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Fair and Green Supply chains:Evaluating the petentials of developing Fair Trade that also lowers greenhouse gas emissions.

Authors : Anita Tamang and Hadija Adam Sanga

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Preface and Acknowledgement

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Anita Tamang and Hadija Adam Sanga

Abstract

Purpose - Fair trade was established with the main vision of promoting the livelihood and wellbeing of producers in developing countries and to encourage sustainable development. Thus Fair trade deals with poverty reduction and fight against negative environmental impacts. The purpose of this study is to examine the potential of Fair Trade to lower greenhouse gas emissions and promote the development of fair and green supply chains in Afro-European settings in horticultural products.

Design/Method/Approach - The study is based on a review of academic articles, research reports, statistical sources and stakeholder's information. Together with these sources we have reviewed five cases which were done in the past on imported horticultural products in Europe from Africa to give the empirical support to our propositions.

Findings – Findings from the five cases show that there is the potential to develop and promote fair and green supply chains in Afro- European settings which depend on the nature of the product, mode of transportation and seasonality. Flowers grown in Africa and imported in Europe have lower greenhouse gas emissions than European flowers while green beans and lettuces which are grown in Africa and imported in Europe have higher greenhouse gas emissions/global warming potential than European green beans and lettuces. The findings also reveal that African farmers are more efficient in water utilization and application of green practices in production stage than European farmers. Furthermore, the findings show that good climatic conditions, European regulations and support, land availability and availability of cheap labour are among the factors which promote the development of horticultural market in Africa. However, poor governmental support, financial and economic difficulties, and technical factors act as barriers for the further development of horticultural supply chains.

Key words: Fair Trade, greenhouse gas emissions, green supply chain, life cycle assessment, horticulture, water utilization, green agricultural practices, mode of transport, Africa and Europe.

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List of Abbreviations

ACP: African, Caribbean and Pacific

ATO: Alternative Trade Organization

CAFOD: Catholic Agency for Overseas Development

CAP: Common Agricultural Practices

CO_2: Carbon Dioxide

COFTA: Corporation for Fair Trade in Africa

COLEACP: Europe-Africa-Caribbean-Pacific Liaison Committee

EFTA: European Fair Trade Association

EPA: Environmental Protection Agency

ESSD: Environmentally Socially Sustainable Development

ETI : Ethical Trade Initiatives

FFP: Fair Flower and Fair Plants

FLP: Flower Label Program

FLO: Fair Trade Labeling Organizations

FTC: Fair Trade Certified

FTF: Fair Trade Foundation

GAP: Good Agricultural Practices

GHG: Green House Gas

GLM: Green Logistic Management

GPS: Global Positioning System

G-SCM: Green Supply Chain Management

GWP: Global Warming Potential

IMF: International Monetary Fund

IPCC: Intergovernmental Panel on Climatic Change

ISEAL: International Social and Environmental Accreditation and Labeling

ISO: International Organization for Standardization

KFC: Kenyan Flower Council

LCA: Life Cycle Analysis

LCDs: Least Developed Countries

MPS-ABC-: More Profitable Sustainability

NEWS: Network of European World Shops

PVS: Private Voluntary Standards

RELU: Rural Economy and Land Use program

SERRV: Sales Exchange for Refugee Rehabilitation and Vocation

SOC: Soil Organic Carbon

SSA: Sub Sahara Africa

TAHA: Tanzania Horticulture Association

TAPAWA: Tanzania Agriculture Workers Union

UNEP: United Nations Environment Programe

UNFCCC: United Nations Framework Convention on Climate Change

USDA: United States Department of Agriculture

WFTO: World Fair trade Organizations

WFTO-LA: World Fair Trade Organization- Latin America

WTO: World Trade Organization

UNCTAD: United Nations Conference on Trade and Development

CHAPTER 1

Introduction

1.1 Background information

Climate change is one of the paramount challenges faced by international community. According to the Global Humanitarian Forum, approximately 325 million people are affected by climate change every year, and the most affected by these global issues are the most vulnerable living in developing countries, least developed countries and islands (Fairtrade International 2009). According to IPCC[1] forecast, by 2020 between 75-250 million people are expected to be exposed to increased water stress and 50% reduction in rain fed yield from agriculture in Africa while in Europe there are increased risk of inland flash floods, losses of species, reduced snow cover and rise of sea level (Jenkins 2013).

The last 60 years have been characterized by tremendous expansion of international trade; this has been influenced by technological changes which has reduced the cost of transportation and communication. Likewise the number of countries participating in international trade has increased (WTO and UNEP 2009). However statistical review suggested that trade expansion leads to greenhouse gas emissions due to increased economic activities. On the other hand participating in international trade is also seen as a channel for technology transfers that mitigate climate change (WTO and UNEP 2009). This situation then gives us a position to cross examine the trade opportunities and their impacts upon the environment.

International agricultural trade on one hand enhanced the welfare levels while on the other hand increases the environmental problems like increased energy consumption, degradation of natural resources, changes in land use patterns etc. The impacts of international agricultural trade in environment and society are complex and debatable. Research is needed to validate the vague impacts of such trade (Wurtenberger, Koellner and Binder 2006).

To fight against climatic change and poverty reduction, there are different environmental certifications which oblige suppliers and producers to adapt sustainable means of

[1] IPCC stand for Intergovernmental panel on climatic change (IPCC 2013)

production and distribution so as to reduce environmental impacts like ISO[2] 14000, ISO 14001[3], GlobalGap[4], Rainforest Alliance, MPS-ABC[5] and the like. Also there are different trade names/logos/brands/certificates which mean the traded products are environmental friendly or ethical and help the poor society to improve their livelihood, for instance "Fair Trade", "fairly traded", "organic products" and "UTZ"[6].

The objective of this study is to provide a comprehensive evaluation for the potential of developing Fair Trade of horticultural products that also lowers greenhouse gas emissions mainly in Afro-European context. Thus, we will review five cases which have been done in horticultural products, and we will assess the possibility of developing fair and green horticultural supply chains in an Afro-European setting.

1.2 The concept of Fair Trade

Fair Trade is an alternative approach to conventional trade and is based on a partnership between producers and consumers (Fair Trade Foundation 2011). Four European organizations created a widely accepted definition of Fair Trade. Fair Trade Labelling Organizations (now Fair trade International, FLO), International Fair Trade Association (now World Fair Trade Organization, WFTO), the Network of European World shops (NEWS) and the European Fair Trade Association (EFTA) created a workgroup known as FINE, an acronym of their names, and defined Fair Trade.

[2] ISO 14000: International Organization for Standardization which deals with environmental management (ISO 2012).

[3] ISO 14001: International Organization for Standardization which defines the criteria for an environmental management system, requiring commitment to compliance with applicable legislation, regulations and continuous improvement. It forms the basis for a systematic approach to reducing the environmental impacts of organizations (ISO 2012).

[4] GlobalGap: G.A.P stand for Good Agriculture Practices so GlobalGap is the worldwide standards which assures good agriculture practices (GLOBALG.A.P 2013).

[5] MPS-ABC: More Profitable Sustainability: These are environmental certificates awarded to participants based on the use of fertilizers, energy, pesticides, wastes and water. The MPS-ABC standard covers floriculture, bulb, arboriculture, vegetables and fruits sectors (ITC 2013).

[6] UTZ Certified good inside is an independent, non-governmental, not-for-profit organization dedicated to create an open and transparent market place for socially and environmentally responsible agricultural products (ITC 2013).

Fair Trade is defined "*as a trading partnership based on dialogue, transparency and respect that seek greater equity in international trade. It contributes to sustainable development by posing better trading conditions and safeguarding the rights of marginalized producers and workers especially in the developing countries"* (EFTA 2006).

The goals of Fair Trade according FINE as they were referred in EFTA (2006) are:

- To improve the livelihoods and wellbeing of producers by improving market access, strengthening producer organisations, paying a better price and providing continuity in the trading relationship.
- To promote development opportunities for disadvantaged producers, especially women and indigenous people, and to protect children from exploitation in the production process.
- To raise awareness among consumers of the negative effects on producers of international trade so that they can exercise their purchasing power positively
- To set an example of partnership in trade through dialogue, transparency and respect.
- To campaign for changes in the rules and practice of conventional international trade.
- To protect human rights by promoting social justice, sound environmental practice and economic security.

The vision of Fair Trade is to reduce poverty and encourage sustainable development in developing countries (Fairtrade International 2011). Thus, when a product carries Fairtrademark means producers and traders have met Fair Trade standards which are designed to address the imbalance of power in trading relationships, unstable markets and the injustices of conventional trade (Fairtrade International 2011). However Fair Trade also addresses global challenges, such as accelerating climate change and worsening environmental conditions. Environmental sustainable farming and production practices are keenly encouraged through the avoidance of agrochemicals and by promoting renewable energy, terracing, rotation and reforestation (Boonman, et al. 2011). Environmental protection standards are designed to ensure safe and sustainable agriculture and

environmental practices to protect and enhanced biodiversity (Elder, Zerriffi and Billon 2012).

According to Raynolds, Murray and Wilkinson (2007), Fair Trade works to reduce poverty in the developing countries through means of 'trade' and 'not aid', improving farmers and workers livelihood through direct sales, fair prices, market information, knowledge of business practices and environment, credit resources and stable market links as well as support for producer organization and communities. Fair price refers to the price that is higher than would be the case in a free market situation, and one that enables local producers to develop sustainable, social and environmental conditions (Zainal 2007).

Most Fair Trade certified products are agricultural products like coffee, tea, cotton, composite products, horticultural products and some manufactured products like sports balls, also pilot certification in apparel and gold were launched in recent years (Fairtrade International 2011).

In the Fair Trade industry the common division of North versus South is often used. North represents the developed countries (including European countries, USA, Canada, Australia, New Zealand and Japan), whereas South represents the developing countries (countries from South America, Asia, Africa) (Boonman, et al. 2011). There are number of organizations which are behind Fair Trade, for instance Fair Trade Organization, Flo-Cert (deals with certification), Fair Trade labelling initiatives, Fair Trade producer network and Fair Trade marketing organizations, which are engaged actively in supporting producers, awareness raising and in campaigning for changes in the rules and practice of conventional international trade (Fairtrade International 2011).

1.3 Green Supply Chain

Global climatic change is becoming the conventional issue in global business environment, thus over the past 10-20 years increasing environmental concern from the public and government has increased pressure to reduce environmental impact, as it is threatening the quality of a life (McKinnon, et al. 2010). It is believed that "anthropogenic greenhouse gases are the main causes of climate change, as their atmospheric concentration have grown markedly since pre-industrial times, with an increase of 70% between 1970 and 2004" (Abdallah, et al. 2012). Several large scale model projections have shown that a business with current scenario, with no changes in the production and consumption habit will lead to an imbalance in ecosystem and damage the stability of our environment (Gupta

and Palsule-Deshai 2011). In response to climate change, international agreement (Kyoto protocol) was established to reduce greenhouse gas emission mainly from 37 industrialized countries. Moreover, new international standard ISO 14001 was introduced to endorse companies' environmental programs and help customers certify that suppliers have the required environmental qualifications (McKinnon, et al. 2010). Different parts of the society, government, environmentalist, media, and international bodies are involved in fighting against increase in global warming and climatic change.

In addition, increasing consumer awareness has become a serious threat to business organization to develop green supply chain as consumer preference is shifting towards greener products. Similarly, business organizations are moving towards sustainable/green supply chain from conventional supply chain with a motivation of decreasing operating cost. Internal drivers (cost reduction and corporate social responsibility), market drivers (consumer demand), legal drivers (current and anticipated future regulations) are the forces that drives businesses to green their supply chain (Caniato, et al. 2012). In the same way Mckinnon, et al. (2010) mentioned the drivers for adapting green supply chain are compliance of government regulations, improving corporate image, reduction of logistical costs, gaining competitive advantage in the market, rising cost of energy and development of alternative network. In order to mitigate global climate problem, and tackle all the threats coming from different parts of societies, business organizations need to rearrange whole supply chain of a product (designing, sourcing, production, warehousing, and distribution) towards green supply chain, as these activities accounts for a bulk of resources consumed and environmental impact (Gupta and Palsule-Deshai 2011).

According to Walker, Sisto and McBian (2008), Green supply chain covers all phases of a product's life cycle, from the extraction of raw materials through the design, production, and distribution phases, to the use of the product by consumers and its disposal at the end of the product's life cycle. Whereas McKinnon, et al. (2010) defined Green supply chain as an alignment and incorporation of environmental management in all practices of supply chain management, for instance green purchasing, green packaging and reverse logistics. Examples of green supply chain management practices include reducing packaging and waste, assessing suppliers based on environmental performance, developing more eco-friendly products, and reducing carbon emissions associated with the transport of goods (Walker, Sisto and McBian 2008). Rao and Holt (2005) argued that greening different

phases of the supply chain leads to an integrated green supply chain, which in turn leads to competitiveness and better economical and operational performance.

1.4 Description of the Research Problem

Fair Trade is an alternative approach to conventional trade, which deals with environmental protection apart from social and financial objectives. The purpose of this study is to examine the potential of Fair Trade to lower greenhouse gas emissions and promote the development of fair and green supply chains in Afro-European settings in horticultural products. In finding answers to the research problem, we will use different case studies on horticultural products exported from Africa to Europe for our analysis and the presentation of findings.

1.5 Research objective and questions

The purpose of this study is to examine the potential of Fair Trade to lower greenhouse gas emissions and promote the development of fair and green supply chains in Afro-European settings in horticultural products. This study will also answer the following questions:

Research Questions

RQ1: Do imported African horticulture products have lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticulture products?

RQ2: Does horticultural supply chains in Africa and Europe differ in terms of water resources utilization? Since African horticulturalists have access to less water resources than their European counterparts, we will look at how both rain (green) and other forms of water bodies (blue) are utilized by both African and European horticultural supply chains for better understanding of the problem understudy.

RQ3: What are the possibilities of promoting the further development of horticulture supply chains in an Afro-European setting?

RQ4: What are the barriers to the further development of horticulture supply chains in Afro-Euro settings?

RQ5: How does the development of Fair Trade initiatives in horticultural supply chains leads to lower greenhouse gas emissions?

1.6 Relevance of the study

Fair Trade has been given great attention and credit on improving livelihood of producers and farmers from developing countries and in environmental conservation. The consumption of food that has travelled long distance is likely to have greater environmental impacts than locally produced food poses a serious challenge to the Fair Trade movements (Barno, Ondanje and Ngwiri 2011).

However few empirical studies have tried to explore the association between horticultural products imported from Africa to Europe and greenhouse gas emissions/global warming potential (Adrian 2007; Andrew 2006; Haug, et al. 2008; Jones, et al. 2009 and Milà i Canals, et al. 2008). This study explores the possibility of developing Fair Trade in horticultural products that also lowers greenhouse gas emissions by reviewing and analysing the previously studied cases. Thus we will make conclusion regarding the development of fair and green supply chains in Afro-European settings in horticultural products depending on the findings from the cases.

1.7 Structure of the thesis

This study is divided into six chapters, first chapters is the introduction about focus on Fair Trade, Green Supply chain, problem statement with research objective and research questions. Chapter two is Research methodology and the design applied in this study. Chapter three presents the development of Fair Trade initiatives. Chapter four consists of key issues on Green Supply Chains, the Fair Trade Movement and Horticultural Market. Chapter five is the evaluation of the fairness and greenness of cases of horticultural supply chains together with the analysis. Chapter six presents summary, conclusions, limitations and further research.

CHAPTER 2

Research Methodology

In this section an insight is provided in terms of the methodology that is applied in this study, including research propositions, research design, data collection, reliability and validity and case analysis.

2.1. Research Propositions

The purpose of this study is to examine the potential of Fair Trade to lower greenhouse gas emissions and promote the development of fair and green supply chains in Afro-European settings in horticultural products. In order to be able to achieve this objective and to find answers to the specific research questions raised in chapter one, the following propositions are of interest to this study:

P1: The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products.

P2: Horticultural supply chains in African and Europe differ in terms of water resources utilization.

P3: The promotion and further development of horticultural supply chains in an Afro-European setting has many possibilities for growth of green supply chains.

P4: Barriers to the further development of horticulture supply chains.

P5: The development of Fair Trade initiatives in horticultural supply chains leads to lower greenhouse gas emissions.

To be able to find answers to the above propositions, a case study approach involving multiple cases of some studies that have been carried out in the past will be used.

2.2. Case Study Research

Case is referred as a spatially defined phenomenon (a unit) observed at a single point in time or over some period of time. A case may provide a single observation or multiple observations (Gerring 2007). A case study is "an empirical inquiry that investigates a contemporary phenomenon within its real life context especially when the boundaries

between the phenomenon and context are not clearly evident" (Yin 2003, p.13). Case study has unique place in evaluation research as it explain the casual links in real life interventions that are too complex for other strategies, case study describe an intervention and real life context in which it occurred, also it illustrate certain topics within an evaluation, it is used to explore situations in which the intervention being evaluated has no clear, single set outcomes and it may be a meta-evaluation. Case study is preferred in examining existing events but when the relevant behaviours cannot be deployed. Case study research comprises three distinct stages, which are research design, data collection and data analysis (Yin 2003).

The case study method involves an in-depth examination of a single instance or event (i.e. a case). It provides a systematic way of looking at the case, collecting data, analysing information, and reporting the results. Case study research relies on multiple sources of evidence and benefits from the prior model development and can be based on any mix of quantitative and qualitative evidence. Thus, case study is an excellent research method to understand a difficult issue and extend experience to what is already known through previous research. A case study analyses a limited number of events and their relationships, and it is a widely used research method to examine real-life situations and provide a foundation for the application of constructs (Zainal 2007).

According to Yin (2003), case studies can be exploratory, descriptive or explanatory, explanatory cases are used for causal studies where pattern matching can be used to investigate certain phenomenon in very complex and multivariate cases. The focus of case study is to answer 'how' and 'why' questions which are more explanatory. So the purpose of this study is to investigate, using the case study method how Fair Trade movements/ initiatives reduce greenhouse gas emissions.

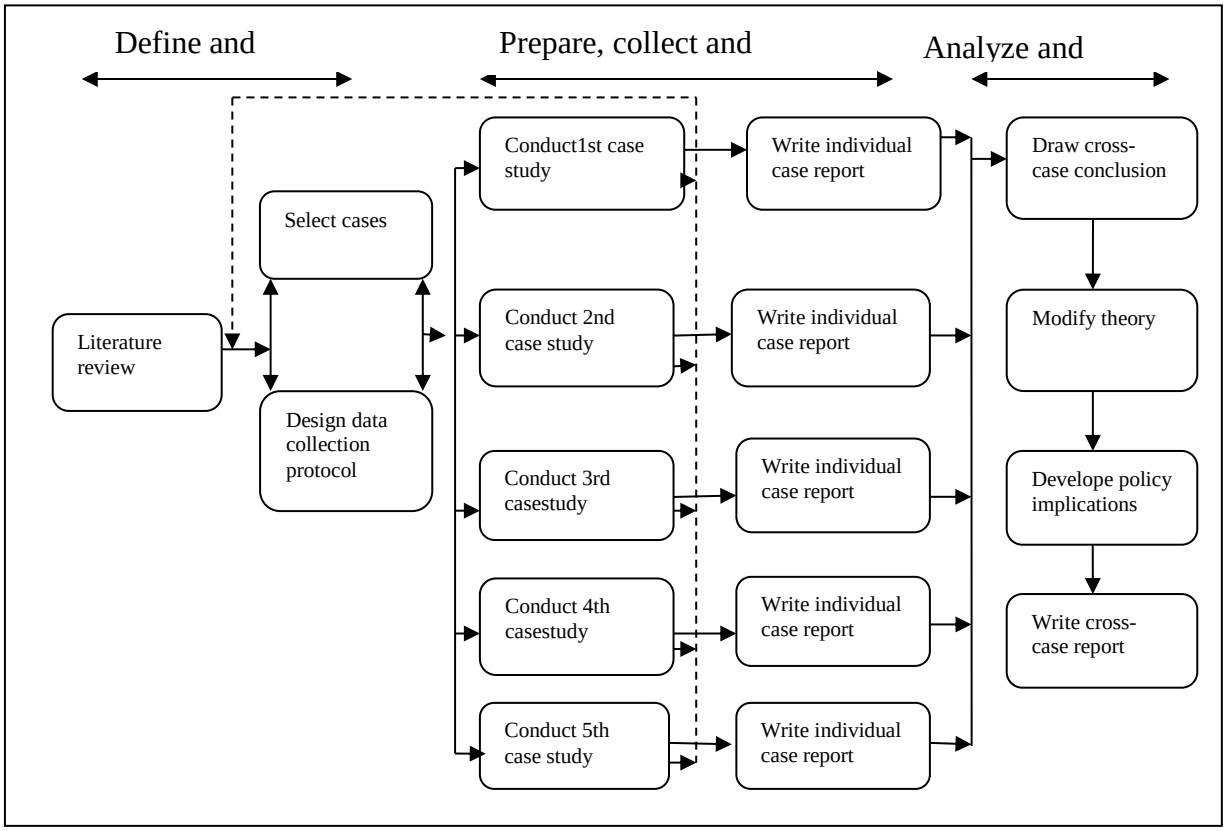
2.3. Research Design

Research design is a plan that guides the investigator in the process of collecting, analysing and interpreting observations. It is a logical model of proof that allows the researcher to draw inferences concerning casual relations among the variables under investigation (Yin 2003). Case study design is categorized into single case study and multi-case study. In this research, we will first identify the core outcome or findings from each single case. And then we will conduct multi-case study (i.e. cross case study) to show whether the phenomenon explained in different cases are uniform or diverse to each other. According

to Stake (2006), one of the main reasons to conduct multi-case study is to examine how the phenomenon performs in different environment.

According to Stake (2006) a good case study should have between 4 and 15 cases. There is no general agreement about this and it would be highly dependent on the subject of analysis and how rich the cases are.

Figure 2.1: Multiple case study method



Source: Yin (2003)

After the necessary literature review, Individual cases will be selected for further analysis. According to Stake (2006), there are basically three main criteria for selecting cases:

- Is the case relevant to quintain (an object, phenomenon or condition to be studied)?
- Do the cases provide diversity across contexts?
- Do the cases provide good opportunities to learn about the complexity and context?

In multiple case studies, selection of cases by sampling of attributes is not the highest priority but relevance to the quintain and opportunity to learn are usually of greater importance (Stake 2006).

2.3.1. Quality of research design

Construct validity, internal validity, external validity and reliability are the four tests that have been used by Yin (2003) to test the quality of case studies.

Table 2.1: Case study tactics to test the quality of research design

Tests	**Definition**	**Tactic**	**Phase of research in which tactic occurs**
Construct Validity	Establish correct operational measures for the concepts being studied	Multiple sources of evidence	Data collection
Internal Validity	Establishing a causal relationship between research variables (certain conditions lead to the other conditions).	-Pattern matching -Explanation building -Address rival explanation -Logic models	- Data Analysis - Data Analysis - Data Analysis -Data Analysis
External Validity	Establishing the domain to which a study's findings can be generalized	-Theory applied in single case study -Replication logic in multiple case studies	- Research Design -Research Design
Reliability	Demonstrating that the operations of a study can be repeated with the same results.	-Case study protocol is applied -Development of case study database	- Data Collection -Data collection

Source: Yin (2003)

2.4. Data Collection

In general two types of data sources are recognized in theory, namely primary and secondary data. Whereas primary data is collected by the researcher itself, secondary data already exists and the researcher is not involved in the collection of it, so the research is analysing pre-existing data (Sachdeva 2009).

According to Yin (2003), Case study deals with variety of evidence like documentation, archival records, arty-facts, interviews and observations. The aim of case study is to expand and generalize theories (analytical generalization) and not to enumerate frequencies (statistical generalization). There are three principles of data collection in case study research: (1) use of multiple sources of evidence (2) creation of case study data base (case study notes, case study documentations, case study documents, tabular materials and narratives) and (3) to maintain chain of evidence to allow a reader to follow the derivation of evidence from initial research questions/objectives to case study conclusion.

2.5. Data Analysis

Data analysis consists of examining, categorizing, tabulating, testing or the use of both qualitative and quantitative evidence to address the intention of the study. There are five techniques for analysing case studies research, pattern matching, explanation building, time-series analysis, logic models and cross-case synthesis, whereby the first four can be used with either single or multiple case studies while cross-case synthesis is mainly used to analyse multiple cases (Yin 2003).

- Pattern Matching: This technique compares an empirically based pattern with a predicted one; since our study is explanatory the pattern may relate greenhouse gas reduction with Fair Trade movements.
- Explanatory Building: This is mainly used in explanatory case studies to explain the casual links about a phenomenon.
- Cross-case Synthesis: This is specifically applied to analyse multiple cases and can be performed whether the individual case studies have previously been conducted as independent research studies or as a pre-designed part of the same study. The technique treats each individual case study as a separate study. If modest numbers of case studies are available, create a word table that display the data from the individual cases according to some uniform framework. Such tables can be further developed into tables which display data on a ‘case-by-case’ basis. These tables

can be used to 'analyse whether different group of cases appear to share some similarities and deserve to be considered examples of the same type of general case (Yin 2003, p. 135). The cross-case synthesis technique together with cross-data tables are used to analyse the multiple study results.

In addition Johnson (1997) mentioned pattern matching and triangulation as strategies used to promote qualitative research validity.

2.6. The design applied in this thesis

The purpose of this study is to explore how Fair Trade movements/initiatives reduce greenhouse gas emissions and to promote the development of fair and green supply chains in Afro-European settings in horticultural products. We have employed case study method to carry out this study for the reason that the case study method answers WH questions (why and how). Also since the boundaries of our study are still unclear (Fair Trade initiatives lower greenhouse gas emissions). Similarly, we have used case study method to gain tremendous understanding of the study. This study is explanatory in nature because it focuses on the causal link between Fair Trade initiatives and greenhouse gas emissions.

According to Eisenhardt and Greabner (2007) multiple case studies facilitate broader exploration of research questions and theoretical expansion. In this study we will use multiple case study approach to explore differences within and between cases which will help us to achieve the study objective and answer the research questions. From the cases we will be able to identify how different horticulture products grown in different countries behave in water utilization, energy consumption and greenhouse gas emissions.

According to Stake (2006), a good case study should have between 4 to 15 cases, in this study we will use five cases which have been studied in the past to find answers for the research questions and accomplish the objective. The unit of analysis for this study is greenhouse gas emissions as we are attempting to identify whether there is the potential for developing Fair Trade that also lowers greenhouse gas emissions and further promote fair and green supply chains. The selection of cases primarily will depend upon the relevance to our research questions and objective. After the selection of individual cases, single case analysis will be done followed by cross-case analysis. However our main concern here will be the cross-case analysis.

In this study we will use secondary data (review of academic articles, research reports, statistical sources and stakeholder information) as the data source. Documentation and

archival records will be used as data collection methods. Fair Trade written reports, administrative reports, newspaper, articles and formal studies can be used as documentation methods whereas archival records include service records (showing number of clients served), organizational and government records, Maps and Charts, list of names and items and survey data.

In case study analysis, we will use pattern matching and explanatory building to validate our study by relating greenhouse gas emissions/water footprint /global warming potential with different horticultural products and product's country of origin. We will also relate mode of transport used to transfer horticulture products from farm to market with greenhouse gas emissions. Similarly, we will relate farms/products which are Fair Trade certified and those which are not Fair Trade certified with greenhouse gas emissions, water footprint and global warming potential. In addition cross-case synthesis will be used to make cross-case analysis, by way of creating a table which will display information from individual cases to identify if different cases share some similarities and if generalization can be made from the cases. Triangulation (i.e. cross checking information within different cases if they are in agreement regarding the phenomenon studied) will be used to check the validity of our study. If different cases have similar information regarding the phenomenon then we have rationale (i.e. Validation).

Since the methodology used in this study is case study using secondary data, outcomes should be used to build theories and not to generalize to a wider population as one of the limitation associated with case study research methodology is lack of generalization and external validity (Larsson 1993). However, Johnson (1997) argues that a rough generalization can be made from the findings of qualitative research. Therefore, rough generalization can be done from the outcomes of this study but the objective of this study enhances the development of theories rather than generalize the findings.

CHAPTER 3

The development of Fair Trade Initiatives

3.1. History of Fair Trade

Fair Trade movement started back in 1940s through the initiative of some European and North American organizations to help disadvantageous producers by establishing alternative trade network. Faith and development groups started buying handcrafts made by poor producers in the south at above market price and selling them to conscious customers at the North (Raynolds, Murray and Wilkinson 2007). By 1950's Alternative trade organizations (ATO) like Sales Exchange for Refugee Rehabilitation and Vocation (SERRV) started selling handcrafts in North America and Oxfam were selling in Europe. During 1960's and 1970's ATO expanded significantly, in 1960's United Nations Conference on Trade and Development (UNCTAD) drew attention to the movement with "Trade Not Aid" motto which came out of that conference (Raynolds, Murray and Wilkinson 2007).

In late 1980's a different aspect of Fair Trade movement was established with introduction of certification and labelling to expand sales by moving beyond handcrafts made products to major food commodities like coffee. In 1988 'Max Havelaar' label was established in Netherlands to identify fairly traded coffee (EFTA 2006).

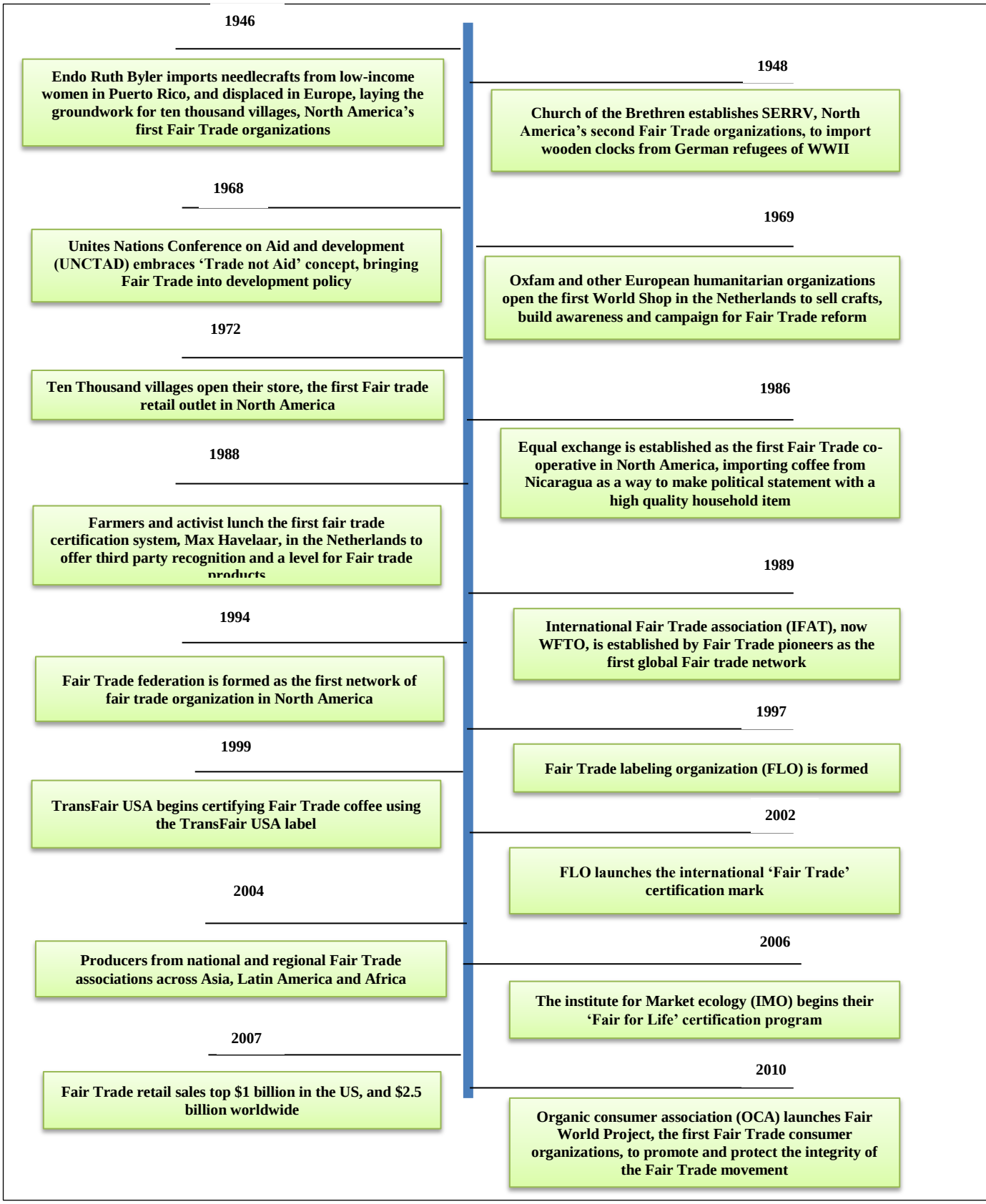
By 1997 Fair Trade Labelling Organization International (FLO) was established as an umbrella organization for the numerous National Initiatives working in individual countries. FLO sets the Fair Trade prices and standards for product categories, producers, and traders (Raynolds, Murray and Wilkinson 2007). In 2002 FLO launched International Fair Trade certification mark to improve visibility of the mark in supermarket shelves, facilitate cross border trade and simplify export procedures for both producers and exporters. In 2004 FLO created an independent entity, FLO- CERT, to verify that producer groups are in compliance with FLO's standards. FLO-CERT is responsible for the certification process and annual monitoring and inspections of each producer group. FLO members consist of four groups: traders, producers, experts and National Initiatives (NIs), also referred to as Labelling Initiatives. In 2007 Fair Trade International was recognized

by ISEAL[7] to reach the highest standard to define ethical trade (Fairtrade International 2011).

In the Fair Trade industry the common division of North versus South is often used. North represents the developed countries (including European countries, USA, Canada, Australia, New Zealand and Japan), whereas South represents the developing countries (countries from South America, Asia, Africa). In Fair Trade the South is the producing side of the Fair Trade supply chain; this is where most Fair Trade products originate. South is seen as consisting of three continents, Africa, Asia and South-America. The North on the other hand, represents the consumer side of the supply chain and forms the main market for Fair Trade products. Though, it is no longer only the Northern countries who buy Fair Trade products, local Fair Trade sales in the South are increasing as well (Boonman, et al. 2011).

[7] ISEAL: - International Social and Environmental Accreditation and Labeling are the global membership association for sustainability standards (Iseal Alliance 2012).

Figure 3.1: Fair Trade timeline



Source: World Fair Trade project (2012)

3.2. Current state of Fair Trade

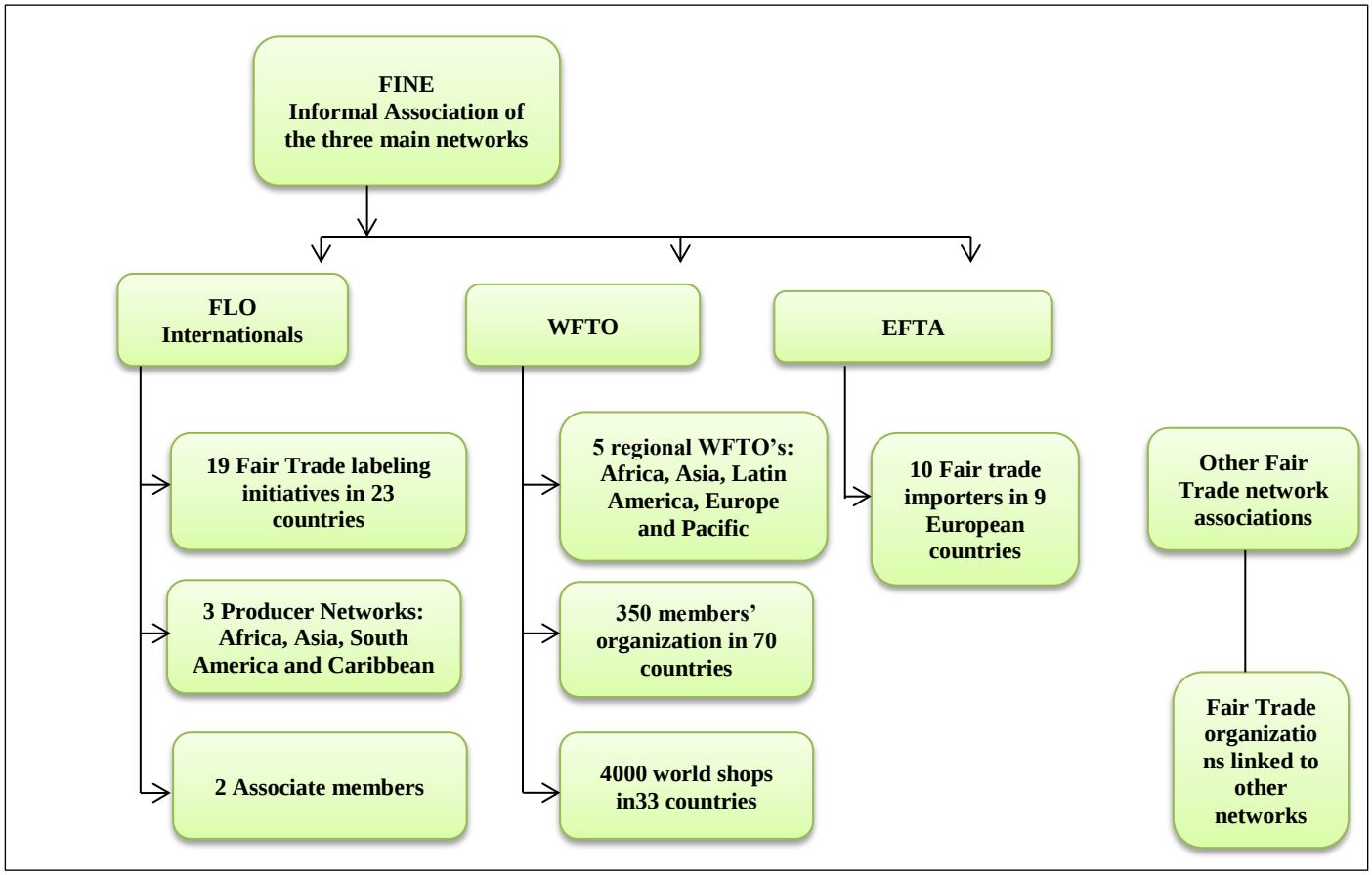
Since the beginning of Fair Trade in the 1980s and the launch of the current FAIRTRADE Mark in 2002, Fair Trade has become the most widely-recognized ethical label in the world (The Fairtrade Foundation 2011). Currently Fair Trade is monitored, certified and promoted mostly by Fair Trade labelling organization (FLO) and Word Fair Trade organization (WFT). According to Boonman, et al. (2011) sales of Fair Trade certified products have been growing at an average of 40% per year over the last five years, there are now over 10,000 Fair Trade products sold in over 70 countries. Sales of Fair Trade products are now taking off in new markets including Eastern Europe and South Africa (Boonman, et al. 2011). Fair Trade certified (FTC) products are found throughout the developed world in thousands of World-shops or Fair Trade shops, supermarkets and health food stores, convenience stores, restaurants and fast food outlets, small and large retail outlets, and numerous online stores. While most FTC products are sold in developed countries (the North), sales outlets in developing countries (the South) are starting to grow. The largest Fair Trade markets in the North are the U.S. and the European Union (Boonman, et al. 2011).

Outlets for Fair Trade products across Europe spread rapidly in 1960s and 1970s (Raynalds 2009). According to Fairtrade International annual report of 2011, there are 66 Fair Trade producer countries including more than 1.2 million Fair Trade producers globally. Fair Trade agreement has attracted lots of farmers and producer organizations all over the world. Producer organizations are growing worldwide every year. For instance, annual report of Fair Trade labelling international organizations of 2011 shows that producer organization grew to total number of 991 by 2011 which is 10 % increase from the year 2010, in which 76% represents small producer group. Similarly, Fair Trade products have attracted consumers mainly in the North who have high earnings, as consumer value have shifted from price and value driven imperatives to ethical values and more importantly on the story behind the products (FLO 2006). According to FLO annual report (2006), the increase in consumer demand for Fair Trade products have attracted retailers in North, mainly in UK and USA. By far UK is the largest market for Fair Trade products with the sales amount of GBP 1,498,207,592 followed by USA in second position with the sales amount of GBP 1,030,670,695 (Fairtrade International 2011). According to FLO annual report (2011), Fair Trade producers received 65 million Euros as a Fair Trade premium and small producer organizations are investing that amount in further

development of their business. For instance; they are using Fair Trade premium for productivity and quality improvements, or investments for processing facilities.

To increase the market for Fair Trade, many volunteers have mobilized themselves in order to spread awareness about trade injustice and promote Fair Trade at the local level. For example; during the Fair Trade fortnight held in UK in March 2007, around ten thousand local events helped promoted Fair Trade by committed volunteers across the country (FLO 2006). Increased in customer awareness regarding ethical products in North has created greater prospects to increase market for Fair Trade.

Figure 3.2: Schematic overview of the biggest organizations in Fair Trade movement



Source: Boonman, et al. (2011)

All Fair Trade standards, including minimum prices and premiums are set by the Standards Unit at FLO and the minimum prices and premiums for each product are included in the product-specific standards (Fairtrade International 2011). The process of agreement in

international Fair Trade standards follows the ISEAL Code of Good Practice for Social and Environmental Labelling, where stakeholders (including producers, traders, NGOs) participate in the research and consultation process and final decision making (Fairtrade International 2011).

3.2.1. World Fair Trade Organization

World Fair Trade organization (WFTO) is the global authority on Fair Trade which represents Fair Traders from grassroots through to the G8 and is the trustworthy voice of Fair Trade, having driven the movement for 20 years (WFTO 2012). It is the only global network whose members represent the Fair Trade chain from production to sale (WFTO 2012). Word Fair Trade operate in 75 countries across 5 regions; COFTA in Africa, WFTO-Asia, WFTO-LA in Latin America, WFTO-Pacific in North America and the Pacific Rim, and WFTO-Europe (WFTO 2012).

- **Fair Trade in United Kingdom (UK)**

UK is the global market leader of Fair Trade products, farmers and workers in 59 developing countries sell their products to UK (Fairtrade Foundation 2012). The Fair-trade Foundation has licensed over 3,000 Fair Trade certified products from coffee to flowers for sale through retail and catering outlets in the UK. According to Fairtrade Foundation (2012), in UK there was 12% increase in retail sales of Fair Trade products in 2011, Fair Trade mark gained recognition by 78%, 508 UK companies licensed to use Fair Trade mark and 20.5 Million pound Fair Trade premium generated for sales of Fair Trade products in 2011. There are different independent world shops in Britain selling Fair Trade products many of them belong to British Association for Fair Trade shops (BAFTS) (Fairtrade Foundation 2012).

Fairtrade Foundation is the authority that deals with Fair Trade movements in UK; it was established in 1992 by CAFOD[8], Christian Aid, Oxfam, Tradecraft, the World Development Movement and the National Federation of Women's Institutes (Fairtrade Foundation 2012). Currently there are more than 270 Fair Trade towns in UK which is also the original place for evolution for the concept of Fair Trade town. Farmers and producer organizations seem to have benefited by the Fair Trade premium paid by retailers (Fairtrade International 2011).

[8] CAFOD is the Catholic Agency for Overseas Development (CAFOD 2012).

- **Fair Trade in Norway**

The Max Havelaar is a Fair Trade label that was established in 1988 under the initiative of the Dutch development agency. In late 80s/early 90s, the max Havelaar initiatives was replicated in Norway together with other European countries (Belgium, Switzerland, Denmark, and France) (Fairtrade International 2013). Nevertheless, the Max Havelaar started coffee as the first product for labelling; there are several food and non-food products that are labelled as Fair Trade product. In Norway there are diverse products which are available as Fair Trade certified products like coffee, flowers, cocoa, sugar, cotton, tea, wine, spices, rice, banana and other fruits (Fairtrade Norway 2013). The consumption of Fair Trade certified goods increased in 2009 by 25% in Norway which indicates that there is a growing interest from consumers and many companies are also showing interest to become Fair Trade Company (Fairtrade Norway 2013).

According to Utsira Gir Energy (2013), there are 30 municipalities in Norway that have been approved as Fair Trade among 428 municipalities where Utsira is the 30thFair Trade municipalities declared in January 2013. The Max Havelaar Norway got the concept of Fair Trade town from United Kingdom and follows the same concept as Fair Trade municipalities (Fairtrade Norway 2013). According to Fairtrade Norway (2012), the five basic criteria that must be met in order for a municipality to have a status as Fair Trade are:

- It must form a local steering committee which is responsible for driving the process forward. The steering group can consist of anyone in the community - the broader the better. The steering group must have at least one representative from the municipal administration.
- Municipal or city council must make a decision that the municipality wants the status of Fair Trade and support Fair Trade. The minimum requirement involves the serving of Fair Trade coffee in the municipal civil service and at political meetings.
- A range of Fair Trade products must be available to consumers in local stores and restaurants.
- Fair Trade products must be used in a number of local businesses, schools, churches etc.
- It will engage an active information work in the community and at least two Fair Trade-related activities each year.

Only getting Fair Trade certification by municipalities is not enough to maintain their status as Fair Trade municipalities. They are required to report annually to the Fair Trade Norway which includes information regarding status of work and further objectives (Fairtrade Norway 2013).

- **Fair Trade in Africa**

Cooperation for Fair Trade in Africa (COFTA) is the Africa Regional Chapter for the World Fair Trade Organization (WFTO) and as such is a network of Fair Trade producer organisations in Africa involved and working with disadvantaged grass root producers to eliminate poverty through Fair Trade (COFTA 2013). COFTA tries to reinforce its members' capacity to benefit from global markets by assisting them to develop quality products and providing them with market access support through shared efforts and resources within the principles and structures of Fair Trade (COFTA 2013).

COFTA was established in 2004 by African producers and aims to be the continental voice in promoting for greater market access and Fair Trade advocacy for African Producers. Currently COFTA is composed of over 170 member organizations from 20 African countries and has networks in Kenya, Tanzania, Rwanda and Swaziland (COFTA 2013).

According to WFTO (2012), in Africa there are three types of producer organization; Primary organization which produces tangible products, secondary organization which provide services and support organization which provide products which are necessary for the management of the company. Trading partners for Fair Trade producers' can be partners from Fair Trade movement or from convectional trade. African producers have 33% of Fair Trade partners and 67% of convectional partners (WFTO 2012). In 2010 total sales in Africa has reached US dollar 27.8 million with 44% of the produce are sold locally while 56% are exported (WFTO 2012). According to WFTO (2012), Fair Trade provide jobs to more than 37, 500 people in Africa.

3.2.2. Quality assurance procedures of the Fairtrade mark

The FAIRTRADE Mark is an independent consumer label which appears on Fair Trade products as an assurance that they have been certified against internationally agreed Fair Trade standards (Fairtrade Foundation 2012). The Mark indicates that the product has been certified to give a better deal to the producers involved; it does not act as a confirmation of an entire company's business practices. For a product to show the FAIR TRADE

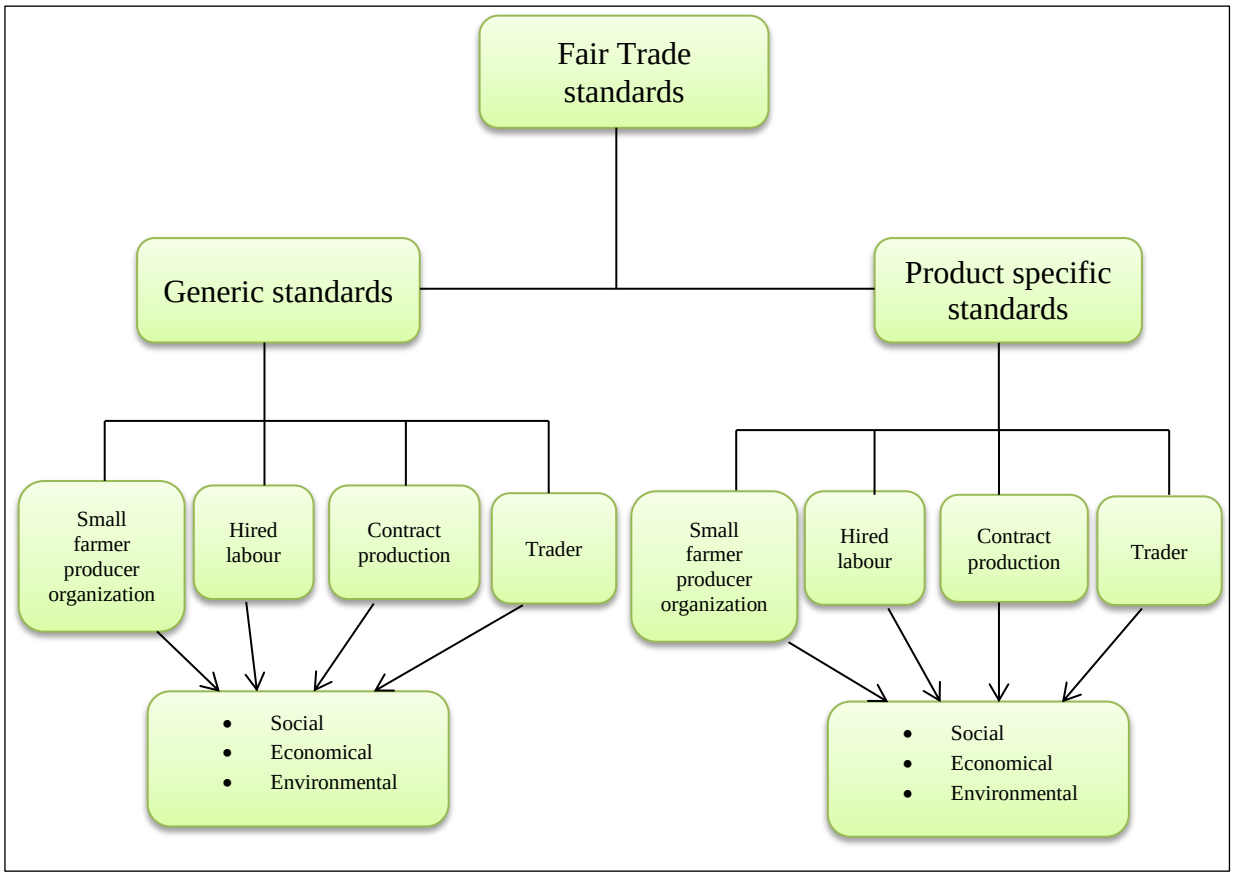
Certification Mark it must meet international Fair Trade Standards. These standards are established by Fair Trade International and are set in accordance with the requirements of the ISEAL Code of Good Practice in standards setting (Fairtrade International 2011).

Fair Trade certification is a product certification system where social, economic and environmental features of production are certified against Fair Trade standards for Producers and Traders (FLO-CERT 2011). Fair Trade certification system is run by the separate company named FLO-CERT by inspecting compliance with Fair Trade standards governing production, buying and selling of a product up to packaging and labelling and ensuring that relevant social and environmental standards are met (FLO-CERT 2011). FLO-CERT is an ISO 65[9] certified body, thus it follows the ISO 65 norm in all its certification operations (Fairtrade International 2011). The certification system involves number of processes with differences in respect to working group (small producers and hired labours) and contract production and traders. The certification processes involves application, audit, evaluation and certification, throughout these processes credible compliance of Fair Trade standards is mandatory (FLO-CERT 2011).

Fair Trade Standards are a set of requirements that producers and traders have to meet in order to obtain Fair Trade product certification. Fair Trade Standards, comprising Fair Trade Generic Standards (minimum requirements) and Fair Trade Product Specific Standards, in which generic standards are divided into small producer organizations, hired labour, contract production and trade (FLO-CERT 2011). These standards are classified into minimum (core) requirements and development (progressive) requirements. Generic and product specific standards have social, economic and environmental requirements that must be met by producers and traders to be certified by Fair Trade (FLO-CERT 2011).

[9] ISO 65 is the international Organization for Standardization which deals with product certification (ISO 2012).

Figure 3.3: Fair Trade standards



Source: FLO-CERT (2011)

Therefore the consumers can be confident that the FAIR TRADE Mark is only used on products that come from Fair Trade certified producers and also the traders meet their obligations under the Fair Trade Standards (FLO-CERT 2013). Likewise Fox (2007) in his case study explains that the certification mark is intended for consumers and aims to guarantee that the producer was paid a premium to grow the Fair Trade product in an environmentally and socially responsible way. It is very important to assure consumer that the Fairtrade mark has been used fairly as they are the one who pay the premium for the product. According to Fox (2007), the promises that Fair Trade international label organization makes to its consumers are:

- Non-discrimination in hiring labours and accepting members.
- Minimum wages for the worker.
- Child or forced labour is not used in the production of product.

- Ban on genetically modified product, limited use of agro-chemical, protection of soil and waterways, and natural habitat protection.

One important principal of Fair Trade is empowerment of smallholder of coffee producers (Fox 2007). One can be confident that the producer is getting price premium as the process is completely transparent and there is documentation along the supply chain to check whether the producers are getting premium or not. National initiatives verify the payment of the premium price by inspecting bills of sale submitted by purchaser and later FLO does the 3rd party inspection during the yearly inspection (Fox 2007).

Even though the FLO-CERT has strong quality assurance procedure of Fair Trade mark, there are lots of co-operatives who violets the rules. In 2005, 261 were found in violation of standards like irregular accounting practices, issue of transparency of budgetary matter. And they suspended some of co-operatives who did not follow the standards until the second inspection (Fox 2007). Suspended co-operatives can sell their products but they will not be allowed to use the Fairtrade mark and sell through the same supply chain. One example of Fair Trade action against the violated co-operatives is: in 2005, Abhahuzamugambi co-operatives in Rwanda was suspended for number of violation and given a period of 9 month for corrections. FLO-CERT's main concern was on the non-transparency in the area of financial records and information about the members (Fox 2007).

3.3. Challenges faced by Fair Trade

There are many challenges in the market that acts as obstacles for the Fair Trade activities as trade operate on multiple levels and involve a range of problems, including those of market expansion; producer knowledge; Fair Trade membership; multiple labelling and certification; direct marketing; state support; diversification and gender issues (Murray, Raynolds and Taylor 2003). Similarly, According to Jones and Brendan (2000), response to technological developments acts as a challenges to farmers and producers when the issue comes to direct marketing. In addition, building attractive Fair Trade brand has become a big issue among the seller of Fair Trade as labelling only provides a technical foundation but it does not guarantee commercial success (Jones and Brendan 2000).

Hira and Ferrie (2006) mentioned uneven awareness and availability across different areas as one of the main challenges faced by Fair Trade. The natural market for Fair Trade

products seems to be young urban professionals and activist groups in higher education (Hira and Ferrie 2006). Fair Trade is growing fast but still only few people know about it and buy Fair Trade product. Transfair Canada survey of 1487 coffee drinkers in 2002 and found that only 11% were aware of Fair Trade coffee among which only 4% had purchased it (Hira and Ferrie 2006).

Bigirwa (2005) identified five challenges which face Fair Trade:

Concentration in the niche market: Fair Trade is a kind of niche market. It consists of very small number of farmers and producers. Fair Trade is not serving the majority smallholder farmers who are mainly involved in horticultural cultivation. Though the market share of Fair Trade products is increasing, it is still not being able to include all the small farmers around the world.

High initial entrance cost: FLO has strict code and standards that must be followed by every smallholder farmers and producers in order to have market access to the fair-trade market. It involves pre-assessments, inspection, verification and certification to assure that the commodity conforms to the code and standards. Certification has been one of the hindrances to farmers joining fair-trade as it is quite expensive especially at the beginning. Together with cost issue, farmers are also bothered to join Fair Trade as it takes long time to get registered initially.

Similarly, Pound and Phiri (2011) mentioned high certification and audit cost as among the main challenges of Fair Trade especially for small, independent organizations.

Fair Trade doesn't trade in finished goods: Fair-trade does not trade in finished products from producing countries but prefers to deal in raw material like green coffee bean. This deprives cooperatives the opportunity to add value.

Fair Trade price is dependent upon conventional trade price: The Fair Trade price depends upon the conventional trade price, although Fair Trade price consists of premium price, sometimes, farmers get very low price for their product even lower than the actual cost of production when the conventional price goes down.

Climate change: Fair Trade producers are among the people who are most affected by climate change. They have been suffered from earthquakes, flooding, hurricanes, landslides and other natural calamities. Similarly, the weather pattern is becoming more

unpredictable which poses challenges in climate change adaptation due to training and expensive equipment (Fairtrade International 2010). Fair Trade International has developed a Climate Change Strategy in cooperation with producer organizations and labelling initiatives in order to cope with challenge provided by it (Fairtrade International 2011).

CHAPTER 4

Key issues on Green Supply Chains, Fair Trade initiatives and Horticulture Market

Green is not a label, mark or certification and it can mean different things according to different perspective/people. There is no any general definition of green; however, the following are some of the definitions of green as cited below (Windsor 2010).

> *"The immediate impact of our product and services and the residual impacts of our products and services (Michael Richmond, Director of Green Business League)"*
>
> *"Having positive environmental thought (Business Dictionary.com)"*
>
> *"A business practice that conserve the natural environment and resources through processes that reduce or eliminate emissions or waste (California Employment Training panel)"*
>
> *"A green business is a business that operate in a way that solve than cause environmental and social impacts (Green America)"*
>
> *"A green company uses practices that are viewed as sustainable and environmental friendly (wisegeek.com)"*

From these definitions we can draw common words which keep appearing in all the definition of green like environment, social and sustainable. Therefore, we can say that 'Green' is something which has deals with sustainability, environment and society. Windsor (2010) propose that the definition of green should contain some measurable parameters and requirements for continuous improvements, for instance measuring carbon emissions is a popular tool for evaluating environmental impacts. The common measures of green are carbon emissions, waste landfills and water usage.

Similarly, Ottman et al. (2006) defined green product as those products which strive to protect or enhance the natural environment by conserving energy or resources and reducing or eliminating use of toxic agents, pollution, and waste. This definition pointed energy, resources, pollution and waste as the focus for green products. In addition The Commission of the European Communities (2001) defines green products as products that 'use fewer resources, have lower impacts and risks to the environment and prevent waste

generation already at the conception stage'. This definition highlights the importance of designing products as "green" from its conception and primary phase (Dangelico and Pontrandolfo 2010). These two definitions of green products emphasizes on the efficient use of resources/ energy for production, usage and disposal which produce low/no negative impacts to the environment.

Therefore from the above definitions of green, we can now define Environmental sustainability. Morelli (2011) defined environmental sustainability as meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them and more specifically, as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity**.** Environmental sustainability involves keeping a balance between nature's capacity to regenerate and the effect of each person's life on Earth. This effect is known as human beings' "footprint" (Green Sustainability 2013).

Environmental footprint is categorized differently from different literature. According to Galli, et al. (2012), environmental footprint may be divided into Carbon footprint, ecological footprint and water footprint.

- The Carbon Footprint

Carbon footprint measures the total amount of greenhouse gas emissions that are directly and indirectly caused by an activity or are accumulated over the life stages of a product. This includes activities of individuals, populations, governments, companies, organizations, processes, industry sectors, etc. In any case, all direct (on-site, internal) and indirect emissions (off-site, external, embodied, upstream, and downstream) need to be taken into account. Carbon Footprint of a nation is the sum of all emissions related to the nation's consumption, including imports and excluding exports. A carbon footprint is specified in tonnes or kilograms of carbon dioxide equivalent (Galli, et al. 2012).

- Ecological footprints

Ecological footprint is a measure of the area required to supply resources and assimilate waste without compromising the ability of those areas to continue to provide services (Monfreda, Wackernagel and Deumling 2004). Indicates how much resources human

beings consume, mainly in terms of water and land. Ecological footprint is expressed in terms of global hectares (Galli, et al. 2012).

- Water footprint

Water footprint is defined as total volume of fresh water that is used to produce the goods and services consumed by the individual or community or produced by the business. The Water Footprint looks at both direct and indirect water use of a consumer or producer (Galli, et al. 2012). Three key water components are: The blue Water Footprint which refers to consumption of surface and ground water; the green Water Footprint which refers to consumption of rainwater stored in the soil as soil moisture; the grey Water Footprint refers to pollution and is defined as the volume of freshwater required to blend in the load of pollutants based on existing ambient water quality standards. Water footprint is expressed in terms of water volumes consumed (evaporated or incorporated into the product) and polluted per unit of time (Galli, et al. 2012).

Therefore reducing ecological footprint, water footprint as well as carbon footprint (can be called as environmental footprint) indicates living 'greener'. Similarly, living green refers to a lifestyle that promotes environmental sustainability (Green Sustainability 2013). In this study we are going to make analysis considering carbon footprint, water footprint as well as ecological footprint.

In the work of Johnson (2008) proposed that In order to reduce environmental footprint, the following are the strategic areas that can aid reduction of environmental footprint: Energy efficiency, Water efficiency, Sustainable buildings, Renewable energy, and transportation and Environmental management systems.

4.1. Greenhouse gas emissions

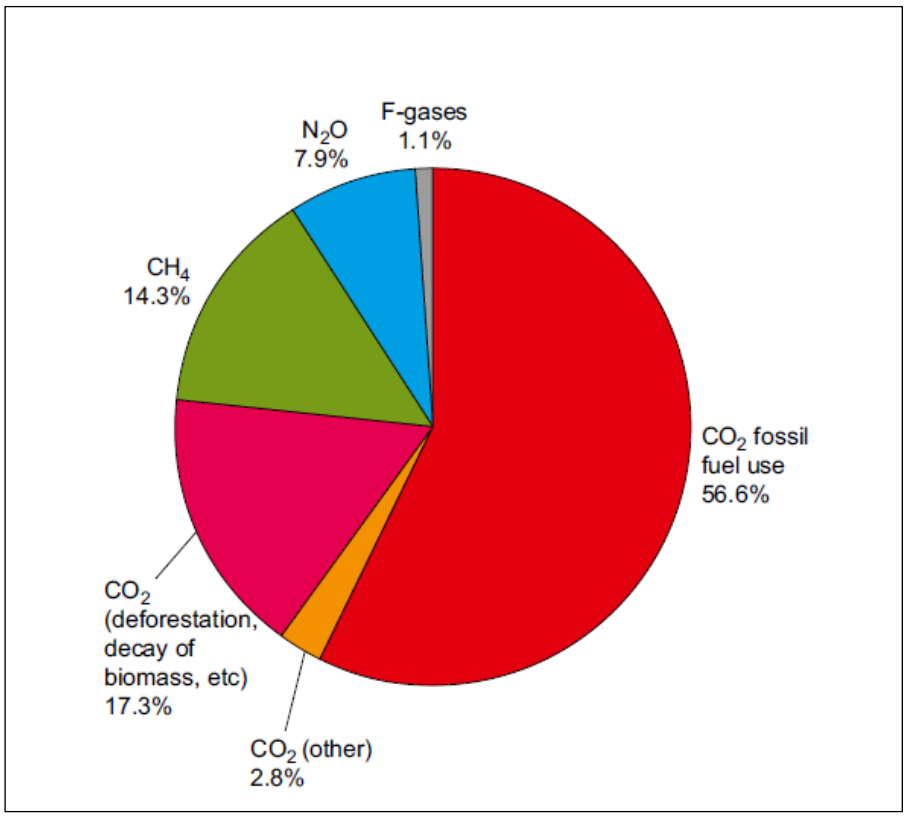
Climate change and development are closely interrelated; development has traditionally triggered increased greenhouse gas emissions (GHG). The accumulated greenhouse gases in the atmosphere are altering global climate and challenging global development (Kenneth 2009). Developed countries are responsible for most of the accumulated greenhouse gases and still emit more per capital than rest of the world. Developing countries are responsible for the current emissions and their contribution is growing quickly. In order to stabilize and reduce greenhouse gas emissions both developed and developing countries need to move to more sustainable path, although developing

countries need financial and technological assistance to do so and appropriate policies will be applied to all (Kenneth 2009).

Greenhouse gases (GHG) are those gases present in the atmosphere which are capable of absorbing and emitting radiation. Such gases in the atmosphere trap the solar radiation and contribute in regulating the heat on earth's surface. Some of the major greenhouse gases are water vapour, carbon dioxide, methane, nitrous oxide, ozone etc. (Casper 2010). Natural greenhouse effect is absolutely necessary for living conditions at earth but human activities are causing artificial greenhouse effect which has led to global warming. About 70 % of the solar radiation is absorbed by the earth surface and the rest 30 % is reflected back to space (Casper 2010). Of the total radiation that enters the earth's atmosphere, most of them are absorbed by the surface and the rest are reflected back to the atmosphere and the GHGs then reflect it back to the earth trapping the heat waves. This wave reflecting effect causes the temperature of the earth to rise, which we term as global warming (Casper 2010).

Greenhouse gases (GHG) covered by United Nations Framework Convention on Climate (UNFCC) are Carbon dioxide (CO_2), methane (CH_4), Nitrous Oxide(N_2O), Sulphur hexafluoride (SF_6),perfluorocarbons (PFC_S) and hydrofluorocarbon (HFC_S) (NRC 2010). Carbon dioxide, Methane and Nitrous oxide have higher percentage than other gases. In the study of NRC (2010) identified the causes of different gases in the atmosphere, CO_2 is mostly from fossil fuel burning, deforestation and other human activities. Agriculture, livestock husbandry and damming projects are the sources of methane (CH_4) and nitrous oxide (N_2O).

Figure 4.1: The global anthropogenic greenhouse gas emissions



Source: IPCC (2007)

Table 4.1: Greenhouse gases emission by sector

Sector	**Fraction of Total emissions**
Energy supply	25.90 %
Industry	19.40 %
Forestry	17.40 %
Agriculture	13.50 %
Transport	13.10 %
Residential and commercial building	7.90 %
Waste management	2.80 %

Source: IPCC (2007)

With respect to the environment, transportation is the most noticeable aspect of supply chains; its contribution to the total global emissions is 13.10% (IPCC 2007). In this study

the main concern is on imported horticultural products in Europe from Africa. Therefore transportation is one aspect which we will take into consideration. According to Dekker, Bloemholf and Mallidis (2012), mode of transportation is one of the key choices in transport, which is transport by plane, ship, truck, rail or pipelines. The choice of mode of transport depends on the type of product (liquid, bulk, package, or perishable products) and the distance. For instance in case of intercontinental supply chains, the main choice is between air and sea while for continental supply chains choices are many between trucks, airplane, train or short sea ship (Dekker, Bloemholf and Mallidis 2012). In addition mode of transport differs in terms of energy use and emissions; this also depends on the type of equipment used and efficiency. For example the larger the transportation unit, the fewer the emissions per kg transported and the new equipment is more energy efficient than the old one (Dekker, Bloemholf and Mallidis 2012). Table 4.2 shows the comparison of energy use and emissions for transport units of different modes

Table 4.2: Energy use and emissions for typical transport units of different modes

Energy use/emissions g/t/km	**PS-type container vessel(11,000 TEU)**	**S-type container vessel(6,600 TEU)**	**Rail-electric**	**Rail-Diesel**	**Heavy truck**	**Boeing 747-400**
kWh/t/km	0.014	0.018	0.043	0.067	0.18	2
CO_2	7.48	8.36	18	17	50	552
SO_X	0.19	0.12	0.44	0.35	0.31	5.69
NO_X	0.12	0.162	0.1	0.00005	0.00006	0.17
Particulate matter	0.008	0.009	N/a	0.008	0.005	N/a

Source: Dekker, Bloemholf and Mallidis (2012)

When comparing transport modes in terms of carbon dioxide emissions, we notice that water transport is CO_2 efficient, followed by diesel rail, electric rail, heavy truck and lastly Boeing 747 (airplane). In terms of SO_X, modes do not differ much except for Boeing 747 (airplane) which emits more. Ships are responsible for NO_X emissions.

In order to reduce greenhouse gas emissions EPA (2009) mentioned three methods:

- Material management through resource conservation and recovery: Material management includes management of material resources as they flow through the economy, from extraction or harvest of materials and food (e.g., mining, forestry, and agriculture), production and transport of goods, provision of services, reuse of materials, and disposal.
- Land management through prevention of contaminant releases and clean-up and reuse of contaminated sites: Land management refers to how we manage and use land to provide open space and habitat, food, natural resources, and places for people to live, work, and recreate. Materials management can be done effectively by using and reusing resources productively and sustainably throughout their life cycles, minimizing both the amount of materials involved and the associated environmental impacts. Land management strategies can be implemented by preventing and minimizing the occurrence of contamination and cleaning up, reusing, and restoring contaminated land for beneficial reuse (EPA 2009).
- Emergency response and preparedness: The potential for reducing Green House Gas emission can be done by analysing and controlling total technical potential. The term "total technical potential" refers to the estimated GHG emission reduction that could occur if the scenarios presented are achieved, setting aside economic, institutional, or technological limitations (EPA 2009). According to EPA (2009) reducing packaging use is one of the technical potential that can be used as a means to reduce GHG emission. Strategies for reducing GHG emissions through materials and land management include materials efficiency, industrial ecology, green design, land revitalization, sustainable consumption, smart growth, pollution prevention, and design for environment (EPA 2009).

4.2. Drivers for greening supply chain

Environmental concerns over the past decade have increased enormously, which forced companies to take initiatives to green their supply chain (Sheu, Chou and Hu 2005). Similarly, consumers are becoming increasingly aware of environmental issues which force companies to be environmental proactive (Carter, Kale and Grimm 2000). According to Carter, Kale and Grimm (2000), proactive environmental policies include developing green products and packages, conserving energy, reducing waste, recycling, and creating a corporate culture that is environmentally sensitive. Andic, Yurt and Tuncdan (2012)

argues that if we set a goal to decrease humanity's negative effects on the environment, the best place to start would be industries, since the negative effect of industries are much greater than those of individuals. Greening the supply chain is of paramount concern for many business enterprises and it's a challenging issue in a global context. Several definitions of green supply chain exist in the literature. The following are some of the definitions of green supply chains:

Green Supply chain management is the set of supply chain management policies held, actions taken and relationships made in response to concerns associated to the natural environment with regard to the design, acquisition, production, distribution, use, re-use and disposal of the firm's goods and services (Zsidisin and Siferd 2001). McKinnon, et al. (2010) definition of green supply chain was adapted from Klassen and Johnson (2004) which defined Green supply chain management as the alignment and incorporation of environmental management within supply chain management, while according to Walker, Sisto and McBian (2008) green supply chain concept covers all phases of a product's life cycle, from the extraction of raw materials through the design, production, and distribution phases, to the use of the product by consumers and its disposal at the end of the product's life cycle. Also Styles, Schoenberger and Galves-Martos (2012) mentioned that supply chain sustainability requires a shift from simple purchasing to integrated supply chain management in which businesses consider multiple upstream and downstream actors.

The study of Rao and Holt (2005) observed that greening different phases of the supply chain leads to an integrated green supply chain, which sequentially leads to competitiveness and better financial and operational benefits. By phase they referred to greening inbound functions of supply chain, greening production, greening outbound functions and reverse logistics. Govindan and Diabat (2011) mentioned green design, green sourcing/procurement, green operations or green manufacturing, green distribution, logistics/marketing and reverse logistics as activities covered in green supply chain.

There are reasons as to why firms should engage in greening of supply chain: In the work of McKinnon, et al. (2010) point out the drivers for greening supply chain as compliance with government regulations, reducing operating cost, rising cost of energy, improving investor relations, gaining competitive advantage, improve corporate image and satisfy customer requirements. While Walker, Sisto and McBian (2008) distinguished between internal and external drivers of greening supply chain. Internal drivers are organizational

factors like personal commitment of owners, desire to reduce cost, improve quality, pressure from investors and policy entrepreneurs. Whereas, external drivers are factors outside the organization like: government regulations and legislations, customers' pressure, competitors, society (public pressure) and suppliers. In addition Zhu and Sarkis (2006) categorised drivers for greening supply chain into four aspects of stakeholders (1) regulatory stakeholders, which either set regulations or have the ability to convince governments to set standards, (2) organizational stakeholders that are directly related to an organization and that can have a direct financial impact on the company like investors (3)community groups, environmental organizations and other potential lobbies who can mobilize public opinion in favour of or against a firm's environmental policies and (4) the media, which have the ability to influence society's perception.

According to Walker et al. (2008); Zhu and Sarkis (2006) the main drivers for greening supply chains are desire to reduce cost (economic concern) and compliance with regulations. On the other hand Andic, Yurt and Baltacioglu (2012) mentioned legal and economic concern as the strongest drivers for greening supply chains. However since not all organizations are exposed to the same type of drivers, since it depends on the scope of operation (international/domestic), level of technology, nature of industry, energy used, type of ownership (private or public) etc. For instance, with Kyoto Protocol requirements and international pressures for reducing greenhouse gas emissions, there may be different and increased pressures on those industries that are heavy emitters of greenhouse gases (example power generation industries) (Zhu and Sarkis 2006).

In addition to drivers there are barriers to greening supply chains; based on the interview done by Walker, Sisto and McBian (2008) in seven different public and private organizations identified that cost and lack of legitimacy are the internal barriers and regulations, poor supplier commitment and industry specific barriers as the external barriers to greening supply chain.

4.3. Green supply chain practices

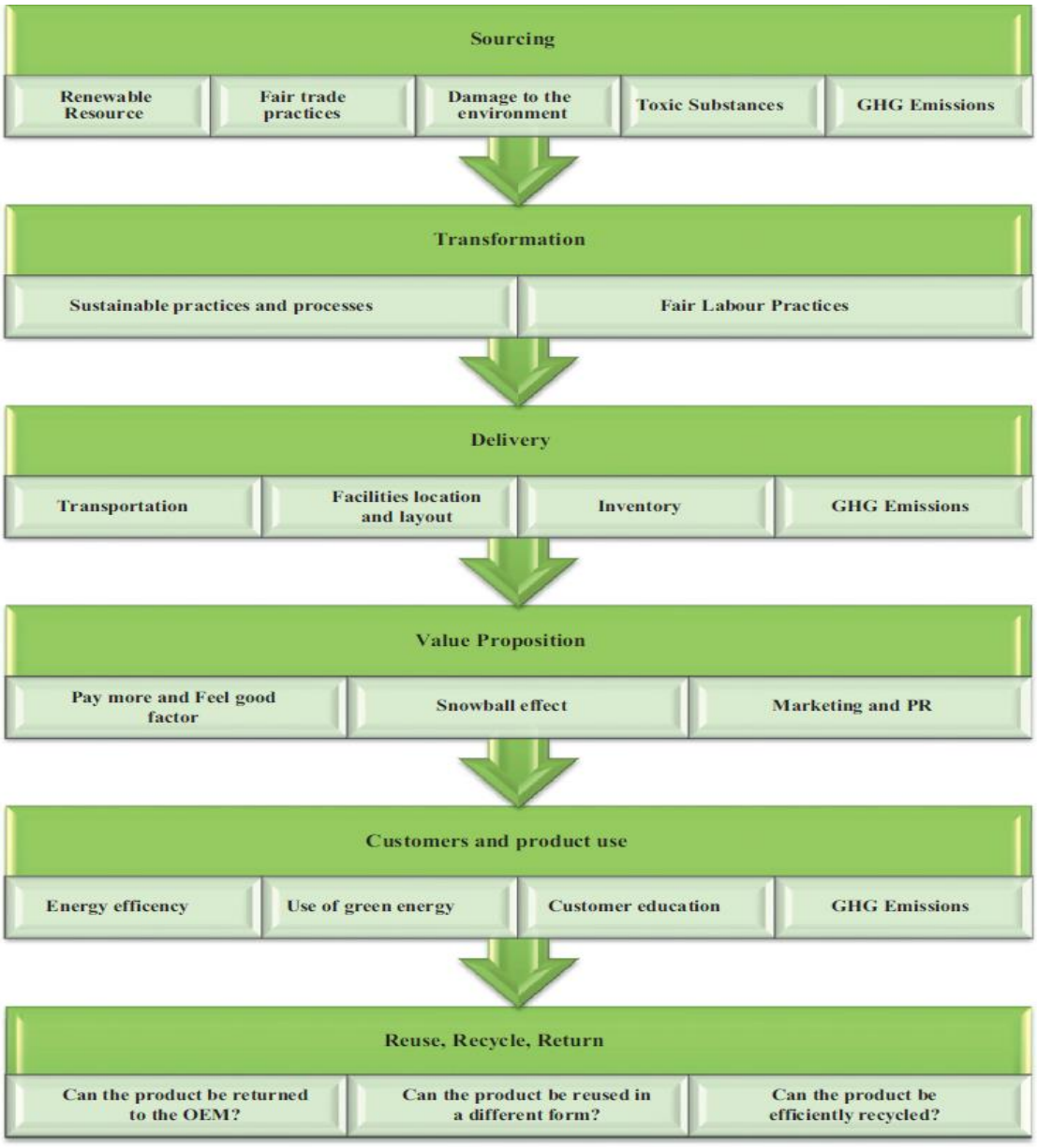
Green supply chain practices are considered to be any action which is performed across the supply chain (inward to the focal company and involving relationships with partners upstream and downstream) to remove or lessen any kind of detrimental environmental impact (Azevedoa, Carvalhob and Machadob 2011). Thus, the practices can be identified at the strategic, tactical or operational level and could be related to the supply process, the

product itself, the delivery process or advanced actions involving some kind of innovation (Azevedoa, Carvalhob and Machadob 2011). Similarly Rao and Holt (2005); Azevedoa, Carvalhob and Machadob (2011) categorized green practices in the supply chain into three broad aspects: practices within the firm (focal firm), from suppliers side and customers' side, thus upstream (inbound) and downstream (outbound). Adaptation and implementation of green practices is becoming a matter of obligation rather than choice.

In the study of Azevedoa, Carvalhob and Machadob (2011); Rao and Holt (2005) green supply chain practices that involve suppliers (inbound green practices) are: environmentally friendly purchasing (like green purchasing), environmental collaboration with suppliers and working with designers and suppliers to reduce and eliminate product environmental impact from the early stage of product development (eco-design). In the focal firm the following green practices are considered: minimizing waste by using either lean production or cleaner technology of production, ISO 14001certification and decrease consumption of hazardous and toxic materials, that is using environmental friendly material. Finally, supply chain approaches to greening outbound functions are: Environmental collaboration with customer, environmentally friendly packaging, working with customers to change product specifications, reverse logistics, eco-labelling, and use of environmental friendly transportation. In the research done by Azevedoa, Carvalhob and Machadob (2011) in Portuguese automotive supply chain, green practices that are considered critical for supply chain to be considered green are reverse logistics, minimizing waste, decreasing the consumption of hazardous and toxic materials and ISO 14001.

Furthermore, Hassinia, Surtib and Searcyc (2012) categorised green supply chain practices (sustainable supply chain management practices) into six functions: Sourcing, transformation, delivery, value proposition, customer and product use and reverse logistics (reuse, recycle and return). Whereby under each function there are different issues involved. Figure 4.3 shows a schematic overview of issues of sustainable supply chain management.

Figure 4.3: Schematic overview of issues for sustainable supply chain management



Source: Hassinia, Surtib and Searcyc (2012)

There are two ways by which a supply chain could become greener; first the manufacturer imposes this on its business partners in the chain; and second the business partners of the manufacturer respect the processes and principles of the manufacturer and desire to emulate these. For instance partners from upstream (suppliers) and downstream (customers) must cooperate in order to make the supply chain green. In addition, this requires use of environmentally friendly materials as well as minimizing waste, meaning that firm must focus on procurement as well as waste disposal besides manufacturing, warehousing and transportation in order to make the supply chain green (Andic, Yurt and

Tuncdan 2012). Therefore the supply chain must be managed in order to maximize the use of these waste materials ensuring that the only waste material is that which can have no possible further use. To minimize the waste, attention should be given to procurement process. "Besides the interest in environmental concerns by business in general, purchasing managers in particular are becoming more focused upon these issues" (Carter, Kale and Grimm 2000).

Whereas Sheu, Chou and Hu (2005) and Lai and Wong (2012) mentioned one important way to make supply chain green is the integration of green logistics in the operation. The integrated logistics operations benefits not only the implementation of effective G-SCM, but also the accomplishment of environmental pollution alleviation without extra expenses charged to any members involved in a given green-supply chain (Sheu, Chou and Hu 2005). Green logistics management reflects organizational ability to conserve resources, reduce waste, improve operational efficiency, and satisfy the social expectation for environmental protection, thus the core of green logistic management is the belief that firms can improve both environmental and operational performance by managing the logistics cycle of their products (Lai and Wong 2012). Similarly their results showed that green logistic management can be embraced as a manufacturing resource to make the logistics cycle less wasteful and regulation plays a role to strengthen the implementation of green logistics management due to customer pressures as well as the performance outcomes in both economic and operational aspects, which ultimately helps firm to make their supply chain green (Lai and Wong 2012).

4.4. Benefits of greening supply chain

The outcomes of greening supply chain have been categorized into four groups by Eltayeba, Zailan and Ramayahc (2011):

- Environmental outcomes

These include positive impacts inside and outside of the organization like reduction of waste; emissions; reduction of resources; minimization of consumption of hazardous and toxic materials and improvement of employee and community health. In the study done by Zhu and Sarkis (2006) in manufacturing sector in China, they found that there is positive correlation between green supply chain practices and environmental performance.

- Economic Outcomes

These are financial benefits that are gained after greening the supply chain like increase in profitability; revenue growth; increase in market share and productivity. This has been proved by Rao and Holt (2005) in their study when they consider five latent paradigms (greening the inbound function, greening production, greening the outbound function, competitiveness and economic performance) and concluded that greening the supply chain essentially leads to increased competitiveness and better economic performance.

- Operational Outcomes

This represents direct impact of green supply chain initiatives on operational performance of a firm. Operational outcomes include cost reductions; product quality improvements; improvements in delivery and flexibility. The most cited operational outcome of greening supply chain is cost reduction (McKinnon, et al. 2010; Rao and Holt, 2005)

- Intangible outcomes

These are theoretical or difficult to enumerate outcomes of green supply chain practices such as improved product image and goodwill of a firm in the eyes of its stakeholders (customers, employees, and community). Such improved image is expected to generate customer satisfaction and loyalty, employee satisfaction, brand value, enhanced publicity and marketing opportunities, and better acceptance of a firm by local communities. Five Winds International study (2003) reports the "success stories" of firms in North America that undertake green procurement initiatives. The study report that these firms realized various intangible benefits from green procurement such as (1) easier compliance with environmental regulations (2) improved image, brand and goodwill, and support of environmental/sustainability strategy and vision, and (3) improved employee and community satisfaction through cleaner air and water, reduced risk of accidents, less demand for landfill and less demand for resources as sited in the work of Eltayeba, Zailan and Ramayahc (2011). In the study done by Azevedoa, Carvalhob and Machadob (2011) in Portuguese automotive industry, support the positive association between green practices and customer satisfaction.

The study by Rao (2003) in South East Asia, organizations believe that greening inbound logistics led to environmental friendly raw materials, greening of production (at focal firm) to cleaner production led to reduction of waste and minimization of cost and greening of

outbound logistics led to environmental friendly waste disposal and mitigate the effects of pollution (Rao and Holt 2005).

According to Rao and Holt (2005) green supply chain practices led to improvement in environmental performance, increase in market share, reduction of cost, enhance new market opportunities and reduce the risk of non-compliance and penalty.

4.5. Green practices for sustainable agriculture

Green growth approaches (green practices) which internalize the environmental externalities in agricultural production can increase economic returns to farmers through more efficient input use and enhanced resource management as well as reduces greenhouse gas emissions (Stevens 2011). Many farms in the developed world have long been implementing best practices such as post-harvest storage; accuracy input application; organic-centred agriculture and watershed management (Binns 2012). Use of organic fertilizer is one of the common practices that have been adopted by the farmers all over the world. There are a wide variety of "green agriculture" best practices techniques and technologies that improve agricultural productivity. Benefits of green practices include improving soil fertility, pest control and water management with reduced use of non-renewable resources and enhancing farmer's livelihoods and strengthening rural communities (Binns 2012).

One of the more widely accepted definition of sustainable agriculture was developed by the US Department of Agriculture (USDA), which defined sustainable agriculture as an integrated system of plant and animal production practices having a site-specific application that will, over the long-term: Satisfy human food and fibre needs (2) enhance environmental quality and the natural resource base upon which the agricultural economy depends (3) make the most efficient use of non-renewable resources and incorporate, where appropriate, natural biological cycles and controls; (4) tolerate the economic capability of farm operations and (5) enhance the quality of life for farmers and society as a whole (Thomas 2002). Thus sustainable agriculture includes economic, social and environmental aspects. Whereas van Loon et al. (2005) defined sustainable agricultural as the one that is productive and gives clear evidence that it will remain productive over the long term, makes efficient use of inputs especially non-renewable inputs, is flexible in the face of pressures, is compatible with its human and natural surroundings and supports equity in the community where it is placed as cited in the work of Sarkar, et al. (2011).

Intensive use of water for irrigation, pesticides and fertilizer application are the practices which contribute to unsustainable agriculture (Sarkar, et al. 2011).

According to Stevens (2011), "it is estimated that increasing the removal of atmospheric CO_2 through carbon appropriation in soil and vegetation sinks in agriculture has the potential to offset up to 20% of global fossil fuel emissions". Application of green practices/green tools can reduce overconsumption and save expenditures on energy, water and agrochemicals (Stevens 2011). Similarly, good land management improves soil quality, nutrient content and moisture holding capacity. Stevens (2011) mentioned water management as an important green practices (involving irrigation water conservation, rainfall retention and waste water reuse) to reduce greenhouse gas emissions. More open agricultural markets will facilitate the sharing of technologies and innovations supportive of Green Growth (Stevens 2011).

GABMPC (2008) considered Integrated Pest Management; planting based on soil moisture; reduced tillage system and manual application of animal waste (bio solids to a soil surface) as a green practices in agricultural field to reduce air emission.

Binns (2012) mentioned nine green practices that can be used as a means to reduce greenhouse gas emission together with improvement in agriculture and farmers life and they are as follows:

Production and use of organic compost fertilizers: Use of organic fertilizers made with biomass wastes, crop residues, tree litter, livestock manures and other photo synthetically produced matter represents sustainable farming which increases Soil Organic Carbon (SOC) level that improves soil structure; enhances its water percolation and retention capacities and sequesters significant amounts of CO_2 that helps reduce greenhouse gas emissions levels in the atmosphere.

More efficient and precise application of inputs based on soil condition and crop growth cycle: High intensity input farming practices often apply excessive amounts of fertilizer and other inputs which generally result in significant environmental pollution from chemical leachates in fresh water sources and greenhouse gas emissions and also poses occupational health hazards to farmer workers and their families. Similarly, the excessive use of pest and herbicides can lead to unintended suppression of non-targeted species that provide biodiversity and other agricultural benefits. In the developed world many farmers

have begun to use improved ‘time release’ fertilizers; nitrogen inhibitor treated fertilizers; and Global Positioning System (GPS) controlled input applicator technologies that adjust the levels of distributed inputs to accurately match specific and varied soil conditions throughout their fields.

Reduced tillage and No Till cultivation: Use of tillage practices can be reduced to avoid soil disruption as conventional tillage practices that disturb top soils during planting and weed management are known to contribute to excessive soil erosion from wind and rainfall runoff. In addition, these practices also promote accelerated volatilization and release of CO_2 and other greenhouse gases that are contained within the soil. Use of less or no till methods minimize top soil disturbance by retaining large quantities of ground cover crop residues or green manure crops which protects the soil surface and gradually return organic nutrients and carbon to the soil.

Improved rainwater capture and watershed management: This practice aims to maintain organic ground covers on fields that retain rainfall and reduce evaporation losses. It includes the integration of vegetative and riparian buffers, field terracing on steeply sloped terrains and agro forestry intercropping to decrease water runoff. Application of these practices insures use of green water and less use of blue water for irrigation.

Agroforestry methods and multiple/inter-cropping rotations: Agroforestry techniques mainly focuses on the integration of purposely selected trees and bushes in the same field with a variety of cereal and cash crops that naturally produce fertilizers and their leaf litter contributes to soil nutrient enrichment. The tree canopies and root structures also helps to reduce soil erosion and excessive heat impacts as well as improves water retention.

Increased crop and livestock diversification: A crop diversification and rotation strategy includes nitrogen fixing crops which provides benefits like: improved soil fertility; reduced vulnerability to pests; and contribute to biodiversity. Use of these practices insures soil erosion through use of conventional fertilizer and pesticides.

Integrated Pest Management (IPM): Survey shows that more than 80% of bio pesticides are used by producers employing conventional farming practices (O’Brien, Franjevic and Jones 2009). Agrochemical pesticide and herbicide use utilize preventative pruning, crop rotations and the encouragement of beneficial predator insects and other species to combat pests and reduce year over year pest pressures.

Improved post-harvest storage to reduce waste and losses: High quality storage system (e.g. metal silos and other structures that protect harvested grains from spoilage and losses to vermin) and improved produce packaging and handling systems can be used to reduce post-harvest waste and losses and

Increased farmer participation in value added processing: Farmer's participation to add value to supply chains (e.g. quality control, sanitation and food safety measures) that are desired by consumer markets is also one practice that contributes for sustainable agriculture.

Furthermore PEPSICO mentioned six global sustainable agriculture practices (PepsiCo 2011):

Water management: Agriculture use 70% of the world water and in developing countries 80% -90 % of fresh water is used for agriculture. To reduce water footprint by managing irrigation water and reducing waste water by responsibly managing runoff risk of contaminated water with pesticides, nutrients or soil.

Soil conservation and preservation: To preserve and improve soil nutrient and fertility, lessen soil loss through erosion and avoid soil damage due to disease and contamination.

Agrochemical management: This deals with regulating the use of pesticides, nutrients, and other agrochemicals. PepsiCo supports sustainable practices that substitute natural controls for some agrochemicals like crop rotation, substitute ecosystem balance, reduce direct and indirect greenhouse gas emissions and reduce crop losses.

Energy management: To reduce direct and indirect greenhouse gas emissions, PepsiCo intend to optimize energy used in crop production and in management of agricultural waste. Developing low carbon fertilizer is one of the strategy employed by PepsiCo do minimize energy consumption.

Farm Economics and Land management: PepsiCo supports sustainable agricultural practices that allow farmers to improve product value by maximizing the desired outputs of an agriculture system while minimizing the needed inputs and avoiding any negative impacts to the farm and surrounding lands.

Social and community improvement: Sustainable agriculture practices can help to make the best use of local and available resources to improve the welfare of communities and supporting smooth agriculture supply chain.

4.6. Fair Trade initiatives and Green supply chain

This sub-section reviews the association/correlation between Fair Trade initiatives and green supply chain. Thus are Fair Trade initiatives serve as green practices in protecting and conserving the environment?

According to New and Westbrook (2004), environmental certification is among the five practices of greening supply chain in addressing environmental attention, improving environmental performance and certification of products (eco-labels) and suppliers, in which there is similarity with Fair Trade initiatives. For producers and traders of Fair Trade products to be certified (that is for their products to have Fairtrade marks) they must comply with Fair Trade standards in which one of them is environmental protection. From this view we can support that Fair Trade initiatives also serve as green practices as they both look in minimizing environmental impacts by certifying the producers and suppliers. In addition Hassinia, Surtib and Searcyc (2012) identified Fair Trade practices as among the green practices at the sourcing stage of the supply chain. This means that by employing Fair Trade practices at the inbound logistics helps to tackle negative environmental aspects at the source.

However the assumption that food that has travelled long distance (food miles) is likely to have a higher carbon footprint than locally produced food has been a challenge to Fair Trade movement, because many people assume locally produced food as more climate-friendly alternative to buying imported food (Fairtrade International 2011). Nevertheless due to different studies, the notion of local food being environmental friendly than imported food has been challenged. According to Kissinger and Gottlieb (2012) food miles refers to the distance food commodity travels from the point of production to the point of consumption and the related energy and CO_2 emitted along the supply chain. Food miles are now used as a sign of the distance food has travelled from the farm where it was produced to the shop where consumers buy it (Fairtrade International 2011).

On the other hand considering the distance a product has travelled is often not significant in terms of product total life-cycle emissions. Moreover, according to Fairtrade International (2011) local does not always mean local since most local products are

produced using imported inputs (fertilizers, pesticides and diesel fuels) from mails away. It is far more relevant to consider the total carbon footprint of a product from production to consumption and disposal. For instance, an analysis of the lifecycle emissions for a cup of tea, carried out for Café direct, found that 93% of the carbon emissions from a daily cup of Fair Trade tea comes from boiling the kettle (Fairtrade International 2011).

The food miles concept originally came from UK in 2006, UK farmers launched a campaign with the slogan "local food is miles better" (Kemp, et al. 2010). In the survey of 22 customers in UK about the reasons behind choosing British product instead of New Zealand, they gave primary reason as "less harmful for the environment" meaning that these customers encourages to stop transportation of foods across globe to reduce food miles (Kemp, et al. 2010). Yet many studies done regarding food miles have controversial results. For instance, flowers imported to Norway from Tanzania have 0.12 to 0.20 kg CO_2 per roses on an average while flowers produced in Norway have 0.35 kg CO_2 per kg on an average (Haug, et al. 2008). Similarly, in the study done by Saunders, Barber and Taylor (2006) apples imported to UK from New Zealand are more energy efficient than UK apples. Saunders, Barber and Taylor (2006) further argues that food miles concept only includes the distance food travels which is false as it does not consider total energy used in production and consumption process of the product. Food miles presents a very incomplete pictures as it is based on only one part of a product's lifecycle where other parts and factors are equally important (Fairtrade International 2011). Therefore, focusing on transport alone overlook many part of product life cycle that contributes to greenhouse gases emissions. A study done in United States in 2008 found that transport count only 4% of the total carbon footprint of the product (Fairtrade International 2011). On the other hand Fair Trade hot drinks company (Café direct), carried out lifecycle analysis for their best-selling tea and coffee products, they found that, on average, 72% of emissions were created at the consumption stage. Transport, was far less significant relative to other parts of the supply chain than expected, therefore knowing how far food has travelled does not provide enough information to make ethical food choices (Fairtrade International 2011). Therefore the term "food miles" should not be used as an indicator for the environmental impacts of food commodity which have travelled long distance nevertheless the whole supply chain of the food commodity should be considered (Kissinger and Gottlied 2012). Furthermore, Barno, Ondanje and Ngwiri (2011) found that in the supply chain of food products, greenhouse gas emissions is dominated by production phase which contributes

83% of the average UK household's 8.1 tonnes CO_2 emissions per year foot print, while transportation represent 11% of life cycle greenhouse gas emissions and 4% represent delivery from producer to retailer. Therefore buying local policy of EU consumers will not decrease the average household food related carbon footprint.

Conversely, export of Fair Trade products from Africa to Europe seems to be more effective to reduce greenhouse gas emission throughout the supply chain as Fair Trade recognizes the significance of environment and global climatic change. As it is mandatory for all Fair Trade certified producers to comply with international Fair Trade environmental standards as part of the requirements for certification, since the standard oblige producers to protect natural environment and minimize the use of energy especially non-renewable energy, also producers are asked to fulfil progress requirements that emphasize sustainable agricultural practices (Fairtrade International 2011). In addition, Fair Trade certification body has also begun to help producers to identify carbon "hot spots- areas where they might be able to reduce the energy use and impact on the climate" (Fairtrade International 2011). By buying Fair Trade products, customers are ensuring that disadvantaged producers and workers receive a Fair Trade premium for investment in economic, social and environmental products. These premiums can enable farmers to implement a range of environmental protection programmes which will contribute to the range of solutions needed to address climate change and ultimately benefit all of us. For instance tea workers in India have invested some of their Fair Trade premium into replacing the traditional wood-burning heating with a solar-panelled system and coffee farmers in Costa Rica have used the premium to replant trees to prevent soil erosion, water shortage and have invested in environmentally friendly ovens, fuelled by recycled coffee hulls and the dried shells of macadamia nuts (Fairtrade International 2011).

Fair Trade has developed several strategies to fight against environmental pollution, such as production methods which generate as little waste as possible, products that use recyclable packaging, and waste recycling (Bailly 2010). Fair Trade has adopted and continuously promoted sustainable agricultural practices in the production of Fair Trade products and supported in mitigation and adaptation of climatic change. Fair Trade also requires farmers to carefully manage water resources. As a result one Fair Trade flower farm in Kenya has already reduced its water use by 30-40% (Fairtrade International 2009).

Taking greenhouse gas emissions into African perspective, average per capital emissions in Africa is one tonne while in UK it is 9.2 tonnes, Africa and other developing countries where the target of Fair Trade is have ecological space and are allowed to develop and even increase their emissions to a sustainable level while developed countries are required to reduce their per capita emissions (Fairtrade International 2011).

4.7. Desirability of promoting the further development of horticulture supply chains in an Afro-European setting

4.7.1. Horticulture in general

Labaste (2005 p. 3) in the world bank working paper defined Horticulture as "the production and marketing of crops/products (vegetables, fruits, ornamentals) with a relatively high value per unit, high perishability, produced under intensive use of land, labour, knowledge, financial means and other inputs, and mainly produced for a selected export market". Horticulture products are destined for fresh consumption, have high perishability and have relatively high value-volume ratio, due to the perishability and high value nature of horticulture products the sector is very capital intensive in production and post-harvest level. Horticulture needs good access to national and international transport, electricity (energy) and communication (Labaste 2005). Marketing horticulture products starts by defining the final consumer for instance supermarket chain and due to complexity and sensitivity of horticulture market ("just in time" and "just in shape"), the suppliers are responsible for coordinating sourcing, control of logistics and product processing (Labaste 2005). Health and safety, convenience, year round supply instead of seasonal products are some of the factors which contribute to the growth of horticulture market (Labaste 2005).

Horticulture as high value crops, sustainable issues are of great concern, these include: the use of fossil fuel for production (heating with natural gas for greenhouse) and distribution purposes (diesel and petrol for trucks and planes, which leads to depletion of natural resources and CO2 emissions), the use of fresh water nutrient minerals for irrigation and fertilizer purposes (which leads to depletion of natural resources and uncontrolled emissions to soil and water), the use of crop protection chemicals (uncontrolled emission of toxic materials in soil, water, air and the food chain) and human and social approaches to the labour factor (Labaste 2005). Adrian (2007) mentioned that agriculture and horticulture are the main sources of methane (CH_4) and nitrous oxide (N_2O).

Most of horticulture growers choose to participate in certification scheme, which can be used as self-regulation, management tool or can be used to profile companies as professional and sustainable. Among the certification schemes mostly used are MPS-ABC, GLOBALGAP, Fair Flower and Fair Plants (FFP), Ethical Trade initiatives (ETI), Rainforest Alliance-Flowers and Ferns and Fair Trade Labelling Organization (FLO) with its Fair Trade and Max Havelaar consumer label (Rikken 2010). In fact, most social and environmental standards in the ornamental sector are not transferred to consumers. Standards like MPS-ABC, GLOBALGAP and ETI[10] are only used in the business-to-business (B2B) environment (Rikken 2010). The leading label in terms of flowers sold is believed to be the Fair Trade label (Fair Trade, Max Havelaar), followed by Fair Flowers Fair Plants (FFP) and Flower Label Program (FLP). According to recent surveys, general consumer awareness of the Fairtrade mark has exceeded 80% in some countries (Rikken 2010).

The following are the opportunities for the further development of horticulture supply chains in an Afro-European setting:

- Market opportunity in Europe

Consumers in Western Europe have become more demanding, requiring more variety and year round availability of horticulture products (ESSD 2004). Likewise, according to Bailly (2010) European customers are shifting their diet from meat to vegetables due to awareness of health related problems attributable by red meat. This provides an opportunity for African producers to increase exportation of horticultural products to Europe.

Furthermore volume of importation of vegetables and fruits in Europe is increasing annually. European Union imported 18667 ECU/Euro vegetables and fruits in 2006, while the figure increased to 20780 ECU/Euro in the 2010 (Eurostat 2012). Similarly, in case of UK, according to DEFRA (2012) importation of vegetables and flowers has been increasing since 2008 and the trend for fruits have been increasing since 2009. As well in Norway the trend for the importation of fruits and vegetables has increased since 2009 to 2011 (Statistics Norway 2013). Therefore from the market trend of horticultural products

[10] ETI is Ethical Trading Initiative which works to improve the livelihood of workers across the globe who make or grow consumer goods (ETI 2013).

in Europe there is big opportunity for African's to increase exportation of horticulture products in European market.

- European Union Regulatory initiatives

The European Union is by far the largest export market for agricultural products from developing countries (ESSD 2004). Apart from the size of the market, European Union trade preferences with developing countries. These preferences include the EU Generalized System of Preferences (GSP), the EU-ACP Agreements (former Lomé, currently Cotonou Agreement which entered into force on April, 1, 2003), the Everything but Arms Initiative, and other bilateral arrangements. The European Union has also commenced initiatives to give agricultural products from developing countries better access to the European Union market by further enhancing the GSP system. For flowers, the import duties are zero for ACP countries (African, Caribbean and Pacific). For commodity fruit (such as apple, pear, plum, peach) originating from ACP countries, duties are imposed. For vegetables, duties are imposed for commodities such as onions and leeks, cabbages, lettuce, carrots but also for spinach and salads (ESSD 2004). The imports of fresh vegetables, fruits and flowers from least developed countries are subject to zero tariffs. Sub Saharan Africa (SSA) countries that are not on the list of least developed countries are: Botswana, Cameroon, Congo, Gabon, Ghana, Kenya, Mauritius, Namibia, Nigeria, Seychelles, South Africa, Swaziland, and Zimbabwe. In addition, the European Union has developed the initiative known as Everything but Arms, or EBA, an amendment to EU's GSP. The EBA came into force in March 2001. It provides free of entry quotas and tariffs for all products export to European Union, except for arms, from the world's 49 least developed countries (LDCs) (ESSD 2004). Free tariffs and quotas are the opportunities for African suppliers to increase production and export to European countries.

Norway on the other hand, grants developing countries better market access on many goods and zero tariffs on imports from the least developed countries (Maurseth 2005).

- European food safety and Private Voluntary Standards (PVS*)*

Suppliers are required to comply with private voluntary standards (PVS) that demonstrate good hygiene, risk management and quality control practices. They include range of process based standards covering good agricultural practices (GAP) to good manufacturing standards. Traceability is the key element of the standard. For ACP suppliers compliance

with PVS increase productivity and competitiveness by reducing input cost (pesticides and fertilizers) and supporting farmers to adopt GAP, good hygiene and modern management. Also being certified by PVS creates the potential to access high value market, increase efficiency of the supply chain, technical support to suppliers and to market expansion, thus increasing horticulture market (Webb 2009). Similar result has been found while analysing the cases. Those farms in Africa which are certified by Fair Trade, their products have lower environmental impacts in comparison to those which are not certified by Fair Trade.

- Ecological space

Ecological space refers to individualized (per capital) rights to natural resources such as energy, food, air, water to global public goods like carbon dioxide emissions (Jones, et al. 2009). The notion of ecological space translate well into 'per capital carbon dioxide emissions' and 'per capita rights to emits carbon dioxide' as documented by UNFCCC Kyoto protocol. The global per capita average global emission is 3.6 tonnes; the UK average is 9.2 tonnes while African average is 1 tonne. Excess of ecological space in African countries is an opportunity to increase production and export of horticulture products. For instance Kenya is in ecological credit while UK is in ecological debit, thus Kenyan have the opportunity to use their carbon credit in air freighting export horticulture (Jones, et al. 2009).

- Bilateral and Multilateral procedures (Investment opportunities)

Bilateral and multilateral procedures are often included in framework contracts between retailers and producers/distributors and accompanied by detailed requirements with respect to private labels, packaging, pricing and production and delivery schedules. These procedures focused on efficiency and effectiveness (ESSD 2004). Also foreign direct investment is encouraged in Africa, Large companies set vertical integration along the entire chain from farm to market and consistent devotion to principles of effective management and good governance, exercised equally in the areas of production, airfreight and logistics, and marketing.

- Favourable climatic condition, low labour cost and land availability

African countries still have arable land for cultivation and easy access to it, together with favourable climatic conditions which provide an opportunity to produce varieties of horticulture products with less effort and cost than in European countries. Also availability

and low cost of labour is another encouraging factor for the development of horticulture in Africa as horticulture is labour intensive sector (Belwal and Chala 2008).

- Desirability of consumers to buy Fair Trade products

In order to identify the desirability of Fair Trade products in Northern market, it is necessary to know to what extent consumers in North (developed countries) are willing to pay premium for Fair Trade products instead of any other. Many surveys have been done in this field to explore consumer behaviour towards Fair Trade products. One example is survey done by Loureiro and Lotade (2005) to identify how much a premium would consumer pay for three different types of coffee (Fair Trade coffee, shade grown coffee and organic coffee)? In a complete survey of 284 consumers with response rate of 67.86% showed that consumers are willing to pay more premiums for Fair Trade coffee and shade grown coffee than organic coffee. In addition, result showed that consumer regarded ethical and environmental benefits associated with Fair Trade practices and shade grown coffee than those benefits associated with organic coffee. Mean willingness to pay for Fair Trade coffee was 21.64cents/lb, for shade grown was 20.021cents/lb, and for organic coffee were 16.2559cents/lb (Loureiro and Lotade 2005). The result from this survey clearly shows that consumers in north market give preference to ethical and environmental criteria (followed by Fair Trade) than organic criteria.

Another experimentation done by Hainmueller, Hiscox and Sequeira (2011) to examine the effect of Fair Trade label on the sale of goods at existing price and when the price is increased from normal price in 26 stores of a major US grocery stores chain also showed that consumers react proactively to the Fair Trade label by increasing demand for labelled coffees. Result showed that Fair Trade label has a positive effect on the sale of coffee as sales increased by 10%when the coffee was sold with the Fair Trade label. However when the price of coffee was increased from normal price, result was opposite. Sales decreased by 17 % on an average (Hainmueller, Hiscox and Sequeira 2011).Though the price for coffee was high in second situation only price sensitive consumers stopped buying coffee from that stores, price insensitive buyers continued to buy coffee even at the high price. Thus the result from this experimentation shows that only price insensitive consumers are not willing to pay premium for Fair Trade products otherwise the demand for Fair Trade product are high among price insensitive consumers and it is increasing.

Similarly, a survey done by Grebitus, Hartmann and Langen (2009) with 200 participants in Germany in 2009 showed that German consumers prefer Fair Trade coffee over organic coffee. Taste is among the most important characteristics German consumer consider while making purchasing decisions. And 88% participants believed that Fair Trade coffee tastes better than cause related making coffee (Grebitus, Hartmann and Langen 2009). Study also revealed that those consumers who have additionally higher knowledge about Fair Trade are more willing to pay higher premium for Fair Trade coffee over other two types. The German consumers are willing to pay 1.32€/500g more for Fair Trade coffee and 0.42€/500g more premium for organic coffee (Grebitus, Hartmann and Langen 2009). Thus the overall results show that Fair Trade has a higher reputation which leads to a higher willingness to pay compared to other coffee in European context and worldwide.

In a survey of the total administrative and academic staff of Ghent University including students in Belgium, result showed that Belgian consumers value the ethical aspect in a product (Pelsmacker, Driesen and Rayp 2005). Investigation was done to know that to what extent consumers consider a Fair Trade label when purchasing coffee. About half of the respondents considered the Fair Trade label when purchasing coffee but when their willingness to pay the actual price premium was taken into account (the share of the consumers that can be expected to buy fair-trade at a given price premium) purchase of fair-trade coffee dropped to 10% because while purchasing coffee the brand was the most important attribute of coffee for Belgian consumers closely followed by flavor and Fair Trade label in third. The willingness to pay for a fair-trade label on coffee of the respondents indicated that about 10% of the sample wanted to pay the current price premium of 27% in Belgium (Pelsmacker, Driesen and Rayp 2005).

Although the Fair Trade lovers are a considerable niche, the size of the Fair Trade liker segment indicated a larger market potential of fair-trade coffee. Consumers could be convinced to buy Fair Trade coffee if more information is provided to them about Fair Trade product and the right marketing efforts are followed. As Fair Trade liker give importance to attributes like brand and flavor the quality of the fair-trade coffee should match that of regular brands to attract them (Pelsmacker, Driesen and Rayp 2005).

4.8. Barriers to the further development of horticulture supply chains

The exchange of product and services or in international trade always involves three kinds of transactional flows; information, goods and financial flow (Harrison and Hoek 2011). All kind of flows are important but there are some differences depending on the type of goods or services and the characteristics of the importing and exporting countries. With respect to Horticultural products imported from Africa to Europe there are range of transactional costs (barriers) which hinder the successful development of horticulture market in Afro-Euro context. The following are the identified barriers:

- Logistical constraints

Appropriate logistics plays an important role in exportation and importation for any country. The geographical distance between production and consumption centres can be seen as a "natural" trade barrier and increasing distances will to some extent increase transaction costs, thereby weakening the competitiveness of an exporting party. African countries (Kenya, Uganda and Tanzania) are far from European countries, thus the transportation cost is very high. Also for locked countries like Uganda, the distance to the sea is long with poor road and rail quality increase transportation cost and lead time (ESSD 2004). Also according to Webb (2009) poor quality of roads connecting farms to the main hubs is a hindering factor for the success of horticulture in African countries.

- Regulatory and certification requirements

Exporters from Africa must meet European Union legal requirements and must also meet private voluntary standards (PVS) of importers and retailers to be able to do business which are often complex and strict than regulations. As well as failures of suppliers to comply with these voluntary standards which are mandatory in practice exclude suppliers out of business. Thus suppliers from developing countries face different PVS which are expensive to comply and certify. For instance; in Kenya, Graffham et al (2006) found that between 2003 and 2006, following the introduction of Euro GAP (GLOBALGAP), 60% of smallholders who had been operating as out growers to export companies, had been dropped by the company, or had withdrawn from compliance schemes, as a direct result of their inability to comply with or maintain GLOBALGAP certification (Webb 2009). Similarly, increase in certification requirement has led to reduction of profit as evidenced from the survey done by PIP[11], 58% of respondent companies in Sub Saharan Africa

[11] PIP is a European cooperation programme managed by COLEACP (COLEACP 2013).

proved reduction of profit as considerable investment are needed to install required infrastructure (Webb 2009).

- Non-market constraints

In the study of COLEACP[12] (2009) mentioned non-market constraints in SSA which are: The increasing cost of inputs such as fertilizers, fuel, and freight is currently having a major impact on export businesses, and was mentioned in several countries. Poor access to credit also acts as a constraint for farmers (e.g. farmers in Ghana and Senegal). Several countries cited the perceived lack of support from their governments (Ghana, Benin, Ivory Coast), or lack of coherent policy (Uganda) and investment (Mali) in the horticultural export sector. In Senegal, Ivory Coast and Uganda, exporters mentioned the lack of locally registered pesticides for export crops, reflecting problems with national regulatory authorities.

- Poor supporting infrastructure (technical)

For successful development of horticulture, the availability of supporting infrastructure like banks (payment), IT services for record management and good coordination are required and better means of communication. IT services in Africa is still underdeveloped and together with the payment system (Belwal and Chala 2008).

- Local politics and government

According to ESSD (2004) local politics and government hinder the smooth flow and development of horticulture. State control very often affects logistics and the costs and availability of important input materials. States control most of the imports of input materials and impose high import duties to protect local industry.

- Corruption

Definition of corruption include three, often intersecting categories: (1) misuse of money or favours for private gain; (2) inappropriate exchanges of money or favours for undue influence or power; and (3) violations of public interest or norms of behaviour (Herbet 2005). Most of the aids or support which are provided in Africa for the development of horticulture are either mismanaged or are used for the individual interest and not for the interest of the provider (Herbet 2005).

[12] COLEACP is a non-profit inter-professional association, representing and defending the collective interests of African, Caribbean and Pacific producers/exporters and European Union importers of fruits, vegetables, flowers and plants (COLEACP 2013).

- Climatic change

Climate change is another barrier in horticultural sector which will affect most countries on the planet and can only be tackled in a coordinated way. It is highly recognized that increases in the frequency of droughts and floods as well as in the ground-level concentration of ozone and many other pollutants will pose a significant challenge to food security in coming years. Modest increases in temperature are expected to cause significant additional costs to farmers and could threaten the industry's competitiveness (Schmutz, et al. 2010).

- Shortage of local expertise

African countries are faced with limited number of expert in horticulture sector, hence they are forced to employ foreigners to work on their farms, which add cost of labour, for instance in Tanzanian farms most of the professional workers are foreigners (Haug, et al. 2008).

- Competition

Horticulture industry is very dynamic and seasonal in terms of variety and production, plus there are many big producers and suppliers of horticulture products in Europe like the Netherland who have experience in the market for decades. Thus African horticulture product is not free form competition (Belwal and Chala 2008).

- Small product range

The range of products East African countries export is very narrow, dominant horticulture products produced for export are flowers and some vegetables. Thus due to dynamic in market trend the risk is very high and these make the industry very vulnerable (Belwal and Chala 2008)

- European policies and non-tariff barriers

EU is opening its markets to African producers (through agreements such as Cotonou and the EBA Treaty) but at the same time it is making it harder for them to be competitive. EU is protecting its internal agricultural market through imposing range of policies for African agricultural products like, intervention in markets to keep prices artificially high, subsidizing the processing of European horticultural produce, and the imposition of non-tariff barriers such as overly strict health and safety regulations (Hunger Notes 2002).

All tariff barriers were removed for African products but still European farmers would remain at an enormous advantage as Europe's farmers are given various support programs and large subsidies including producer subsidies, subsidies to processors, and export subsidies through common agricultural policies (CAP) (Hunger Notes 2002). As a consequence of such policies African farmers find it impossible to compete with European farmers even if they are highly efficient. Similarly, African governments also cannot afford to give their farmers the same benefits as European farmers receive through the CAP which poses challenge for African farmers (Hunger Notes 2002).

The sanitary legislation of the EU somehow doesn't fit with realities on the ground in Africa. Particularly small and independent farmers find it impossible to comply with over-stringent EU legislation. As a result African small farmers are effectively excluded from the horticultural supply chain (Hunger Notes 2002).

CHAPTER 5

Evaluating the fairness and greenness of cases of horticulture supply chains

In this section cases are presented and analysed to give answers to the prior research questions and problem. The analysis of the cases will help find answers to the research propositions that have been proposed in chapter two.

5.1. Summary of case study profile

In this section we will present summary of horticulture market and trend in Africa, United Kingdom and Norway and we will explain Fair Trade horticulture.

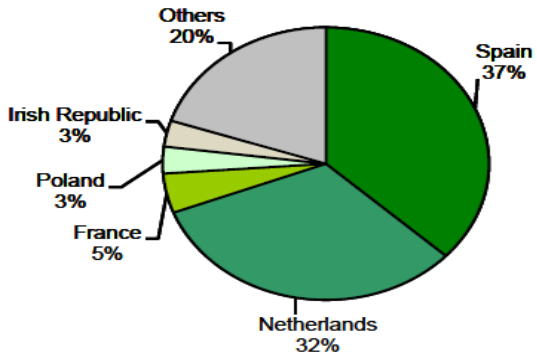
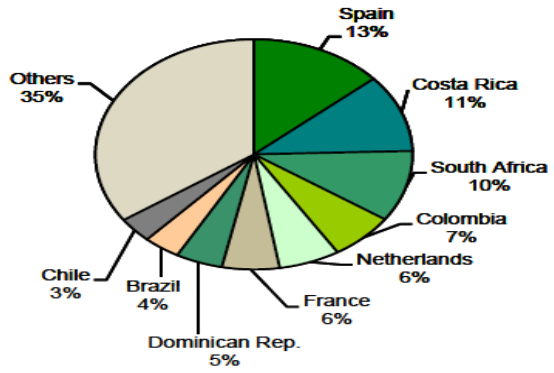
5.1.1. Horticulture Market structure and trend

This section reviews the market structure and trend of horticulture products in Europe (Norway and UK) and in Africa. Trade in fresh horticultural products has become progressively globally. In which vertical integration through contracts is mainly used rather than control and ownership of the means of production .This trend has been encouraged by a liberalizing international and national regulatory framework, related with World Trade Organization (WTO), International Monetary Fund (IMF) and the World Bank policies, and it has been facilitated by improvements in communication and packaging technologies (Barno, Ondanje and Ngwiri 2011).

- **Horticulture in the United Kingdom**

Horticulture accounted for 3% of the total crop able area in UK, with 13% of total agriculture output (DEFRA 2011). As per 2010 statistics, United Kingdom has trade deficit in fresh vegetables and fresh fruits as the value of imports are larger than the value of exports. The top three countries from which the UK imports fresh vegetables and fruits from are Spain (37%), Netherland (32%) and France (5%) while the top three countries in terms of fruits are Spain (13%), Costa Rica (13%) and South Africa (10%) (DEFRA 2011).

Figure 5.1: Importing countries for fresh fruits and vegetables in the UK

Importing countries for fresh Vegetables	Importing countries for Fresh fruits
	

Source: DEFRA (2011)

Table 5.1: Supplies of fruits and vegetables in the United Kingdom (Thousand tonnes)

Year	2008	2009	2010	2011
Vegetables				
Home Production	2,590.5	2,659.6	2,728.5	2,570.0
Imports	1,969.8	1,836.8	1,883.9	1,988.6
Exports	80.9	79.3	96.1	90.2
Fruits				
Home Production	412.7	412.2	439	427.1
Imports	3,313.9	3,163.8	3,204.5	3,319.9
Exports	113.7	145.7	126.5	132.5

Source: DEFRA (2012)

Production of fresh vegetables in UK has declined by 6% between 2010 and 2011 due to drought, frost and bad weather, which led to the increase in import to meet local demand and decline in export. With fresh fruits there was 3% decline in production.

Table 5.2: Supplies of plants and flowers in the United Kingdom (£ million)

Year	2008	2009	2010	2011
UK production	819	879	997	1 051
Import	945	921	977	1 032
Export	48	51	49	59

Source: DEFRA (2012)

In 2010, greenhouse gas emissions from agriculture in the UK was 9% of the total greenhouse gas emissions in the UK (44% of total methane emissions, 80% of total nitrous oxide emissions and 0.8% of total carbon dioxide emissions) (DEFRA 2012).

According to Barno, Ondanje and Ngwiri (2011) price; convenience; safety; functionality; ethical standards of production and trade; image and experience from both local and global producers are some of the criteria which drive UK consumers to purchase horticulture products. Labour cost, rising cost of energy, transport and distribution, water shortage and climate change are potential challenges facing UK horticulture sector in the future (Promor International 2006).

- **Horticulture in Norway**

In Norway only 3% of the area is cultivated, agriculture amounted to 1.8 per cent of the total employment and 0.3 per cent of the gross domestic product. Agriculture is responsible for about nine per cent (9%) of total greenhouse emissions of Norway (StatisticsNorway 2013).

Table 5.3: Horticultural production in Norway (Tonnes)

Products	2007	2008	2009	2010
Fruits	25,673	32,795	30,545	25,028
Vegetables(Field Grown)	112,714	127,058	124,530	106,934
Vegetables (Greenhouse grown)	28,914	28,947	30,114	31,917

Source: Schee (2012)

Production trend of fruits in Norway is changing. In case of vegetables grown outdoor, production declined in 2010 while that grown in greenhouse is increasing, which means more energy is consumed for heating and lighting in greenhouse.

Table 5.4: Value of imports and export for fruits and vegetables in Norway (NOK)

Products	2009	2010	2011	2012
Fruits and Vegetables				
Imports	1, 952, 437	2,164,031	2,212,423	2,324,504
Exports	5 158	7 097	6 269	7 541

Source: Statistics Norway (2013)

Value for the importation of vegetables and fruits increased from 2009 to 2012, which means the import quantity for fruits and vegetables also increased. While the value for export decreases.

Value of vegetables and fruits imported from developing countries in 2011 in Norway is NOK 4,632 million, in which the portion form developing countries is higher than any other countries in the world (statistics Norway 2013).

- **Horticulture in Africa**

Horticulture export from developing countries in Africa has become the main sector in international trade (Barno, Ondanje and Ngwiri 2011). Most horticultural products in developing Sub-Saharan countries are produced on small farms and normally in labour intensive ways. When appropriate policies and technologies are applied, horticultural production can significantly contribute towards increasing the incomes of small-scale farmers, expanding employment opportunities, improving rural development and a source of foreign exchange earnings (Barno, Ondanje and Ngwiri 2011). In Africa, Egypt, Ivory Coast and Zimbabwe have usually been important exporters of horticultural crops however recently Kenya, Gambia, Uganda, Tanzania and Zambia have greatly increased their horticultural exports as well (Barno, Ondanje and Ngwiri 2011). In Kenya horticulture contributes KSH 114.59 Billion in the economy in 2010 (HCDA 2010). Kenya is the largest producer of flowers in Africa followed by Ethiopia, Zimbabwe, Zambia, South Africa and Tanzania (Rikken 2010).

According to Bailly (2010), in the European Union the recognition of reducing greenhouse gas emissions by shifting to vegetables and reducing meat consumption increases African export of Horticultural products in European Union market. The main market for African horticultural products is Europe, followed by Middle East, Asian and North America (Rikken 2010).

High value and perishable products like vegetables and cut flowers from Africa to UK are air freighted while most fruits and other vegetables are transported by ship which has lowest per ton impacts (DEFRA 2007).

5.1.2. Fair Trade horticulture

Horticulture products in Fair Trade include fresh fruits; vegetables and flowers which are grown in developing countries and exported to developed countries. Netherland is the main importer of African flowers; fresh vegetables and fruits are supplied in the UK and other European countries when local produce are out of season or when there is deficit in local production (The Fairtrade Foundation 2011). Fair Trade concentrates largely on tropical agricultural products such as bananas that can't be grown in moderate climates or products that can't be grown in enough quantities in Europe like grapes and oranges (Fairtrade International 2011). In Europe local supply of flowers is not enough to meet the total demand and so imports are necessary to keep up with customers' shopping favourites (The Fairtrade Foundation 2011).

Sales volume of Fair Trade flowers in 2011 was 362, 086, 000 stems which is 11% higher than 2010 while that of fresh fruits was 16,185 MT and fresh vegetables was 474 MT (Fairtrade International 2012).

Down to freshness of flowers and vegetables which are air freighted to the market raise attention of food miles, equally the questions about water use and food security are also addressed by many. However all these issues have been clearly considered in Fair Trade standards (The Fairtrade Foundation 2011). Fair Trade vegetables represent an important source of income for farmers and workers in developing countries which are responsible for only a tiny proportion of overall global emissions. Whereas producing certain vegetables uses a lot of water, Fair Trade requests farms carefully manage water resources. For example one Fair Trade flower farm in Kenya has reduced its water use by 30-40%. To meet the Fair Trade standards, farmers must also reduce pesticides and chemicals, protect the local ecosystem, and not use genetically modified crops (Fairtrade International 2009).

5.2. Case studies of Afro-European horticulture

Case studies presented below use life cycle analysis (LCA)[13] approach to map production, distribution and consumption part of products life cycle, although none of the studies provide a complete farm to fork analysis, as they focus on emissions related to specific supply chain segment. Most of the studies have been conducted between few African countries (Kenya, Uganda and Tanzania) and few European countries (UK, Norway, Spain and the Netherland). Three studies focus on single measure of energy (MJ) or carbon dioxide (CO2), while others offer a range of metrics including detail of other greenhouse gases, water footprint, land utilization, acidification and eutrophication. Even though the focus of this study is on greenhouse gas emissions, some cases which assess the energy associated with product life cycles are included, since energy is also an indicator of global warming. Also we supplement the cases with other available sources to have the information that will allow us to make analysis and cross case comparison.

5.2.1. Individual case review and analysis

Case 1: Flower Import from Tanzania to Norway (Haug, et al. 2008)

One of the objectives of this case was to find out the extent to which import of horticultural products from Africa is achieved in a way that is environmentally sustainable and contributes towards poverty reduction (i.e. increasing the quality of life of farmer in Africa together with reduction of greenhouse gas emissions from the supply chain). This case was done to asses both environmental and social impacts of flowers which are produced in Northern Tanzania and sold in Norway and those which are produced and sold in Norwegian market.

Tanzanian roses are produced under natural heating and transported by truck from Tanzania to Kenya, then by plane from Kenya to Frankfurt and by track from Frankfurt to Oslo while those roses which are produced in Norway and sold in Norwegian market are produced under greenhouses. The comparison is mainly in carbon dioxide emissions produced from flowers produced from Tanzania and those flowers which are produced in Norway.

[13] Life cycle assessment (LCA) is a tool for evaluating environmental impacts of a product, process, or activity throughout its life cycle or lifetime, which is known as "from cradle to grave analysis" (Roy, et al. 2009).

Findings and case analysis

Roses produced and sold in Norway

- Total electricity used in greenhouse for rose production in Norway is 68,000,000 kWh
- Total Carbon dioxide emissions from Norwegian rose production is 1.1786 tonnes (which include 4.510 tons of fossil fuel and 7,276 tonnes of electricity)
- Total Carbon dioxide emissions per rose produced and sold in Norway is 0.35 kg CO_2

Rose produced in Tanzania and sold in Norway

- Transport of roses from Arusha to Nairobi and from Frankfurt to Oslo by track corresponds to 0.02 kg CO_2 per rose.
- Air transport of roses from Nairobi to Frankfurt corresponds to 0.10 kg CO_2 per rose.
- There are no emissions related to rose's production (heating) in Tanzania.
- Total carbon dioxide emissions per rose produced in Tanzania and sold in Norway is between 0.12-0.20 kg CO_2 per rose.

Norwegian rose growers use gas, electricity, propane and oil for heating while there is no heating in rose production in Tanzania. Greenhouse gas for rose produced in Tanzania and sold in Norwegian market is between 0.12 kg/CO_2 and 0.20 kg/CO_2 per rose while roses produced and sold in Norway have 0.35 kg/CO_2 per rose. The evidence from case findings indicates that Tanzanian flowers have lower greenhouse gas emissions than Norwegian flowers, thereby supporting the first proposition:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products."

Figure 5.2: Distribution channel of Tanzanian flowers to Norway (MesterGrønn)

In Tanzania the production of rose is not big enough to use Kilimanjaro International Airport (KIA) in Arusha. Increase in production of rose would make it beneficial to use KIA, and this would reduce the emission and transportation cost considerably. Because exporting roses directly from KIA will remove the transportation of roses from Tanzania to Omniflora in Kenya by truck. The analysis gives evidence to support the third proposition:

P3: "The promotion and further development of horticultural supply chains in an Afro-European setting has many possibilities for growth of green supply chains".

The flower industry in Tanzania has become an example of the private sector being capable of organizing itself and making its own arrangements in order to meet international standards. Also the availability of land, water and labour in Tanzania are the most important reasons to invest in rose production. In addition the climate conditions (lower temperatures) and geographic location (high altitude) in Tanzania is favourable for flower production. Similarly, increasing demand and market opportunities in developed countries trigger rose production in Tanzania and in Norwegian market, roses are imported products that avoid some of the strict food safety regulations and since roses are not met with the same scepticism as food items in the sense that roses "do not take the food away from the hungry Africans". This evidence provided in this case supports the third proposition:

P3: "The promotion and further development of horticultural supply chains in an Afro-European setting has many possibilities for growth of green supply chains".

The initial investment costs in flower production are high and since the industry is new in Tanzania, there is still lack of national expertise in the sector as a result out of 18 flower farms in Arusha only two are owned by locals, the rest is owned by foreigners mainly of Dutch origin. Also the production of roses is capital and knowledge intensive, which is an obstacle for most of Tanzanians to run their own farm. In addition the rose market in Europe progressively demands both social and environmental certifications; this poses a challenge for Tanzanian producers who are not certified by any certification body as the certification process is demanding a lot of time, effort and paper work. Likewise competition from other experienced East African countries like Kenya and Ethiopia makes effects. And since the industry is operating in the growing market with large number of

entrants entering the market; this makes rose production in Tanzania and other rose producers in East Africa to share the market with new entrants. Furthermore Tanzanian Government has been inactive actor, not playing the role of facilitator but rather slowing down the development with high levels of bureaucracy. The Tanzanian Government has not provided investment incentives such as favourable loans to flower producers in the country. This evidence from the case review supports the fourth proposition:

P4: "Barriers to the further development of horticultural supply chains".

Tanzania and Norway are politically stable countries, which give room for more trade, development and investment. Also, Norway has removed tariff in grain/fodder, meat, milk products (e.g. cheese), flowers and vegetables for less developed countries (LDC) and low income countries. Thus, there is possibility to import other Fair Trade horticultural products than flowers and reduce the negative environmental impacts of trade. Flower farms in Tanzania are certified by different environmental bodies like Floriculture environmental program (MPS-ABC), Fair Trade Labelling Organization (FLO) and Flower label program (FLP). This review from the case supports third and fifth proposition:

P3: "The promotion and further development of horticultural supply chains in an Afro-European setting has many possibilities for growth of green supply chains".

P5: "The development of Fair Trade initiatives in horticultural supply chains leads to lower greenhouse gas emissions".

Case 2: Comparative study of Cut roses for British Market produced in Kenya and the Netherlands (Adrian 2007)

This case was conducted by the team of experienced staff in Cranfield University; it compared production and deliveries of roses from Kenya and the Netherland. This case estimated carbon footprint of producing cut roses supplied to the UK market from Kenya and the Netherland. The supply chains from the two producer countries are different. Roses from Kenya to UK are air freighted while those from the Netherland use road transport. Moreover, electricity and heat used in Kenyan greenhouses are from geothermal

energy while in the Netherland heat comes from burning natural gas and electricity was from combination of sources including fossil fuel. Roses produced in Kenya and Netherland are similar and sold in British market. Life Cycle Approach (LCA) was used to calculate the values of energy used and the emission of interest was carbon dioxide and global warming potential (GWP).

According to Fairtrade Africa (2010), Oserian farm in Kenya is certified by Fair Trade and different other environmental and ethic organizations like MPS-ABC and Kenya Flower Council (KFC) (Fairtrade Africa 2010). Furthermore, the farm employs 4,600 people and involved in different community development projects like infrastructure development and building of schools (Oserian 2010).

Findings and case analysis

Table 5.5: Energy consumption (MJ/kg) and greenhouse gas emissions of flowers from Kenya and the Netherland

	Kenya	**Netherlands**
Primary energy	53,000 MJ (of which 15% from fossil fuels)	550,000 MJ (of which 99% from fossil fuels)
Greenhouse gas emissions	2,200 kg/CO2	35,000 kg/CO2

Source: Adrian (2007)

Greenhouse gas emissions from the Netherland flowers are approximately 16 times higher than that of Kenyan flowers. Also the Global warming potential (GWP) of the Netherland flowers was 6 times larger than that of Kenyan flowers.

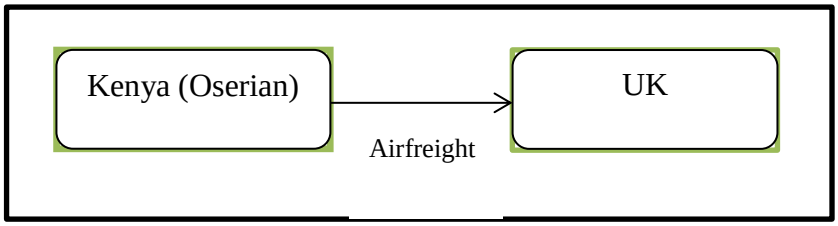
The review from table 5.5 and the analysis, gives evidence to support the first proposition:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products".

Energy and electricity used in Kenyan flower production is from geothermal energy while the energy used in the Netherland is from burning natural gas and electricity is dominated by fossil fuels. A lot of energy is consumed and emissions are generated in the production

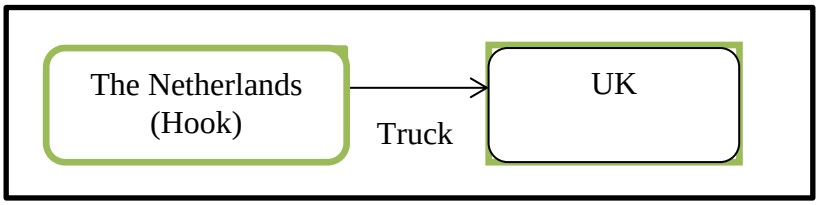
stage in the Netherland while in Kenya more energy is consumed and emissions are generated in the transportation stage.

Figure 5.3: Distribution channel of roses from Kenya to UK



Flowers are transported by air from Oserian - Kenya to the World flower retail distribution channel (RDC) in UK, in which a lot of energy and emissions are produced during transportation as air transport is the main contributor of carbon dioxide emissions in comparison to other means of transport.

Figure 5.4: Distribution channel of roses from the Netherlands to UK



Flowers are transported by truck for the Netherland to UK; from literature review, truck has lower emissions than airplane.

The annual yields of the stems were 1,350,000 per hectare in the Netherland while in Kenya yield is 2,285,000 per hectare. This supposes that Kenyans are more efficient in land utilization together with the natural climatic condition and labour availability supports the rose production in Kenya.

Oserian farm in Kenya use 100% integrated pest management (IPM) in flower production, which means that there are low Nitrous Oxide and Methane emissions from the production and they use drip irrigation as water conservation and management techniques (Oserian 2010). Oserian also does recycling of plastics and recycling and reuse of waste to conserve the environment this is due to the requirements from Fair Trade standards. This review aligned with the fifth proposition:

P5: "The development of Fair Trade initiatives in horticultural supply chains leads to lower greenhouse gas emissions".

Case 3: LCA- Case study: Green bean production in Kenya and the UK; A comparison (Andrew 2006)

This case compares green beans produced in UK and those produced in Kenya and transported by airplane to the UK. For Kenyan green beans exported to UK, the whole life cycle is considered up to the point of entry into the UK and for beans produced in the UK up to the farm gate has been considered to analyze the emissions. Values for green bean production in Sweden, Netherland and Switzerland were used to estimate values for the UK. This case study used energy consumed in production, packaging and transportation as the unit of analysis. In the UK the energy used in production is 0.8-1.4MJ/kg while in Kenya energy used is 0.7-1.7MJ/kg. More energy is consumed in the form of diesel for machinery to manufacture and supply fertiliser. In the UK fertiliser application rate is on an average range from 218kg/hectare to 312kg/hectare while in Kenya the recommended rate is 80-120kg/hectare with most of small scale farmers who apply less than 80kg/hectare. Energy used in packaging is 3.92MJ/kg for both countries and energy used in transportation is 57.90MJ/kg from Kenya to the UK.

Findings and case analysis

Table 5.6: Energy consumption of green bean production, packaging and transportation (MJ/kg)

	UK	Kenya
Cultivation	0.8 – 1.4	0.7 – 1.7
Packaging	3.92	3.92
Transport		57.9
Total	4.74 – 5.30	62.51- 63.54

Source: Andrew (2006)

Energy used in Kenya is 12-13 times higher than the UK, the difference between sourcing in Kenya and the UK is 57-59MJ/kg of green beans. Transportation is the main part of the supply chain which consumes high energy as Kenyan green beans are air freighted to the UK.

In Kenya more energy is consumed in the form of diesel for machinery to manufacture and supply fertiliser, so if the machines can be modernized and use hydro-electric or geothermal energy, Kenyan emissions in production will decrease.

Similar study was done by Jones, et al. (2009) to compare Global warming potential (kg CO_2 Equivalent per 1 kg of beans) for five green beans supply chain in Kenya, Uganda and the UK.

Findings and case analysis

Table 5.7: Summary of the findings from the case

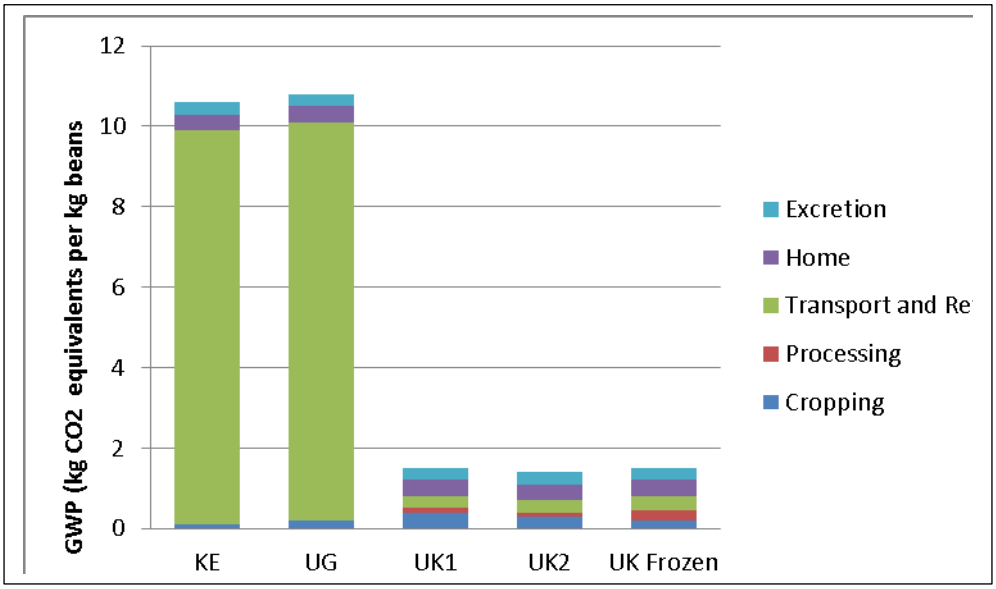
	UK	**Uganda**	**Kenya**
Level of mechanization	High	Low	Low
Irrigation	Occasionally	Occasionally	Occasionally
Growing Period	4 Months	4 Months	5 Months
Yield	12tonnes/ha	9.5tonnes/ha	36-38tonnes/ha
Transportation	------	Air freighted	Air freighted

Source: Jones, et al. (2009)

Level of mechanization in UK is higher than that of Kenya and Uganda which means that more energy is consumed during the cropping stage in UK. However the yield in Kenya is 3 times higher than that in UK, for that reason Kenyan's are more efficient in land utilization than UK and Uganda. Thus, if Fair Trade initiatives are implemented in Kenya and Uganda and increase level of mechanization, consequently yield would increase exponentially.

In Kenya and Uganda, production of green beans is throughout the year while in UK it is between May to September/October. This means that, when UK green beans are out of season the import rate increases. Thus, if the UK produces green beans out of season then the analysis would give different results, since heating, lighting and more water for cooling would be needed to produce green beans under greenhouse. Therefore if we take this assumption in consideration, UK emissions will be higher than that of Kenya and Uganda.

Figure 5.5: Global warming potential of green beans (kg CO_2 per kg of beans)



Source: Jones, et al. (2009)

The global warming potential (GWP) of Kenya and Uganda is higher than that of UK, since more energy is consumed during transportation (air freighted). While in UK home processing is the dominant stage followed by cropping and for frozen beans. In UK transport and retailing contributes to GWP after home processing. The analysis of figure 5.5 does not support the first proposition:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products".

From the two cases, transportation is the main part which consumed a lot of energy and has higher global warming potential than any other stage of the product life cycle; thus if the mode of transport could shift from air to sea, it could result in reduction of energy used and global warming potential and African export to UK will also increase as the environmental impacts for African green beans will be low.

From ecological point of view, average per capita emissions in Africa is one tonne while in UK it is 9.2 tonnes (Jones, et al. 2009). Africa and other developing countries where the Fair Trade is operating have ecological credit and are allowed to develop and even increase their emissions to a sustainable level while developed countries are required to

reduce their per capita emissions. From this perspective, Kenya and Uganda are in position to continue with green beans production in a similar manner but the UK has to alter their production so as to reduce emissions.

Case 4: Virtual water: A case study of green beans and flowers exported to the UK from Africa (Orr and Chapagain 2006)

United Kingdom (UK) is actively helping countries to make efficient use of natural resources, especially water and energy; which reduces the impact of UK consumption, production and procurement on the global environment because access to water resources and water for meeting basic human needs is a daily struggle for people in most of the parts of the world. As a result of scarcity of fresh water, issue of water footprint is being connected with trade to reduce the waste of water and use it wisely. Unsustainable use of freshwater resources has not only environmental problem but also creates economic and social impacts. Orr and Chapagain (2006) explains water footprint as a measure of the total water requirement of products consumed by a particular individual, business or nation for different purpose.

This case focuses on one particular aspect of global food trade, assessing the significance of the virtual water[14] trade for selected fresh products imported into the UK mainly from African countries and Spain.

This case has used term evaporative virtual water content and non-evaporative virtual water content of beans and flowers. Evaporative virtual water content simply refers to the amount of water transpired by the crop to reach harvest. Whereas non-evaporated virtual water content refers to water that has been applied to the field but has not been transpired by the crop. It can also be called irrigation losses. This case explores water amounts owing to traded products and analyzes its impact in terms of their growth in specific areas.

[14] Virtual water content of a product is the volume of water used to produce a product, measured at the place where the product was actually produced which consists of green water and blue water (Orr and Chapagain 2006).

Table 5.8: Total water footprint of the UK

	WF (Gm^3/yr)			
	Internal	External	Total	% of total WF
WF of agricultural products	28.4	46.4	74.8	73
WF of industrial products	6.9	17.2	24	24
WF of household water use	3.3	–	3.3	3
Total WF (Gm^3/yr)	38.6	63.6	102.1	100 %
% of total WF	38 %	62 %	100 %	

Source: Orr and Chapagain (2008)

UK's external water footprint[15] for agricultural products consists of 46.4% of the total water footprint. Therefore in this case the external water footprint of the UK is through the import of green beans from Kenya and Spain as a water footprint in the production of green beans in those countries respectively.

Table5.9: Virtual water content of green beans (m^3/tonne) in Kenya and Spain to the UK (2000-2004)

			Virtual water content of green beans (m3/tonne)			
			Evaporative			Non-evaporative
Countries	Product import(tonne/yr)	%of share total	Green	Blue	Total	
Kenya	77,954	0.7	1,295	3,320	4,614	2,253
Spain	8,217	0.07	198	1,008	1,206	799

Source: Orr and Chapagain (2006)

Result shows that virtual water content per tonne of green beans from Kenya is 4,614 (m^3/tonne), whereas, Spanish green beans consists of 1,206 (m^3/tonne) virtual water per tonne. However Kenyan yields' is approximately 10 times higher than that of Spanish, thus if Spain could have the same yield as Kenya, means Spain would have used more litters of

[15] The external water footprint of a country refers to the use of water resources in production of commodities in other countries and imported to the country where it is consumed (Orr and Chapagain 2008).

water than Kenya. Therefore from these findings we can say that Kenyan farmers are more efficient to utilize the total water resources to produce green beans than Spanish farmers.

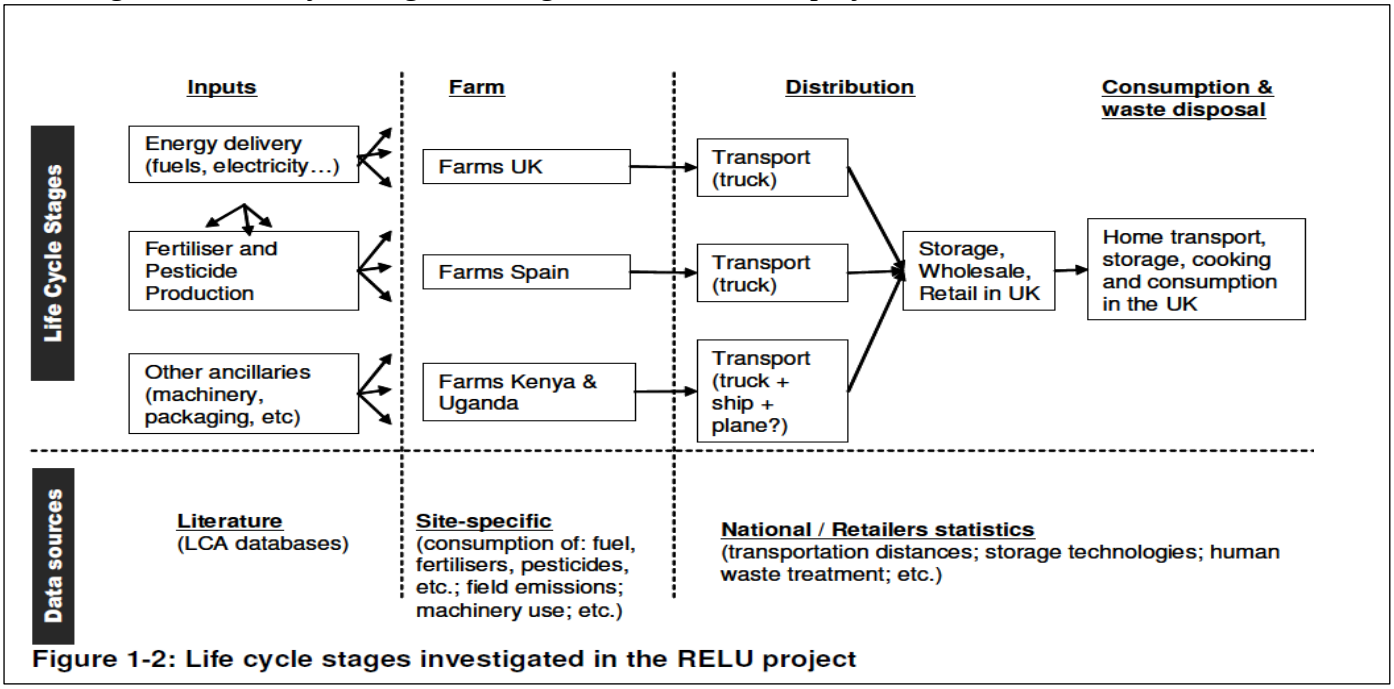
Moreover, UK imports 28% of green virtual water and 72% of blue water of green beans from Kenya and 16% of green virtual water and 83% of blue water green beans from Spain this proves that Kenya is more efficient to use green water (rainfall) than Spain. This implies that more energy is used to pump water for irrigation in Spain than in Kenya. Results from table 5.9 together with this analysis supports proposition two:

P2: "The horticultural supply chains in Africa and Europe differ in terms of water resources utilization".
In addition, if the Kenyan farmers work under Fair Trade, then there is a huge probability to reduce water footprint through the management of water resources.

Case 5:Life Cycle Assessment (LCA) of Domestic vs. Imported Vegetables. Case study on salad crop (lettuce) (Milà i Canals, et al. 2008)

This report presents the life cycle assessment (LCA) of lettuce produced in UK, Uganda, and Spain. It has compared the environmental impacts generated for the delivery of lettuce from Uganda, Kenya, Spain and UK to UK consumers. The purpose of this study was to investigate the environmental impacts associated with different stages for vegetable production, in order to understand the environmental impacts of imported vegetables against the locally produced vegetables. The life cycle of lettuce has been divided into three major stages: cropping, processing (cooling), and retail to grave (includes all the operations from the retail outlet until human consumption).
Proposition one (P1) of our study states that the supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products. Therefore from this report we will be able to answer this proposition.

Figure 5.6: Life cycle stages investigated in the RELU[16] project



Source: Milà i Canals, et al. (2008)

Lettuce in UK

In this study we will consider UK9 which grows lettuce indoor and outdoor.

- None of the British lettuce farms uses manure or any other organic fertilizer
- All the farms used water irrigation which comes from the grid. UK10 used more water because of the higher temperature inside the greenhouse.
- Most operations are highly mechanized (30-50 tractors, depending on the size of farm) in all the farms except those that can only be performed manually such as harvesting.
- Polythene fleece is used for early crops in order to prevent frost damage.
- The farm has on-site facilities for cooling and packing salad crops.
- The use of mineral (solid) fertilizers in farm UK10 is lower than in other British farms.
- 0.15 to 0.35 kWh/m3 electricity is used for irrigation in the UK
- Harvesting is done by hand.

Lettuce in Spain

Two big outdoor lettuce producers were assessed in Spain: ES2 and ES7.In this study we will use ES7 for the analysis.

[16] RELU= Rural Economy and Land Use program

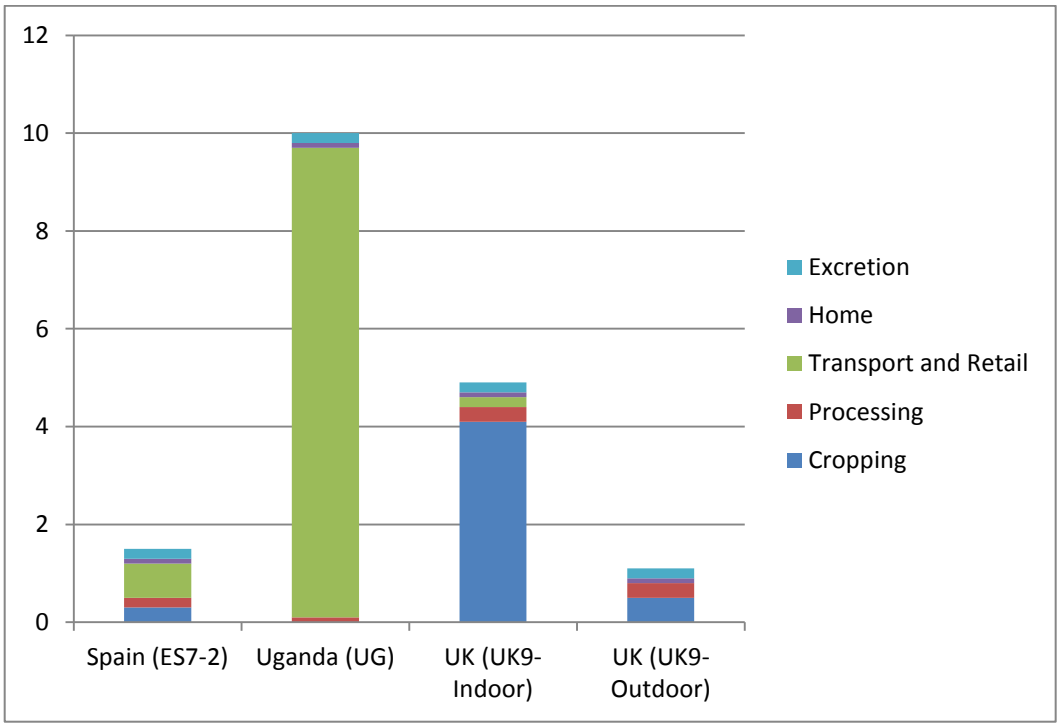
- These two farms input more pesticides, fertilizers (liquid) and water than the British farms.
- Higher doses of mineral fertilizer are applied to overcome the nutrient fixation in the basic soils of Spain.
- Utilization of land is lower as compared to UK; however, crop yield is higher. Spain uses ground water for irrigation. Therefore energy used for irrigation is much higher than UK.
- 1.1KWh electricity per $m^3$is used for irrigation.
- Less mechanization than the British farms (22 and 15 tractor hours per crop).
- Both farms have on-site cooling facilities.
- Harvesting is done manually.

Lettuce in Uganda

Three different lettuce growers were interviewed and assessed for the report.

- They all have a very low level of mechanization, none of these three farm reports the use of machines.
- The yields are relatively high compared to Spanish and UK farms.
- All operations are manual, including soil preparation; fertilizer and pesticide application.
- In Uganda worker's transport is normally on foot or by bike (i.e. no environmental impacts associated).
- Farms are mostly rain fed, but all farmers bring in additional water from streams either by gravity irrigation or watering cans.
- All growers use organic fertilizers and some use mineral fertilizer as a complement.
- Harvesting is done manually.

Figure 5.7: Global warming potential (kg CO_2 equivalent/kg of lettuce on plate)

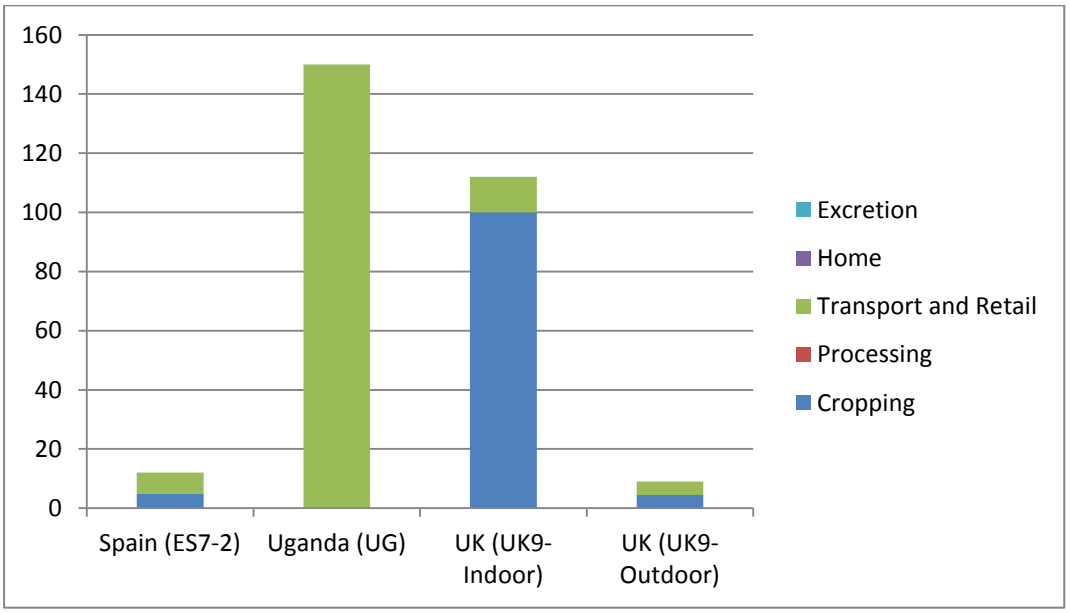


Source: Milà i Canals, et al. (2008)

Total global warming potential for Ugandan lettuce is much higher than that of UK and Spain due to the transportation of lettuce by airfreight from Uganda to UK. UK indoor lettuce also has higher global warming potential due to the use of energy in cropping stage for heating, lighting, cooling and irrigation. This analysis goes against the first proposition:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products"

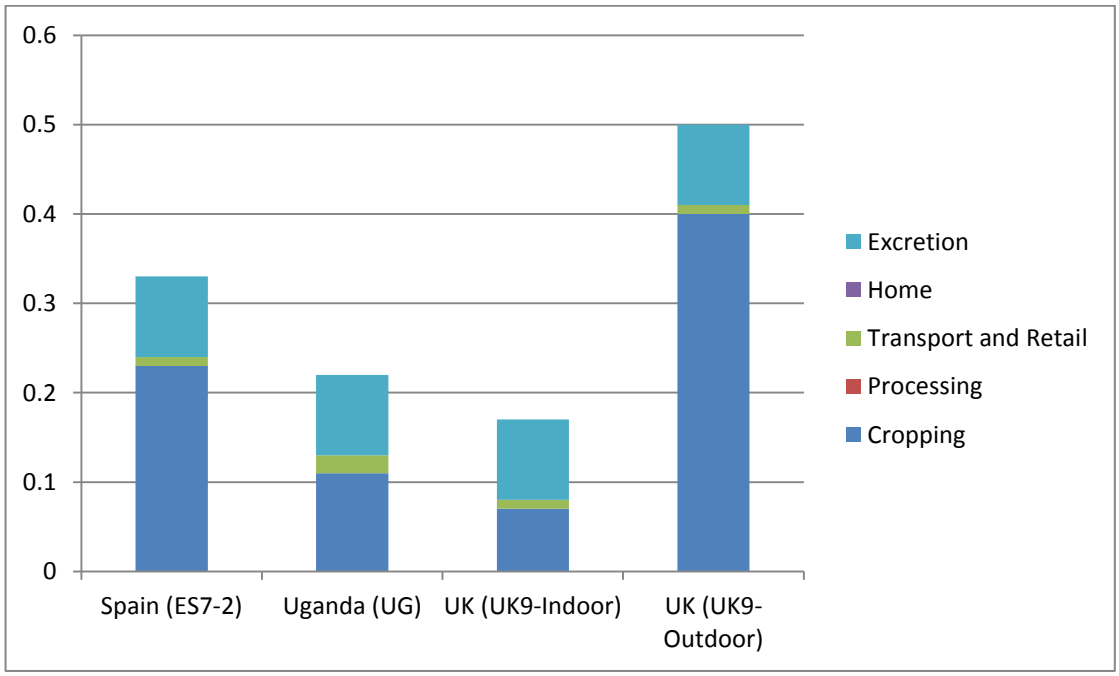
Figure 5.8: Primary Energy used (MJ/kg lettuce on plate)



Source: Milà i Canals, et al. (2008)

Once more, primary energy (MJ) used for Uganda is higher than other two countries because lot of energy is used in the transport and retail stage. However, UK9 (Indoor) farm has higher primary energy used than other UK and Spanish farm due to energy used in cropping.

Figure 5.9: Land utilization (m^2 yr/kg lettuce on plate)

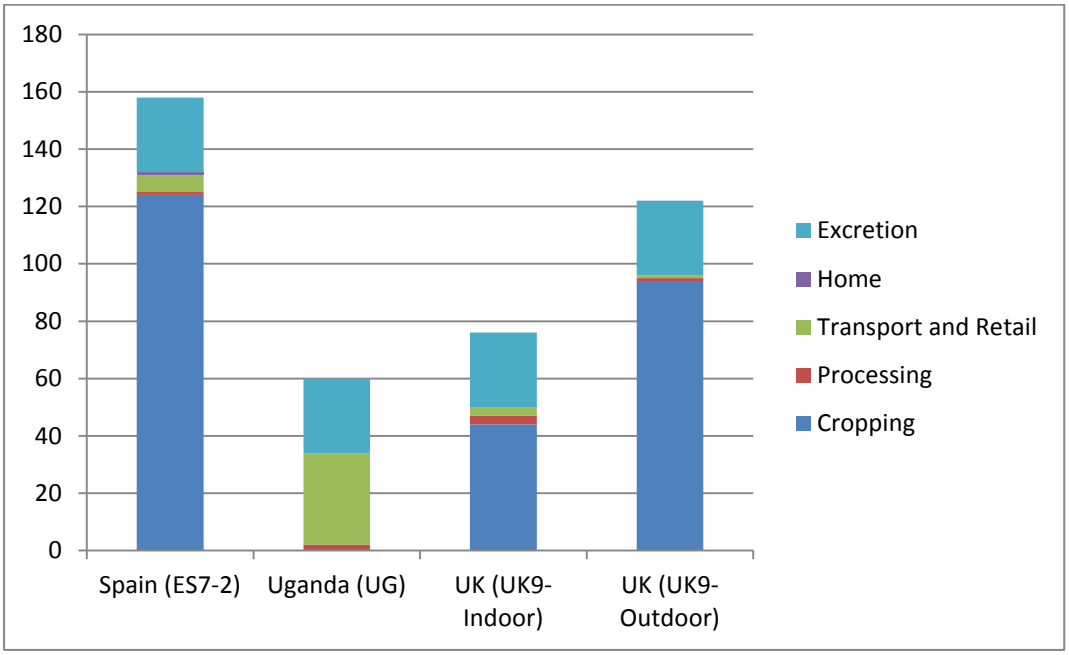


Source: Milà i Canals, et al. (2008)

The highest land occupation corresponds to UK outdoor lettuce, followed by Spanish outdoor lettuce, then Ugandan, and the lowest score is for UK indoors. Therefore, UK indoor is more efficient in land utilization because all the cropping are done in greenhouses and Uganda farms are efficient in utilization of land as they use less land and the yield are higher as compared to UK and Spain. This analysis gives evidence to support third proposition:

P3:"The promotion and further development of horticultural supply chains in an Afro-European setting has many possibilities for growth of green supply chains".

Figure 5.10: Water utilization (L/kg lettuce on plate)



Source: Milà i Canals, et al. (2008)

Uganda is more efficient in water utilization than UK, and Spanish farms because Ugandan farms are mostly rain fed (use green water). On the contrary, Spanish and UK outdoor farms use more water for irrigation and the UK indoor farm use more water for cooling in the greenhouse.

According to the analysis of water utilization, we can suppose that Uganda is more efficient in water utilization than UK and Spain. Therefore, the results support the second proposition:

P2: "The horticultural supply chains in Africa and Europe differ in terms of water resources utilization".

Uganda scores the least in environmental impacts in the cropping stage, because of the low level of mechanization, the use of organic fertilizers and the use of green water. Nonetheless when we take the result of global warming potential as in the, Uganda has higher global warming potential than Spain and UK due to the transportation of lettuce to UK by plane (transportation counted for almost 95% of the total life cycle of lettuce). If transportation stage is excluded, Ugandan lettuce would have least global warming potential and the energy consumption would have been lower than UK and Spain.

Table 5.10: Summary of individual case analysis

Product	Country of production	Destination	Mode of Transport	Energy consumed	GWP	Greenhouse gas emissions	Water footprint	Reference
	Kenya	UK	Airfreight	53,000 MJ		2,200 kg/CO2		(Adrian 2007)
Flowers	Netherland	UK	Truck	550,000 MJ		35,000 kg/CO2		(Adrian 2007)
	Norway	Norway				0.35 kg/CO2		(Haug, et al. 2008)
	Tanzania	Norway	Truck and Airplane			0.12-0.20 kg CO2 per rose		(Haug, et al. 2008)
	Kenya	UK		62.51-63.54 MJ				(Andrew 2006)
					10.5kg/CO2			(Jones, et al. 2009)
			Airfreight				4,614m3/tonne	(Orr and Chapagain 2008)
Green Beans	UK	UK		4.74 – 5.30 MJ				(Andrew 2006)
					3.8kg/CO2			(Jones, et al. 2009)
	Uganda	UK	Airfreight		10.6kg/CO2			(Jones, et al. 2009)
	Spain	UK	Truck				1,206m3/tonne	(Orr and Chapagain 2008)
	UK9-Indoor	UK		112MJ/kg	4.9 kg/CO2 per kg		76L/kg	(Milà i Canals, et al. 2008)
Lettuces	UK9-Outdoor	UK		9MJ/kg	1.3 kg/CO2 per kg		122L/kg	(Milà i Canals, et al. 2008)
	Spain	UK	Truck	12MJ/kg	1.5 kg/CO2 per kg		158L/kg	(Milà i Canals, et al. 2008)
	Uganda	UK	Airfreight	150MJ/kg	10 kg/CO2 per kg		60L/kg	(Milà i Canals, et al. 2008)

5.2.2. Cross case analysis

In this section we are analysing energy consumed, carbon dioxide emissions, water footprint and global warming potential into different perspectives.

Nature of the product

Considering each product individually, **flowers** which are produced in Africa (Kenya and Tanzania) and exported to Europe (Norway and UK) consume little energy and have lower greenhouse gas emissions than flowers which are produced in Norway and consumed in the Norwegian market and those which are produced in the Netherland and consumed in the UK. This is despite the long distance African flowers have travelled to reach the consumers. In Norway and the Netherland flowers are produced in greenhouses and consumed a lot of energy for heating and lightening and produce a lot of carbon dioxide. This analysis supports the first proposition:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products".

On the other hand **green beans** which are produced in Africa (Uganda and Kenya) and consumed in the UK appear to have higher global warming potential (GWP) and consumed more energy than those beans which are produced in the UK and consumed in the UK market. Long distance travel is the reason behind African green beans to have higher global warming potential and consumption a lot of energy. This analysis doesn't support the first proposition:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products".

However if the comparison was to be done with UK green beans which are produced out of season and under greenhouses with the same yield (tonnes/kg as in Kenya and Uganda) the results could have been different, since more energy could have been used and the global warming potential would have been higher for UK green beans (off season and produced under greenhouse) than African green beans.

Furthermore the comparison in terms of water consumption between Kenyan green beans and Spanish green beans shows that Kenyan green beans consume a lot of water than Spanish green beans. However Kenyan yield is approximately 10 times higher than that of Spanish green beans. This implies that Kenyan is more efficient in water utilization than Spanish. This supports the second proposition:

P2: "The horticultural supply chains in Africa and Europe differ in terms of water resources utilization".

Whereas **lettuce** provide the same results as green beans in terms of global warming potential and energy used, thus more energy is consumed for transporting Ugandan lettuce to UK which makes the total energy consumption higher for Ugandan lettuce than that of Spanish and UK. This analysis doesn't support the first proposition:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products".

While in terms of water utilization, Ugandan lettuces consume little blue water for irrigation while Spanish and UK lettuce consume approximately 3 times higher than that of Uganda. This supports the second proposition:

P2: "The horticultural supply chains in Africa and Europe differ in terms of water resources utilization".

Mode of Transport

Another important finding is the mode of transport which is used to transport flowers, lettuces and green beans from Africa to European market. From the literature review, air fright is regarded as the most emitter of carbon dioxide and consumes a lot of energy than any other transport mode, which have been proven from the four cases we have studied. Transport is part of the supply chain which has higher emissions of carbon dioxide in comparison to all other part of the supply chain.

Fair Trade certification

From the first two cases of flowers, all the flowers farms in Tanzania and Kenya are certified by Fair Trade, thus they follow Fair Trade standards and initiatives. Thus, we take

Fair Trade certification as the reason for Kenyan and Tanzanian flowers to have lower emissions in comparison to Norwegian and the Netherland flowers. So there is the negative association between greenhouse gas emissions and Fair Trade certification, thus as Fair Trade initiatives increase greenhouse gas emissions decrease. This analysis gives evidence to support the fifth proposition:

P5: "The development of Fair Trade initiatives in horticultural supply chains leads to lower green gas emissions".

Cross country analysis

In this part, we analyse greenhouse gas emissions, global warming potential and water utilization based on the same product within African countries and European countries.

Table 5.11: Analysis between African countries

Africa				
Products	Kenya	Tanzania	Uganda	Difference
Flowers	0.18 kg/CO_2	0.12-0.2kg/CO_2		Insignificant
Green beans	10.5kg/CO_2 per kg		10.6 kg/CO_2 per kg	Insignificant

From table 5.11 shows that within African countries, the difference in greenhouse gas emissions/global warming potential for the same product is insignificant. Therefore we can suppose that, horticultural products from African countries do not differ in greenhouse gas emissions/global warming potential.

Table 5.12: Analysis between European countries

Europe					
Products	Netherland	Norway	Spain	UK Outdoor	UK Indoor
Flowers	3 kg/CO_2 per rose	0.35kg/CO_2 per rose			
Lettuce(GWP)			1.5 kg/CO_2 per kg	1.3 kg/CO_2 per kg	4.9 kg/CO_2 per kg
Lettuce(water)			158 L/kg	122 L/kg	76 L/kg

Form table 5.12 the difference in global warming potential (GWP) for flowers between Norway and the Netherland is significant, since the emissions for the Netherland includes the emission created during transportation. Also lettuces produced in UK indoor have three times higher global warming potential than Spanish lettuces even though Spanish lettuce includes global warming potential from transportation. Therefore it is better to import lettuces from Spain than consuming UK lettuces which are grown indoors. However when the comparison is done in terms of water utilization between UK (Indoor and outdoor) and Spain, UK is more efficient in water utilization than Spain.

Implementation of green practices

In this section we will use agriculture and supply chain green practices explained in the literature review as the indicators for sustainability. We will analyse the implementation of green practices in the supply chain of African horticulture and European horticulture. Although not all the cases provide enough information of the green practices but the few available will serve the purpose.

Table 5.13: Individual and cross case analysis for the implementation of green practices

Green indicators/practices	**Case 1**		**Case 2**		**Case 3**			**Case 4**		**Case 5**			**Cross case rating**
	TZ	**NO**	**KE**	**NE**	**UG**	**KE**	**UK**	**KE**	**SP**	**UG**	**SP**	**UK**	
Organic Fertilizer application / IPM	√	N/a	√	x	√	N/a	x	N/a	N/a	√	x	x	4
Water management[17]	√	x	√	x	√	√	x	√	X	√	x	√	7
Low Mechanization[18]	√	x	√	x	√	√	x	√	X	√	x	x	6
Utilization of green fleece	√	x	X	x	√	√	x	N/a	N/a	√	x	x	4
Environmental certification	√	N/a	√	√	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	3
Reduced tillage cultivation	√	N/a	√	N/a	√	√	N/a	√	N/a	√	x	x	6
Environmental friendly Packaging	x	x	x	x	x	x	x	N/a	N/a	x	x	x	0
Environmental friendly transport[19]	x	√	x	√	x	x	√	x	√	x	√	√	6
Land Utilization(yield per hectare)	√	x	√	x	x	√	x	√	x	√	x	x	5
Waste management	N/a	N/a	√	N/a	N/a	√	N/a	N/a	N/a	N/a	N/a	N/a	2
Efficient use of energy	√	x	√	x	√	√	x	√	x	√	x	x	6
Individual case rating	8	1	8	2	6	7	1	5	1	8	1	2	

TZ=Tanzania, NO= Norway, KE= Kenya, NE= the Netherland, UG= Uganda, UK = United Kingdom and SP= Spain

√ = application of green practices and X = no application of green practices

N/a = not available: There is no information given in the case

[17] Water management: The use of green water (Rainfall water) more than blue water.
[18] Low Mechanization: Mechanization in terms of the use of tractors for cultivation (Tractors hours per litters of diesel).
[19] Environmental friendly transport: We regard all modes of transport as environmental friendly except Airfreight.

Individual case rating: This refers to the implementation of green practice in a particular product in a given country.

Cross case rating: This refers to the implementation of green practice in all the countries.

- Individual case rating

Tanzanian supply chain for flowers (case 1), Kenyan supply chain for flowers (case 2), Kenyan supply chain for green beans (case 3) and Ugandan supply chain for lettuce (case 5) are the greenest supply chain (with the score of 8/10 and 7/10 from the table) as the farm fully deploys green practices like; Organic Fertilizer application (IPM), Water management, Low Mechanization, Land Utilization(yield per hectare), Waste management, Use of renewable energy in product life cycle except environmental friendly transportation and environmental certification. Transportation and packaging are the highly rated practices which have not been implemented by the given supply chain. Ugandan supply chain for green beans (case 3) is the next green supply chain with the score of 6/10, followed by Kenyan supply chain for green beans (case 4) and the Netherland supply chain for flowers (case 2). The supply chain for Norway flowers (case 1), UK supply chain for green beans (case 3), Spanish supply chain for green beans (case 4) and UK and Spanish supply chain for lettuce (case 5), are the supply chain which used environmental friendly mode of transport. From the analysis of individual case rating gives evidence to support third proposition:

P3:"The promotion and further development of horticultural supply chains in an Afro-European setting has many possibilities for growth of green supply chains".

- Cross case rating

Considering all the cases and all countries, green practices with the highest level of implementation is water management by almost all African countries and UK indoor farm. Similarly, mechanization, environmental friendly transport, energy efficiency and reduce tillage cultivation are among the highest green practices by most of the countries after water management. Land utilization comes next which is highly implemented mainly by African countries followed by integrated pest management (IPM)/ organic fertilizer application and utilization of green fleece. Implementation of waste management is very low or the information provided is not enough to conclude. Environmental friendly packaging scored the lowest, none of the products/ supply chain mention about how friendly their packaging are.

5.3. Lessons learnt from the cases about the import of horticultural products from Africa to Europe

Greenhouse gas emissions/global warming depends on the nature of the product; flowers from Africa consume little energy and have lower greenhouse gas emissions than European flowers, while lettuces and green beans from Africa have higher greenhouse gas emissions/global warming potential than European lettuces and green beans. As well Africans are more efficient in water utilization than European in production of lettuces and green beans.

From the above analysis of horticultural products, transport stage of the life cycle does certainly make an important contribution to the environmental impacts of these products. Since these horticultural products are transported by air from Africa to Europe, and airfreight is by far the most greenhouse gas intensive mode. This is evidenced by higher global warming potential of imported lettuce and green beans, which was contributed by transportation stage. This also proves that airplane is the most greenhouse gas intensive mode of transport.

African countries prove to have better water management/utilization in comparison to European countries in horticultural production. This is due to utilization of green water (rainfall) more than blue water. Use of more green water also results in lower emission due to consumption of less energy to pump water for irrigation. Similarly, farms in Europe grow their products in greenhouse (e.g. In Norway, Netherland etc.), they use lot of water for cooling and thus results in consumption of high energy and emission. African horticultural supply chains seem to make a better utilization of water resources than their European counterparts. This analysis supports second proposition:

P2: "The horticultural supply chains in African and Europe differ in terms of water resources utilization".

Land utilization is better in Africa than in Europe, first this is due to availability of fertile land in Africa and also good climatic condition which support horticultural production, thus yield per hectare in Africa is large than yield per hectare in Europe. For instance yield per hectare of green beans in Kenya is three times higher than that of UK.

Low mechanization in African countries (Kenya, Tanzania and Uganda) means less usage of tractors and diesel which implies low energy consumed and low emissions. Although low mechanization may indicate inefficiency and low yield but this doesn't apply in African case, as manual workers are cheaply available so yield is high.

In addition, horticultural products from African countries do not differ in greenhouse gas emissions/global warming potential. This supposes that most of the African countries have the same methods for production of horticultural products, same climatic condition, water availability and labour. While in Europe greenhouse gas emissions/global warming potential is different between countries and with the same product.

From the case analysis above, Africa countries apply most of the green practices in their horticultural production than their European counterparts, but African suffers the most from airfreight emissions as it is the highest contributor of global warming potential. In this case if African counties could shift the mode of transport form from air to sea, the emission will go down tremendously. Proposition one states that:

P1: "The supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products". However, the supply of African horticultural products by means of sea transport has a greater potential in lowering greenhouse emissions and global warming.

Environmental certification is an important aspect of green practice in the supply chain, as it helps to select suppliers and reduce negative environmental impacts. For instance flower farms in Tanzania and Kenya have been certified by Fair Trade, and the greenhouse gas emissions from the flowers are lower as compared to their counterparties.

Horticultural products which are grown out of season in Europe use more energy for heating and lighting while heating or lighting does not apply in Africa due to differences in climatic condition, as Africans' horticulture uses free sunlight. Thus seasonality is a contributing factor to total products' greenhouse gas emissions.

CHAPTER 6

Summary, Conclusion, limitations and further research

6.1. Summary of the findings

The key objective of this study was to find out the potential of Fair Trade to lower greenhouse gas emissions and promote the development of fair and green supply chains in Afro-European settings in horticultural products and to clarify on key issues that can be taken into consideration for policy and management decisions. These issues are like water utilization, barriers and opportunities to the further development of horticulture supply chains. The second purpose is to contribute to previous studies which have been done on the subject of food miles. This study used five previous studied cases on horticultural products which were imported in Europe from Africa to find answers to the research propositions and objective. The unit of analysis used in this study is greenhouse gas emissions. The results obtained from the reviewed cases and analyses provide evidence for the proposed propositions:

The first proposition which states that the supply of African horticultural products has lower global warming potential (GWP) or lower greenhouse gas emissions than the supply of European horticultural products was supported by the first and second case (Flowers), while case three (green beans) and case five (lettuce) do not support proposition one. This means that flowers which are grown in Africa and exported to Europe have lower greenhouse gas emissions than flowers which are grown in Europe for European market. Thus for environmental, social and economic reasons, it is better to increase importation of flowers from Africa than growing them in Europe. However in terms of green beans and lettuces, the cases suppose that, for environmental reasons during growing season in Europe it is way better to use local produced green beans and lettuces. More importantly, type of the product and seasonality are the contributing factors when calculating greenhouse gas emissions of the product.

The second proposition, the horticultural supply chains in Africa and Europe differ in terms of water resources utilization was supported by case four (green beans) and case five (lettuces). These cases verified that Africans' are more efficient in utilizing green water

(rainfall) than their European counterparties. Thus, little energy is used for pumping machines for irrigation and so does little greenhouse gas emissions.

The third proposition, the promotion and further development of horticultural supply chains in an Afro-European setting has many possibilities for growth of green supply chains was supported by all the five cases and the cross case analysis shows that all the farms in Africa apply green practices in production stage. Also the availability of arable land, natural climatic conditions, cheap labour and more utilization of rainfall water are the added advantages for the further development of green horticultural supply chains in Africa.

The fourth proposition is about the barriers to the further development of horticultural supply chains in an Afro-European setting; case one supports this proposition by mentioning some of the barriers like high initial investment costs, lack of local expertise in Africa, low governmental support, poor infrastructure and competition.

The last proposition "the development of Fair Trade initiatives in horticultural supply chains leads to lower green gas emissions" was supported by case one and case two. The flower farms in Kenya and Tanzania are certified by Fair Trade, thus they follow all the Fair Trade standards and requirements. From these cases we studied that there is negative association between Fair Trade certification and greenhouse gas emissions.

Mode of transportation is another factor that has been identified to have an influence in overall product's greenhouse gas emissions. Most of the literature reviewed that transport represent only a small portion of emissions in the total product life cycle analysis, for instance in the study of Barno, Ondanje and Ngwiri (2011) said transport represent only 11% of the total product emissions and in the study done in United States in 2008 found that transport count only 4% of the total carbon footprint of the product (Fairtrade International 2011). However, from the review and analysis of the cases, the results show that transport is the main part of the supply chain which consumes a lot of energy and emits greenhouse gases the most. Therefore, from our findings and analysis of the cases, we propose that transport stage of the life cycle does certainly make an important contribution to the environmental impacts of horticultural products.

It is important, however to note that both Africans and Europeans horticultural products have higher greenhouse gas emissions/global warming potential impacts. We have used

higher and lower greenhouse gas emissions/global warming potential for the case of comparison.

6.2. Conclusion

This study apprehended the theoretical evaluation through which the study focus was achieved. Also the application of the reviewed literature in the case analysis increased affirmation of this study. The research design applied by this study helped us to gain more understanding about the subject. We have reviewed three horticultural products from six different countries. Using primary data for the study was not possible because of time limitations.

More importantly, the potential and desirability of promoting green and fair supply chains in an Afro-European setting was assessed, as supported by theoretical review and analysis of the cases. Fair Trade aims to reduce greenhouse gas emissions from production stage to waste management (throughout the supply chain) along with the increase in consumers' preference for Fair Trade products. There is a high probability for Fair Trade to grow in Africa, which will improve the livelihood of Africans and reduce greenhouse gas emissions. From the analysis, we found out that all the African countries apply sustainable agricultural practices in production of horticultural products, so this is an opportunity for Fair Trade to widen their market base in Africa.

Potential for developing fair and green supply chains is also possible in some fruits and vegetables (semi perishable) which can be transported by sea. Sea transport is regarded as the most efficient mode of transport in energy consumption and greenhouse gas emissions. For instance in the study of Wangler (2006) shows that transport of green beans from Kenya to the UK by ship consume 1.7 MJ/kg while by plane consume 57.8 MJ/kg, this would result in a significant energy saving of 56 MJ/kg of reduction in emissions. Likewise in the study of Saunders, Barber and Taylor (2006), they found that apples which are imported in UK from New Zealand by sea were more efficient in greenhouse gas emissions than UK apples. Therefore, there is a high possibility for Africans' fruits and vegetables that are less perishable to be exported to the European markets. Although the competition in the fruits and vegetables market is global (Worldbank 2004), in geographical perspective (lead time) Africa is close to Europe than Asia and South America.

Although Fair Trade has the opportunity to grow but its total market share is still small, therefore Fair Trade should widen its market and product range to cover all the small holder farmers from all over the world. Fair Trade idea can be promoted to a broader audience if a genuine Fair Trade brand is created instead of labelling other brands with Fair Trade (Pelsmacker, Driesen and Rayp 2005). In the same way, the entrance and inspection cost certified by Fair Trade should be minimal for small holder farmers. In addition, if the European Union genuinely intends to improve quality of life by the food standards regulations, instead of simply setting rigid limits, it needs to make an effort to help Southern farmers comply with them (Hunger Notes 2002).

Finally, from ecological point of view, average per capital emissions in Africa is one tonne while in UK it is 9.2 tonnes (Jones, et al. 2009). Africa and other developing countries where the Fair Trade is operating have ecological credit and are allowed to develop and even increase their emissions to a sustainable level while developed countries are required to reduce their per capita emissions. From this perspective, Kenya and Uganda are in position to continue with green beans production in a similar manner but the UK has to alter their production so as to reduce emissions.

6.3. Limitations of the study

This study is completely based on secondary data. The findings and conclusion drawn in this study is based on the analysis of five cases. Therefore it is not wise to generalize the findings of this study although some insight can be made. Further study by considering primary data is needed to find out more valid and reliable findings.

Also the presented cases did not provide enough information on the emissions of the whole life cycle of the products from farm to fork and the volume of products (kg/tonnes) which restricted our analysis. Another limitation in this study is use of cases that concentrates only on few African and European countries to identify whether there is the potential and desirability of promoting green and fair supply chains in an Afro-European setting. Thus, the results found from this study lack the quality of strong generalization.

6.4. Further research

There are several views towards further research regarding this thesis. First and main, the research was a case study based on the review and analysis of the past studied cases, which limit generalization of this study. There is need for primary data, which will provide

statistical results; such study could help generalize the findings from both qualitative and quantitative viewpoints and have reliable and viable findings.

Further research may be interesting if all the studied cases provide information about the Fair Trade certification of the farms, thus more general findings can be obtained about the association between Fair Trade and greenhouse gas emissions. In addition, further research is recommended by taking more cases with different countries to discover valid and reliable outcomes in order to study whether there is the potential and desirability of promoting green and fair supply chains in an Afro-European setting in horticultural products.

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