Firm 3**	**Firm 4**	**Firm 5**	**Firm 6**	**Firm 7**
Product(s)	Pineapple	Pineapple Banana	Mango	Yam	Pineapple Banana	Yam	Banana
Int. Destination(s)	Netherlands USA	Germany, Belgium, USA	UK, Holland, Libya	UK, Holland	USA, UK, Holland, Germany	UK, Germany	Belgium, UK, Italy
Transport mode (Inland Phase)	Truck	Truck	Truck	Truck	Truck	Truck	Truck
Transport mode (International Phase)	Sea	- Sea - Air	- Sea - Air	Sea	- Sea - Air	Sea	- Sea - Air
Export Frequency	3 times a week	Daily	Twice a week	Twice a week	Twice a week	Once a week	3 times a week
Volume per season	N/A	960 tons (bananas) 320 tons (pineapples)	210 tons	N/A	200 tons (bananas) 300 tons (pineapples)	N/A	600 tons
Insurance	No	Yes	No	No	Yes	Yes	Yes
Access to bank loan	Yes	Yes	Yes	No	Yes	Yes	Yes

The interpretations above support the following proposition:

P1: The size of farmer or exporter determines the extent of flexibility present in the supply chain.

4.3 Government's position and function

The GEPC which is a government body, only deals directly with exporters, either individual exporters or associations, as well as exporters of other products. It acts as a link between the exporters and the central government, by intervening on issues to give satisfaction to both parties. For instance, they oppose government policies which they think will have severe negative impact on exporters and vice versa. An example is with regards to access to funds. Not until late 1990s there was no funding from the government to non-traditional exporters because the government felt that this sector was not as important as the traditional sector such as cocoa and timber (Buatsi, 2002). Currently the non-traditional exporters can access fund from the government as a result of GEPC's successful discussions with Ministry of Agriculture to motivate these exporters.

There are periodic meetings and consultations, through which the GEPC informs and discusses with exporters about new and amended government policies. The policies could either have favourable or unfavourable impacts on exporters. Exporters on the other hand, channel their grievances, complaints and requests to the government through the GEPC. Through GEPC's initiative, an Exporters' Forum is held twice a year to discuss their problems. At such fora, the GEPC invites other parties involved (eg customs, port authorities) to attend and to answer questions and concerns of exporters. GEPC in collaboration with the other actors then develop programs and projects to solve the problems highlighted at the fora.

Furthermore, government offers training programs to farmers whereby extension officers visit the farms to educate farmers on modern farming methods and the proper application of weedicides and pesticides. The government controls the chemicals used in farming activities through the Environmental Protection Agency. This is done through unannounced visits to the farms to inspect what and how chemicals are applied.

4.4 Intermediaries' position and function

- **Transporting agencies.**

Most exporters do not have their own trucks and vans to cart the produce from the farms to the ports so they engage the services of private transport operators**.** The arrangement varies from spot hiring to long term contracting. The exporter assumes ownership of goods on the farm. However, the transport company is responsible for the goods in the process of transporting from the farm to the port.

There is no cooperation between small and medium scale farmers with transporters. This is due to the fact that usually these farmers do not make transport arrangements. However large scale farmers who undertake exporting activities themselves have vertical integration for transport activities.

- **Insurance companies**

Only about 57% of the respondents (exporters) are insured against risks. The insurance covers marine, accidents and theft. Insurance companies do not insure the farm's produce because they perceive it to be very risky. They are only willing to insure the farming equipment and other assets of the farmers but not the farm or produce.

- **Banking system**

Banks are involved in advancing personal loans to farmers and exporters, but most farmers do not have access to bank loans because the banks do not accept the farms to be enough collateral security. Only few have access to loans by using their personal properties, such as houses or land. The same applies to the exporters.

- **Ports**

There no any break-points in the inland phase of transportation. Therefore ports (Tema port and Kotoka International Airport) are major and only break-points in this supply chain. At the port the cargo is placed in the storage facility before it is inspected and shipped to the international destination. Since the ports' operations and management are provided by the government, we have considered port authorities as actors under the government instead of intermediaries as shown in figure 5.

5. ANALYSIS AND DISCUSSION OF THE FINDINGS

5.1 Internal flexibility

This will be looked at in relation to actions and reactions of individual actors within the supply chain.

5.1.1 Product flexibility

One of the most important elements of flexibility is the ability to adjust to speed. From table 6, we notice that most of the products are cultivated in regions which are not too far from the ports. This implies that product deterioration can be greatly reduced because it takes only one hour when the road is good and three hours under poor road/traffic conditions. So that even though there are no cooling facilities on the trucks, product qualities are not greatly affected. Also flexibility is enhanced by the fairly long post-harvest shelf life of products in such that products can get to the international market in good condition. This condition is further prolonged when products are stored and transported under the right temperature conditions. It is also worth mentioning that yam has a wider margin of flexibility than the other products under consideration. This is because yam can be stored in various traditional ways without a refrigerated system. These include keeping the yam in barns or underground structures, putting the yams in ashes and covered with soil with or without grass mulch. Also unlike bananas, pineapples or mangoes which have to be harvested once they are matured, yams tubers can be kept in the ground until there is demand for them without deteriorating. In the light of this, yam has wider degree of freedom under uncertainty such that, delays in pick-ups and lack of storage facilities at the farm may not affect it as it does to the other products under consideration.

Table 6: Flexibility elements characterising the produce

Produce	Region cultivated	Distance from the farm to the port (hrs)	Distance from the port to Int. Market (days=24hours)	Mode of Transport		Appr. Product post-harvest shelf life	Nature of the demand in int. Market	Number of production season per year
				Inland phase	Int. phase			
Pineapple	Central and Eastern	1 -3 hrs	Sea: 9-12 days Air: 1day	Road	Sea/air	1-3 weeks	Predictable, growing	Year-round, peak season (April-August)
Banana	Central and Eastern	1 – 3 hrs	Sea: 9-12 days Air: 1day	Road	Sea/air	10-18 days	Predictable, growing	Year-round, peak season (Jan-June)
Mango	Central and Eastern	1-3 hrs	Sea: 9-12 days Air: 1day	Road	Sea/air	10-14 days	Predictable, growing	2 peak seasons (June season and December season)
Yams	Northern	12-24 hrs	Sea: 9-12 days Air: 1day	Road	Sea	1-7 months	Predictable, growing	Year-round with varying peak seasons

NB: Under the appropriate cooling temperatures the post-harvest shelf life of the product goes beyond what is depicted in the table.

5.1.2 Supply flexibility

The whole process of producing or cultivating perishables is characterised by seasons as shown in table 6. During the peak seasons farmers can supply any volume demanded, and for that reason can adjust quickly to the amount demanded by the exporter. Exporter's order to the farmer is induced by the demand from the international market. However during the lean season, supply flexibility is reduced as farmers are unable to meet large volumes demanded individually. To cope with this situation they consolidate cargo among each other so as to satisfy exporters' order. This goes for pineapples and bananas. The story is however different for mangoes because there are only two seasons of production after which there is no supply of the produce even though there may be demand throughout the year. Another inflexibility aspect of the supply of mangoes is that exporters place order during the flowering stage which means that the exporter can not adjust his previous order irrespective of the demand from the international market. There is high supply flexibility for yams because the product is available and produced all-year-round to satisfy any exporter's order.

5.1.3 Flexibility in demand for storage facilities

There are no storage facilities on or near by the farms. This is because farmers feel that the distance from the farms to the ports is not far and also most of them are faced with financial constraint to own these facilities. Flexibility element is introduced when in coping with the situation farmers resort to harvesting only on pick-up days, thus using JIT techniques. We therefore believe that having a storage facility on or near by the farms may not be as crucial as at the ports; in the sense that when there are pick-up delays on the farms, farmers can easily sell products to the local market. On the other hand, when there are delays or cancellation of ship/plane arrival it results in extra costs for the exporter to bring the product back to the local market, this situation consequently reduces his contribution margin. The flexibility regarding this situation at the port has been enhanced through the port authority's initiatives to rent out storage facilities to SPEG and other Exporters' Associations. In addition, GEPC, which is a government body, liaises with some organisations and port authorities to put up extra cold storage facilities at the ports.

5.1.4 Flexibility at the ports

The supply chain is faced with congestion at the ports, especially with regards to loading activities and documentation procedures mainly due to the activities of Plan Protection and Regulations Services (PPRS). This is a body which has the authority to thoroughly inspect all consignments going out of the country to prevent exportation of drugs and also control goods' quality. However this situation is being managed through introduction of the GCNet which hastens scanning of consignment thus minimizing delays. In addition, elements of flexibility can be realized through GEPC's negotiations with PPRS to give priority to perishables in documentation processing. Furthermore, during periods of severe congestion, port authorities open an emergency gate for only perishables to enable smooth loading.

5.2 External flexibility

This part looks on what is happening beyond the individual supply chain actor's environment.

5.2.1 Transportation infrastructure flexibility

The provision of transport infrastructure (roads, air ports and seaports) has remained the sole responsibility of government thereby exposing the supply chain to limited number of transport modes (table 7). This situation has resulted in a restriction on the number of modes available. Over reliance on road implies that there is no chance of intermodility hence severe inflexibility with respects to choice of mode. However, the deregulation of operations, management and pricing tends to introduce some flexibility elements with respect to availability of trucks. Thus exporters have a wider choice of truck operators from which they are free to decide which operator to engage using criteria given in table 7. This enables the exporter to focus on their core exporting activities.

At the international phase, there is high flexibility in mode choice since the exporter has the freedom to decide whether to use air or sea or both depending on demand conditions and criteria in table 7.

Road conditions may pose inflexibility in terms of traffic congestions, inaccessibility and accidents. However, the GEPC collaborates with the Ministry of Roads and Transport to construct feeder roads into areas where perishables are cultivated. Over

the last four years through cooperation with the Ministry of Agriculture under the Agricultural Diversification Projects it has been able to construct some feeder roads. Examples are the Aburi and Nsawam roads from the Eastern Region and some parts of the Central Region leading into Accra where the ports are located. The criteria for the selection of these areas are short distances to the ports, the volume of the produce from the region, concentration of the farming activities, and the type of produce. In addition, part of the Millennium Challenge Account (MCA), a funding from the USA government to develop the Agriculture sector is used to improve roads from the farms to ports of exports. Through this funding, a dual carriage is being constructed from the Mallam Junction through the Tetteh-Quarshie interchange linking both the air and the sea ports.

More flexibility has been introduced by government giving exception to trucks carrying perishables to travel after 6pm. The aim of this policy exception is to facilitate the smooth flow of perishables so as to reduce product deterioration.

Demand for storage facilities at the international phase of the transportation is necessary to maintain the quality demanded by the international consumer. Even through it takes several days (sea) and hours (air), to reach the international destinations, the presence of cooling systems (refer to tables 6 and 7) on the modes makes it possible to prolong post-harvest shelf life for the products. Thus the presences of such cooling systems present a form of flexibility in the supply chain.

The above reasoning supports the following propositions:

P2: The presence of flexibility in the supply chain is influenced by availability and quality of transportation infrastructure.

P3: Regulations have negative impacts on flexibility.

Table 7: Transportation modes

	Mode of Transport available	% Usage (based on response)	Reasons of using by ranking			Reason(s) of not using	Distance travelled (hours or days)	Cooling system presence
			1	2	3			
Inland phase	Railway	0 %	-	-	-	Limited coverage	-	No
	Road	100 %	Reliable	Easy access	Affordable cost	-	1-3 hours	About 30 %
	Air	0 %	-	-	-	Limited coverage	-	No
	Waterway	0 %	-	-	-	Limited coverage	-	No
Int. phase	Sea	70 %	Low cost	High capacity	Preferred by international market	-Slow	9-12 days	Yes
	Air	30 %	Low risk to damage	Fast	Reliable	- High cost - Low capacity - Discouraged by the international market due to environmental reasons	12- 16 hours	Yes

5.2.2 Capacity flexibility

There are times when the exporter's order to the farmer can not be fulfilled by the local supply. This may tend to induce inflexibility in adjusting to the capacity required by the end customer. However, large scale farmers can adjust to this situation by top-up from other subsidiaries in other countries.

On some occasions flexibility is compromised when expected space capacity of an exporter on the ship is reduced upon the arrival because it has loaded cargo from neighbouring countries it has been to. The low volume of cargo at the Ghana port does not make it attractive for shipping lines to call at the port. This results in high freight costs being charged by the few that call which is not proportional to the distance travelled. In the case of air, the capacity is dependent on the weight of produce and residual space of the size of the passenger traffic. Even though yams tend to be heavier than other produce under consideration it enjoys a fairly high degree of capacity flexibility. This is because, unlike the other product whose weight can not be reduced, yam's weight can be reduced by 10-12% in the first 3 months and 30-60% after 6 months through traditional ways of storage (Opara, 1999).

5.2.3 Quality flexibility

Exporters share information about quality demanded by international market with farmers each time changes occur in the market. This information could be the amount and type of pesticides to be used, what stage of life cycle should the pesticides and weedicides be applied and the proper time for product harvesting among others. This information helps the farmers to adjust to suite the quality demanded by the end-user at the international market. For instance, when the market shifted their preference from Cayenne to MD2 pineapples, exporters immediately shared this information with farmers.

Based on the above discussion, we can say that there is presence of flexibility to some extent with regards to the internal and external elements, which have positive influence on the performance of this supply chain.

5.3 Internal supply chain risks

This part discusses supply chain risks that originate as a result of action(s) or inaction(s) of chain members. These risks can be controlled by the actors either individually or through collaboration.

Table 8: Main risks the perishables supply chain has been exposed in the past five years reported by GEPC

Ranking	Nature of risk	Government action(s)
1	Delays in ship/plane arrival	Government has no control
2	Power curtailments	Rationing
3	Damages	Left to the exporters' management
4	Accidents	-Education and training programmes -reserving night driving to only perishables trucks
5	Storms	Visited the farms affected, liaised with Min. of Agric. to come up with policies

Table 9: Main risks reported by exporters and their corresponding mitigating strategies

Inland phase - Current risks			
Ranking	**Nature of risk**	**Management strategy**	**No. of Respondents**
1	High fuel prices	Subsidization of fuel price by the Government	All respondents
2	Financial obstacles	Government loan schemes	60% of the respondents
3	Poor transport infrastructure	Construction of more roads and upgrading existing ones	40% of the respondents

4	Capacity problems	No response	20 % of the respondents
5	Weather conditions	No response	5 % of the respondents
Inland phase - Past-exposed risks			
1	Delays in transport arrangements	Alternative transport arrangements	80 % of the respondents
2	Labour strikes	Hire temporary workers on daily basis	60 % of the respondents
3	Power curtailments	Buy generators	40 % of the respondents
4	Accidents	No response	20 % of the respondents
International phase - Current risks			
1	Bureaucratic documentation processes	Ghana Standard Board staff should be proactive	80 % of the respondents
2	Delays in ship/plane arrival	Beyond their control	60 % of the respondents
3	Capacity problems	Beyond their control	40 % of the respondents
4	Power curtailments	Buy generator	40 % of the respondents
International phase-Past-exposed risks			
1	High fuel price	No response	60 % of the respondents
2	Financial crisis	No response	60 % of the respondents

3	Weather effects and seasonality of produce	No response	40 % of the respondents
4.	New entrants into the market	No response	5 % of the respondents

Table 10: Main risks reported by farmers and their corresponding mitigating strategies

Ranking	Nature of risk	Management strategy	No. of Respondents
1	Unpredictable rainfall pattern	Personal loans	All respondents
2	Financial obstacles	Personal loans from banks	80 % of the respondents
3	Lack of modern farming technology	No response	50 % of the respondents
4	Product deterioration due to delays in pick-ups. The consequence of this is that the products absorb heat which reduces the product shelf life by 3 days when there are delays in pick-ups.	Sale to local market	20 % of the respondents
5	Fire	Fire education	10 % of the respondents

5.3.1 Power curtailments

In the past recent years, Ghana has had to resort to the rationing of power as a result of the low water level in the Akosombo dam during the dry season each year. Such power curtailments tend to have grave impact on businesses that depend on power in their day-to-day operations as in the case of perishables. For perishables the main challenge posed by power curtailments is with respect to the availability of continuous supply of power for the storage facilities at the ports as they depend mainly on electricity to keep products at the appropriate temperatures. The absence of this has effect on produce quality by reducing the post-harvest shelf life. To manage this risk exporters resort to the use of generators

and consequently incurring extra cost of buying fuel to run them. It is our view that since power curtailment is under the domain of government it should contribute in managing such risks. This could be done either by subsidizing fuel or by exempting businesses whose operations are contingent to continuous supply of power from curtailments. This is particularly crucial if government is determined in its pursuit of making non-traditional exports an alternative to cocoa.

5.3.2 Financial obstacles

Both farmers and exporters are not financially sound enough to expand their operations. This is as a result of inaccessibility and unavailability of funding schemes and loans. In the case of farmers, even when these schemes are available they are not aware as they have very little dealings with government agencies. Moreover, there are a lot of conditions which farmers have to fulfil to access bank loans (refer to section 4.4). In the case of exporters even though there is no direct funding from government, there is however an Export Development Fund which they can access. Nevertheless this is only possible through recommendations by the GEPC after fulfilment of some conditions. Some of these conditions are that the exporter should be able to present proposal in a convincing manner, a proof of exporting such as certificate of business and satisfactory quality of facilities owned. The government also provides them with export tax rebate whereby they pay 8% instead of 25% of export tax as another strategy to manage this risk. The only way farmers can improve their financial status is by organizing themselves into groups. Through these groups they will be able to present their loan proposals to banks and government bodies. This will make it possible for them to get bank loans and also government can reach and educate them on fund accessibility and management processes easily when they are in groups than individually.

5.3.3 Damages and Accidents

Damages and accidents are risks which the supply chain is exposed to on everyday bases. This may be due to poor road conditions, poorly maintained trucks, insufficient driving training and overloading. There are regulations regarding each of the mentioned situations, and we believe that strict enforcement of these regulations will help manage these risks.

5.3.4 Capacity problems

Exporters are uncertain of the capacity space they will get during ship or plane arrival as discussed under 5.2.2. In addition, during the peak seasons the size of the trucks may limit the volume that the exporter is willing to transport to the port from the farm. The exporter may manage this risk by entering into spot (sometimes short-term) contracting with another company apart from the long term contract already in place. The problem with the spot contracting is that, it is very expensive during peak seasons. The exporter can also opt to satisfy the peak demand for transport by relying on second hand trucks to avoid incurring excessive costs. This however leads to unreliability problems as they encounter a lot of breakdowns during transportation process.

5.3.5 Bureaucratic documentation procedures

Bureaucracy in documentation and custom procedures is a big source of risk. Due to the time critical nature of perishables, exporters in their attempt to hasten the clearance process try to bride officials handling documentation. To minimize this risk, government has taken initiative of organising periodic trainings to officials responsible for perishables documentations.

5.3.6 Delays in pick-ups

Normally there are fixed pick-up days but the exporter can deviate from this with unknown frequency. During the peak seasons, pick-ups are done at least twice a week, with once a week during the lean seasons. For the large scale farms, pick-up is daily. The season determines pick-up frequency, volume, and cost but does not affect the transport mode. When there are delays or failures in pick-ups, farmers experience lost sales due to quality deterioration with no compensation. They manage this risk by selling to the local market at reduced prices.

5.3.7 Labour strikes

Usually exporters assume ownership of the cargo at the farm during harvesting. The exporter who performs consolidating activities at the farm before the cargo is transported to the port will usually make arrangements for labour to work at the farm. There are periods when workers may strike for various reasons including low wages or poor working conditions. In situations like these the exporter may make alternative labour arrangements. Usually, this contingency plan comes with extra cost to the exporter.

5.4 External supply chain risks

This part discusses various supply chain risks that originate beyond the boundaries of perishable supply chain (as presented in table 8, 9, and 10). These risks can not be controlled or avoided by supply chain actors; they can only adjust to these risks or put in place contingency plans.

5.4.1 Delays in ship/plane

Delay in ship/plane arrival is a common risk experienced in this supply chain. The consequences of this are reflected into severe congestions at the ports. These congestions may harm the quality of the produce and service level by increasing the lead time it takes from the port to the international market. To manage this risk, it is important that there are adequate storage facilities at the port to preserve product quality.

5.4.2 Weather conditions

These are natural occurrences which are difficult to predict and/or control. These could come in terms of storms, unpredictable rainfall pattern (too little or too much rain) and fire. The only precautionary measures farmers can take will have to be with regards to planting and harvesting time. Furthermore, group loans from the banks as well as insurance may be possible management strategies to cover risks incurred from these disasters. The government could also intensify fire education programs.

5.4.3 High fuel price

High fuel price tend to raise the transporting cost that the exporter has to incur in both the inland and international phase. The high transport cost in turn reduces the exporter's profit margin. In an attempt to protect his profit margin, the exporter may pass this burden to the farmer by paying low price. Additionally, the exporter may opt to transport large volume of cargo using few trucks to reap the full benefit of economies of scale. Another alternative is for government to help manage this risk by subsidising fuel price.

5.4.4 Global financial crisis

Global financial crisis may have an impact on the international consumer demand as reviewed with the aid of figures 1and 2 in sections 1.1.1. In effect global financial crisis will tend to reduce peoples' income and therefore reduce or limit their consumption level. One management strategy the exporter may use regarding this situation is to be proactive

in responding to any changes in international market demand and supply the market accordingly.

The above examination supports the following proposition:

P4: There is a positive relation between supply chain risk and supply chain flexibility.

On the other hand, the analysis partially supports the next proposition:

P5: Each level in the supply chain is exposed to unique or different types of supply chain risks.

The investigations revealed that, there are some risks which are not only experienced on individual level basis but common to more than one level irrespective of the position in the supply chain. For instance financial obstacles, delays in pick-ups and weather conditions affect the farmer, transporter and exporter.

It is our view that if the risks under discussion are properly managed or adequate contingency plans are put in place, supply chain flexibility will be greatly enhanced.

5.5 Power and dependency

Table 11: Sources of power and dependency in perishables supply chain

Actor	Source(s) of power	Power over which actor	Sources(s) of dependence	Reliance on which actor
Exporter	Information/ resource	Farmer	Peak seasons	Transporter
	Formal education and associations	Farmer, Port authorities		
	Access to funding	Farmer		
	Peak seasons	Farmer		
	Incentive structure	Farmer		
Farmer	Lean season	Exporter	Feeder roads conditions	Government
			Lack of cooperation	Exporter
	Large scale farming operations	Exporter, Transporters	Less access to information	Exporter
			Low financial status	Government, Banks
			Price structure	Exporter
Transporter	Peak and rainy seasons	Exporter	Travel time and tonnage regulations	Government
	Poor feeder roads	Farmer		
Government	Policy formulation and enforcement	Farmer, Exporter, Transporter		

5.5.1 Exporters' power

5.5.1.1 Information/resource

Unlike farmers, exporters by dealing directly with government agencies (GEPC), transport operators and the international market possess more information about various variables in the supply chain. These variables could be prices, quality, volume and preferences demanded by the international consumer. The information asymmetry then becomes a

powerful tool to which they use to their advantage by exploiting the farmer, especially during price fixing for the product. This tends to confirm Berthon et al's (2003) argument about how possession of a resource (information in this case) in a relationship can be a source of power.

5.5.1.2 Formal education and associations

Most of the exporters have formal education and are able to organise into associations or groups, which helps them to reap full benefits of collaborations. SPEG is a good example which advances issues regarding exporters' interests. Through such associations, members obtain power to secure storage facilities at the port and discusses with port authorities to provide emergency check-points in times of congestions. Moreover associations gain more power with regards to negotiation for space reservation on ships and fleet charges. The associations are also able to press their grievances to be addressed by the government and other stakeholders.

5.5.1.3 Access to funding

Generally exporters tend to be financially strong because they have the chances of accessing government funding schemes through commercial banks with conditions discussed under section 5.3.2. An example of such schemes is pre and post shipment credits for non-traditional exporters. Such financial strengths give the exporter the power to dictate important activities in the supply chain, especially with regards to product prices paid to farmers and the choice of transport operator (inland phase) and mode (international phase), as well as the choice of a consolidator.

5.5.1.4 Seasonality

The negotiation power of the exporter in pricing the produce is dependent on the seasonality of the produce. During peak seasons of pineapples and bananas, exporter has more power to fix lower price than during lean seasons. Since yams are supplied throughout the year, its price fixing by the exporter is more-or-less the same. For mango which is characterised by only two seasons, exporter has less negotiation power during peak seasons because payments are made during flowering seasons.

5.5.1.5 Incentive structure

Usually exporters are responsible for purchasing the produce from the farm. In the course of this, the exporter would prefer unwritten, spot buying contracts because they are not binding and consequently increase uncertainty risks on the dependent actor and opportunistic behaviour on the part of the powerful actor. Through these contracts the exporter can vary the terms at each dealing to his advantage. For instance, an exporter can reach a verbal agreement with the farmer to supply him 5 tonnes of produce for 2 months. Together with this situation, the exporter pays the farmer for the produce after products have been sold to the international market. This phenomenon reflects unequal incentive sharing between exporter and the farmer in such a way that the exporter passes on more risks than rewards to the farmer to advance his own profit. The source of this power is due to the fact that the exporter is aware that he pays more for produce than prices on the local market. This assertion is in line with Kumar, Scheer and Steenkamp's (1995) disclosure that, in a relationship where there is interdependence asymmetry as in the case of exporter-farmer, the most independent partner dominates the exchange.

5.5.2 Farmers' power

Generally farmers are the actors in this supply chain who have the least power, hence their high dependence on other actors. Numerous reasons can be cited for this situation. There are however instances where the farmer possess power enough for him to dictate the pace of activities.

5.5.2.1 Feeder roads conditions

When it comes to matters regarding infrastructure like improving the quality of feeder roads and policies concerning land acquisition, farmers are dependent on government for assistance. The poor conditions of roads, affect the farmers in terms of responsibility in the physical movement. During the rainy seasons the exporters leave the burden of carting the produce from the farm to the road side or to exporter's sheds to the farmers. The shifting of this burden onto the farmer is as a result of their high dependence on the exporter.

5.5.2.2 Lack of cooperation

Farmers' cooperation is limited to cargo consolidation during the lean season and borrowing each others' spraying machine. Due to low educational level, they do not recognise the full benefits of other forms of cooperation like purchasing of farming

equipment and sharing technical know-how. This lack of cooperation reduces their negotiation power with other actors especially with the exporter during price negotiations.

However, small and medium scale farmers cooperate with exporters through inspection and follow-ups to make sure that the products meet international quality standards. Most of the time this is done in favour of an exporter so as to satisfy international customers.

5.5.2.3 Less informed

Most often small and medium scale farmers are not aware of changes of consumers' demand in the international market. This situation is as a result of the little interaction between farmers and the government. They are then placed in vulnerable situation of depending on the exporter for all information concerning the international market, even when they are aware that they are exploited. Even though Kumar, Scheer and Steenkamp (1995), suggested that firms in asymmetric relationships are expected to have high motivation of engaging in conflict, this is not the case in this supply chain because of the critical nature of the perishables. Accordingly, farmers tend to show little or no resistance at all to exporter's power influences as a result of high dependency rather than trust.

5.5.2.4 Low financial status

Farmers are financially weak because they do not receive any direct incentives from government. This is because IMF and other funds Ghana accesses prevent the government from subsidising farmers. It is also impossible for them to access bank loans as they do not meet the collateral security requirements of banks. There are only few banks interested in agriculture due to perceived risks of agricultural investments. Since banks only do collateral lending, it is almost impossible for farmers to produce clear title to their lands due to the structural problems surrounding land ownership and titling in Ghana.

5.5.2.5 Pricing structure

The practice where the exporter is the one who set prices for products in most cases is as a result of the fact that there are only few number of processing companies to buy the produce due to low local consumption of canned fruits products. This means that the farmer has to rely largely on the exporter which exposes him to opportunistic behaviour on the part of the exporter.

5.5.2.6 Seasonality of produce

The only time the farmer tends to have some form of power is during the lean seasons. Here, demand tends to be higher than supply and this makes it difficult for the exporter to fix prices arbitrarily.

Another exception is with regards to the scale of farming operations. Large scale farmers, who also engage in exporting activities, undertake vertical integration with other exporters through sharing international market demand information and storage facilities at ports. This type of integration becomes more of interdependence than dependence.

5.5.3 Intermediaries' power

Transport operators are the main intermediaries whose power possession can impact the activities of other actors. They have power during peak seasons especially when they are contracted on the spot. Within this period they have high negotiation power to determine transport rates as there are no alternative to road transport (trucks). Bad road conditions empower transporter during peak and rainy seasons when the road becomes difficult to travel. This is because only few transport operators will be willing to convey produce; as a result they charge high rates to cover maintenance services.

5.5.4 Government's power

Government power is limited to the formulation and enforcement of various policies. These policies tend to have impact on the performance of the supply chain. These range from tonnage limit, travel time, recommendations on access to fund by exporter, provision of transport infrastructure and documentation processes.

The above discussion supports the following propositions:

P6: Differences in power structure have a positive influence on supply chain risks.

P7: Reduction of power-gap enhances flexibility.

P8: Possession of resources (information, education, and funds) has a positive association with power.

On the contrary, the discussion only partially supports the next proposition:

P9: Cooperation within each member group in the supply chain and/or between groups improves reliability.

Cooperation to a large extent is favourable in dealing with problems collectively. However, this is not always the case as different actors may be pursuing different individual and group interests. This may lead to delays in decision making as there is the need to cater for the interests of different associations, and this does not augur well for a delicate supply chain as that of perishables.

The actions of actors in this supply chain exhibits more asymmetric relationship as each member tends to pursue different interests. As a result there is a high level of dependence than interdependence. It is also our contentment that, the ability of supply chain actors to cooperate and collaborate within each member group and among them, will act as an important strategy in closing the power gap. This will in turn help in minimizing most of the risks discussed above.

5.6 Conclusion of Analysis

From the above discussions of flexibility, risks and power, there is evidence of the presence of reliability in this supply chain to some extent. These are especially prominent in connection with reliability elements such as reduction in product deterioration; shorten lead time, and customer satisfaction. However to achieve higher reliability other elements like maximizing profits and increasing delivery frequency as depicted in the model need to be addressed. The means of dealing with these essentials will be advanced in our recommendations in the next chapter.

6. CONCLUSION

6.1 SWOT Analysis

The SWOT analysis is employed here to present a summary of our findings. It offers in-depth insights as to whether the attainment of reliability is feasible by focusing on the elements in each matrix.

Table 12: SWOT analysis for the perishables supply chain

STRENGTHS	**WEAKNESSES**
- There is wide use of electronic means of communication e.g. Mobile phones, faxes, e-mail and GCNet. - There is ongoing research for strengthening domestic supply chain through the World Bank. - Favourable geographical location of Ghana compared with competitors like South America. - Farmers are readily adapting to the international market standards. - Large scale farmers have integrated logistical systems (planting, harvesting, packing, transporting, storage) which ensures: - reliable delivery to ports - good produce quality - avoidance of transaction cost of middlemen. - Relatively low labour costs - Political stability favourable for further developments in the sector. - Most products are produced in regions relatively close to the ports.	- Lack of modern farming and harvesting technology. - Credit and financial constraints and high interest rates. - Only few processing companies in the local market. - Business culture difference between Ghanaian suppliers and their European customers. - High uncertainty in shipping schedules as it depends on availability of residual space. - Lack of refrigeration facilities on farms premises and during inland transportation affect product quality. - Poor infrastructure (roads, storage) - High temperature conditions. - High freight costs.
OPPORTUNTIES	**THREATS**
- Recent construction and improvement of roads from farms to the ports. - Growing global demand for perishables - Political instability in Ivory Coast will contribute to expansion of Ghanaian market	- Yield of Ghanaian growers (pineapples) per hector is on average less than that of Costa Rica - Global financial crisis - World competition from Cameroon, Costa Rica, Ivory Coast etc. - Introduction of new product varieties as Ghana is slow in adopting. - Complexity of information and quality assurance systems.

6.1.1 Managerial Implications

Probably the main implication of the SWOT analysis is that it presents a concise but captures a wide dimension of issues. These are issues which offer supply chain managers useful insights and broad understanding of the various elements that actors need to consider in decision making with regards to the perishables supply chain. It provides both the pros and cons of the system; therefore it becomes a point of reference and a comparison tool for decision makers.

The assessment of which components of the SWOT to focus on depends on the motive and position of the decision maker in the supply chain. It is however important for decision makers to consider all the elements in the matrix.

The managerial implications of this knowledge from the government point of view is to put in place the necessary structures with the aim of making Ghana an attractive business environment. Issues to be considered here are with respect to policy formulation and implementation, regulations as well as provision of physical structures which will aid the smooth flow of goods. By doing this, government will be able to fulfill the needs and requirements of both shippers and shipping lines. This will consequently give Ghana a competitive edge over competing neighbouring ports.

An important managerial task for exporters is for them to avoid over reliance on government; but for exporters themselves to take actions that will reduce costs and increase profits. For instance, attraction of ships to the ports is not only the responsibility of government but also the ability of exporters to have enough cargo to fill the ships that call the port.

6.2 Recommendations

In view of the numerous issues captured in the SWOT analysis, we believe that for reliability to be achieved, it is important to address some of these issues. We therefore proceed to put forward some recommendations of areas which need improvements to enhance performance of the supply chain.

Ghanaian farmers need to improve their efficiency to increase volume. This will attract more shipping companies to transport freight from Ghana and reduce their reliance on residual space on ships from neighbouring countries. This will also bring some competitiveness and tend to reduce freight costs.

SPEG should extend its role further to cover pineapples farmers as well. Other horticultural exporters' associations, such as banana exporters' association, should also strengthen their role. The collaboration between SPEG and other associations should be advanced. This will enable them to press forward their interests.

The current practice where GPHA makes all infrastructural investments while their private partners only manage the facilities tends to undermine the competitiveness and efficiency of the port. In the light of this, we support Rønnevik's (2009) proposal on the need for ports like Tema's with a throughput higher than 100 000 TEUs to encourage and give incentives to private operators to invest in infrastructure improvements and expansion projects. In his view, this will not only reduce the port's dependency on government budget but also share investment risks and improve performance.

Long term relationships between farmers and exporters that would provide an assured market will be beneficial. Lack of this provides little incentive to invest heavily in production as there is no guarantee that farm products will be sold at good prices.

Rural credit facilities should be made available for farmers in the form of government subsidies to be able to finance the purchase and use of improved agricultural technology, farming tools, improved seeds, and farm chemicals. In addition, to overcome the problem of unpredictable rainfall pattern it will be necessary for government to invest in small-and-middle-scale irrigation projects that can be managed by the farmers themselves with little or no interference from government.

Since government cannot meet all demands, it will be imperative for agricultural extension officers to educate and encourage farmers to cooperate in investing and acquiring cooling facilities at the farms. This will enable them to reduce the deteriorating rates and their dependence on exporters, thereby increasing their bargaining power and reducing exporters' opportunistic behaviour. This implies that extension officers need to also be updated on modern technological know-how to transfer it to the farmers.

Government's initiative to expand local processing industries as well as continuous improvement of transport infrastructure will enhance reliability.

For actors to reap the full benefits associated with this supply chain, it is important for all levels to be aware of their responsibilities in order for them to take the needed initiatives that will have positive impacts on the supply chain. An example could be adopting strategies for establishing and managing relationships and risks. Accordingly, it is critical for decision makers at all levels to cautiously consider the issues raised and take steps that will result in continuous and long term benefits to the supply chain as a whole.

6.3 Suggestion for future studies

Our studies revealed that there are several areas that need to be looked into in the near future. We therefore suggest to students who will be interested in any of the building blocks/constituents in our study (flexibility, transport infrastructure, perishables, and developing countries) to consider the following suggestions.

We believe that future study can investigate further into the issue of reliability from a more quantitative approach basis. This can be done by considering the extent to which each element of flexibility (regulations, infrastructure, power etc) contributes to reliability. Ability to quantify the contribution of each factor will enable actors to know which elements need to be given more attention.

Currently, there is a lot of construction of new roads and old ones are being rehabilitated; in addition, there is advancement of plans to revamp and extend the rail coverage. It will be of great interest for future students to delve into how these initiatives will impact transport cost and reliability of perishables in the next 5 to 10 years.

Future research should be directed towards the exploration of flexibility on the basis of large scale farmers who integrate their activities and undertake the exporting activities themselves verses exporters who consolidate volume from several small scale farmers.

An in-depth future research study could be extended to include how the role or activities of intermediaries (transport companies, port authorities, and insurance companies) promote or hinder the achievement of reliability.

Using our studies as a starting point, we would also like to encourage future studies in the same topic in another developing country but from a different continent (probably from Asia or Latin America) to see if the supply chain is exposed to similar or different elements.

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APPENDIX A

Questionnaire to Exporters/Consolidators

Dear respondent,

I am a student in logistics currently working on my master thesis, exploring transportation challenges of perishables from Ghana into the international market. I will very much appreciate if you could kindly fill the questionnaire to the best of your knowledge. All information will be for academic purposes only. Thank you for your time and for agreeing to take part in this study.

What is the main exporting product do you deal with?

- Yams ☐
- Bananas ☐
- Pineapples ☐
- Mangoes ☐
- Others ☐
- What is the percentage share (in value)? .....

What is your responsibility/role in this transportation chain? (possible answers :)

- Storage ☐
- Packaging and labelling ☐
- Customs and documentation ☐
- Transportation ☐
- Others ☐ Please specify:……..

A: Inland Transportation Phase

1. What mode of transport do you use to convey produce from the farm to the ports?
   a. Truck ☐
   b. Mini Van ☐
   c. Train ☐

d. Boat ☐

e. Other ☐ Please specify…..……

2. Do you use more than one mode?

a. No ☐

b. Yes ☐ Which modes?.....

3. Origin and destination

- Origin: ……
- Destination: …….
- Number of break points (re-loading/consolidation locations) if any……

4. When do you assume ownership of the cargo? (possible answers:)

a. On the farms ☐

b. At the break-points ☐

c. When it is loaded ☐

d. Others ☐ Please specify…….

5. Who makes the domestic transport arrangements/decisions?

a. Farmer ☐

b. Consolidator ☐

c. Exporter ☐

d. Government ☐

e. Other ☐ Please specify:.....

6. How often do you transport?

a. Daily ☐

b. Once a week ☐

c. Twice a week ☐

d. Thrice a week ☐

e. Other ☐ Please specify.....

6b. How much volume per the season?.....

7. Are there some refrigeration/cooling systems on the mode you use?

a. Yes ☐

b. No ☐

7b. Is the cooling system sufficient?

Yes ☐

No ☐

If no, how do you do cope with the problem?

8. Who owns the vehicles?

a. Government ☐

b. Farmer ☐

c. Exporter ☐ (what is the percentage share?.....)

d. Other ☐ Please state:.....

If you do not own transport vehicles, how do you arrange for the transport?

(possible answers:)

a. Hired transport from private operators ☐

b. Collaborate with customers ☐

c. Cooperate with the government ☐

d. Others ☐ Please

specify:…….

9. On what basis is the mode chosen? Please rank your answer on the scale of 7 to 1, with 7 being the highest and 1 the lowest.

a. Availability ☐

b. Cost ☐

c. Speed ☐

d. Reliability ☐

e. Frequency ☐

f. Low risk to damage ☐

g. Flexibility ☐

h. Other ☐ Please specify:.....

10. How long does it take to transport from the farm to the port?

a. ..... hrs

b. ..... day(s)

10b. What is the distance?.....

11. What challenges do you face in the inland phase of transportation?

a. Heavy rainfall ☐

b. High fuel price ☐

c. Financial obstacles ☐

d. Poor transportation infrastructure ☐

e. Capacity problems ☐

f. Unreliabliability of local transporting agencies ☐

g. Others ☐ Please

specify…….....

11a. What are the three most important/crucial of these challenges and possible ways of meeting them?

No.	Kind of challenge	Suggested solutions
1	Heavy rainfall	
2	High fuel price	
3	Financial obstacles	
4	Poor transportation infrastructure	
5	Capacity problems	
6	Unreliabliability of local transporting agencies	
7	Others	

12. What risks are you exposed to or have you experienced in the past in this phase? (possible answers:)

a. Storms ☐

b. Accidents ☐

c. Thefts ☐

d. Delays in transport arrangements ☐

e. Labour Strikes ☐

f. Fuel shortage ☐

g. Power curtailment ☐

h. Capacity problems ☐

i. Others ☐ Please specify:……..

12b. How was the risk mitigated/managed?

No.	Kind of risk	Risk management
1	Storms	
2	Accidents	
3	Thefts	
4	Delays in transport arrangements	
5	Labour strikes	
6	Fuel shortage	
7	Power curtailment	
8	Capacity problems	
9	Others	

13. Is your business insured against risks?

No, why not?.....

.....

.....

Yes, what kind of insurance do you have?
.....

.....

.....

B: International Transportation Phase

14. Which mode do you use to the international market?

a. Sea ☐ Destinations…….

b. Air ☐ Destinations……..

15. On what basis is the mode chosen? Please rank your answer on the scale of 7 to 1, with 7 being the highest and 1 the lowest.

a. Availability

b. Cost ☐

c. Speed ☐

d. Reliability ☐

e. Frequency ☐

f. Low risk to damage ☐

g. Flexibility ☐

h. Other ☐ Please specify:.....

16. Who owns the storage facilities at the port?

a. Government ☐

b. Individual Exporters ☐

c. Exporters' Associations ☐

d. Shipping company ☐

e. Other ☐ Please specify:.....

17. What are the three main challenges do you face in this phase of transportation?

a. Delays and interruptions in documentations ☐

b. Financial obstacles ☐

c. Capacity problems ☐

d. Delays in ship/plane arrivals ☐

e. Power curtailment ☐

f. Others ☐ Please specify:…….....

17a.What are the three most important ways of meeting these challenges?

No.	Kind of challenge	Suggested solutions
1	Delays and interruptions in documentations	
2	Financial obstacles	
3	Capacity problems	
4	Delays in ship/plane arrivals	
5	Capacity problems	
6	Power curtailment	
7	Others	

18. What are the three main risks are you exposed to or have you experienced in the past in this phase?

a. Fuel prices ☐

b. Financial crisis ☐

c. Global economy/recession ☐

d. Weather effects and seasonality of produce ☐

e. New entrants in the market ☐

f. Others ☐ Please specify:

18b. How was the risk mitigated/managed?

No.	Kind of risk	Risk management
1	Fuel prices	
2	Financial crisis	
3	Global economy/recession	
4	Weather effects and seasonality of produce	
5	New entrants in international market	
6	Others	

19. Is your business insured against risks?

No, why not?.....

.....

.....

Yes, what kind of insurance do you have?
.....

.....

.....

C: In General (Entire Supply Chain)

20. Among the actors in the transportation chain, who holds more power and why?

    a. Farmers ☐

    b. Government ☐

    c. Exporters ☐

    d. Transport operators ☐

    e. Other ☐

21. Do you use any form of electronic means of communication?

    a. No, why?.....

    .....

    .....

    b. Yes, which ones?.....

    .....

    .....

    c. How has the use of electronic communication impacted on your business?

    .....

    .....

.....

22. Which bureaucratic practices hinder the smooth transportation of perishables?

.....

.....

.....

.....

23. Mention any three most important suggestions on what could be improved in this supply chain? (possible answers:)

a. Improved quality of transportation infrastructure ☐

b. Improved cooperation between actors in this chain ☐

c. Loading priorities for perishable cargo into transportation vessel at ports ☐

d. More government involvement in reducing fuel prices ☐

e. Increase the number and capacity of storage facilities ☐

f. Increase information sharing ☐

g. Others ☐ Please specify:……

APPENDIX B

Interview Guide for Government Agency (Ghana Export Promotion Council)

1. Which actors in the perishable transportation does the Export Promotion Centre deal with? (possible answers:)
    - Exporters
    - Transport companies
    - Ports
    - Farmers
    - Storage facility operators
2. What kinds of corporation exist between the EPC and the actor(s) mentioned in 1? (possible answers:)
    - Long/short term cooperation
        i. On what?
    - Funding
        i. Which areas?
    - Cooperation with other public agencies?
        i. Ministry of Roads and transport
        ii. Ministry of Agriculture
        iii. Ports and Harbours Authority
    - Others? Who?
3. From the view point of EPC, what factors influence the smooth transportation of perishables into the international market? (possible answers:)

    Public/government regulations

    Are there any public regulations or government initiatives which seek to facilitate the smooth transportation of perishables?

    - What requirements do products have to meet before being shipped?
    - Does your institution inspect the state of the products before they shipped?
    - Is congestion present?
        - If so, where?
        - Seaport (amount, duration, frequency, consequences)
            - Storage

        - Loading
        - Others
    - Airport (amount)
        - Storage
        - Loading
        - Others
- Due the time critical nature of perishables, what steps can be taken to reduce congestion at the ports?
    - Regulation (what kind)
        - New ones?
        - Enforcement of existing ones?
    - Give priority to perishables at the ports
    - Others Please specify……

Infrastructure (availability and quality)

Have there been any improvements of road, rail or water infrastructure leading to areas where such perishables are produced over the past 10 years?

- No
- Yes, which areas/regions?

Yes, on what bases were those areas selected? (possible answers:)

- Proximity/distance
- Concentration of farming activities
- Volume of produce for the region
- The type of produce
- Other factors, which ones?

If yes, how has the improvements impacted on the transportation activities of perishables? (possible answers:)

- Less accident (by how much?)
- Shorter travel time (by how much?)
- Increased reliability (in what terms?)
- Less transport cost (by how much?)
- Expanded existing businesses (by how much?)

- Attracted more businesses (by how much)
- Others? Which ones?

How do transport regulations (e.g. operation, pricing, capacity etc) differ in terms of ownership?

- State-owned
- Privately owned
- Mixed
- How does transport ownership affect the transportation system? (possible answers:) (Link to the ownership structure above)
    - Availability
    - Cost
    - Capacity
    - Reliability

Are there some state-owned storage facilities at the ports?

- Airport?
- Harbour?
- How many?

What are the main challenges with respect to condition of facilities at the ports?

How do these challenges impact on transportation activities?

What percentage in tons is transported by rail?

Why? (possible answers:)

- Rail lines do not go to all regions
- Infrequency of trains
- Frequent train breakdowns
- Very slow due to frequent stops
- Only few regions have access to rail transport
- Cost
- Reliability
- Accessibility
- Capacity
- Others

What percentage in tons is transported by water?

why? (possible answers:)

- Low cost of transport
- Reliability
- Capacity
- Very slow due to frequent stops and low speed
- Only few regions have access to water transport
- Availability
- Accessibility
- Others

- What percentage in tons is transported by road ?
- Why? (Possible answers:)
  - Cost
  - Reliability
  - Availability
  - Location of farms and ports
  - Accessibility
  - Capacity
  - Others

Financial constraints

Does government offer some form of financial assistance?

- Yes
- No

If yes to whom? (possible answers:)

- Farmers?
- Transport operators?
- Exporters?
- Storage facility operators?
- Individuals
- Associations/groups
- Others, who?

What form of assistance? (possible answers:)

No.	Kind of assistance	Receiving group(s)	By how much?	Why?
1	Flexible loan schemes			
2	Export tax rebates			
3	Subsidies: - Fuel - Farming tools - Others			
4	Research and development			
5	Cooperation in information system			
6	Assistance in customs and documentation			
7	Others			

Social factors (corruption, bureaucracy)

Which bureaucratic practices hinder the smooth flow of perishables?

Are there some possible means of minimizing bureaucratic practices?

4. What are the main kinds of risks have the transportation chain of perishables been exposed to in the past? (Possible answers :)
    - Storms
    - Accidents
    - Thefts
    - Delays in ship/plane arrivals
    - International risks
    - Strikes
    - Fuel shortage
    - Power curtailment

- Capacity problems
- Damage/breakage
- Others

- How often have they occurred in recent years?

No.	Kind of risk	No. of occurrence/ Examples
1	Storms	
2	Accidents	
3	Theft	
4	Delays in ship/plane arrivals	
5	International risks	
6	Labour strikes	
7	Fuel shortages	
8	Power curtailment	
9	Capacity problems	
10	Others	

- What role did the EPC play in its management?

No.	Kind of risk	How was it amended?	Who was responsible for the amendment?
1	Storms		
2	Accidents		
3	Theft		
4	Delays in ship/plane arrivals		
5	International risks		
6	Labour strikes		
7	Fuel shortages		
8	Power curtailment		
9	Capacity problems		
10	Others		

5. Which recent developments are potential threats to this supply chain? (Possible answers:)
    g. Fuel prices
    h. Financial crisis (loans, protectionism, markets)
    i. Weather effects
    j. New entrants (who?)
    k. Regional competition (how?: in terms of capacity, quality, season, price)
    l. Others?

APPENDIX C

Farmers' Interview guide

1. What kind of export products do you deal with? (possible answers:)
   - Yams
   - Bananas
   - Pineapples
   - Mangoes
   - Others

   Where in the physical movement of the products are you responsible?

   a. From……..to……..
   b. What is the cost involved?
   c. Not responsible
2. What is the demand nature of your product? (possible answers:)
   - Seasonal (peak seasons?)
     - Urgent
     - Planned
     - Predictable
     - How do you deal with the demand outside the seasonality of the produce?

2b. How much volume (units) do you produce per year?

3. What type of technology is used in farming and harvesting?
   - Are there any factors that affect the choice of technology?
     - If yes, what are they?
   - Who controls it? (possible answers :)
     - Government
     - Exporters
     - Banks/Financial institutions
     - Others?
     - How is it controlled?
       - Price
       - Availability
       - Permission to buy
       - Other

4. Is there any support from government?
   - No, why?
   - Yes, what kind? (Possible answers :)
     - Flexible loan schemes (what condition? how does it work)
     - Subsidies on farming equipment (how much?)
     - Education by Agric extension officers
     - Others
   - How does it affect contribution to productivity?

4b.What could be improved? And why?

5. What mode of transport is used from the farms? (Possible answers :)
   - By truck
   - Trains
   - Canoe
   - Others?
     - What is the distance covered?
     - How long does it take?
     - What is the volume transported?
     - Costs?
6. What factors influence this mode choice? (possible answers:) (consider all modes)
   - Payable costs
   - Time to market
   - Availability and accessibility
   - Availability of infrastructure
   - Reliability of the transport
   - Other actors in the chain decide (who? Why?)
   - Others
7. Who makes transport arrangements? (Possible answers :)
   - Individual Farmers
   - Farmers' groups
   - Consolidators
   - Exporters
   - Others (who?)

8. How does this arrangement affect the activities of transport? (possible answers:)
    - Increases/reduces costs
    - Increases/reduces reliability
    - Makes it possible to choose a faster mode (from……..to……..)
    - Reduces/increases disruption risks
    - Easy/difficult to adjust capacity
    - Others
9. Are there fixed pick-up days?
    - Yes
    - No
    - How does this affect the following:
        - Time
        - Volume
        - Costs
        - Transportation mode
        - Others
        - Has there been any changes? And what were the effects?
10. Are there storage facilities on the farm or nearby? (Possible answers :)
    - If no, why?
        - What are the consequences?
    - If yes, what type, who owns them?
    - Accessibility to them
    - Flexibility
    - Costs (planned, urgent)
11. What happens when there are delays or failures in pick-ups? (possible answers:)
    - Loss of sale due to quality deterioration with no compensation
    - Products are kept in storage facility in the farm until next pick-up
    - Cooperate with exporters/transporters/consolidators for contingent transportation arrangements
    - Compensated for the loss of sale and time by defaulting party (e.g. exporter, transporter)
    - Sale to the local market

- Others

12. Is there any cooperation among farmers?
    - No, why not?
    - Yes, what kind of cooperation? (possible answers:)
        - Consolidation of cargo
        - Transport arrangements
        - Purchase of farming equipments
            - If they own equipments, do they have operation in common?
        - Other areas of knowledge sharing (how?)
13. Is there any cooperation between farmers and transport companies?
    - No, why not?
    - Yes, what kind of cooperation? (possible answers:)
        - Vertical integration (what kind)?
        - Consolidation
        - Information sharing
        - Others (what?)
14. How do you cooperate with the exporters in making sure that products meet international quality standards? (Possible answers :)
    - inspection
    - follow-ups
    - Vertical integration through:
        - international market demand information sharing
        - storage facilities
        - harvesting tools
        - others (what?)
    - Others (what?)
15. Who are responsible for purchasing from the farm?
    - Exporters/consolidators
    - Big private companies
    - Local transporters
    - Farmers' Associations
    - Others (who? why?)
16. What kinds of purchasing contracts do you have? (possible answers:)

- Long term
- Short term
- Spot buying
- Others

17. How does the type of contract affect the negotiation powers of farmers?
18. How are prices for the products determined? (Possible answers :)

- Negotiated
- Fixed by exporters
- Fixed by governments
- Market determined
- Others

18b. Are there price variations? How does it vary? (Possible answers:)

- Systematically with season
- Negotiating power of actors involved
- Others?

19. How are payments made? (Possible answers :)

- Pre-paid (as and when products are cart from the farms)
- After it has been sold into the international market
- Instalments (part initial payments)
- Barter trading
- Others (which ones)

20. What main risks are you exposed to or have been exposed to in the past? (possible answers:)

- Rainfall
- High fuel price
- Lack of modern farming technology
- Product deterioration due to delays in pick-ups
- Fire
- Financial obstacles
- Theft
- Transport delays
- Others
- How was it managed? (Possible answers :)

- Support from government
    - Fuel rebates/subsidies
    - Tax rebates
    - Discount of farming tools
    - Others
- Personal loans from banks
- Loss compensated by exporters/transporters/government/consolidators
- Risk insured
- Collaboration or cooperation with exporters
- Contingency transport arrangements
- Others

21. Are you insured?
    - If no, why not?
    - If yes, what kind? (Possible answers :)
        - Theft
        - Bankruptcy
        - Weather
        - Fire
        - Others

22. Who are you more dependent on? (Possible answers :)
    - Government
        - Policies
        - Infrastructure
        - Financial assistance
        - Education
    - Exporters
        - Pricing
        - Information sharing
        - Storage
        -
    - Transporters
        - Reliability
        - Transport cost

- Banks
    - Financial assistance
    -
- Others
- Why this dependency?
- How does the dependency nature you selected above on each actor affect your business?