ASSESSMENT OF CHALLENGES ENCOUNTERED BY SMALL SCALE CUT-FLOWER SECTOR IN CENTRAL KENYA IN COMPLYING WITH ENVIRONMENTAL STANDARDS

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Assessment of Challenges Encountered by Small Scale Cut-Flower Sector in Central Kenya in Complying with Environmental Standards

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

This thesis is dedicated to my parents Peter and Ruth Kinyanjui for the love, discipline, sound advice, inspiration, support and encouragement they have shown me.

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ABBREVIATIONS AND ACRONYMS

BGI	German Flower Wholesale and Import Trade Association
CBI	Centre for the Promotion of Imports from Developing Countries
CSR	Corporate Social Responsibility
CTE	Committee on Trade and Environment (World Trade Organization)
DFID	Department for International Development
EMCA	Environmental Management and Co-ordination Act
EMS	Environmental Management System
EPA	Environmental Protection Agency
EUREPGAP	European Union Retailers Practice – Good Agricultural Practice
FAO	Food and Agriculture Organization
FIAN	Food-First Action and Information Network
FLP	Flower Label Programme
FPEAK	Fresh Produce Exporters Association of Kenya
HCDA	Horticultural Crop Development Authority
ILO	International Labour Organisation
IPM	Integrated pest management
ISO	International Standards Organisation
IUCN	International Union for the Conservation of Nature and Natural Resources
KARI	Kenya Agricultural Research Institute
KEPHIS	Kenya Plant Health Inspectorate Services

KFC	Kenya Flower Council
KHDP	Kenya Horticultural Development Programme
MoA	Ministry of Agriculture
MPS	Milie Programma Sierteelt or Floriculture Environmental Programme
NEMA	National Environment Management Authority
OECD	Organization for Economic Co-operation and Development
PCPB	Pest Control Products Board
PPE	Personal Protective Equipment
SARD	Sustainable Agriculture and Rural Development
SHG	Self-Help Group
TBT	Technical Barriers to Trade
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development
WCED	World Commission on Environment and Development
WTO	World Trade Organisation

ABSTRACT

The purpose of this research was to assess the challenges faced by small scale cut-flower growers in Central Kenya in complying with environmental requirements of the international markets and propose potential interventions. The specific objectives of the study were: to identify activities, actors/players along the supply chain involving smallholder cut flower growers, audit these activities for compliance with key international markets requirements with emphasis on environmental standards and to propose viable compliance interventions for small scale cut-flower growers.

The study was carried out within 3 regions in Central Kenya: Nyeri, Murang'a and Kiambu. A total of 360 small scale cut flower growers were randomly selected. Four main methods were used to collect data namely; field visits and interviews whereby the researcher used closed ended questionnaires, observation and a checklist as means of data collection instruments, consultations with experts and desk studies were also used to help the researcher to reach a conclusion. Analysis was done using both qualitative and quantitative techniques. To achieve this MS Excel computer package was used.

The findings of this study revealed that farming, post harvest handling, transportation, inspection and distribution of flowers to markets are the activities along the supply chain involving small holder cut flower farmers. The major actors/players along the value chain are input suppliers, exporters, Horticultural Crops Development

Authority, Kenya Plant Health Inspectorate Services, Fresh Produce Exporters Association of Kenya, Kenya Flower Council, Ministry of Agriculture and donors. Key constraints faced by out growers in producing and complying with environmental requirements administered by international markets include: lack of pesticide storage facilities, lack of training in safe use of pesticides and fertilizers, first aid, water and waste management in flower production, lack of proper record keeping, lack of financial assistance, poor human safety related to handling of chemicals, poor waste disposal strategies, poor water management skills and lack of proper post harvest handling infrastructure.

The proposed interventions include formation of stable producer groups with organizational structures to be classified as single farms, facilitation of group certification under the option 2 of the GlobalGAP, strengthening of capacities to meet environmental standards by government, private sector and donors. An enabling policy framework that assures environmental requirements and provision of incentives to comply with private voluntary standards was recommended.

CHAPTER 1

INTRODUCTION

1.1 GENERAL INTRODUCTION

International trade of floriculture products provides good opportunities for diversification of exports, poverty alleviation and rural development in Kenya. Export-oriented production also offers benefits at a macro level including foreign exchange earnings, balance of trade and can also stimulate improvements in both rural transport infrastructure and services provision.

1.1.1 The Kenya's Flower Industry

Kenya's flower industry, the oldest and largest in Africa, expanded at a very fast pace in the early years has now remained relatively stable, maintaining an average growth of 20% per annum. The value of floriculture exports in 2007 was Kshs 43 billion out of the total amount of Kshs 67 billion for horticulture making the industry a significant source of foreign exchange. While in 2006 the flower export volumes were over 80,000 tons, volumes for 2007 hit the 90,000 tons (Economic intelligence unit, Horticultural Crops Development Authority, 2008). Cut flowers are not only an important source of foreign income, the industry also offers both direct and indirect employment which is very important for a country like Kenya with a high unemployment rate. The Kenya cut flower industry is structured such that the large

scale growers account for 60% of the exports and the rest are contributed by small and medium scale growers. Small scale farmers mainly produce summer flowers which are grown in open fields and require low input systems with little investment. Small-scale farmers constitute a significant proportion of the rural economy and the poor in the country. Thus, this type of farming is a primary source of growth and a means of poverty reduction.

By far the greatest proportion of Kenyan flower exports go to markets in Europe. The Dutch flower auctions have historically been the most important channels through which Kenyan flowers have reached European wholesalers and retailers. However, changing consumption patterns and supermarket supply chain rationalisations are beginning to erode the auctions' importance. In a few key importing countries, particularly the UK, buying behaviour has changed away from occasional towards regular flower purchasing. This has increased not only the volume of purchases but also the importance of convenience stores (such as supermarkets) as retail outlets. Simultaneously, several large European supermarkets have simplified their horticultural supply chains by establishing direct links with producers. Although supermarkets continue to buy flowers through the Dutch auctions, direct trade with growers or their import agents has gained considerable importance over recent years.

1.1.2 EU Demands of Kenya's Cut-flowers

Major trends in the EU include growing demand for bouquets and subsequently summer flowers and foliage, both for higher-quality main products and small varieties in the EU. This offers an opportunity for small-scale cut flower growers in Kenya who mainly grow summer flowers which are used as fillers in bouquets. Floriculture exports on the other hand, face increasingly stringent environmental requirements in international markets. This includes both mandatory regulations and private voluntary standards (PVS), which set specific requirements for documented, audited and certified production methods including environmental conditions under which cut flowers are produced.

1.2 COMPLIANCE BENEFITS OF ENVIRONMENTAL STANDARDS

Compliance with environmental standards provides a broad spectrum of both commercial benefits (i.e inducing producers to comply with standards can enhance competitiveness and give them access to higher priced markets, high productivity and quality produce which reduce the level of rejection by the buyers and increase the returns) and sustainable development benefits (e.g reduced environmental impacts, improved workers' health and safety, better hygiene practices and application of modern management methods).

1.3 CONCERNS FOR SMALL HOLDER FLOWER GROWERS IN INTERNATIONAL TRADE

Cut flower production and exports continues to provide opportunities for many environmental, social and development gains in Kenya. However, conditions to continue the "Kenya success story" have become more difficult, particularly for small-scale growers engaged in production for export to developed-country markets. Far reaching changes in the characteristics of cut flower trade in recent years risk adversely affecting the participation of small scale growers in the global supply chain. Private sector standards have also exacerbated the exclusion of these growers from the global cut flower. The smallholders' ability to maintain and strengthen their role in floricultural exports will depend on their capacity to adapt to these changes and comply fully with the emerging standards. The general view is that smallholders, especially the poorest ones, are increasingly being squeezed out from high standards export production (Dolan and Humphrey, 2000; Reardon *et al.,* 2003; Weinberge and Lumpkin, 2005).

1.4 IMPACTS OF NON-ADOPTION OF ENVIRONMENTAL STANDARDS

Demands for private standards which continue to increase in number and complexity are having negative effects on small-scale growers. Since 2003, Kenyan smallholders wishing to continue exporting to EU retail markets were required to comply with GlobalGAP. However, many small-scale growers were unable to meet these requirements. Moreover, a risk for Kenya non-compliance was to loss market share

leading to a drop in fresh produce exports and a reduction of incomes for suppliers. To offset these trends, exporters would maintain market share by establishing large-scale farms and thus buying less from out growers. This led to income loss in rural areas (Mwangi, 2007).

Lack of certification of small holders can lead to income loss resulting to poverty in the rural areas, environmental degradation through poor management of waste, poor hygiene practices, exposure to chemicals, loss of image of the sector and increased rejections due to poor sanitary and phytosanitary measures. To avoid this set backs there is an urgent need for interventions to ensure that small holder farmers remain competitive and take advantage in international trade.

1.5 GROWTH MAINTENANCE

In order to maintain growth, we must recognize that enhancing the competitiveness of exports is critical to the development of a nation's economy. In Kenya, the horticulture stakeholders have made practical interventions to achieve compliance for small scale growers in particular lobbying to make standards more "Small holder friendly". This has resulted to the formulation of KenyaGAP, the Kenya flower council code of practice; Silver standard and the Gold standard. Despite this efforts majority of the small scale cut-flower growers are not certified.

The risk of small holder exclusion are well recognized but there is no documentation of the challenges faced by small scale cut-flower growers in Kenya in complying with standards that are being developed through legislation, codes, labels and certification with respect to the environment by the European Union member states which are gaining importance. Filling these gaps has been the primary rationale for this study.

1.6 REPORT ORGANISATION

Chapter 2 reviews literature of the export floriculture industry in Kenya and the separate literature describing the environmental impacts of the flower industry, development of measures, benefits of environmental standards in the flower sector, changing characteristics of cut flower trade in Europe and the impacts of supply chain governance. Chapter 3 outlines the methodology used for the research. Chapter 4 explores the challenges faced by small holder farmers in the flower sector in complying with environmental requirements and the potential interventions. Chapter 5 concludes the findings and provides recommendation on the way forward.

CHAPTER 2

LITERATURE REVIEW

2.1 HORTICULTURE SECTOR

Agriculture accounts for about 24% of Kenya's GDP with an estimated 75% of the population depending on the sector either directly of indirectly. The horticulture sub-sector of agriculture has grown significantly to become a major employer and foreign exchange earner only second to tourism. Currently, horticulture which comprises of fruits, vegetables and flowers, is the fastest growing sub-sector of the economy with Kenya having a long history of growing horticultural crops for both domestic and export markets. Structural and macro-economic reforms, plus the introduction of a more liberal trading environment under WTO arrangements have provided a major boost to Kenya's horticultural prospects (Floriculture in Kenya, 2008).

One way that Kenya and other sub-Saharan African countries have attempted to reduce poverty and achieve higher rates of growth is by diversifying their export portfolio away from primary commodities into non-traditional exports with more auspicious market trends (Solomon *et al.,* 2007). Participation in international trade is generally recognized to favor economic growth and especially agricultural exports would promote development in low income countries due to the link with the rural economy (Aksoy, 2005). Extensive household surveys have shown that smallholders

participating in export horticulture, whether as producers or the workforce employed in the sector, are better off than non-export smallholders, with average annual household incomes being almost five times higher (McCulloch and Ota, 2002).

There are concerns that the proliferation and enhanced stringency of environmental standards that are imposed by high-income countries can negatively affect the competitiveness of producers in developing countries in particular smallholders and impede actors from these countries from entering high-value markets (Augier *et al.*, 2005). An alternative and less pessimistic view emphasize that compliance with environmental standards can be a catalyst for upgrading and modernization of developing country's supply systems (Maertens and Swinnen, 2006). This has important implications for addressing rural poverty and is of concern to both national governments and donors (Coleacp, 2007).

2.2 WORLD CUT-FLOWER MARKET

2.2.1 World Demand

The European Union (EU) consumes 70% of the World's flowers and includes countries with strong purchasing power. The largest country destination is Germany (18%) followed by UK (17%) and the USA (16%) (Fig.1). European consumers buy flowers for different purposes. The main purpose of purchase is as gifts, representing 40% - 50% of European consumer spending. Another 20% - 30% is bought for special

occasions like weddings and funerals. The remaining 20 - 25% is spent on flowers for decoration of homes and offices (CBI, 2007).

Germany is the World's largest and most significant import market for floricultural products. It is also a significant producer, covering about 10% of domestic demand. The Netherlands dominates the German import market with an average share of nearly 75%. The remaining 25% imports mainly come from Kenya, Israel, Colombia and Ecuador.

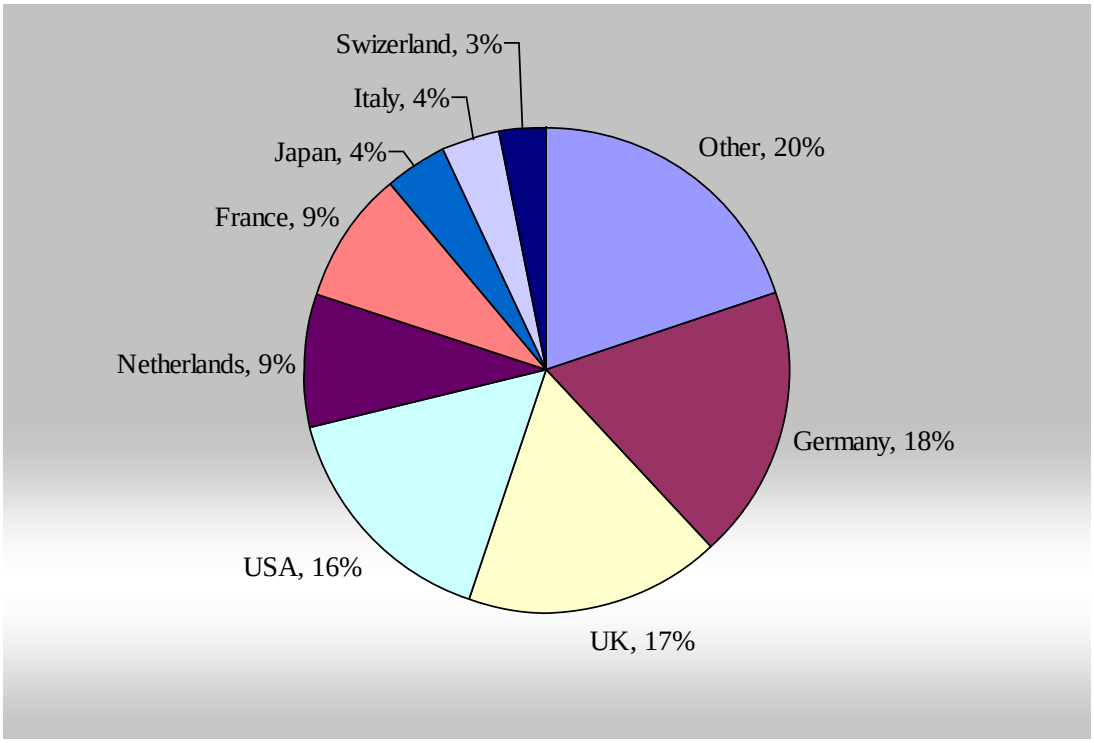

Figure 1. Cut-flowers importers, 2005.

Source: Trade Competitiveness Map- International Trade Centre (UNCTAD/WTO); Team analysis

2.2.2 World Supply

The cut-flowers World market is a $ 5.7 billion market dominated by Netherlands which accounted for about 54% of exports in 2005. The other top exporters are Columbia (16%), Ecuador (6%) and Kenya (6%) (Fig. 2). The Netherlands constitutes the major market for developing countries because of its massive trading role in distributing imported flowers throughout Europe. The importance of developing countries as supplier to the EU is demonstrated by the presence of Columbia, Ecuador, Kenya, Zimbabwe, Thailand, Zambia, India, South Africa, Turkey, Tanzania and Uganda among the top fifteen supplying countries (CBI, 2007).Developing countries play a more important role in the Netherlands imports than in the imports of other EU countries, illustrating the Netherlands' gateway function to the European market for imports from developing countries (CBI, 2007).

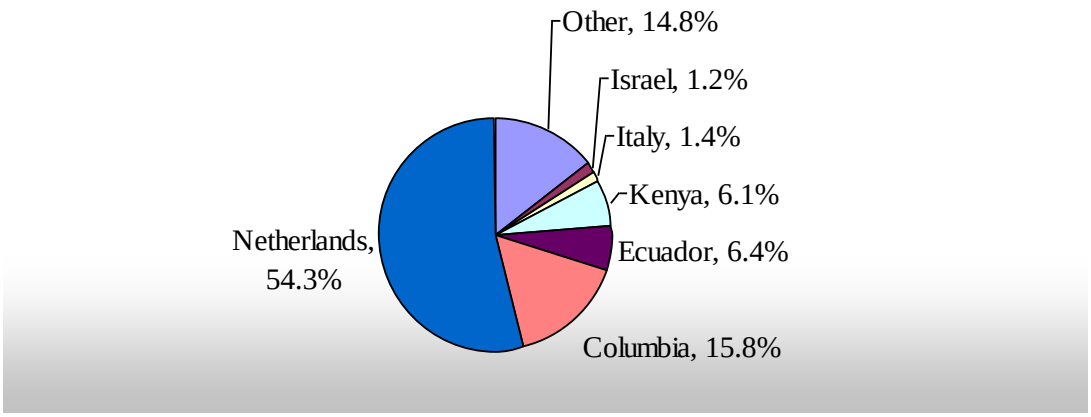

Figure 2. Cut-flowers exporters, 2005.

Source: Trade Competitiveness Map – International Trade Centre (UNCTAD/WTO); Team analysis

2.3 KENYA CUT-FLOWER INDUSTRY

Kenya boasts the oldest and most successful cut flower industry in Africa. This has been attributed to Kenya's agro-climatic diversity which allows the production of a wide range of floricultural crops: tropical, sub-tropical and temperate. The Kenyan cut flower industry has seen steady growth over the last fifteen years. During the 1990s, the sector experienced its most robust expansion in terms of production volume and areas, varietal improvements, and the number of growers and exporters. The government implemented economic reform measures conducive to local and foreign investment, including liberalization of foreign exchange controls, establishment of retention accounts by exporters and duty waivers. Procurement of inputs for new and expanded investments was facilitated (Fintrac Inc., 2005).

By far the largest proportion of Kenyan flower exports is supplied to Europe. Of the total production, 97% of the flowers are exported to the EU, which is believed to consume over 60% of the World flowers, while the balance is consumed locally. Kenya dominates flower exports into the EU market and has a 38% market share (International Trade centre – UNCTAD/WTO: Team analysis). The major market for flowers being Holland, with 65% stake. Other destinations include UK which accounts for about 23%, Germany 7% and France 2%.

2.3.1 Socio- Economic Importance of the Flower Industry

The industry is widely considered an economic story, with the volume of cut flower exports increasing from 14,000 tons in 1990 to approximately 39,000 tons in 2000 to 61,000 tons by 2003. In 2006 over 80,000 tons were exported compared to just over 90,000 tons exported in 2007. The total value of floriculture exports in 2007 was KShs 43 billion out of the total amount of KShs 67 billion for horticulture, this accounted for about 60% of horticulture exports (Economic intelligence unit, Kenya's horticultural crops development authority, 2008), making the industry a main source of foreign exchange earnings (Table 1).

Table 1. Export values and volumes for cut-flower (1997-2007)

Year	Volume (Tons)	Value (In Billion Kshs)
1997	35,853	5
1998	32,513	5
1999	36,992	7
2000	38,757	7
2001	41,396	10
2002	52,107	15
2003	60,983	16
2004	70,666	19

2005	81,218	23
2006	86,480	24
2007	91,192	43

Source: The Economic Intelligence Unit, Kenya Horiticultural Crops Development Authority (HCDA)

Floriculture is estimated to employ over 100,000 people directly, while indirect employees in ancillary sectors (transport, packaging, inputs etc) are approximately 1.2 million people who derive a livelihood from the export industry (Floriculture in Kenya, 2008). If each has four dependants, the total beneficiaries are 4.8 million people or 14% of the population! The fact that these opportunities in employment are in the rural areas is very important, as it not only stems rural-urban migration but also contributes to poverty alleviation and redistribution of wealth which is a major focus of the government.

2.3.2 Structure of the Kenya Cut-Flower Industry

In contrast to the situation in the 1970s to 1980s when only one or two companies accounted for the bulk of cut-flower exports, there are presently over 1,000 producers/exporters growing cut-flowers in Kenya. Table 2 shows the different categories of cut flower producers operating in the Kenya floriculture sector. Large scale producers have over 20 hectares of land under flower cultivation; the flowers are grown both in greenhouses as well as open fields and are exported directly to Supermarkets at the European Union. Large-scale growers account for over 60% of

the exports (Dolan *et al.,* 2004). The rest of the exports are contributed by small and medium scale growers. Small scale producers cultivate their flowers under 5 hectares of land and mainly grow summer flowers in open fields which require little investments. Small-scale farmers mainly sell their produce to exporters who in turn supply the Dutch auctions rather than shouldering the risks and transaction costs associated with exporting. The security of these exporters in the supply chain is somewhat tenuous as they face constricting margins and increased environmental standards from the European market (Thoen *et al.,* 2003).

Table 2. Categories of Kenya's cut-flower producers

Category	**Approximate Production Area and crop**	**Typical Features**
Large producer / exporter	Above 20 hectares of protected production (greenhouses) plus open fields. Sophisticated infrastructure and expatriate management.	Manage own export operations. Diversified markets (direct sales to supermarkets). Large employers (250 - 6000 staff)
Medium scale producers	5 hectares to 20 hectares of protected production (greenhouses) and open fields.	Own export and / or act as out grower. Sell through the auctions

	Sophisticated infrastructure Produce mostly roses and open field flowers	and limited direct sales. Employment approximately 100 staff
Small scale producers	Under 5 hectares. Grow only open field flowers particularly summer flowers Low input system with little investment	Act as out growers. Product sold through the auction. Mostly family labour.

2.3.3. Small Scale Cut-Flower Growers In Kenya

In the early 1990s, small scale cut flower growers got involved in the export market – primarily in the production of "summer flowers", the general name given to annual species and bulbous perennials which have traditionally been grown during the summer in northern Europe. Air transport stimulated a year-round demand for these previously "summer only" flowers. The small holder concentrated on summer flowers that did not require high capital investment. Their main line were Alstromeria, Ornithogalum, Eryngium, cut foliage, Papyrus, Tuberose and Arabicum amongst others. Exports declined considerably during 1998 - 2000. Alstromeria, which was a major variety grown by small-scale growers in Kinangop and Limuru areas, exported through flower producers and exporters such as Carzan, Maua Management, Mac Limited Celinico Flowers and Sher Agencies (under previous management) and other exporters (middlemen) dropped drastically due to the enforcement of plant breeders'

rights and a demand of high quality flowers from new varieties. As the majority of these growers did not have tangible irrigation and cooling systems or capital to buy new varieties, quality of the flowers could not be maintained. Increased costs in freight for handling small size shipments also had a negative effect on their returns (Fintrac Inc., 2005).

Growers, who had been delivering to Carzan, a pioneer in summer flowers, also dropped drastically and eventually stopped as the company switched to production on its own farms. A number of growers who had invested in open/shade netting to grow summer flowers in the Uasin Gishu area also incurred major losses as a result of El Nino and its aftereffects. This included two major players, Ndola Flowers and Rift Flora, who had invested heavily in storage, handling and transportation facilities. Some of these facilities are now being used for handling vegetables (Fintrac Inc., 2005).

More recently, various exporters have stepped in to provide small holders with technical information (Table 3). Small holders in return sell their produce at a fixed contract to the exporter. Exporters also carry out individual market development programs. As part of their social responsibility strategy, some exporters and their European buyers are keen to include small-scale growers within the industry.

Table 3. The number and distribution of small scale cut flower growers supplying produce to exporters in the study area.

Location	Number of small – scale farmers
Nyeri	1,190
Kiambu	608
Kirinyanga	215
Murang'a	917
Thika	259
Meru/Embu	86
Rumuruti	126
Kitui	68
Timau	88
Total	3,557

Source: Exporters; Wilmar Agro Limited and Nature Grown Limited, Kenya.

Smallholder flower producers are now at a critical juncture; poised for potential expansion and growth, but only if they can overcome serious production, post harvest and compliance with voluntary codes and labels which are the new market standards. According to the Kenya Horticultural Development Programme (KHDP), a USAid funded small scale farmers support institution, overseas markets are hungry for

specialized flowers which can grow easily in the open on small parcels of land, with minimum investment capital and are less demanding on labour.

Kenya's small holders can be major players in the global multibillion dollar flower industry because the flowers they produce are indispensable components of bouquets as fillers (Plate 1) which don homes, offices and special occasions in Europe. They are also sold as stand – alone to those seeking varieties (Riungu, 2008).

Bouquets comprised 10% of flower exports in 2006. Small holder farmers produced 2,600 tonnes of flowers in 2006. This increased to 3,313 tonnes in 2007 and the figure is seen to go up in 2008 (Mbogo, 2008). The summer flowers planted are predominately green foliage and a range of coloured flowers that are less resource intensive and can grow in open fields. Small holder cut flowers farming has also lead to reduction of crime rates as the unemployed youth can earn a leaving from growing flowers (Mbogo, 2008).

An exporter of summer flowers who works with over 3,000 farmers, Wilmar Agro Limited ships flowers five times a week, mainly to Amsterdam. Prices for summer flowers have grown as demand in the local and international markets increases and only 30% of the market requirements are met (Riungu, 2008). Demand for bouquets in the domestic and foreign markets is growing. For instance, about 63% of the German population buys cut flowers of which 30% are bouquets. The share of exports

to the UK has been increasing considerably, in response to a growing market especially on mixed bouquets, and more direct sales as compared to the auction system (CBI, 2007).

Small growers have traditionally enjoyed certain advantages in the production of cut-flowers vis-à-vis large producers. Such production advantages include availability of ample labour, as small farmers may have a competitive advantage in labour – intensive production because of their ability to call upon family labour. Other advantages are close proximity to crops, attention to detail for high - value and labour intensive crops (Garbutt and Coetzer, 2005).

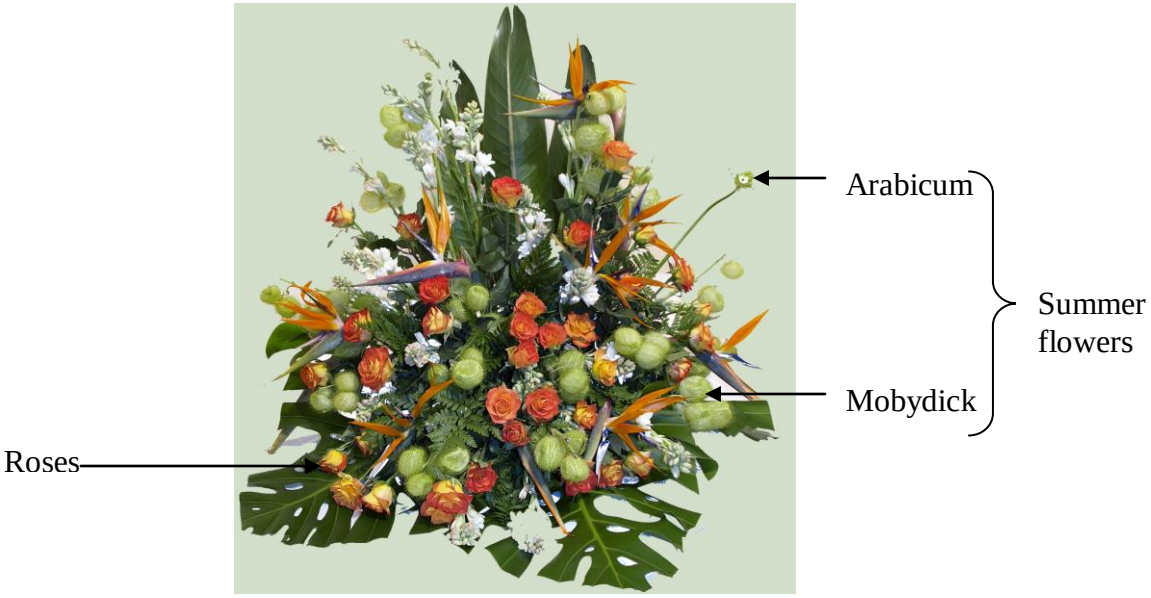

Plate 1. Bouquet containing summer flowers as fillers

Drawing on fieldwork in Kenya, (Mithofer, 2007) points out that small - scale producers tend "to operate on a lower input – output level with a turnover – cost ratio similar to that of exporter owned farms. This simple efficiency measure shows that although small holders produce lower yields they operate at a similar efficiency level as exporter – owned farms. From an exporter perspective, it is cheaper to source from smallholders than from medium to large-scale farms despite higher transaction costs in terms of monitoring of small holder production." Mithofer *et al.,* 2008 also emphasizes that by procuring export produce from small holders, exporters strive to spread production risk (e.g hailstorms) over various regions in Kenya as to ensure even supply throughout the year. However, demands for private standards, which continue to increase in number and complexity are having negative effects on small-scale growers. Certification to private voluntary standards (PVS) is expensive and particularly difficulty for small and medium scale producers in African Caribbean and Pacific countries as they do not have the necessary capital and their countries lack infrastructure and services (Coleacp, 2007).

Threats to imports from developing countries such as Kenya are; poor image attributed to flower production in this countries, retail chains increasingly require suppliers and products certified and competition from East European countries. Opportunities for imports from developing countries are; shift of adding value from the wholesale towards the growers in developing countries, off-season supplies and

bouquets (CBI, 2005). For small scale farmers to be able to tap into this opportunity they have to be able to meet the environmental standards set by these markets.

2.4 ENVIRONMENTAL IMPACTS OF THE FLOWER INDUSTRY

2.4.1 Water Extraction

One major concern for different stakeholders within the flower industry is the impact of the flower industry on the hydrology of regions where it operates, as its demands for water are high and it places pressure on water resources, especially where water resources are scarce.

In Colombia, one hectare of chrysanthemums flower uses 150,000 litres of water per week. Unsustainable cultivation led to sinking ground water levels and dry rivers so that the supply of drinking water was no longer guaranteed in some areas like Sabana de Bogota (Maharaj and Doren, 1995). The Lake Naivasha region in Kenya is one area where flower production is thought to be leading to serious pressure on the ecosystem and social conflicts. Since the first flower farm was established near Lake Naivasha in the 1980s, the area has experienced a floricultural boom and has attracted many people to the lake, which has put additional stress on the lake's water resources. The level of the lake is currently falling and some have blamed the flower industry (Nathalie *et al.*, 2007).

In the Naivasha catchment, the area under irrigation is 4,800 ha of which 800 ha is under flowers and 4,000 ha under dairy and vegetable farming. In total, there is an irrigation demand of 39 million m^3, which is granted by the District Water Resource Department, while the safe yield (in order to maintain all the functions of the lake) is estimated at 16.5 million m^3 per year. Flowers consume 8 million m^3 of water through very efficient drip irrigation systems and diary and vegetables use 31million m^3 through open-air sprinklers. Although flowers take more water per hectare than the vegetable and dairy production, the profit of flower production is much higher than the vegetable and/or dairy profits (Odada *et al.*, 2005). Therefore strategic planning towards water is a very important issue since the opportunity cost of not having water in future due to over use could wipe out the benefits brought about by the industry.

Prior to the proliferation of the flower farms and subsequent decline in water levels, Lake Naivasha was one of the world's top ten sites for birds, with more than 350 recorded species (Food and Water Watch, 2008). It was also renowned for its sparkling clear water and the papyrus plants and water lilies that could be found at it edges (Food and Water Watch, 2008). The overuse of water has taken a toll on Lake Naivasha. Scientists have concluded the Naivasha's water levels are 10 feet lower than what is healthy (Vidal, 2006). In the past two years, the number of hippos has dropped by more than 25 % because of decreased water levels. There were 1,500 hippos in 2004, but their numbers fell to 1,100 in 2006 (Food and Water Watch, 2008).

In 1995, Lake Naivasha was designated a protected site under the Ramsar Convention, formally known as the Convention on wetlands of international importance. It was created in 1973 to preserve wetlands as habitats for wildfowl, but has since grown into a program to ensure the sustainable use and conservation of wetlands worldwide (Food and Water Watch, 2008). While such sites are required to have management plans to ensure that they are used wisely and protected, " the Ramsar designation yield only a small amount of legal power, insufficient to work as a deterrent to those who would, for example, seek to develop or purchase riparian land or do damage to Naivasha's catchment (Food and Water Watch, 2008).

2.4.2 Chemicals

One of the characteristics of the flower industry is its use of agrochemicals, which can be dangerous to human health and the environment. Around Lake Naivasha in Kenya, there are serious concerns about the impact of chemical use on the water quality of the Lake, especially since Lake Naivasha was designated as a Ramsar site in 1995. Environmentalists and fisherfolk fear that the chemicals washed into the lake end up in the food chain. The large flower farms and the smallholders in the upper catchment clearly have an effect on the lake's water quality. Nevertheless, the trophic status of the lake is still acceptable (Odada *et al.,* 2005).

"Water, sediment, red swamp crayfish and largemouth bass were collected from five sampling stations around the lake. All the organic chlorine residues being investigated

were detected in both black bass and crayfish. This was an indication that farm pesticides such as dieldrin, aldrin, lindane and endosulfane were in use in the lake's water catchments. Aldrin and dieldrin are among the twelve persistent organic pollutants the so called "dirty dozen" the Stockholm Convention focuses on eliminating. The report said it was deduced that the residues existed in the system at low concentrations and manifested in living tissue mostly because of the chemicals affinity to fat." (Nathalie *et al.,* 2007). The Environmental Protection Agency (EPA) in the USA prohibits the use of aldrin, dieldrin and lindane chemicals for the production of flowers due to their carcinogenic potential.

The impact of chemicals on water quality is one concern in Kenya; other concerns include their impact on the broader environment, on human beings, animals and soil. According to other research (Smith *et al.,* 2004), serious problems persist with workers complaining about health problems related to pesticide use (coughs, sore chests, skin irritation and dizziness). These problems were attributed to working with freshly sprayed plants, working unprotected in greenhouses while chemicals were sprayed or entering greenhouses before re-entry times had expired.

Mitoko, (1997) report on occupational pesticide exposure among Kenyan Agricultural workers states that cholinesterase levels (a sign of organophosphates) on horticulture workers in the flower growing Naivasha region were found to be low. Organophosphates affect the nervous system on humans. Primary cause of concern is

also the use of highly toxic and ozone layer depleting methyl bromide which has been phased out under the Montreal Protocol and developing countries, including Kenya, are being asked to phase out the use of this substance by the year 2020, but it is still widely used by Kenyan flower growers (Mitoko, 1997). The most likely mode of exposure is by inhalation of the gas. Methyl bromide may cause burns to the skin or eyes. Soil applications are particularly likely to cause burns to the feet and legs and adversely affect the wildlife (Mitoko, 1997).

According to Asocolflores, the association of Colombia's principal flower exporters, about 200 kg of pesticides per hectare in a year are sprayed on flowers. This is double the amount used in Holland (Brabel, 1999). The intensive use is to a great extent related to the consumer preferences for high quality products and regulations in export markets. The European Union maintains extremely high phytosanitary requirements. Until 1995, dangerous and prohibited substances like Captan were in use in Colombia. In Ecuador, up to 36 different pesticides had been counted in use within three days (Ulrike, 1999).

In the cut-flower producing countries of the South, employers often fail to provide sufficient training and protective gear to workers who face daily exposure to toxic chemicals. A survey of 8,000 workers in plantations near Bogotá, Colombia, found that workers were exposed to 127 different pesticides, three of which are considered extremely toxic by the World Health Organization (Mendez, 1991). An International

Labour Organization (ILO) survey of the Ecuadorian flower industry found that only 22% of companies trained their workers in the use of chemicals (Palan and Carlos, 1999). Governmental regulations regarding pesticide use and health and safety standards were often insufficient or unenforced. The health of the workers is compromised as a result of the lack of effective protection. Two-thirds of Colombian and Ecuadorian flower workers reportedly suffered from work-related health problems, including headaches, nausea, impaired vision, conjunctivitis, rashes, asthma, stillbirths, miscarriages, congenital malformations and respiratory and neurological problems (Mendez, 1991).

2.5 SUSTAINABLE AGRICULTURE (INTERNATIONAL SOLIDARITY)

In 1983, the United Nations appointed an international commission to propose strategies for 'sustainable development', ways to improve human well being in the short-term without threatening the local and global environment in the long-term (WCED, 1987). At the 1992 United Nations Conference on Environment and Development (UNCED, or the Earth Summit) in Rio de Janeiro, the international community adopted Agenda 21, a global plan of action for sustainable development. The commission on sustainable development was created in December 1992 to ensure effective follow-up of UNCED (Dankers, 2003).

Agenda 21 deals with sustainable use of resources. Chapters 4 and 14 stipulate the changing consumption patterns and sustainable agriculture and rural development

respectively. It states that governments and international organizations, together with the private sector, should develop criteria and methodologies for assessment of environmental impacts and resource requirements throughout the life-cycle of products and processes. Governments, in co-operation with industry and other relevant groups, should also encourage expansion of environmental labeling and other environmentally related product information programmes designed to assist consumers to make informed choices (Danker, 2003).

The World Trade Organization and other regional trade associations across the globe have underscored the need to include the environment as an important issue in international trade. We can witness such execution through the following; first, through environmental legislation, policies have been formalized and institutionalized to effectively consider pre-and/or post-environmental effects of international trade transactions. Second, we can increasingly see that such policies are enacted through market forces such as environmental labels and management systems.

2.6 DEVELOPMENT OF ENVIRONMENTAL MEASURES IN THE FLOWER SECTOR

The environmental and health impacts of flower production can be considerable. They include groundwater contamination resulting from the excessive application of agrochemicals, and health effects stemming from inadequate protection of workers who handle dangerous chemicals. Too much use, or misuse, of herbicides and

pesticides that can threaten human, animal and plant life. Also, the trade, transport, and sales of flowers and plants cause a considerable amount of organic waste, packaging waste such as boxes, trays and plastics that can cause pollution due to toxic substances.

Conditions in the cut-flower industries of Latin American countries began to attract attention in Organisation for Economic Co-orporation and Development (OECD) countries during the late 1980s, particularly with the release in 1988 of the award-winning documentary, *Amor, Mujeres Flores* (Love, Women and Flowers), which depicted poor working conditions at Colombian flower farms and highlighted the excessive use of pesticides, which affected the health and well being of the mostly female work force (OECD, 2002). The film marked the beginning of an international campaign that has severely tarnished the industry's image. Among the allegations made in the film were that female workers in the business were being exposed to pesticides without respiratory protection and appropriate protective clothing which resulted to premature birth, vomiting, skin and respiratory problems (OECD, 2002).

In 1990 a "fair flowers" campaign was launched by a Swiss-Colombian working group on cut flower issues, Greenpeace and the World Wildlife Fund, who just before Mother's Day when sales of flowers are high, depicted poor working conditions and high pesticide use in the Colombian flower industry (Victoria, 2001). In 1995, Migros (Swiss supermarket) created a label for flowers produced under "socially and

environmentally sustainable conditions". In subsequent years, the working group continued with Mother's Day campaigns and organized other activities, such as conferences on Fair Flowers. The campaign was eventually extended to Austria and Germany. The original focus of the campaigns was the poor working conditions in Colombia's flower farms but later on it was broadened to include other countries, such as Ecuador, Zimbabwe, Kenya and Tanzania (Victoria, 2001)

In 1991, concerned about the plight of worker conditions in developing countries where flowers for the cut-flower market were being grown, a group of German human rights and church organizations, including FIAN (Food-First Action and Information Network), *Brot für die Welt* (Bread for the World) and *Terre des Hommes* — formed the Flower Campaign "to secure the fundamental rights of the workers as well as environmental protection in flower production." Among other activities, the Campaign created a newsletter, *Blumen-Zeitung* (Flower News), which drew attention to environmental problems and social conflicts in flower exporting countries. In order to support foreign flower workers in their attempts to worker safety, and general working conditions, the Campaign began urging German importers to deal only with "clean" flower growers and exporters (Wijk, 1994).

In 1994 FIAN joined together with the German Flower Wholesale and Import Trade Association (BGI) to discuss appropriate social and environmental criteria for flower growing. The BGI together with representatives of Expoflores, the Ecuadorian Flower

Growers and Exporters' Association, developed a mutually acceptable eco-labelling scheme. The scheme demands compliance with over 60 social and environmental criteria relating to pesticide and fertiliser use, health and safety measures and general working conditions (Greiner, 1998).

The BGI also approached the larger of Colombia's flower exporting associations, Asocolflores, with a proposal to establish a separate programme called the "Colombia Flower Declaration". The idea was that cut flower companies who wanted to export to Germany would sign the declaration in order to be placed on a "white list". In so signing, the companies would declare that they would strictly comply with all Colombian laws and norms concerning labour regulations, agrochemical use and handling, and environmental and natural resources preservation (Wijk, 1994). The companies would have also had to consent to having their compliance checked by a commission comprised of both Colombian and German experts. Despite the risk of losing access to the European market, Asocolflores decided not to subscribe to the programme, echoing the Colombian Government's position that doing so would be "an act against national sovereignty." BGI then approached Asocolflores and encouraged it to participate in the Flower Campaign's established "Flower Label Programme" Asocolflores again declined.

At around the same time, in the Netherlands, the Stichting Milieukeur (Environmental Choice Foundation) began developing environmental criteria for labelling agricultural

products, including flowers. The criteria for the Milieukeur (MPS) label, which have been solely determined by domestic interests, are meant to assure consumers that the products are considerably less damaging to the environment than those produced using conventional methods. For the cultivation of MPS-labelled flowers, only limited and selected use of chemicals and artificial fertilisers are permitted (Verbruggen *et al.*, 1997).

2.6.1 Environmental Legislation in Kenya's Floriculture Sector

The rapid expansion of areas under flower production has led to serious concerns about environmental impacts particularly to the ecosystem of Lake Naivasha, Kenya's largest freshwater lake around which floriculture industry is based. Concerns about worker health also have been raised, particularly with respect to the use of agricultural chemicals. The Kenyan industry has responded quickly to these criticisms, implementing technology and managerial changes and attempting to allay social and environmental concerns. In 1990s Fresh Produce Exporters Association of Kenya (FPEAK) lobbied the government to enact the Environmental Management and Co-ordination Act of 1999 and also to establish the National Environmental Management Authority to implement the act (Barrientos *et al.,* 2001).

In the last decade, European buyers of goods produced overseas have increasingly insisted on common adherence to international standards of conduct, particularly on environmental protection and worker welfare, in part to level the playing field

between developed and developing – country producers codes of practice have been developed to monitor the conditions of the production and distribution of goods throughout the supply chain, from European importers and large-scale buyers, such as supermarket chains, to producer trade organization (Opondo, 2001).

In the late 1990s, Kenyan growers and exporters developed their own industry codes to try to satisfy European concerns. The two organizations, Kenya Flower Council (KFC) and Fresh Produce Exporters Association of Kenya, have taken the lead role in developing codes for the self – regulation of their members. FPEAK was formed in 1975 to represent the interests of producers and exporters of cut flowers, fresh vegetables and fruits by supplying market information and technical assistance and training. FPEAK members adhere to a voluntary code of conduct on responsible production, environmental protection and social accountability which was first developed in 1996 and relaunched in 1999. Since June 2004 the code has been transformed into KenyaGAP and has now attained the EurepGAP / GlobalGAP equivalent status. KFC was formed by flower producers / growers and exporters in 1997 largely in response to concerns to develop standards on worker welfare and environmental protection that would enable members to meet European buyers' demands (Chandra, 2006). KFC members work to achieve this KFC code of practice at either the Silver or Gold standard by meeting requirements on plant breeders' rights, wages, labour conditions, worker safety, safe use and disposal of pesticides and other agro – chemicals and environmental protection (Chandra, 2006).

There exist today overlapping codes of practice for worker welfare and environmental protection. Producers seek certification from MPS, the Flower Label Programme and GlobalGAP, depending on market they want to access. Even if the producers have KFC certification, they must obtain certification from other sources as well. Complying with complex and often conflicting codes is a major barrier to participation particularly for small producers (FAO, 2002).

The codes of practice have been important instruments for the dissemination of improved practices and also incentives to invest in technology. The codes focus on the use of knowledge based, rather than chemical based technologies and to some extent require local technology development. The need for the local development of "green technologies" such as integrated pest management (IPM), has spurred research investments by local firms such as Homegrown, one of the large growers, which has created a unit to develop IPM technologies (Chandra, 2006). Additional local research focuses on using local predators in the natural control of pests. Research and consulting firms, such as Real IPM, have emerged to help producers shift away from the chemical control of pests and diseases in order to meet certification standards. Food and Agricultural Organization (FAO) has also funded research to reduce the use of methyl bromide, which is used extensively for soil fumigation (FAO, 2002).

2.7 BENEFITS OF ENVIRONMENTAL STANDARDS IN THE FLOWER SECTOR

The impact of chemicals on water quality is one concern. Other concerns include their impact on the broader environment; on human beings, animals and the soil. According to other research (Smith *et al.,* 2004), codes of conduct have brought considerable improvements in occupational health and safety particularly with respect to the safe use of chemicals and the provision of protective clothing, toilets, washing facilities and drinking water.

There is evidence that major environmental and health improvements in the companies from countries that have participated in the flower labeling programme scheme have been achieved. In Kenya, time limits for entering the greenhouses after the use of pesticides have been introduced to avoid any health hazards to workers. In Ecuador, the majority of workers have now long-term contracts, and the workers are provided with protection clothes (Brabel, 1999). In addition, it has been found that not only environmental and social costs are partly internalized by labels, but even cost-saving effects based on more efficient production processes and more interested and productive workers can be realized (Verbruggen *et al.,* 1997).

2.8 IMPACT OF CONSUMER LABELS NON-COMPLIANCE ON TRADE

According to the World Trade Organization (WTO) committee on trade and environment (CTE), well-designed eco-labeling programs which are covered by the

technical barriers to trade (TBT) agreement can be effective instruments of environmental policy and in theory, one of the main trade-related risks presented by private voluntary eco-labelling programmes is that they may act as a kind of non-tariff barrier favouring particular process and production technologies (Zarilli *et al.,* 1997).

Eco-labels can be powerful marketing tools in the hands of domestic NGOs and industry groups for lobbying consumers. This is a point that some exporters have discovered to their cost. With 17% of the international market share, Colombia is a significant global trader in cut flowers and this generates more than half a billion euros a year for the industry. Between 1992 - 1996, when global trade in cut flowers was expanding, Colombia's flower exports to Germany declined, registering a fall of nearly 25% between 1995 and 1996. Colombia explicitly cited a private, voluntary eco-labelling programme (Flower Label Programme (FLP)) for this reduction. The FLP was established in the early 1990s in Germany and, thanks to effective NGO lobbying, it rapidly became the de facto market standard. Colombia criticised this scheme for its distortive impact on trade, citing in particular its lack of respect for WTO rules, including its use of inappropriate one-size fits-all standards; and its opaque and costly certification requirements. In 1998, Colombia submitted a paper to the CTE (Government of Columbia, 1998), raising concerns with respect to the impacts of eco-labels on the Colombian flower market. Colombia stated that eco-labeling had negatively affected its exports (OECD, 2002).

2.9 CHANGING CHARACTERISTICS OF CUT-FLOWER TRADE IN EUROPE

Horticulture trade including cut – flower trade, has been undergoing significant changes in recent years such as; an increasing stringent regulatory environment, the stronger voice of consumers and civil society and globalization of supply and distribution systems (Fulponi, 2007). These changes have significant implications for producers in developing countries, including Kenya. Producers who wish to participate in major horticultural supply chains need to apply specific production methods that address environmental risk and manage quality and health issues.

In the 1990s, supermarkets in the United Kingdom restructured the floriculture value chain, moving away from wholesale markets to tightly knit supply chains. As a consequence, supermarkets have become "global sourcing companies." However, by the end of 1990s, the need for capital and technical capabilities had led to exclusion of many small exporters who were unable to meet supermarket requirements. The exclusion was evident in all major African horticulture exporting countries, particularly in Kenya (Dolan and Humphrey, 2000).

Restructuring of the value chain also led to changes in production. First, production moved away from small holders to large farms, many of which were owned by exporters. This partly stemmed from the perception of supermarkets that small holders would not be able to meet process controls such as safety and pesticide regulations,

and exporters were concerned about the costs entailed in monitoring large number of small farmers. Second, several large Kenyan exporters began to acquire their own growing capacity, with an increasing number of centralizing production on their own estates (Ulrich and Vossenaar, 2008). Exporters in several other Sub-Sahara Africa countries also felt the need to rely more on their own production to ensure compliance with traceability requirements and obtain EurepGAP (Maerten and Swinnen, 2006).

Supermarkets may continue to maintain company standards and their associated governance structures because branding and product differentiation are key to their competitive strategy. As increasing numbers of consumers make choices on the basis of social and environmental concerns, supermarkets recognize the benefits that codes of practice can provide in differentiating their products and which clearly distinguish them from competitors (Ulrich and Vossenar, 2008).

2.10 IMPACTS OF SUPPLY CHAIN GOVERNANCE

Global supply chains are increasingly replacing spot market deals and thus are reshaping the organization of production and trade relations in the global supply chains, one or a small number of firms exercise control over suppliers without ownership relations (in captive value chains), using three cluster of tools: 1) Standards 2) Brand names 3) Patents or similar intellectual property rights aimed at achieving monopolistic market power, protecting innovation rents and appropriating an increasing share of overall gains in value chains. These main governance tools can be

used individually or in combination, depending on the sector. For horticultural products, for instance, mostly standards are used, while in the clothing and apparel industry, brand names often in combination with standards, predominate, whereas in the electronics industry all three clusters of tools are being used (Humphrey, 2006).

"Captive" supply chains are a double – edged sword for developing country producers. On the one hand, they offer ample opportunities for process and product upgrading, better management practices, material and resource efficiency gains, higher occupational safety, lower environmental impact of production, employment generation and related social benefits and they enable developing country firms to export to markets that are otherwise difficult to penetrate. On the other hand, functional upgrading of supply capacity (i.e moving from original equipment manufacture to own design and own brand manufacture) is often blocked, perpetuating the dependence on small number of powerful customers (Humphrey, 2006).

Altenburg, (2006 b) summarizes the impacts of changes in supply chain management for developing countries as follows; "The fact that trade is shifting from anonymous market-based exchange of products to more durable patterns of industrial organization, with an increasingly prominent role of lead firms, has multiple implications for developing countries minimum requirements for participation in value chains tend to rise as lead firms demand increasing scales of production as well

as compliance with more sophisticated product and process standards. The competitiveness of the respective chain may rise or decline, hence the viability of developing country firms in these chains; gains and risks will usually be renegotiated and redistributed among customers, retailers, traders, processors and suppliers and not least, the increasing and decreasing efficiency of value chains will affect the quality availability and price level of goods and services.

2.11 PROBLEM STATEMENT

Over the past 20 years the number of standards and certification programmes for floriculture production has grown fast. Direct consumer protection (hygiene, residue of agrochemicals) is becoming more and more important and both retail companies (European Union supermarkets such as Tesco, Sainsbury, Marks and Spencer) and consumers are increasing asking for products produced according to acceptable ecological minimum standards. This is why practically all floriculture exports from Kenya to Europe are facing the challenge of providing evidence of sustainability of their production and quality of their products by means of labels or other relevant certifications. Certification of cut-flower production is great for Kenya, as it helps promote conditions for sustainable production and ensure access to markets in the long run but it is a cause of concern for small holder exclusion in the global market (Michael and Roger, 2006; Coleacp, 2007; Nathalie *et al*., 2007).

2.12 HYPOTHESIS

2.12.1 Null Hypothesis

Small – scale cut flower growers in Kenya have the capacity to comply with international environmental standards.

2.12.2 Alternative Hypothesis

1. Small scale cut-flower growers in Kenya do not comply to environmental requirements of key export markets.

2. Small holder cut-flower growers in Kenya do not have the capacity to implement environmental requirements administered by international markets.

2.13 RATIONALE AND JUSTIFICATION

Floriculture provides Kenya opportunities for export diversification, foreign income, poverty alleviation and rural employment. The market opportunities offered by the European Union are some of the most financially attractive but most exacting. Accessing EU markets requires compliance with a strict regulatory framework of measures designed to ensure human and plant health are protected. Large retailers and some wholesalers also require suppliers to demonstrate compliance with independently verifiable private standards such as GlobalGAP for farms and consumer labels. These so-called private voluntary standards have extended the level of control by European retailers back along their supply chains to Kenyan farmers. Private voluntary standards are also beneficial to Kenya through the provision of safe

and healthy products, improved worker health and reduced environmental impacts. Enhanced capacities to meet product environmental requirements in international and domestic markets also help to maintain and increase international competitiveness and diversify into high-value (niche) markets. Efforts made to meet external requirements, and initiatives such as the promotion of programmes on "Good Agricultural Practices" (GAP), eco-labelling may also contribute to effective compliance with domestic environmental standards that are otherwise poorly enforced, and may reduce the risk of small economies and small producers being marginalized as a result of new mandatory and voluntary requirements.

2.14 OBJECTIVES

2.14.1 General Objectives

To assess the challenges faced by small scale cut-flower growers in complying with environmental standards of the international markets and propose potential interventions.

2.14.2 Specific Objectives

a) To identify activities, actors/players along the supply chain involving small scale cut flower growers
b) To audit these activities for compliance with key international markets requirements with emphasis on environmental standards.
c) To propose viable compliance interventions for small scale cut-flower growers.

CHAPTER 3

METHODOLOGY

3.1 SITE DESCRIPTION

The major growing areas of cut flowers by smallholder farmers within Central Kenya are Nyeri, Murang'a and Kiambu districts. Thus the study was based on these three regions (Fig. 3).

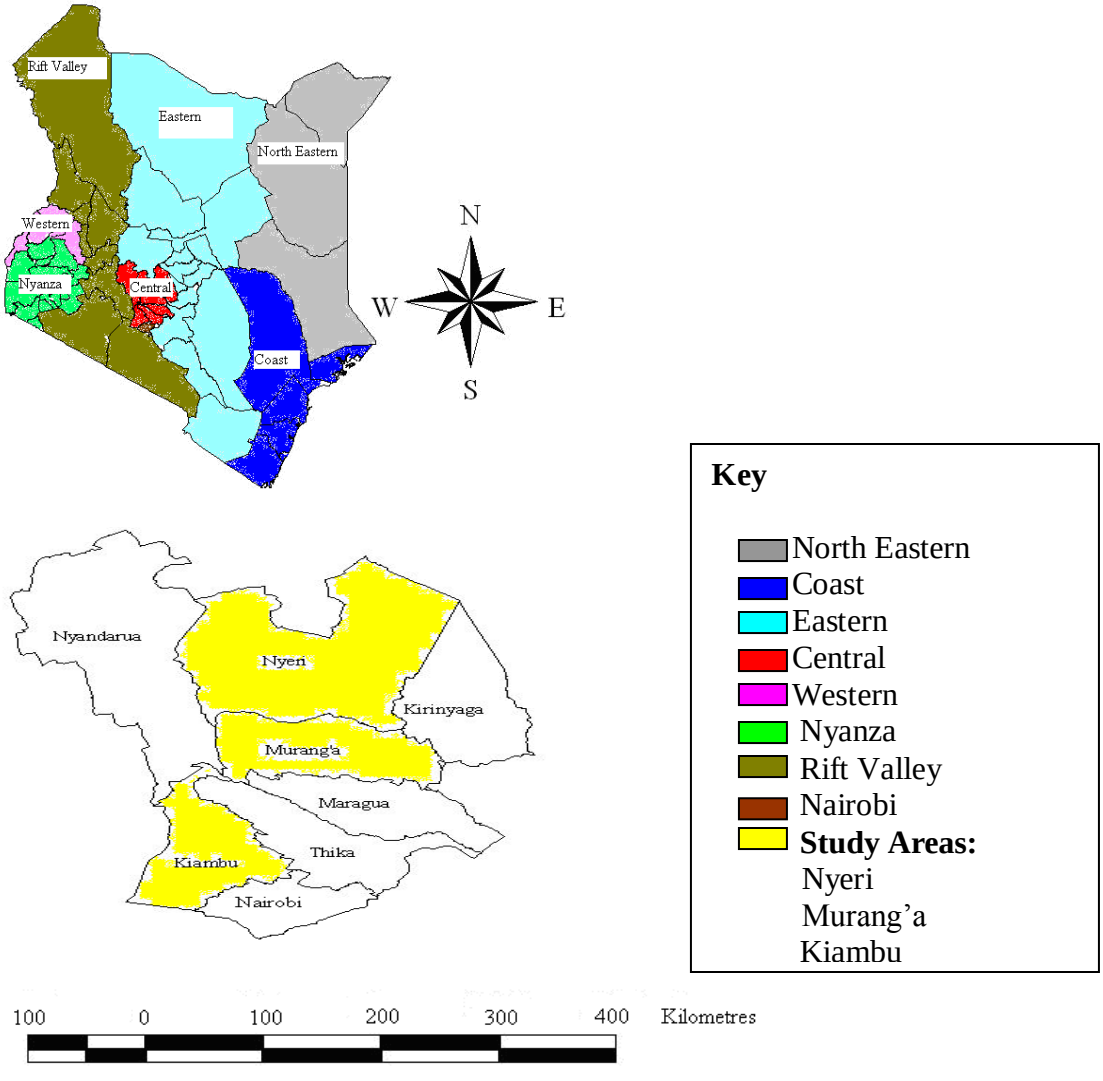

Figure 3. Study areas

3.2 SAMPLE SIZE AND SITE STRATIFICATION

The target population in the study was based on Kenya's small-scale cut flower growers (out growers) who are estimated to be 4,000 to 5,000 farmers (Thoen et al., 2003). The following formula has been used to determine the sample size (Mugenda and Mugenda, 1999).

$$n_f = \frac{n}{1 + n/N}$$

Where: n_f = the desired sample size (when the population is less than 10,000).

n = the desired sample size (when the population is more than 10,000).

N = the estimate of the population size

n; the desired sample size (when the population is more than 10,000) is given by the formula below.

$$n = \frac{Z^2pq}{d^2}$$

Where: n = the desired sample size (if the target population is greater than 10,000).

Z = the standard normal deviate at the required confidence level.

P = the proportion in the target population estimated to have characteristics being measured

q = 1-p

d = the level of statistical significance set.

Since there is no estimate available of the proportion in the target population assumed to have the characteristics of interest, 50% will be used. The corresponding z-statistic is 1.96, and the desired accuracy at 0.05 level, then the value of n which is the desired sample size (if the target population is greater than 10,000) is:

$$n = \frac{(1.96)^2 (0.50) (0.50)}{(0.05)^2} = 384$$

Thus the sample size n_f when the population is less than 10,000 is:

$$n_f = \frac{384}{1 + (384/5,000)} = 356.61 \sim 357$$

Due to lack of data showing the number of smallholder cut flower producers and their distribution, a 10% sample size was used based on small scale farmers who supply their produce to two major exporters (Wilmar Agro Limited and Nature Grown Limited). These two exporters have a total of 3,557 registered out growers thus a sample size of 360 small-scale farmers was used for this study and their distribution was as shown on Table 4 below. The study was carried out at Mathira and Kieni divisions in Nyeri district and the various locations were, Magutu, Konyo, Ruguru, Kabaru and Ngorano. In Murang'a district, the study areas were Kiambuthia, Kiriani, Njumbi and Kangema at Mathioya and Kangema divisions. While in Kiambu district the research was carried out in Limuru division mainly at Itungi, Ngecha and Karanjee where most small-scale farmers are concentrated. Nyeri is 150 Kilometres

North of Nairobi, lying between the eastern base of the Aberdare (Nyandarua) range, which forms part of the eastern end of the Great Rift Valley and the Western slopes of Mount Kenya. Murang'a is quite hilly with an altitude of 1255 metres above sea level. Kiambu and in particular Limuru is located on the eastern edge of the Great Rift Valley about 50 Kilometres North – West from Nairobi with an altitude of about 3,000 metres.

Table 4. Sample stratification of small scale farmers in the study areas

Location	**Proportion**	**Respondents (n)**	**Sampling Clusters**	
			Area/Place	No. of respondents
Nyeri	44%	158	Magutu	12
			Konyo	10
			Ruguru	92
			Kabaru	20
			Ngorano	24
Murang'a	34%	122	Kiambuthia	51
			Kiriani	13
			Njumbi	39
			Kangema	19

Kiambu	22%	80	Itungi	50
			Ngecha	16
			Karanjee	14

3.3 DATA COLLECTION TECHNIQUES

This study was undertaken in the period between March to June 2008. Consultations with experts, desk studies, field visits and interviews with farmers were the main methods used to carry out the study.

3.3.1 Field Visits and Interviews

Audits were carried out through field visits on small holder farms to identify areas of weakness and constrain that hinder their compliance to environmental standards administered in the floriculture industry. Data collection instruments employed were semi-structured questions, an observational checklist (Appendix 1 and 2 respectively) and interviews. These tools were developed after a review of environmental standards administered by the European Union and the Kenya Flower Council. The researcher mainly administered the questions to the farmers in form of face to face interviews. According to Mugenda and Mugenda (1999), interviews make it possible to obtain data required to meet specific objectives of a study and very sensitive and personal information can be extracted from the respondent by honest and personal interaction between the respondent and the interviewer.

The questionnaire was administered in Kikuyu (local) language and the farmer's responses written down. This was adopted since the respondents were unable to interpret the questions due to low literacy levels. An observational checklist (Appendix 2) was used to record activities at the collection centres. Random sampling was the main sampling technique used to select small scale farmers in the study. This was applied to help gather information that is viable and representative for each farmer in the research population.

3.3.2 Consultations with Experts

Consultations were made with experts in the cut flower industry to identify activities and actors/players along the supply chain involving small scale cut flower growers, environmental standards administered in the sector and compliance interventions for smallholder flower producers. The experts consulted are listed in Appendix 3 and mainly constituted stakeholders in the floriculture sector namely Kenya Flower Council, Ministry of Agriculture, Export Promotion Council, Kenya Plant Health Inspectorate Services, Fresh Produce Exporters Association of Kenya, Horticultural Crops Development Authority, donors and exporters.

3.3.3 Desk Studies

Secondary data was obtained from various websites of standard setting bodies, horticulture related institutions and publications. The following reports and standards were reviewed to help the researcher reach a conclusion, identify activities and actors

involved in the supply chain of small scale farmers and to establish environmental requirements which were used to carry out audits amongst smallholders.

- CBI, (2003). European Union Market survey: Cut flowers and foliage. Available online: www.cbi.eu (Date accessed 5/16/2008).
- CBI, (2005). European Union Market survey: Cut flowers and foliage. Available online: www.cbi.eu (Date accessed 11/28/2008).
- CBI, (2007). CBI Market survey: The cut flowers and foliage in the EU. Available online: www.cbi.eu (Date accessed 6/3/2008).
- CBI, (2008). International sustainable label: MPS, for flowers. Available online: www.cbi.eu (Date accessed 6/3/2008).
- Hornberger, K.; Ndiritu, N.; Lalo,P.; Tashu, M. and Watt, T. (2007). Kenya's cut-flower cluster, micro-economics of competitiveness.
- Thoen,R.; Jaffee, S.; Dolan, C. and Fatoumata, B. (2003). Equatorial rose: The Kenyan-European cut flower supply chain.
- Graffham, A. and Bill. V (2005). Standard compliance: Experience of impacts of EU private and public sector standards on fresh produce growers and exporters in Sub-Saharan Africa.
- GlobalGAP (EurepGAP) standard.
- Kenya Flower Council Code of Practice.
- Flower Label Programme (FLP).
- Floriculture Environmental Project (MPS – ABC).

3.6 DATA MANAGEMENT AND ANALYSIS

Quantitative analysis was carried out by first converting the data obtained from administering questionnaires to numerical codes which represented measurements of variables. The coded data was entered into a computer using Microsoft Excel worksheet and analysed. To determine various relationships among the selected variables descriptive statistics such as mean, frequencies and percentages were used. Qualitative data mainly obtained from desk studies, observations made during field visits and consultations with experts in the floriculture sector was analysed subject to content in order to come up with useful conclusions and recommendations. Data was presented in form of tables, pie charts and bar charts. The data was stored in the computer hard disk, while compact and flash disks were used to back up data.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 SMALL SCALE FARMER'S SUPPLY CHAIN

Requirements laid down in government regulations are transmitted to producers and exporters in exporting countries through the supply chain. For example, EU legislation tends to hold importers accountable for compliance with its provisions with regard to imported products. The need to take responsibility for the safety of the produce they import into the EU market, places importers under an obligation to exercise due diligence over supply chains. The increasing importance of large buyers (retailers and processors) and their increasingly stringent requirements for environmental, health and safety requirements, quality and reliability of delivery has strengthened the role of supply chain management or value chain management in the floriculture industry.

4.1.1 The Value Chain Activities

The supply chain involving small scale cut flowers growers between the farm and the air-freighting of Kenyan flowers to overseas markets is summarised in Fig. 4. Critical activities that small-scale farmers are involved include the following:

4.1.1.1 Farming and Harvesting

Cultivation of flowers involves preparation of the land by ploughing it, bed preparation whereby the beds are well leveled to improve soil drainage (to avoid stagnant water from forming). Manure is then applied and thoroughly mixed with the soil before planting which is done by placing suckers/bulbs or seedlings depending on the type of flower being grown onto the well prepared beds. Water is then applied onto the crop. Depending on the crop stage of growth, the presence of pests, insects and diseases, chemicals are then applied. When the crop is mature, harvesting is done.

4.1.1.2 Post Harvest Handling

The flowers are sorted, graded and bunched by the farmer at the grading shed. Product quality is defined by colour and size as well as the absence of abnormal florets, diseases and blemishes. The grading process eliminates damaged, diseased, malformed blooms and arranges flowers according to stem length. The flowers are then inspected by the exporter's grader to ascertain the produce is of the right grade and quantity before purchasing. Depending on the species of the flower, they are then placed in buckets containing a floral preservative prior to packing in order to maintain post harvest quality. The flowers are packed in boxes and transported to the exporter's pack house.

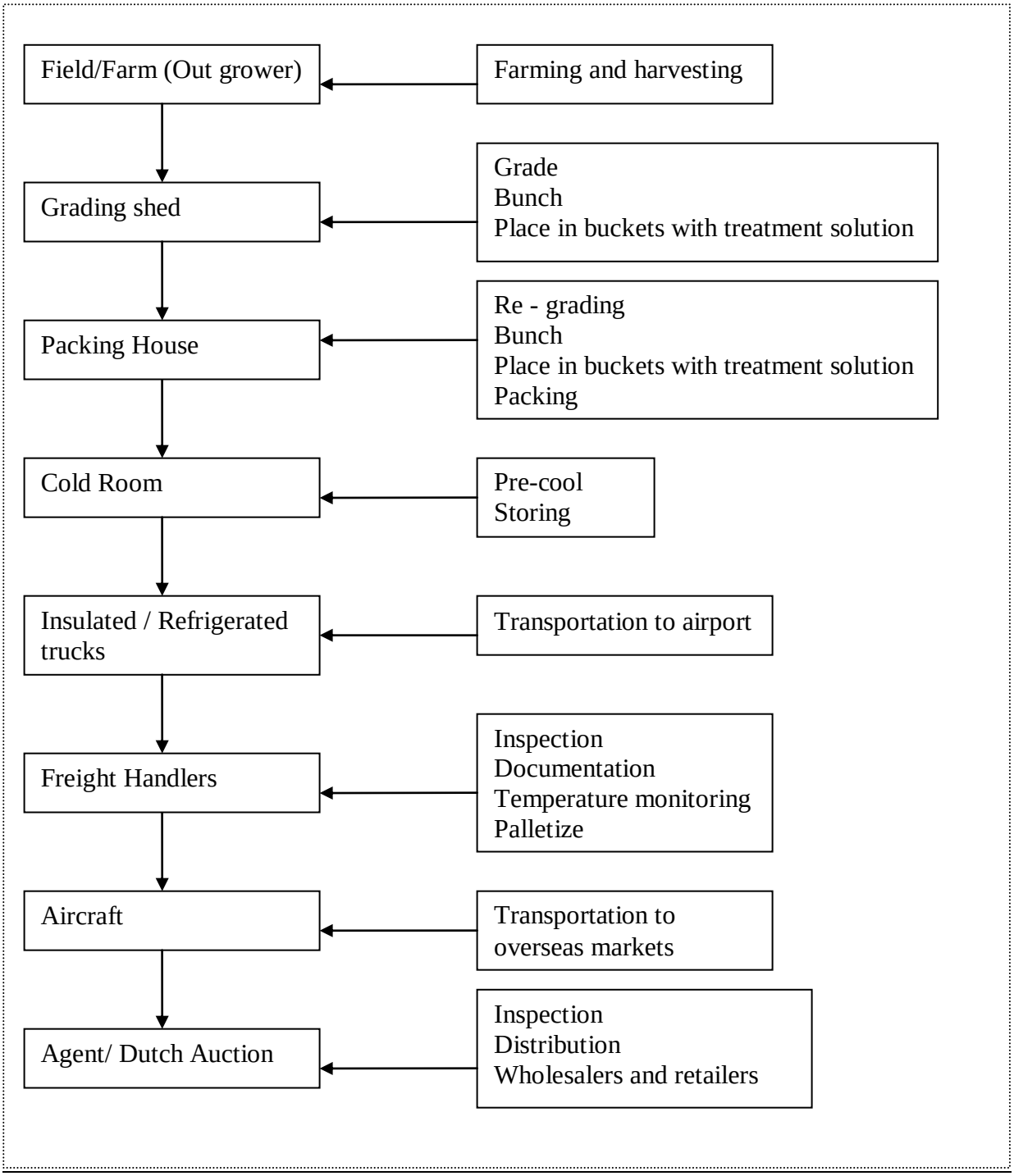

Figure 4. Supply chain for Kenyan smallholder cut flower growers and activities involved from the field to Agent

4.1.1.3 Quantity Verification

At the pack house the quantities of flowers are counter checked. The flowers are then placed in buckets containing pre-treatment solution, regraded and repacked. The flowers are then placed in a cold room to pre-cool and maintain their freshness. The flowers are transported to the airport where they are received by freight forwarders.

4.1.1.4 Inspection of Flowers

Freight forwarders check quantities, varieties and temperatures and keep flowers in a conditioned atmosphere until they are transported to the plane. They also facilitate customs and inspection by Kenya plant health inspectorate service (KEPHIS) official for phytosanitary certificates. Once inspection for phytosanitary is done and a phytosanitary certificate issued, the produce is palletized and air lifted. In the importing country the produce is received by an agent.

4.1.1.5 Purchasing of Flowers at the Auctions

Agents offer various services which facilitate trade between exporters and consumers. Agents play an important role in transferring flowers from air-transport based to auction based packaging. Exporters particularly those who source their produce from smallholder cut flower growers are dependent on these services.

The flower auctions in the Netherlands that are of particular interest to Kenya cut-flower industry include:

- Aalsmeer Flower Auction (VBA)
- FloraHolland
- Landgard (previously known as NBV-UGA)
- Tele flower auction

Upon submission to the auctions for sale, each batch of product is examined by auction inspectors with respect to maturity, length, and number of buds. They sort the flowers according to various grade classification standards. During the process, the flowers are checked for diseases and pests, for colour deviations and leaf yellowing. All the information is stored in the auction computer, and the products are cleared for auctioning. Floricultural products submitted to the auctions are sold either by means of the auction clock or through the Intermediary office.

4.1.2 Actors/Players and Supporting Industries in the Flower Sector

Drawing from Table 5, there are several actors along the supply chain involving small holder flower growers. There are two main professional trade associations serving the Kenyan flower industry: the Kenya Flower Council (KFC) and the Fresh Produce Exporters Association of Kenya (FPEAK). Their core function is the promotion and implementation of self – owned codes of practice among their members to foster good agricultural practices (GAPs), ethical practices and other marketing requirements. They also perform lobbying function both locally and internationally.

Table 5. Actors and organizations supporting smallholder flower production

Actor	Key engagement in the chain
Input suppliers (e.g. Juanco SPS Ltd., Syngenta East Africa Ltd, Organix Limited	Responsible for agro-chemical (fertilizers, pesticides, herbicides) and equipments (irrigation and spray equipments) supplies.
Exporter (e.g. Nature Grown Ltd., Wilmar Agro)	Responsible for the exportation of the produce. Offers services such as transportation of produce from the field to the pack house, cold storage of produce and extension services.
Ministry of Agriculture	The Ministry of Agriculture coordinates the implementation of agricultural, cooperative and rural development policies. The specific functions which will be pursued by the Ministry include: rural development policy, agricultural policy, crop production and marketing, land use policy, information management for agricultural sector, cooperatives and regional development authorities.
Horticultural Crops Development Authority (HCDA)	Responsible for promoting and developing the horticultural industry. Its brief includes provision of market information, extension, identification of

	markets, provision of advice on availability of planting material and seeds, the gross marginal analysis of various horticultural crops.
Kenya Agricultural Research Institute (KARI)	Responsible for research activities covering agriculture. KARI has been instrumental in undertaking research on some of the varieties being grown for export and domestic markets. They also play part in commercialization efforts.
Kenya Plant Health Inspectorate Services (KEPHIS)	Responsible for all matters related to phytosanitary services, Plant Breeders Rights, inspection, testing, certification, quarantine control, and implementation of EU Directives in relation to harmful organisms in plants and cut-flowers.
Kenya Flower Council (KFC) and Fresh Produce Exporters Association of Kenya (FPEAK)	Private sector membership organizations for horticultural and floricultural exporters. Lobbies for the industry both domestically and internationally. Implements codes of practice for the industry.
Export Promotion Council	It is responsible for the country's export development and all export promotional activities. Its major mandate is to identify and remove constraints facing exporters and producers of export goods and services, formulate

	market strategy and identify export opportunities, and promote public awareness to the need of export development.
Pest Control Products Board (PCPB)	Regulation of imports, registration, manufacturing, distribution and use of products for the control of pests and other organic functions of plants and animals for commercial purposes.
National Environment Management Authority (NEMA)	The principal agency of government in all matters of environmental management. NEMA implements the provisions of Environmental Management and Coordination Act (EMCA) of 1999 through the general supervision and coordination of environmental conservation activities being undertaken by government agencies, private sector and the civil society.
USAID Kenya Horticultural Development Programme (KHDP)	A USAID-funded program that is focused on increasing and sustaining smallholder sales and incomes through crop diversification, improvements in production and market linkages.

Universities and Colleges of Agriculture	Among the universities and colleges, Nairobi, Jomo Kenyatta, Moi, Egerton and Baraton provide courses at degree and diploma levels related to agriculture, horticulture and environment and are also involved in research.

The public sector facilitates the industry market development, promotion and research for smallholders. It also performs inspection and plant quarantine services through the Kenya Plant Health Inspectorate Service (KEPHIS). The Ministry of Agriculture (MOA) and the Horticultural Crops Development Authority (HCDA) are key players in policy matters, overall development and promotion of the industry.

4.2 ENVIRONMENTAL AUDIT

It is very important that legislative requirements (i.e product legislation) in the EU are taken into account. For flowers phytosanitary issues i.e regulation intended to prevent the introduction of plant pests and diseases which are not present in the EU are very important. Moreover, market parties have developed environmental standards connected with the conditions in which plants and flowers are grown and harvested.

4.2.1 Environmental Standards Used

Environmental standards used for questionnaire (Appendix 1) and observation checklist (Appendix 2) developments include:

4.2.1.1 Environmental Issues as Stipulated in the GlobalGAP / EurepGAP

GlobalGAP is a global scheme and the reference for Good Agricultural Practice, which is managed by the GlobalGAP (EurepGAP) Secretariat. GlobalGAP provides the standards and framework for independent, recognized third party certification on farm production process and is a business-to-business tool. The standard serves as a global reference system for other existing standards and can also easily and directly be applied by all parties of the floriculture sector. In other words: GlobalGAP operates like a satellite navigation system. It equips members with a reliable tool kit, which allows each partner in the supply chain to position themselves in a global market with respect to consumer requirements.

EurepGAP scheme principles are based on the following concepts.

a) Environmental protection

The standard consists of Environmental Protection and Good Agricultural Practices, which are designed to minimize negative impacts of agricultural production on the environment.

b) Occupational health, safety and welfare

The standards establishes a global level of occupational health and safety criteria on farms, as well as awareness and responsibility regarding socially related issues; however it is not a substitute for in-depth audits on Corporate Social Responsibility (CSR).

c) Animal welfare (where applicable).

The standard establishes a global level of animal welfare criteria on farms.

4.2.1.2 Floriculture Environmental Programme (MPS)

MPS stands for Milieu Project Sierteelt, or 'Floriculture Environmental Project' and is a set of business to business labels in the floriculture sector. MPS is active in more than 50 countries but the Netherlands, where the MPS scheme was first developed remains the largest market (CBI, 2008). The Dutch market is important, as more than half of the flowers entering the EU market from countries outside the EU arrive in the Netherlands. The MPS foundation's aim is to reduce the burden on the environment caused by the cultivation of flowers and plants. Growers who take part in the MPS scheme register and lower the usage of crop protection agents, fertilisers, energy, water and waste. A company can join MPS and achieve the label when it has met requirements of the environmental audit. Regular checks guarantee that a company still is engaged in the regime.

MPS-A, B and C are environmental registration certificates where A is the most environmentally friendly. The system is based on data recording and reporting by the participants. Based on their achievements, they are awarded points. The requirements include usage of crop protection agents, fertilizers, water and waste. Participants are awarded a qualification four times a year for either MPS-A, B or C based on the total number of points achieved.

4.2.1.3 Flower Label Programme (FLP)

Table 6 shows consumer labels Flower Label Programme (FLP) and Milie Programma Sierteelt (MPS) which are used on certified flowers as tools for communicating to consumers that the flowers have been produced in an environmentally friendly way.

The Flower Label Programme (FLP) was created in 1998. Its founders are two major associations representing the flower trade in Germany, BGI (Flower Importers and Wholesalers) and FDF (German Florist's Association), and a number of human rights and development organisations. Products bearing the FLP label are mainly sold in participating German retail shops and can be recognised by consumers.

The Flower Label Programme sets standards of environmental protection for flowers farms based on the International Code of Conduct (ICC) in the areas of;

1) Health safeguards and a secure working environment
2) Protection of the environment: Farms should make every effort to protect the environment and residential areas, avoid pollution and implement sustainable use of natural resources (water, soil and air)
3) Documentation of farm activities

Flower farms in Kenya can apply to have their farms inspected by independent environmental auditors and become FLP members provided they comply with the FLP standards.

Table 6. European consumer labels

MPS	Milieu Programma Sierteelt (MPS)
FLOWER LABEL PROGRAM / FLOWERS CARING FOR MANKIND AND ENVIRONMENT	Flower Label Programme (FLP), Germany

Source: Barbara *et al.*, 2007

4.2.1.4 The Kenya Flower Council Code of Practice

The Kenya Flower Council (KFC) was launched in March 1997 partly in response to the growing number of European flower industry codes of practice. The hope in creating a robust Kenyan code was that local growers would be able to avoid having to comply simultaneously with two or more European codes. Consequently, the KFC has had to raise its profile in Europe in order to convince buyer that its code is of a sufficiently high standard. To a large extent this has been achieved, although the pressure to comply with the European codes has not entirely disappeared. In addition, the Council also has 14 associate members representing the major cut flower auctions and distributors in the United Kingdom, the Netherlands, Switzerland, Germany and Kenya. The associate members are involved in the flower sector through the flower imports, provision of farm inputs and other affiliated services. KFC offers two levels of code compliance. The silver standard covers worker terms and condition, health and safety and environmental responsibilities. Having successfully complied with this

standard, KFC members are free to progress to the gold standard, which concentrates on achieving much higher standards of environmental performance. I have focused this study on the silver standard because its broad based approach covers environmental responsibilities.

4.2.2 Parameters and Indicators

Table 7 shows the parameters and indicators used for auditing smallholder farm activities as stipulated in environmental standards administered in the flower sector.

Table 7. Parameters and indicators used for auditing

Parameter	Indicator	Standard Reference
Chemical application and usage	• Pesticide storage • Fertilizer storage • Provision of personal protective clothing • Facilities for changing cloths and washing after pesticide application • Medical checks • Re-entry boards	• Flower Label Programme • GlobalGAP • Floriculture Environmental Programme (MPS-A B C) • Kenya Flower Council Code of Practice

Soil conservation	• Manure usage • Crop rotation • Soil analysis	• Flower Label Programme • GlobalGAP • Kenya Flower Council Code of Practice
Water management	• Harvesting of rainwater • Drip or mini sprinkler • Water meters	• Flower Label Programme • MPS-A B C • Kenya Flower Council Code of Practice
Waste management	• Guidelines for waste disposal • Designated areas for burning waste • Incineration • Separation of waste • Recycling of waste • Compositing of organic waste (flower).	• Flower Label Programme • Floriculture Environment Programme (MPS-A B C) • GlobalGAP • Kenya Flower Council Code of Practice
Documentation of farm activities	• Records on water usage on farm • Records on pesticide usage • Records on fertilizer usage • Records on produce	• Flower Label Progarmme • Floriculture Environment Programme (MPS-A B C) • GlobalGAP • Kenya Flower Council

	dispatched (sold) • Employee records	Code of Practice
Training	• Health and safety matters relating to pesticide application • First Aid • Chemical storage practices • Irrigation practices • Waste management practices	• Flower Label Programme • GlobalGAP • Kenya Flower Council Code of Practice
Post harvest handling	• Collection centres (grading sheds); floors should be impervious, easy to clean, good drainage, building rain proof, vermin proof, hygiene maintained, no smoking and eating signage. Availability of water for post harvest handling and its analysis. • Post harvest treatment; recording of post harvest plant protection product application,	• Kenya Flower Council Code of Practice • GlobalGAP

	geographical area of application, date of application, quantity applied and the name of the operator applying the plant protection product. • Workers working conditions at the grading sheds; Supervisors trained in emergency procedures, Suitable personal protective equipment (PPE), Lighting and ventilation, sufficient toilets and washing facilities. • Waste management at the grading sheds, organic and preservation chemical disposal	

4.3 QUESTIONNAIRE SURVEY FINDINGS

The total number of small scale cut flower growers interviewed was 360 and their geographical distribution was as shown in Table 4. Small scale producers were defined as farmers with less than 4 hectares of land (Fintrac Inc., 2005; Bolo, 2006).

4.3.1 General Observations

4.3.1.1 Age Distribution

Fig. 5 shows the age distribution of the respondents. The highest numbers of the subjects were aged between forty one to fifty years followed by those aged thirty one to forty years.

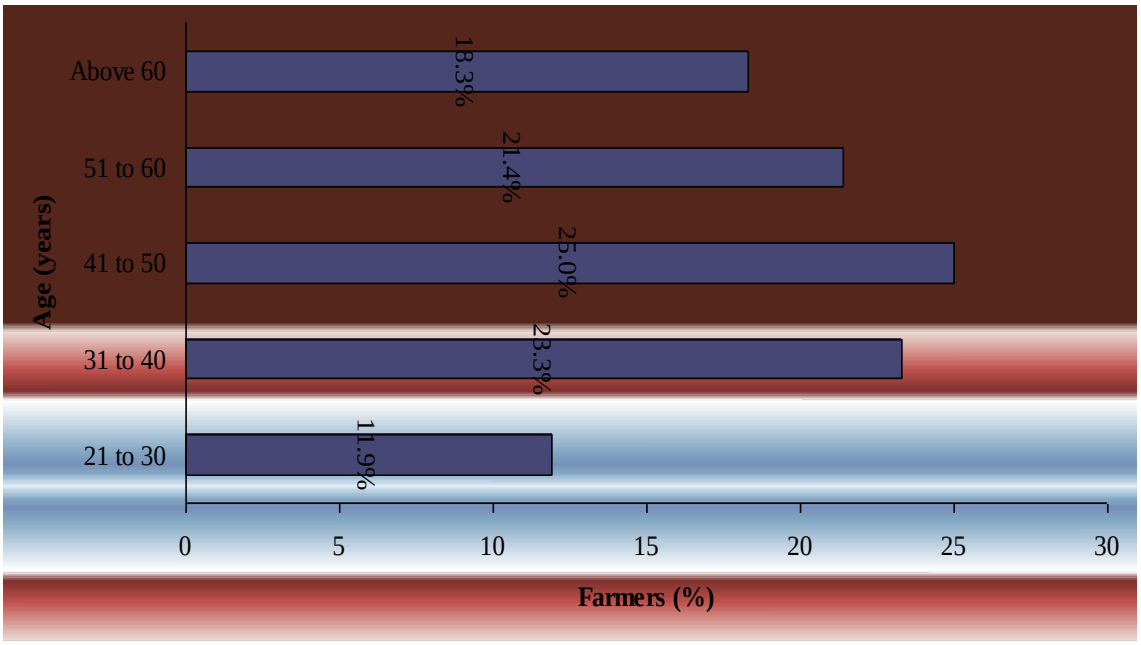

Figure 5. Small-scale farmers' age distribution

Fig. 5 also indicates that flower farming is a source of income for both the youth and the elderly (Above 60 years of age) which also implies that they are economically productive and do not have to rely on dependants.

4.3.1.2 Flowers Grown by Small Holder Growers

All the respondents interviewed cultivated flowers in small portions of land (under 4 hectares). Table 8 shows the type of summer flowers grown by the respondents at the study areas. The major cut-flowers grown in Nyeri and Murang'a are Arabicum (*Ornithogalum saundersiae*) and Mobydick (*Asclepias fruiticosa*). Molucella (*Mollucella laevis*) is an on and off crop for small holders in Nyeri. This is a difficult crop that is easily damaged by hailstorms and fungal diseases. However, with recommended sprays and application of fertilizers, small holders are able to grow it. Eryngium (*Eryngium spp*) and Crocosmia (*Crocosmia luciferans*) type of flowers were being introduced to farmers by the exporter in Nyeri and Murang'a. In Limuru (Kiambu) Ornis (*Ornithogalum thyrsoides*) was the major summer flower grown, while Crocosmia (*Crocosmia luciferans*) is also being introduced in the area.

Table 8. Main cut-flower grown at the study areas

Study Area	**Major cut flower grown**	**Others**
Nyeri	Arabicum and Mobydick	Molucella and Eryngium
Murang'a	Arabicum and Mobydick	Crocosmia
Kiambu	Ornis	Crocosmia

The summer flowers grown by the respondents comprised predominantly of green foliage and a range of coloured flowers that are less resource intensive and grow in open fields as shown on Plates 2, 3 and 4. The flowers are not grown in green houses. Plate 2 shows Arabicum that is about to be harvested. Plate 3 and 4 show Mobydick and Ornis that are being grown in open fields in Nyeri and Limuru respectively. The farmers got the parental seed/material from either the exporters or other farmers.

Plate 2. Arabicum (*Ornithogalum saundersiae*)

Plate 3. Mobydick (*Asclepias fruiticosa*)

Plate 4. Ornis (*Ornithogalum thyrsoides*)

4.3.1.3 Period For Which Farmers Have Grown Flowers

Majority of the respondents (91.1%) had grown cut flowers for more than 1 year. Fig. 6 shows that 44.4% of the subjects had grown flowers for a period of one to three years. 31.4% had grown flowers for a period of four to six years this indicates that the farmers had experience in flower production.

4.3.1.4 Other Types of Crops Grown by the Respondents

The small-scale farmers interviewed practiced a mix of commercial and subsistence production (in crops or livestock) or either, where the family provided the majority of labour and the farm provided the principle source of income. As shown on Table 9 farmers also cultivated vegetables, fruits and cash crops both for local and international markets.

4.3.1.5 Group Formation

Several farmers interviewed (79.4%) are members of different self–help groups (SHG) which are registered under the Ministry of culture and social services. The remaining 20.6% are not represented in a group and are all in Limuru, Table 10. The purpose of group formations is to ease collection of produce by the exporter and dissemination of information. Some of the short comings noted were lack of proper organization skills among the groups.

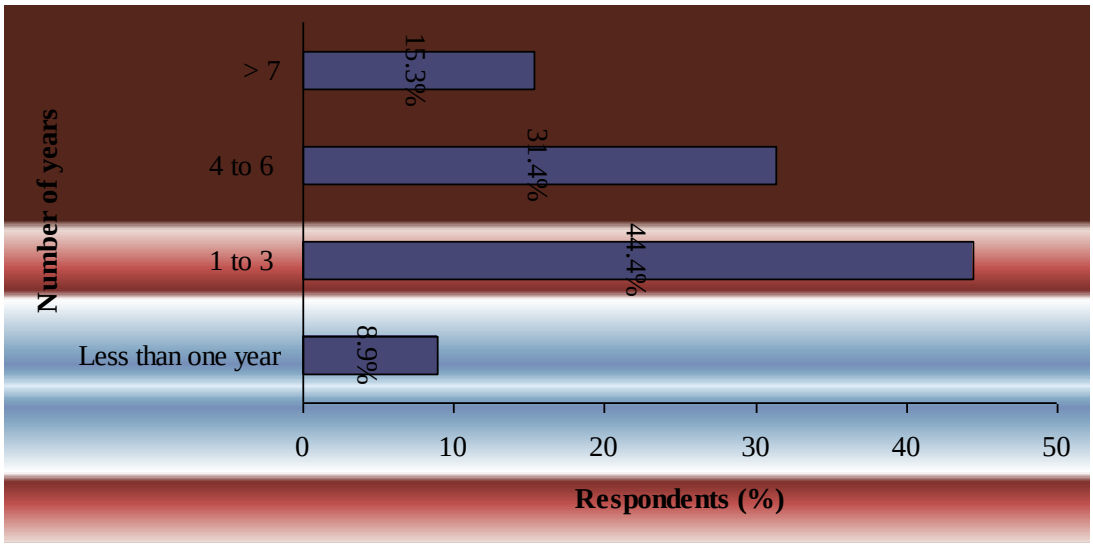

Figure 6. Production periods farmers have grown cut-flowers

Table 9. Major crops grown by the subjects other than cut flowers at the study areas

Study Area	Crops cultivated other than cut flowers
Nyeri	Cabbages, spinach, kales, carrots, capsicum, potatoes, peas, strawberries and Other horticultural crops such as French beans, Baby corn,
Murang'a	Maize, bananas, arrowroots and cash crop especially tea
Kiambu	Spinach, Kales, Coriander plants

Table 10. Status of small scale cut-flower farmers' group representation at the study areas

Study Area	No. of farmers represented in a group	No. of farmers not represented in a group
Nyeri	158	-
Murang'a	122	-
Kiambu	6	74
Total	286 (79.4%)	74 (20.6%)

4.3.1.6 Marketing

All farmers sold their produce to an exporter and in some instances a broker depending on the season (peak or off-peak). None of the farmers interviewed was aware of the final destination of their produce. This is an indication that the farmers are not aware of the market requirements of their produce as well as the actor/players of their supply chain. All subjects interviewed in Nyeri, Kiambu and Murang'a areas had signed contract agreements with an exporter. The contract clearly prohibited farmers from getting into multiple contracts with other exporters or even selling their produce to other middlemen. Unfortunately, exporters sometimes lost their contracted flowers to brokers who sometimes woo farmers with higher and instant pay especially when there was a high demand for cut-flowers. These brokers/middlemen maintain their export licenses to benefit from opportunistic sales. Although these middlemen

provide sales outlet to growers, they are seen as unreliable buyers who fail to turn up when prices fall. For this reason farmers supply their produce to the well established exporters who are consistent and at the same time sell to other middlemen to cash in on the price.

4.3.1.7 Pricing of the Flowers

Market prices for cut flowers are sensitive to demand as well as supply conditions. Although there has been some shift from retailer dependence on holiday promotions to year round sales, prices for summer flowers tend to be high around certain seasons when demand peaks. The sales prospects for non-EU cut flowers lie essentially in the European winter months (CBI, 2007). The favourable climate is a major advantage for farmers in Kenya. A very high proportion of the extra-EU cut flower imports are delivered during the months of November to May, whereas in the summer months EU growers can satisfy most of this demand quantitatively. Imports are consequently of less importance in this period. Thus supplies are determined by growers' strategic planting and pinching schedules as well as the weather. When peak production does not coincide with peak demand, prices fluctuate. Certain physical characteristics, such as stem length, color, appearance, and freshness, are also important in establishing prices for cut flowers. The price of summer flowers is set depending on the type of flower and the grade. The flowers are bought per stem and vary depending on the head size and the length of the stem.

The prices of flowers per stem at the farm gate fluctuated on a weekly bases as shown in Fig. 7, 8 and 9. These prices were recorded between March 2008 and May 2008. The farmer was paid what was left after the exporter deducted his procurement, marketing costs and margin for his profit. This came to about 20% of the price the exporter was paid. The price farmers actually received varied with every consignment of flowers sold, since exporter's costs of procurement (including oversight) and marketing changed routinely.

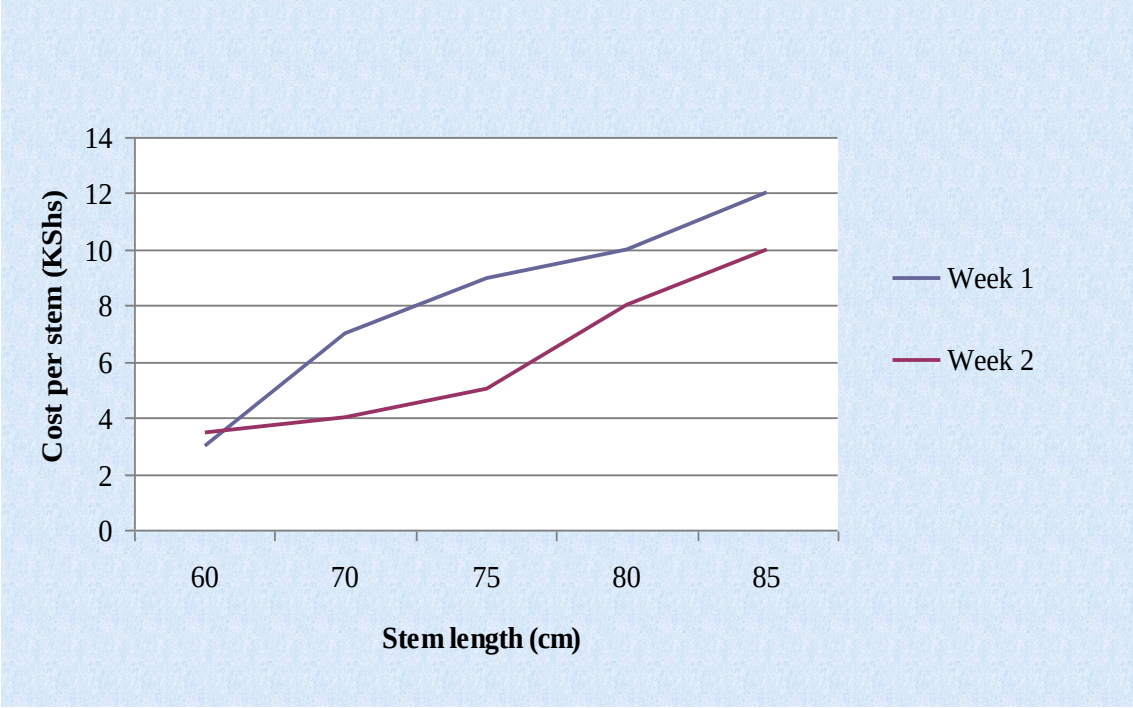

Figure 7. Average cost of Arabicum per stem length

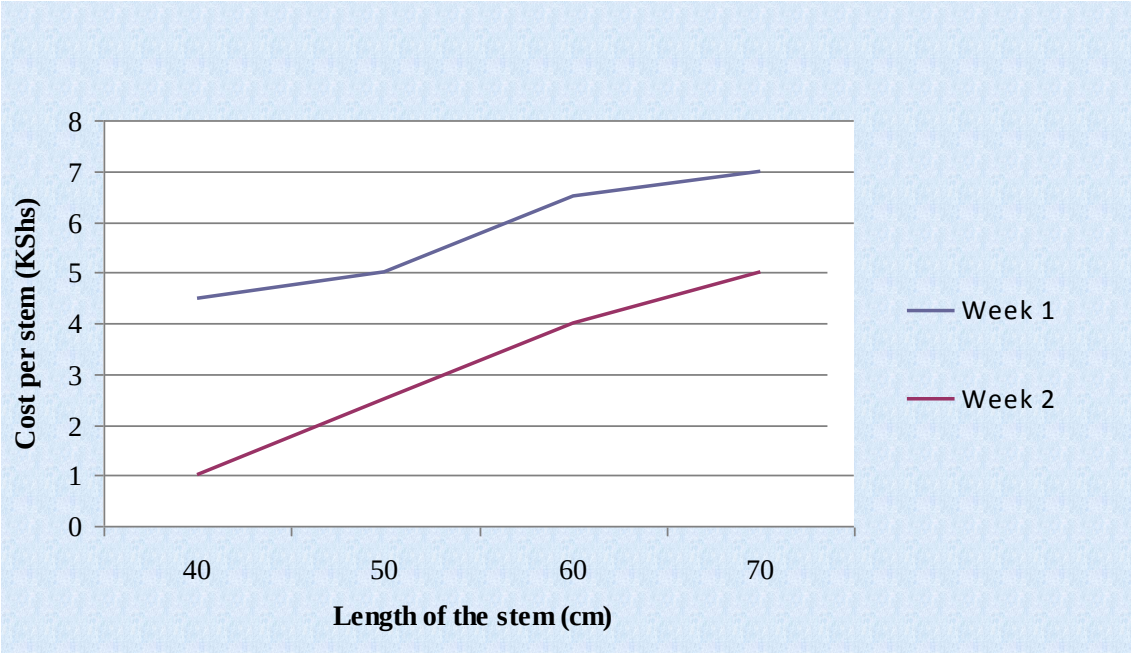

Figure 8. Average cost of Mobydick per stem length

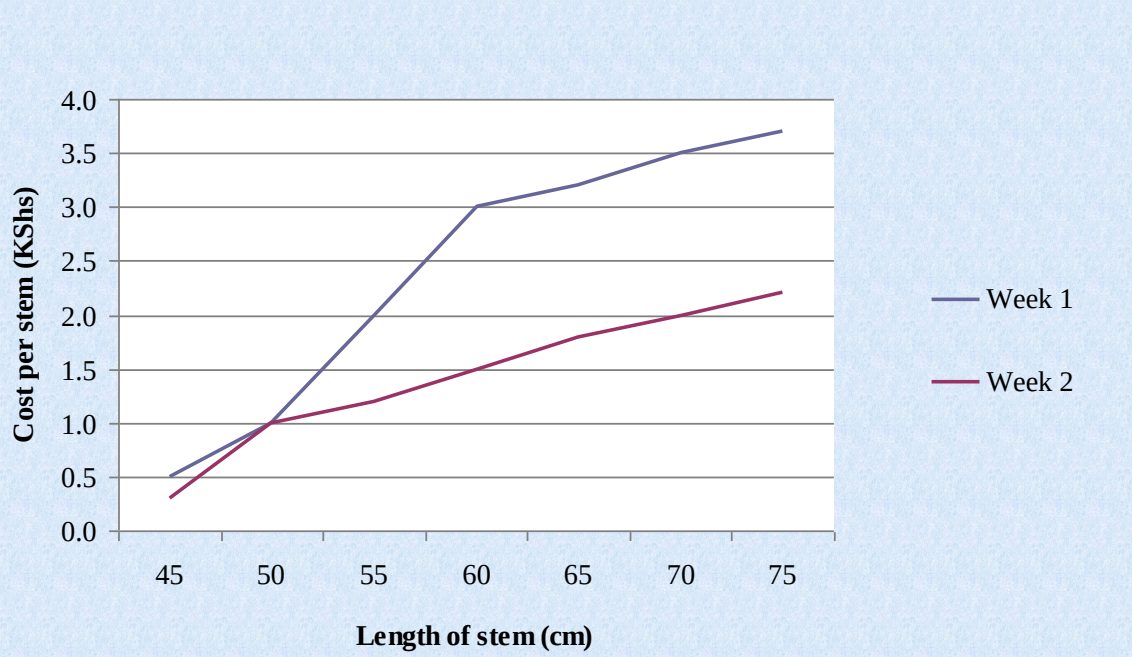

Figure 9. Average cost of Ornis per stem length

4.3.1.8 Technical Assistance

The subjects interviewed mainly received technical assistance from the exporter's agronomist, who advised the farmers on the chemicals (pesticides and fertilizers) to use, soil preparation and when to harvest their produce. The technical assistant was not able to visit all farmers at the field since the number of farmers the technical assistants supervised were too many, for instance all the technical assistants in all the areas visited Nyeri, Murang'a and Kiambu had over 300 farmers to coordinate. Table 11 shows the number of extension officers at the study areas and the number of small – scale farmers they served. All regions visited had one technical assistant from the exporter who were serving 399, 413 and 310 farmers at Nyeri, Murang'a and Kiambu respectively. On average the ratio of technical assistant to farmers was 1:374. No technical assistance was offered to the respondents by a government extension officer, HCDA member or Kenya Flower Council regarding flower production.

Table 11. Technical assistants serving small – scale farmers at the study areas

Study Area	Number of Technical Assistants	Number of Farmers
Nyeri	1	399
Murang'a	1	413
Kiambu	1	310
Total	3	1122

All respondents interviewed had not received any financial assistance either from the government or financial institutions. The exporter contributed towards the construction of sheds at different collection centres whereby he would contribute half the total amount of money needed for the construction of a shed. This was mainly evident in areas where farmers were organized in groups.

4.3.1.9 Certification and Auditing

All the subjects' (100%) farms had not been audited based both on the international environmental standards and local codes of practices even after majority of the farmers 91.1% (Fig. 6) being in the production of flowers for more than one year. All small-scale farmers interviewed had not carried out risk assessment on their farm sites. All respondents' farms had not been evaluated by an environmental protection officer suggesting need for improvement and inspecting their farms compliance with national regulations.

4.3.2 Performance of Key Environmental Audit Parameters

4.3.2.1 Chemical Application and Usage

The use of chemicals is imperative in the production of flowers for control of pests and supply of balanced nourishment. Most of the subjects interviewed were advised on when to apply the pesticides by an agronomist (as one of the services offered by the exporter). All respondents used chemicals in the production of flowers. Table 12

shows the different classification of chemicals used by the small scale farmers interviewed.

Table 12. Chemical substances commonly used by the small holder flower growers

Chemical Substances	**Active Ingredient (Common name/s)**	**Trade Name**
Fertilisers	Nitrogen; Phosphorus; Potassium (NPK) ratio 17: 17: 17	Active 7T
	Nitrogen; Phosphorus; Potassium (NPK) ratio 23: 23: 0	Active 7B
	Calcium ammonium nitrate (CAN)	Active 6T
	Diammonium phosphate (DAP)	Active 6B
	Urea	Active 5T
Foliar feeds	Calcium	Calmax
	Phosphorus	Murex P
Growth regulators	Auxins and Cytokinins	Kelpak
	Triacontanol and sterols (β-Sito sterol, Campe sterol and stigma sterol)	Vipul booster
Fungicides	Propineb and Cymoxanil	Milraz WP 76

	Monopotassium phosphate and Dipotassium phosphate	Fosphite
Nematicides	Azadirachtin	Achook 0.15% EC
Acaricide	Pyrethrin and Garlic extract	Pyegar
Herbicide	Limuron	Farmuron 50 WP
Insecticides	Imidacloprid	Confidor SL 200
	Dimethoate	Twigathoate
	Ethoprophos	Mocap GR 10
	Pyrethrins	Pyagro

By the nature of the flower industry growers must resort to fertilizers to increase yields and improve quality, and to pesticides and fungicides to control spider mites, thrips, caterpillars, aphids and other pests which invade the flower crop. No doubt, these chemicals have an effect on the environment and the human health. The mode of application used by the subjects were either spraying for most pesticides or hand application for the case of fertilizers. While spraying pesticides the subjects did not take into consideration the weather conditions as stated on the Kenya Flower Council code of practice that "pesticides shall not be applied in adverse weather conditions such as strong winds or rain. Spraying during high mid-day temperatures should be avoided". The GlobalGAP standard states that "the application of fertilizers should be based on a calculation of the nutrient requirements of the crop and on appropriate

routine analysis of nutrient levels in the soil". All respondents (100%) had not carried out soil analysis and the application of fertilizers on their crop was based on flower production experience and routine work. From the analysis shown on Fig. 10 only 16.7% of the small holder farmers interviewed did use personal protective clothing during application of chemicals at their farms, the remaining 83.3% did not make use of personal protective clothing or were inappropriate.

From the analysis on Fig. 11 majority of the farmers who used personal protective clothing were the youth who accounted for 56.6%, (farmers' aged between 21 to 30 and 31 to 40 years).

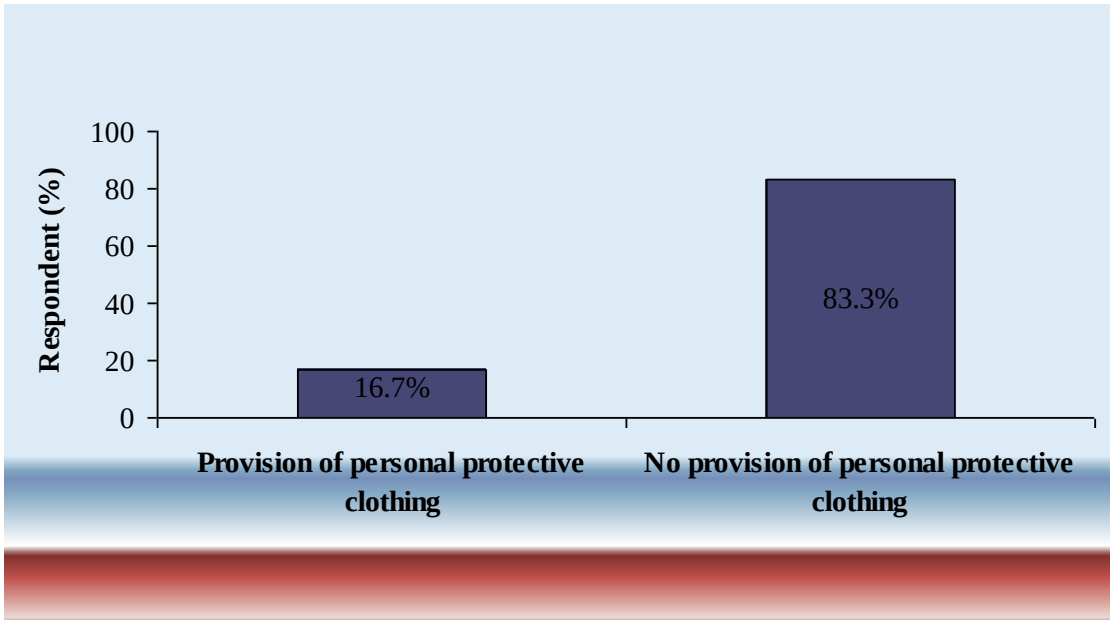

Figure 10. Personal protective clothing provision during application of chemicals

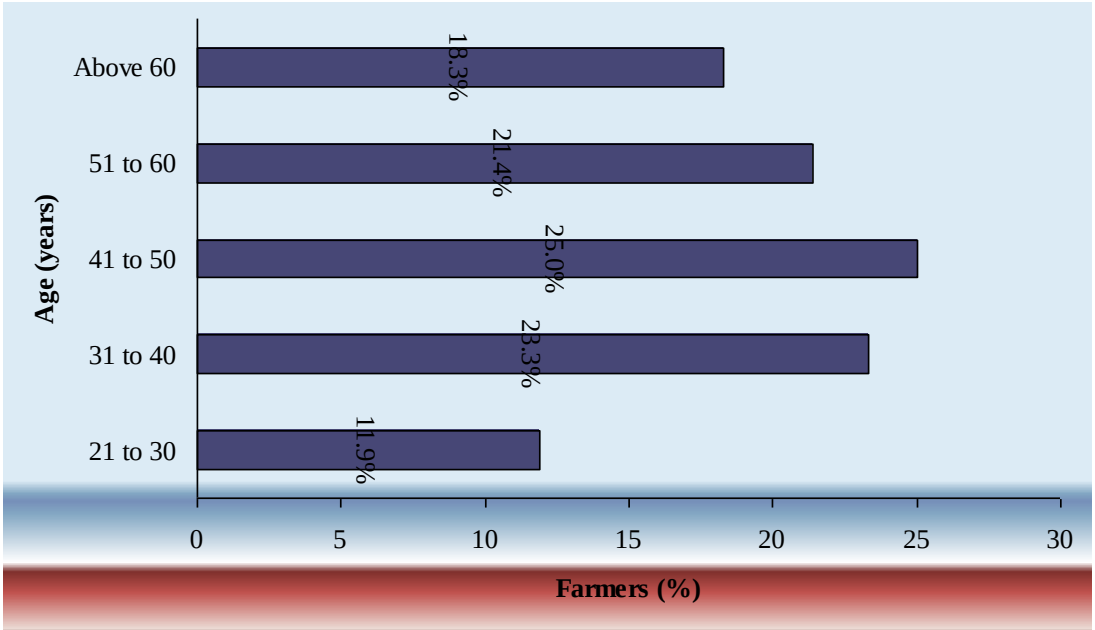

Figure 11. Age distribution among small – scale farmers who used protective clothing.

In addition to lack or/and inadequate safety procedures, another mechanism for pesticide exposure that was observed was poor methods of application, such as inadequate or unsuitable clothing. Whilst it is required that the sprayers use non-permeable overalls, for example the overalls used by the farmers do not meet this standard. Plate 5 shows a farmer spraying her farm in Limuru without personal protective clothing (gas mask, overall, gloves or gumboots). At times, the clothings were highly contaminated because of being worn for too long, or not being used because of high temperatures. After spraying of chemicals, no farm had re-entry boards placed at sprayed area indicating the time spraying was done, date of pesticide application and re-entry time.

Plate 5. Small scale farmer in Limuru spraying pesticides on Ornis flowers

All subjects did not have facilities for changing clothes and washing after application of pesticides and had not under gone medical checks. This posed a health risk to individuals who dealt with pesticides. The respondents did not also have pesticide stores for the purposes of storing pesticides or even securely locked cupboard or box in case of small quantities of pesticides.

All subjects sourced their chemicals from the exporter but at instances when the farmers found out that the prices of chemicals sold to them by the exporter were high, they would opt to buy from local agro chemical shops. Chemicals sold by the exporter

did not have labels indicating the chemical composition, rates of application, mode of application or even storage methods as recommended in the Kenya Flower Council code of practice.

4.3.2.2 Soil Conservation

All respondents used organic manure especially at the early stages of planting. The farmers mainly used the organic (flower) waste generated at their farms back onto their farms after decomposition or as mulch. This is in line with all environmental standards reviewed namely the Flower Label Programme, Floriculture Environmental Programme, GlobalGAP and the Kenya Flower Council code of practice that state that "the use of organic manure and composted waste should be encouraged for maintenance of soil condition and fertility". Organic mulching of a crop acts to keep the weed down, it retards soil drying and it breaks down adding organic matter to the soil.

To maintain the soil condition, reduce reliance on agro-chemicals and to maximize plant health, the Kenya Flower Council code of practice stipulates that "growers must recognize the value of crop rotation and seek to employ these whenever practicable". The field survey showed that 63.3% (Fig. 12) of the respondents practiced crop rotation. The farmers who practiced crop rotation were mainly from Nyeri (69.3%) and Murang'a (30.7%) areas as shown on Fig. 13, whereby after harvesting the flowers, they could uproot the crop and plant other types of plants mainly horticultural

crops in Nyeri and staple foods in Murang'a. Kiambu farmers did not carry out crop rotation, this is mainly due to Kiambu farmers grew Ornis that stays on the farm for a long period of time before it becomes dormant and the fact that farmers at this region had relatively small parcels of land.

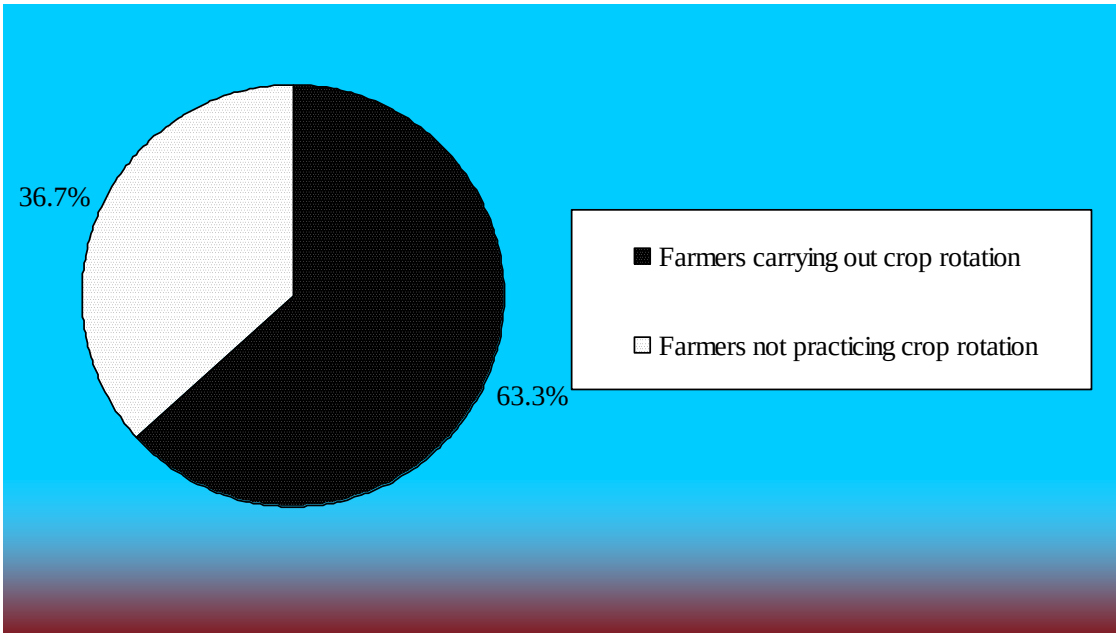

Figure 12. Crop rotation practice among out growers

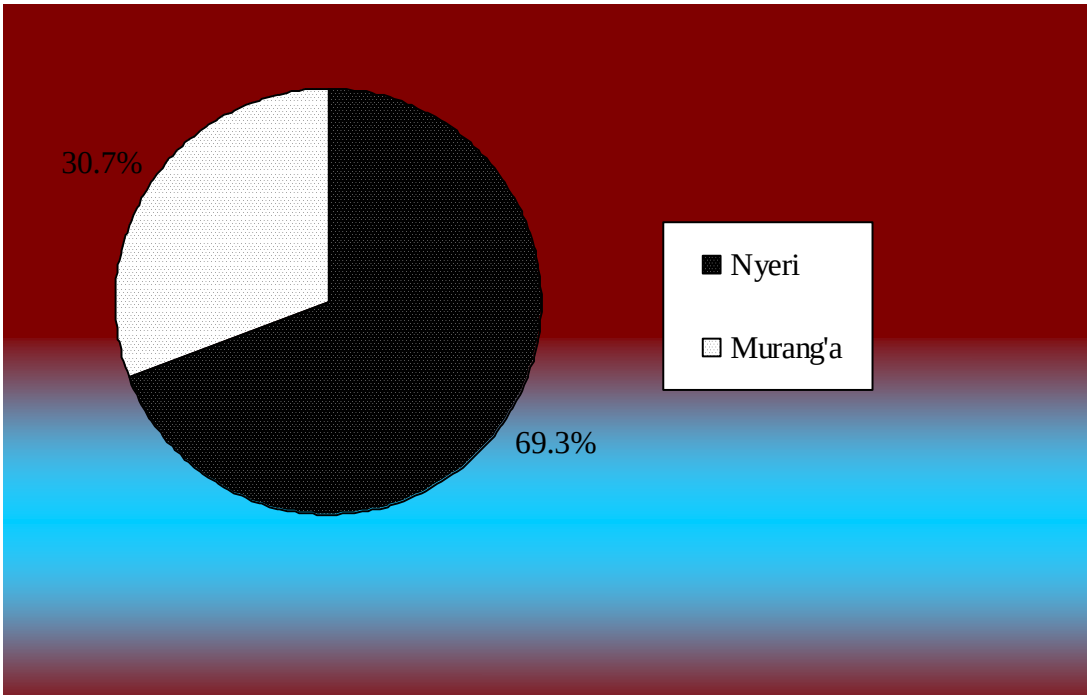

Figure 13. Crop rotation practice among small – scale farmers by district

4.3.2.3 Water Management

Flower production consumes a lot of water. Thus water usage and the mode of application are critical to minimize wastage. All farmers interviewed heavily rely on direct rain fed as a source of water for the planting of flowers. During the hot seasons, most of the subjects about 78.3% sourced water from rivers as shown in Fig. 14.

Different modes of water application are used by the respondents, Fig. 15. The commonly used method by the farmers was over-head sprinkling and watering cans, 40.8% and 40.3%, respectively. This can be attributed to the fact that most of the farmers growing flowers in Nyeri are under the Sagana Irrigation Scheme, farmers in

Limuru and 43.4% of farmers in Murang'a are close to streams of water where they abstracted water by use of watering cans. In Murang'a, tap water was also used relying heavily on hose pipes. Over-head irrigation is cheaper and easier to install but it is an inefficient use of water. The guidelines of the Flower Label Programme state that "irrigation must be done with methods and systems minimizing water consumption as much as possible such as drip irrigation, water application direct to the root zone and by using adequate and controlling methods". From the field survey, the farmers' practices on mode of water application were against the set environmental standards.

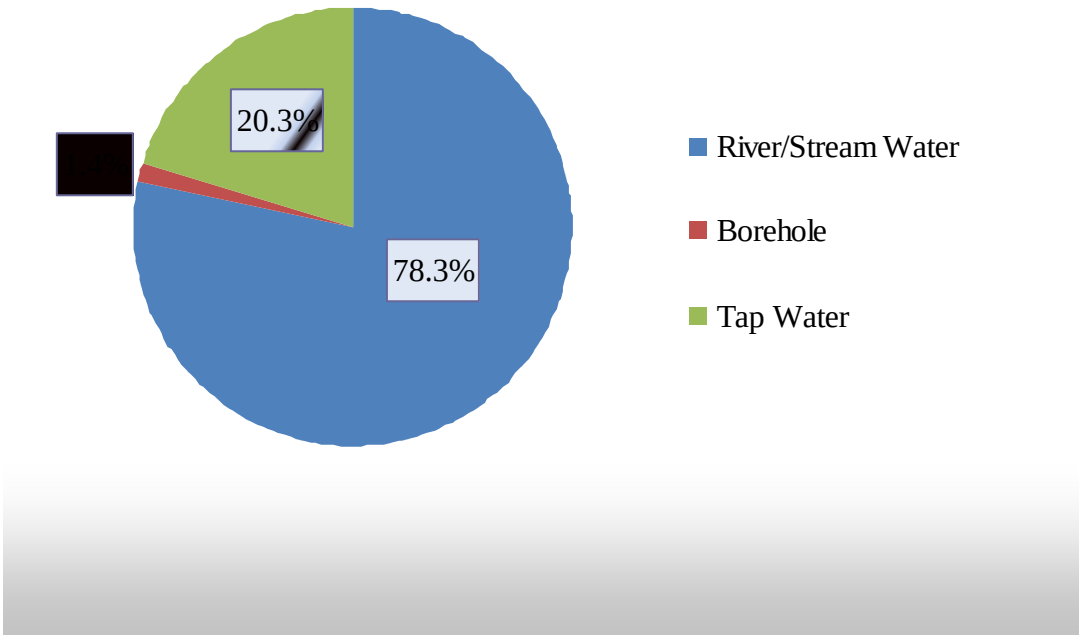

Figure 14. Sources of water for flower cultivation at the study areas

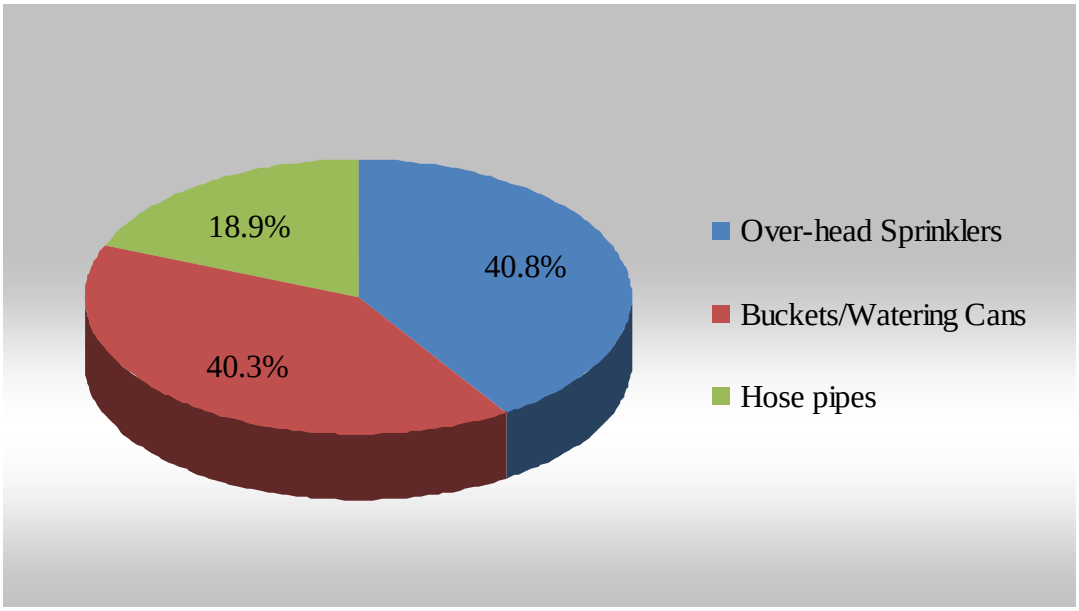

Figure 15. Mode of water application used by the respondents

None of the subjects interviewed made use of harvested water or monitored their usage of water in terms of water meters installations. This indicates that the farmers do not conserve or account for water usage which is a recommendation of all the standards set by the international markets as well as private and governmental bodies.

4.3.2.4 Waste Management

There was no proper guide on waste disposal. All subjects did not practice waste separation and recycling. Both paper and plastic waste generated from the farming activities were either burnt or buried at the farms. Pesticide waste was mainly of two types at the study areas, namely diluted pesticides including tank (spray) washings and empty pesticide containers. Chemical containers were not properly disposed off.

They were either burnt in open air, thrown haphazardly such as leaving on the farm once the farmer used the chemicals. Diluted pesticide waste was mainly as a result of unused spray mixtures and tank washings. This kind of waste should be disposed of by applying over an untreated part of the crop as long as the recommended dose is not exceeded or at designated fallow land, where legally allowed and records kept (GlobalGAP standard). Small scale farmers interviewed disposed off the diluted pesticides by open draining either on soil or water bodies. This may result in contamination of land or water depending on where the farmer drains the waste.

4.3.2.5 Documentation of Farm Activities

Documentation is essential as a means of tracing back of products or a process and in order to prove that a particular standard (code) has been carefully followed and that the actions identified have been implemented. It must show that the farmer, with regard to the code, is a pro-active, self-improving thus demonstrating that all reasonable precautions have been taken.

All farmers interviewed did not keep records of all the documents required by the code involving field operations which include records of dates and process of soil preparation, planting through to harvest including, pesticides and fertilizer application dates and rates of use, nature, quantities and consignees of all their produce dispatched. They only carried out partial documentation (Fig. 16). Majority of the farmers did not consider documentation of the farm operations as a management tool.

All respondents interviewed neither carried out any record keeping that entails water usage during flower poduction nor employee records. Most of the small-scale farmers, 82.4%, carried out documentation of records that involved the nature, quantities and consignee of produce sold to the exporter in form of farmer purchase voucher or delivery note for the purposes of counter checking during payment which was done by cheque but not for purposes of auditing.

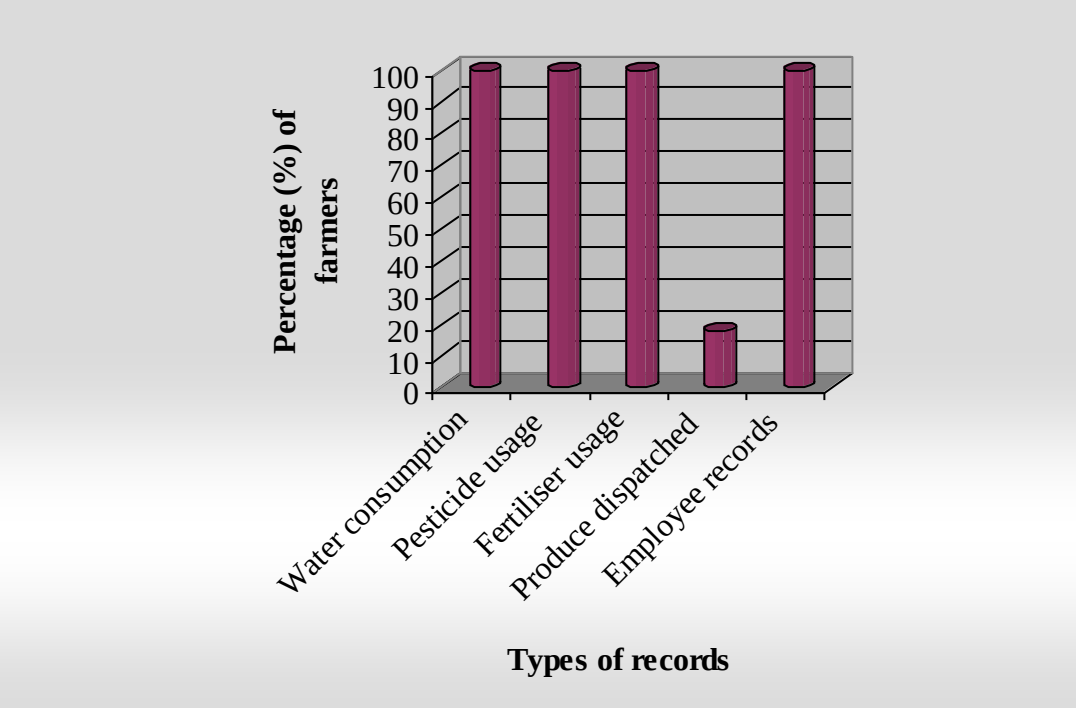

Figure 16. Forms of documentation and record keeping practices among small-scale farmers

4.3.2.6 Training

The respondents had not received any form of training regarding safe use of pesticides and fertilizers, irrigation practices, first aid and waste management in flower production. However, as noted on Fig. 17 some farmers in Nyeri who grow other horticultural crops for export are constantly trained by exporters who deal with their produce since GlobalGAP also applies to fruits and vegetables. The trained small-scale farmers had personal protective clothing during application of chemicals, practiced crop rotation at their farms and kept records on the nature, quantities and consignees of their produce dispatched (Fig. 18). However, the trained farmers did not have chemical storage facilities at their farms, they did not conserve water in terms of harvesting rain water or using drip irrigation system on their farms. This is an indication that after training there was no follow up to ensure that there was implementation. Systems such as the change of the current mode of water application from the use of over-head sprinklers to drip irrigation require financial assistance which the farmers are lacking.

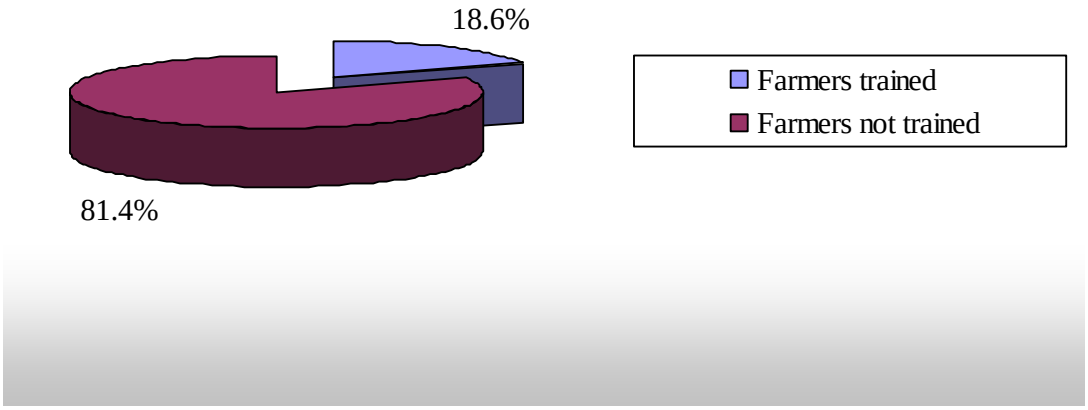

Figure 17. Small scale farmers trained on farm practices in other horticultural sectors other than flowers in Nyeri.

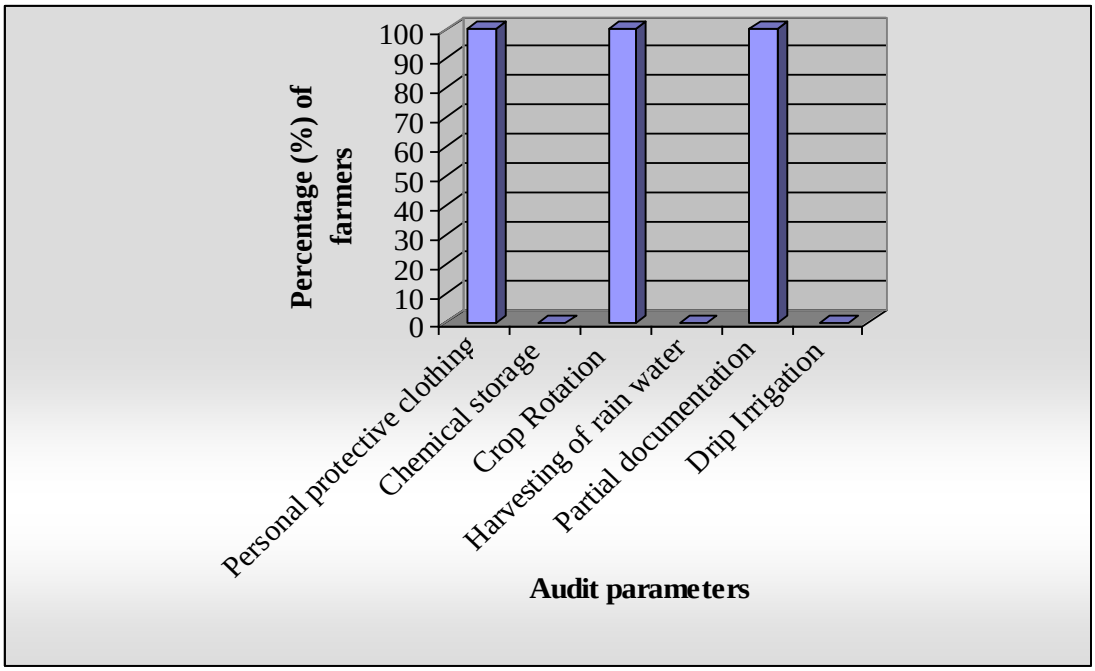

Figure 18. Level of adaption of various farm practices by small – scale farmers who have undergone training

4.3.2.7 Post Harvest Handling

High standards of post-harvest handling of cut-flowers from the field to final dispatch are key elements in ensuring environmental and quality standards are achieved. The speed with which flowers are moved from the farm to the buyer's pack house has always been critical since flowers are perishable. How long flowers are held in the farm, after picking, the conditions under which they are stored, how they are transported from the field to the collection point and how long they are held at the collection point all affect the overall quality of fresh export flowers.

4.3.2.7.1 Harvesting and Transportation of Flowers to Collection Centres

Harvesting of flowers was done by hand. Flowers were harvested when the proper stem length and inflorescence required for sale at the auctions were reached. Generally, the optimal stage of growth for harvesting is when the flower has just opened. Stems with more than one flower were usually harvested with less than one-third of the flowers fully opened. Since flower conditions will not improve after picking, growers must calculate the cutting time precisely so that the flower will not be past its prime when it reaches the consumer. The proper stage of openness is a critical factor in vase life. Flowers cut at an advanced stage of development will have a shorter vase life. Alternatively flowers harvested too early may never open. The stem length is also considered when the flowers are being harvested. For example, farmers at the study areas had to liaise with the exporter's extension officers to know the right stem length the exporter expected from them. There were instances where

farmers could loss their produce due to flowers having short stem lengths. At the study areas visited, Arabicum and Mobydick flowers were harvested by use of sharp knives and pruning shears respectively. Ornis was harvested by pulling the stem up through the support layers of the crop. They where then cleaned at the farmer's farm and graded. The cleaning was done by using the closest source of water the farmer could get at his farm. For example, farmers in Kiambu cleaned the flowers using water from streams of water that were flowing through their farms. No pretreatment solution was used by farmers immediately after harvesting to maintain the quality of flowers. Arabicum and Mobydick type of flowers did not require much cleaning and the grading of this type of flowers is easy as opposed to Ornis. The produce is then transported to the collection centres. Fig. 19 summarizes the different modes of transportation employed by the respondents from the field to the collection centres. 47.2% of the farmers transported their produce on their backs and 33.3% of the farmers relied on bicycles this was because of the distances that need to be covered.

Fig. 20 shows the time it takes for flowers to reach to the exporter's pack house from the field (farm). It takes 57.5% of the respondents 7 – 12 hours for their produce to get to the exporter's pack house and subsequently the cold room. This is a very long time for perishable goods such as flowers to be out of the cold chain. The exporter further grades the flowers to remove the damaged produce. The long periods (13 – 18 hrs) and (19 – 24 hrs) are attributed to the harvesting of Ornis which is done the day before purchase because of the time it takes to grade the flowers.

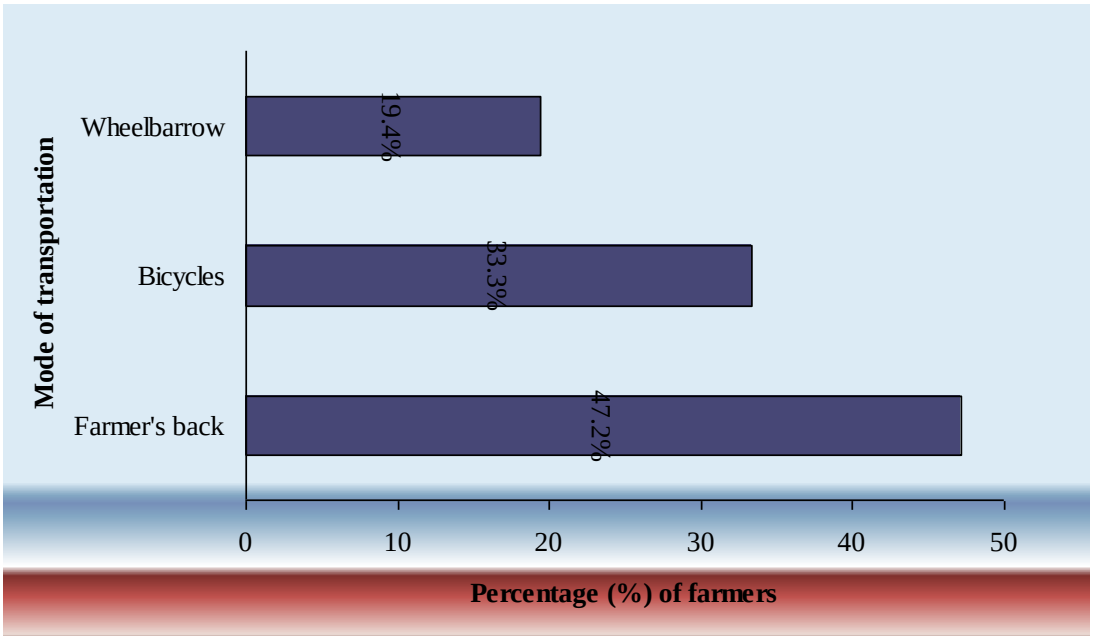

Figure 19. Mode of transportation of flowers from the field to collection centres

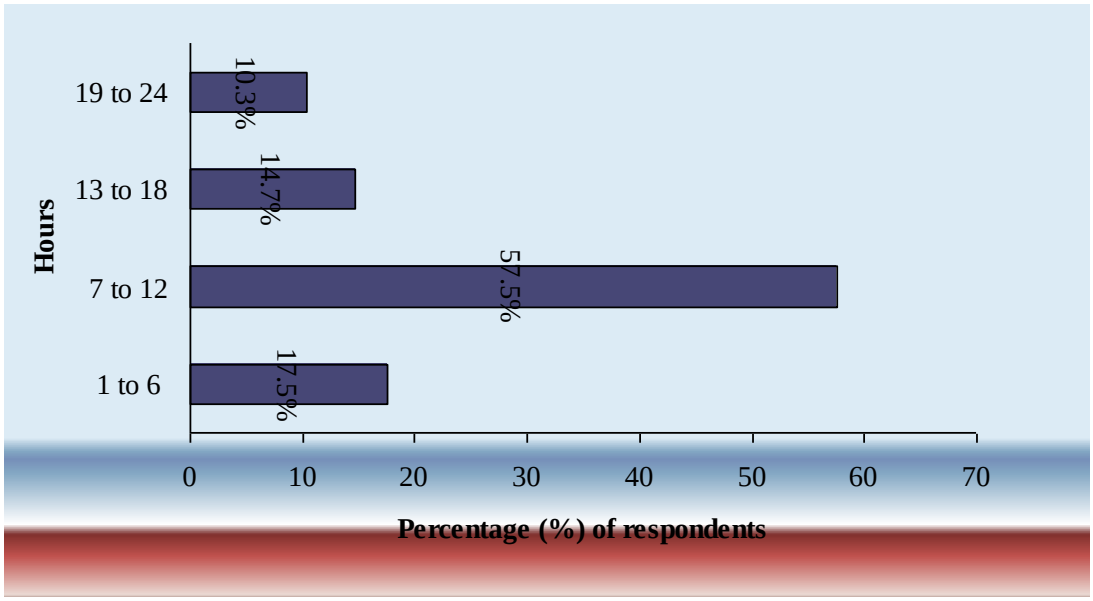

Figure 20. Time taken for harvested flowers to be dispatched to the exporter's pack house

4.3.2.7.2 Collection Centres (Grading Sheds)

A collection centre is where the farmer takes his produce after harvesting and grades the flowers awaiting the exporter who verifies the grading. A standard collection center should allow a smooth flow of produce with adequate separation of raw produce and finished product. The floor should be smooth, impermeable to water and free from cracks to allow easy cleaning. Wastewater should be fed through a series of cleansing ponds and re-cycled. Ventilation and light levels should be adequate to provide a comfortable working environment. The grading tables should be designed to be easily cleaned. First aid equipment should be on site and readily accessible. Signs should be displayed forbidding smoking, eating or drinking within the grading area.

During the field study 14 collection centers were visited and none of the centers had all the requirements met. At 5 collection points (36%) no sheds had been built, the grading and buying of flowers was done in the open air (Fig.21). This is against the recommendations of both the GlobalGAP standard and the Kenya Flower Council code of practice. At the collection centres visited, the grading shed also served as a packaging store.

Absence of a shed can be very detrimental to the farmers due to poor hygiene practices e.g grading of flowers near a dump site (Plate 6) this leads to contamination of flowers. Moreover, during the rainy season the produce can be damaged as they await collection by the exporter.

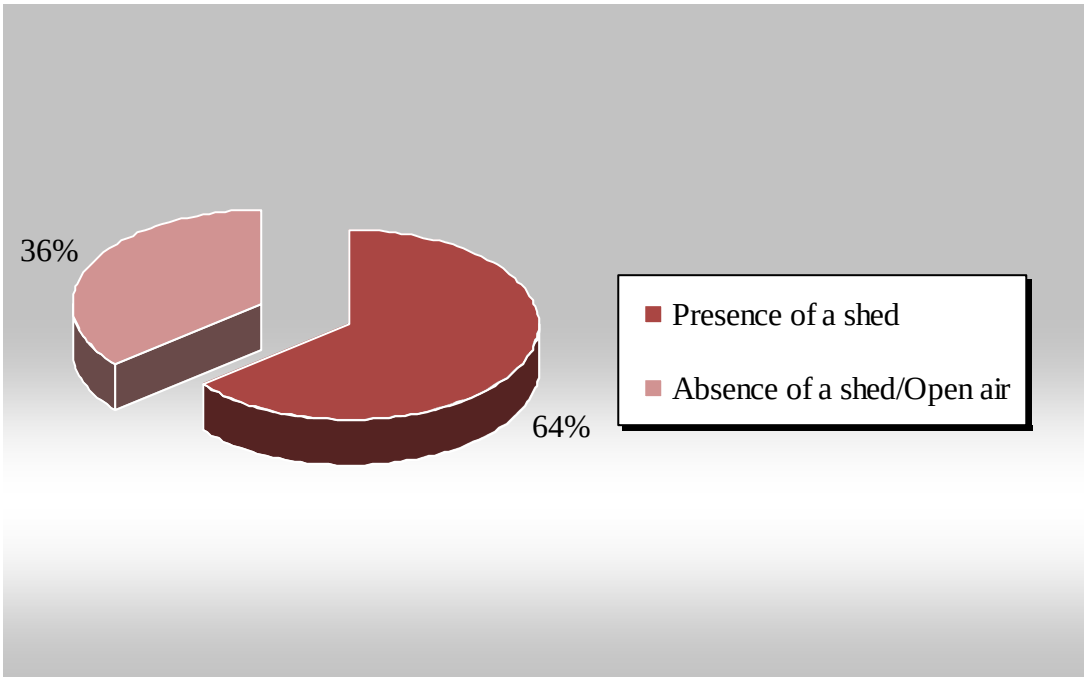

Figure 21. Availability of shed at the collection centers

Plate 6. Collection centre at Kangema division without a grading shed

Fig. 22 shows the features at collection centres visited that had sheds constructed. Out of the 9 grading sheds built only 6 sheds (66.7%) were rain proof, the roofing was mainly done using iron sheets. The rest of the sheds (33.3%) the roofing was poorly done, no maintanance was done and one shed had a thatched roofing that had not been done well resulting into leakages during the rainy seasons. Only 3 grading shed (33.3%) had an impervious, easy to clean with good drainage floor (concrete), the remaining sheds (66.7%) had earthen floors or made of ballast or hardcore see Plates 7 and 8.

Although hygiene was maintained in most of the sheds, the process was tedious because it involved hand picking of the waste or sweeping the floors resulting into too much dust especially where the floors were earthen type. Five sheds had water for post harvesting representing 55.6%. Unfortunately no water analysis had been carried out as recommended. Out of the 9 grading sheds, only one had poor lighting and ventilation. 77.7% of the sheds visited had well built accessible toilets. No shed had signs displayed forbidding smoking, eating or drinking within the grading area and fire fighting equipments were absent. 55.6% of the grading sheds did not have washable or easy to clean tables for grading resulting to farmers placing flowers on the floor, Plate 7. This can lead to contamination of flowers especially in areas where the floors are not properly done. Plate 8 shows a grading shed which has a proper roofing that does not leak, tables that are used for grading but the shed's floor is not concrete as recommended by the Kenya Flower Council code of practice.

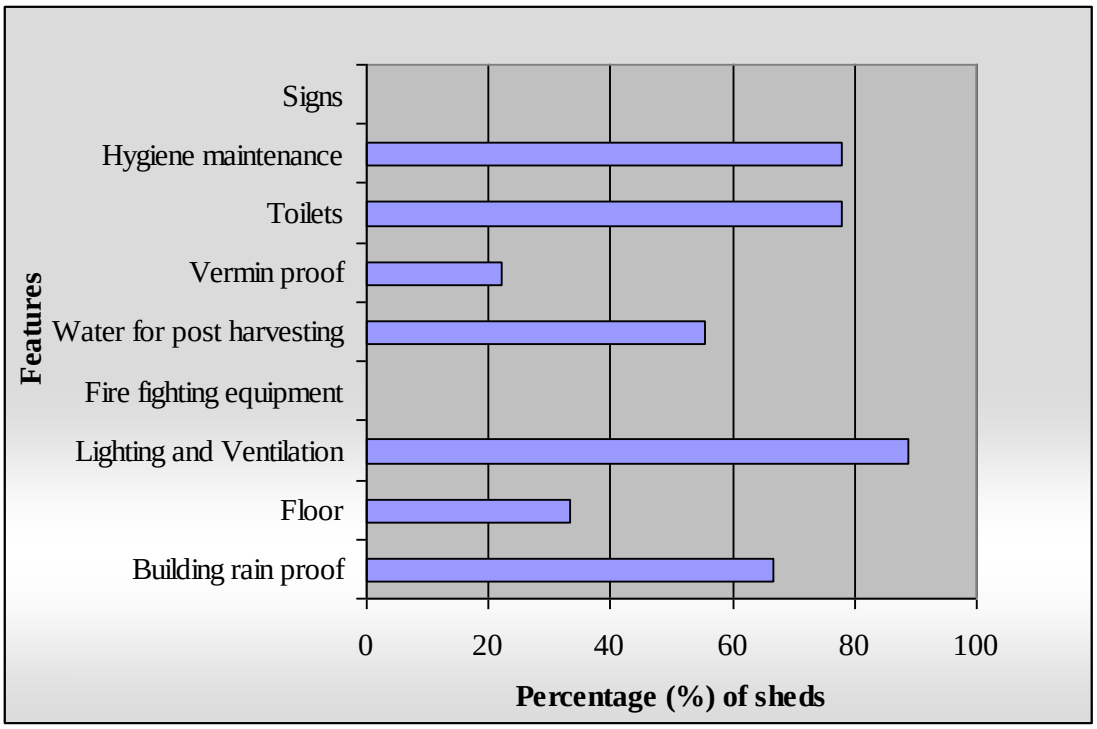

Figure 22. Occurrence rate of recommended features at collection centres

Plate 7. Collection centre/grading shed at Limuru

Plate 8. Collection centre at Mathira division, Ngorano Location, Chieni sub-location

4.3.2.7.3 Working Conditions of Workers at the Grading Sheds

At the grading sheds supervisors should be trained in emergency procedures in case of fire, accidents, first aid, use and dangers of post harvest treatments, general hygiene and regular removal of organic waste. The general workers should be provided with clothing suitable for the work at hand, adequate toilet facilities and potable water at all times. These minimum standards on the worker's conditions were used to carry out audits at the grading sheds (Fig. 23).

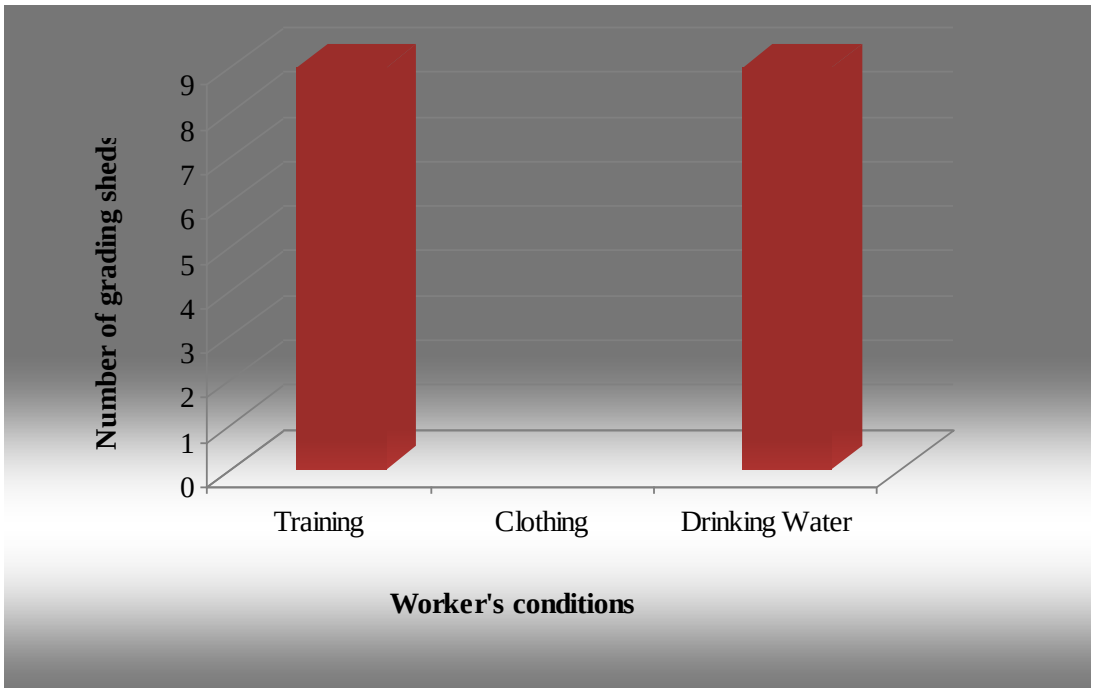

Figure 23. Working conditions of workers at grading sheds

At all the grading sheds visited the supervisors are graders who are employees of the exporter or a chairman/chairlady of the respective groups. Neither the graders who are responsible for the grading of the flowers nor the chairman/chairlady are trained on any emergency procedures. All the graders in all the grading sheds visited had appropriate clothing (white overcoats). Of the 9 collection centers with built sheds, 7 sheds (77.8%) had accessible toilets (Fig. 22) but drinking water was never supplied.

4.3.2.7.4 Waste Management at the Grading Sheds

The grading of cut flowers is done to eliminate all unsatisfactory materials and provide uniformity. Stems are generally graded by stem length (18 to 24 inches for

most flower types) and are downgraded for short or broken stems, poor flower condition, poor foliage condition, or old flowers. Stems are then tied together with rubber bands. This results to a lot of organic waste which should be well managed. Organic waste at 55.6% of the grading sheds visited, was well managed by decomposing it whereas, at 44.4% of grading sheds visited, the organic waste was neglected (Fig. 24).

Organic waste generated at the grading sheds was mainly as a result of cutting the flowers to the right stem length and sorting of the flowers to remove diseased, damaged and malformed blooms. The organic (flower) waste generated at 5 grading sheds was mainly disposed of in a pit or landfill (Plate 9). Once it decomposed, it was reused on one of the farmer's land. Farmers neglected the waste on the remaining 4 sheds, which resulted into losses since it would have been used on their farms as manure. There was minimal paper waste at the grading sheds since the default cardboards/boxes mainly were given back to the exporter for replacement.

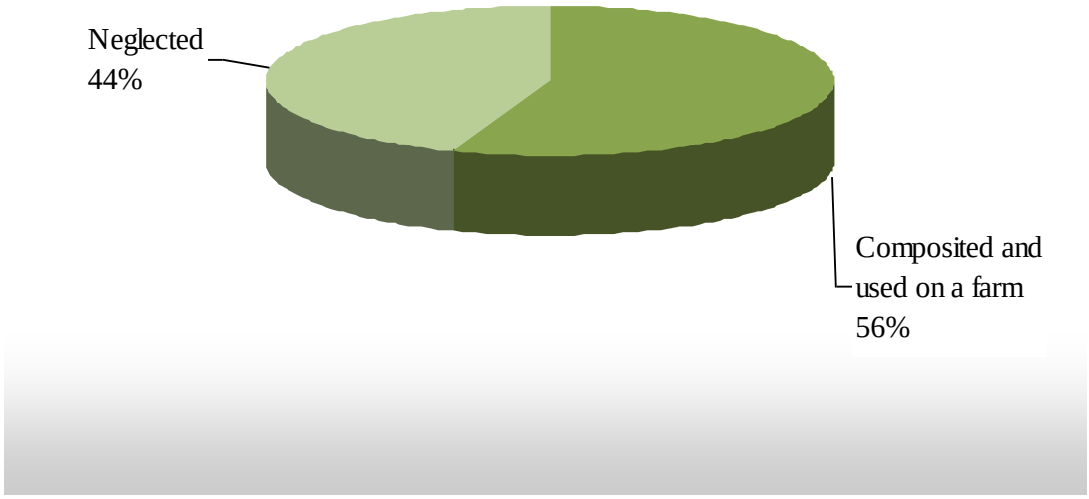

Figure 24. Method of handling organic waste at the grading sheds

Plate 9. Disposal pit at one of the grading sheds

4.3.2.7.5 Transportation of Flowers to the Exporter's Pack House

Flowers remain fresh by employing a "cold-chain" of distribution, providing the flowers with controlled atmospheric conditions of temperature, humidity and ventilation. Unfortunately, none of the grading sheds visited had cooling systems in place awaiting transportation of produce to the pack house. Transportation of flowers (one of the services provided by the exporter) at all the collection centers was done using well insulated pick ups or refrigerated trucks.

4.3.3 General Discussion of Key Findings from the Field

4.3.3.1 *Certification and Infrastructure by Small Scale Cut Flower Growers*

While the intent behind environmental standards is often admirable, more environmentally sensitive production methods, lower pesticide residues and so on, the standards place added burdens on growers and exporters. Smallholders have difficulty getting access to the credit necessary to invest in the equipment and training to meet the technical and reporting requirements of the supermarkets. Environmental standards (MPS A B C, Flower label programme, GlobalGAP/EurepGAP and the Kenya Flower Council code of practice) require that growers have toilet and washing facilities, a pesticide store and waste disposal facilities. For producers with small plots of land and little or no access to credit as indicated on this monograph that the subjects had not received any financial assistance from the government, such investment is costly.

In order to reach certification, the smallholder farmer has to invest mainly in infrastructure and protective clothes. From the study conducted, no small scale farmer was found to be certified under any environmental standard. Only 16.7% of the farmers interviewed, made use of personal protective clothing. Additionally, the farmer faces increased labour demand for record keeping. As stipulated on this monograph, no respondents keep records for the purposes of certification. Majority of the farmers (82.4%) kept records on nature, quantity and consignment they dispatched to the exporter for the purposes of counter checking during payment. Other forms of record keeping were never carried out. The farmers did not appreciate the fact that documentation is one of the most effective management tools. The smallholder farmer receives external support from the exporter company mainly for transportation of produce and extension services. The most challenging criteria for the smallholder is to cover the costs necessary for building the infrastructure.

4.3.3.2 *Financial Assistance*

In many developing countries there is a scarcity of financial schemes appropriate for the needs and demand of rural small-scale enterprises (Davis *et al.*, 2004). The main players are commercial banks, whose product range is usually aimed at the formal established segment of the (urban) market. This is evident in Kenya in that all respondents interviewed (100%) had not received any financial assistance including all forms of credit facilities from the government or financial institutions as shown on Fig. 25. Small-scale farmers-friendly loan schemes are not available to help a broad

clientele in the rural areas. Exporters assisted farmers in the construction of grading sheds whereby the exporter contributed half the amount of money that was required for the construction of a shed this resulted to 65.3% of the respondents interviewed being assisted financially by the exporter only on post harvest handling of their produce. This was evident only among the farmers who were members of self help groups and were willing to contribute money collectively to raise the remaining half of the amount that was require for a grading shed.

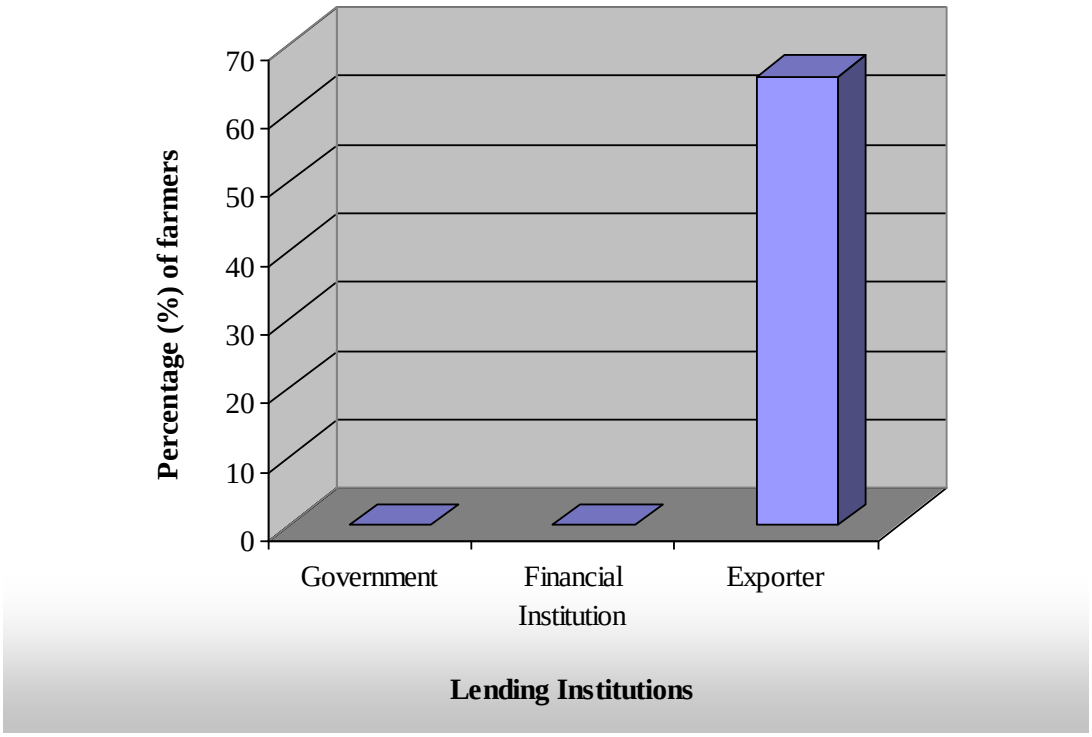

Figure 25. Sources of financial assistance among Small – Scale farmers

4.4 GAPS IN COMPLIANCE TO ENVIRONMENTAL STANDARDS

Table 13 shows the gaps that were identified during the study and proposed interventions that would help small scale farmers comply with environmental standards administered both locally and internationally.

Table 13. Proposed interventions to gaps identified

Parameter	GAP/Current practice	Proposed Intervention
Chemical application and usage	• No chemical storage facilities put in place by the farmers. • Lack personal protective clothing. • Lack of facilities for changing and washing after application of pesticides. • No medical checks • No re-entry boards on farms.	• Farmers should be organized in well structured groups. • Each group should employ a trained technical assistant, have a small pesticide store and hire pesticide spray operators. • Exporter (buyer's of the farmers produce) should facilitate monitoring of the farmers' group by having personnel at the field level who would check on the farmers production practices, pesticide use, handling and storage.

Water management	• No harvesting of rain water. • Inappropriate water application methods: use of over-head sprinklers, watering cans.	Facilitation (by the government) is needed to provide the technical and financial support to change the current mode of water abstraction by the farmers to better water saving techniques such installation of drip irrigation systems, harvesting of rain water.
Waste management	Improper disposal of used chemical containers.	The government should provide the necessary infrastructure for the purposes of waste separation and disposal for example construction of incinerators meant for the disposal of chemical containers in high horticultural production areas.
Documentation	Lack of record keeping regarding water, pesticide and fertilizer usage.	• Proper group organization whereby the group employs a technical assistant who would ensure that farmers record their production practices including fertilizer and pesticide usage.

		• Exporter can monitor the group by having personnel to ensure that accurate records are kept by individual group members and the records accompany the group's produce to the exporter's packhouse.
Training	Lack of training on health and safety matters relating to pesticide application, chemical storage, irrigation practices and waste management.	The government can facilitate the development and implementation of environmental standards by providing training in collaboration with other stakeholders in the horticulture sector and donors.
Post harvest handling	• No shed had all the relevant features up to standard. • Lack of training of supervisors.	• Group formation due to the lumpy investments required. • Donor support

Graffham and Bill, (2005) report on supporting small-scale farmers access to high value agriculture markets through the development of improved production and

management systems compliant with EurepGAP shows that, small-scale farmers must be: (i) organised into near homogenous groupings that can be classified as single farms; and (ii) with individual growers becoming blocks within the parent farm to implement EurepGAP and achieve certification. Success depends on small-scale farmers having access to finance and information to establish the required infrastructure, management and production practices and the capacity to arrange third party auditing.

Public and private sector support needs to be provided to establish and consolidate stable and efficient producer groups. The group could provide a basis for farmers to pool produce, resources, as well as facilitate access to knowledge. The result of a pooled producer group is that they are able to employ a trained technical assistant who would enforce member compliance with pesticide use, handling, storage and disposal requirements. The group would also construct a small pesticide store which would be used by members of the group. The group would also purchase pesticides and fertilizers in bulk and make them readily available to members at a discount. This would ensure the technical assistant kept accurate technical records of pesticide use by individual farmers. This would eliminate the need for group members to build pesticide stores in their homes since the members of the group would buy pesticides as needed. To reduce exposure to pesticides and expenses associated with purchase of protective clothing, the producer group could hire pesticide spray operators. The exporter/buyer should facilitate the monitoring of the group's activities (production,

accurate record keeping and hygiene maintenance around the grading sheds) by having personnel at the field level.

The advantages of a producer group is that, operational costs such as construction of appropriate grading sheds with all features (cemented floors, washable tables, latrines, facilities for washing hands, coolers and storage units) in place at collection centers that would be beyond the reach of a single grower, are shared amongst members within the group.

The move by smallholders to form and join producer marketing groups appears to be the major strategy enabling smallholder farmers to remain in the fresh export business. Joining a farmers' group can enable farmers to take advantage of economies of size and remain competitive. Evidence from South Africa supports this finding. For instance, smallholders in South Africa have been successful in obtaining costly third party EurepGAP certification by coming together to form producer marketing organizations which then seek certification under option 2 (Mungai, 2004).

Government can facilitate the implementation of environmental standards by providing technical and financial support, improving the necessary infrastructure and providing training. The government can play a key role in ensuring the involvement of all relevant stakeholders, especially small holders in the process and in helping to clarify the concepts and objectives of environmental standards in the flower sector.

The government can also promote awareness of the benefits of environmental standards including good agricultural practices and encourage their wider use.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

- The activities identified that comprise of small scale cut flower growers' supply chain include input supplying to the farmers, farming (land preparation, planting, pruning, weeding, spraying pesticides, fertilizer application and harvesting of flowers), post harvest handling (cleaning, sorting and grading of flowers) transportation, inspection and distribution of the flowers to the markets.

- The major actors/players along the supply chain of small scale cut flower growers are input suppliers (agro-chemical suppliers ranging from fertilizers to pesticides), exporters, freight forwarders, regulation control bodies which include Horticultural Crops Development Authority, Kenya Plant Health Inspectorate Service, Fresh Produce Exporters Association of Kenya, Kenya Flower Council, Pest Control Products Board, National Environment Management Authority, the Ministry of Agriculture and donors.

- Main constraints faced by small scale cut flower growers in producing and complying with the international market environmental requirements in particular the European Union include: 100% of the respondents lacked pesticide storage facilities, poor human safety related to handling of chemicals, only 16.7% of

farmers interviewed used personal protective equipment when applying chemicals, absence of re-entry boards at the farmer's farm, lack of medical checks especially on individuals dealing with pesticide spraying. Poor water management skills due to use of over head sprinklers and watering cans (40.8% and 40.3% of respondents made use of over-head sprinkling and watering cans respectively as methods of water application on their crops) and lack of harvesting of rain water. Lack of training regarding safe use of pesticides and fertilizers, first aid, water and waste management in flower production. Lack of record keeping of farm activities which is a major component of all standards administered in the flower sector. Inadequate infrastructure especially at the grading sheds including cold storage for post harvest handling at the field level. Lack of credit or any financial assistance from the government, particularly to cover the cost of investments needed to comply with environmental requirements.

- The proposed interventions include formation of stable producer groups with good organization structures to be classified as single farms.

5.2 RECOMMENDATIONS

- The cost of compliance need to be continuously assessed and minimized. This can be achieved by shifting the cost of compliance down the value chain. Costs of certification coupled with erosion of margins down the value chain are the biggest threat to small holder incomes, retailers need to share the costs. The improved

market access that results from better infrastructure, benefits the entire value chain including the bottom line of the buyers/exporters. Therefore, buyers/exporters should contribute towards these infrastructure costs, rather than pushing them down the chain to the producer/farmer. The exporter should also manage more complex parts of the standards such as the organization involving documentation and traceability components of the system.

- There is need to facilitate group certification of small holders under option 2 of the GlobalGAP. This can be achieved by strong producer group cohesion and efficient management structures to be put in place to enhance transparency, accountability and effective functioning of the group. Farm management and agri-business skills need also to be developed amongst group members.

- Public and private support needs to be provided to establish and consolidate stable and efficient producer groups including at the village level. Groups can be further strengthened through clear rules and additional goals that translate into benefits such as saving schemes, all of which can increase cohesion and trust within the group.

- The government, the private sector and donors can play an important role in strengthening capacities to meet private-sector standards thus resulting to sustainable benefits. Government could promote awareness of the benefits of

adopting environmental standards and good agricultural practices and encourage their wider use, improve the necessary infrastructure (e.g cold storage facilities and construction of incinerators in high horticultural production areas), provide and strengthen extension services and support private sector activities (e.g training).

- The government should facilitate training and the necessary infrastructure for waste management and post harvest handling. Deploy tools and mechanisms to reduce compliance and certification costs of small farmers. This can be achieved by providing bridging finance to small - scale producers and providing guarantees to motivate banks to give loans to small farmers for their fixed capital investment in private voluntary standards compliance.

- An enabling policy framework is needed that assures enforcement of environmental requirements and provides incentives to comply with private voluntary standards.

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APPENDICES

Appendix 1: Questionnaire

A. Bio Data

1a. Name of respondent.

Mr./ Ms/ Mrs. /Dr./ Prof

……..

1b. Farmer's age:

□ 21 to 30 years □ 31 to 40 years

□ 41 to 50 years □ 51 to 60 years

□ Above 60 years

B. Land Under Farming

2a. Location of the farm.

District:……Division:……Location:……

2b. Is this farm:

□ Hired □ Owned

□ Given

3. What area of land do you have under cut-flower?

□ Below 4 hectares □ Between 5 hectares to 10 hectares

□ Above 10 hectares

4. Are you represented in a group?

□ Yes □ No

5. If your answer to question 4 is yes, what is the group's name?

……

C. Flower Grown

6. What flowers does your farm grow?

□ Summer flowers (Outdoor flowers)

□ In greenhouses

7. Name the type of flower grown.

……..

8. Have you grown this particular variety of flower throughout?

□ Yes □ No

9. If your response to question 8 is No name the other varieties you may have grown.

……..

10. Where did you obtain the parental seed/material from?

□ Exporter □ Other farmers

□ Others

11. For how long have you grown flowers?

□ Less than 1 year □ 1 to 3 years

□ 4 to 6 years □ 7 to 9 years

□ Above 10 years

12a. Do you grow flowers all year round?

□ Yes □ No

12b. What other crops do you farm?

□ Cash crops □ Fruits

□ Cereals □ Vegetables

□ Others

12c. Do you practice:

□ Mixed farming □ Single crop farming □ Crop rotation

12d. Which crops are grown together under mixed farming?

……..

D. Marketing

13. How much do you sell your flowers per stem?

□ Below 1 Kshs. □ Between 1 Kshs to 5 Kshs

□ Between 6 Kshs to 10 Kshs □ Between 11 Kshs to 15 Kshs

□ Between 16 Kshs to 15 Kshs

14. Is the price of flowers the same all year round?

□ Yes □ No

15. Do you export your cut-flowers directly to your client?

□ Yes □ No

16a. If your response to question 15 is No who buy's your produce?

□ Exporter

□ Broker / Middlemen

16b. Name your exporter or broker.

……..

16c. Is your exporter or broker reliable/consistent?

□ Yes □ No

17. Are you aware of the final destination of your produce?

□Yes □ No

18 If your response to question 17 is yes tick your market?

□ Dutch □ Locally

□ Germany □ Others

□ UK

E. Certification

19. Is the farm certified with any of the international standards?

□ Yes □ No

20. If your response to question 19 is yes tick the certification programme.

□ EurepGap □ GlobalGaP

□ KenyaGap □ KFC code of practice

□ FPEAK code of practice □ MPS ABC

□ MPS – GAP □ MPS Quality

□ MPS- Socially Qualified □ Fair flowers fair plants

□ Flower label programme

F. Pesticide Application and Usage

21a. Do you use any kind of pesticides in your flower farming practices?

□ Yes □ No

21b. If your response to question 21a is yes what type of pesticides do you use in your farming practices and for what purpose?

TYPE	USAGE

21c. What are the sources of pesticides?

□ Exporter □ NGO

□ Local Agro Chemical □ Other

22. Do you have a pesticide storage facility (store/securely locked cup board or box)?

□ Yes □ No

23. How do you dispose pesticide containers?

□ Burning □ Burying

□ Incinerate □ Others

24. Do you provide protective clothing and equipment to all spray operators?

□ Yes □ No

25. Have the spray operators received any training covering any of the following?

□ Working safety

□ Correct application of chemicals

□ Ensuring protective clothing is in good shape

□ No training

26. If your response to question 25 is yes name the training institution.

……..

27. Are there facilities for changing clothes and washing after applying pesticide?

□ Yes □ No

28a. Do spray operators have medical checks?

□ Yes □ No

28b. If your response to question 28 is yes how often and does it involve checks on blood cholinesterases levels?

……..

29. Do you place re-entry boards on your farm after pesticide application indicating the date and time of pesticide application, type of pesticide sprayed and re-entry time?

□Yes □ No

30. How do you dispose waste water contaminated with the pesticides / chemicals?

□ Carbon filters □ Chemical detoxification

□ Open draining □ Others

G. Fertilizer Usage

31. Do you use any fertilizers?

□ Yes □ No

32. If your response to question 31 is yes, name the fertilizer.

……..

33. Do you use organic manure?

□ Yes □ No

34. Do you have a fertilizer storage facility?

□ Yes □ No

35. Do you carry out soil analysis?

□ Yes □ No

H. Water Management

36. What is your source of water that is used for flower cultivation?

□ Tap water □ River / Stream

□ Harvested rainwater □ Direct rain fed

37. What is the mode of application of water?

□ Over-head sprinklers □ Drip or mini sprinkler

□ Use of buckets/ watering cans □ Use of hose pipes

38. Have you installed any water meters and water usage recorded?

□ Yes □ No

39. Is the water quality monitored?

□ Yes □ No

I. Waste Management

40. Do you composite and reuse organic waste (flower waste materials)?

□ Yes □ No

41. How do you reuse the organic waste?

……..

42. Are waste such as paper, plastic, metal, wood and other waste materials separated and recycled?

□ Yes □ No

43. Is there written procedure for safe hygienic disposal or organic waste packaging (evidence).

□ Yes □ No

J. Auditing / Inspection

44a. Have you been audited by any recognized body?

□ Yes □ No

44b. Tick those bodies that have audited your farm among the following:

□ NEMA □ KFC □ Others

□ KEBS □ FPEAK

45.Is there any inspection, evaluating the farm by an environmental protection officer making suggestion for improvement and inspecting the farm's compliance with regulation?

□ Yes □ No

46. If the response to question 45 is yes, state who carried out the inspection and when.

……..

47a. Has an environmental impact assessment or an environmental audit been carried out on your farm?

□ Yes □ No

47b. If in the affirmative, give the name(s) of the assessor.

……..

K. Employees

48. How many employees do you have?

……..

49. Employee's age:

□ Below 21 years □ 21 to 30 years

□ 31 to 40 years □ 41 to 50 years

□ 51 to 60 years □ Above 60 years

50. On average how much do you pay your employee?

□ Below 50 Kshs □ 50 Kshs to 100 Kshs

□ 101 Kshs to 150 Kshs □ 151 Kshs to 200 Kshs

□ Others

51. Do you keep any records of your past and present employees?

□ Yes □ No

L. Produce Trace-ability

52a.Do you carry out any form of documentation pertaining to your flower farming operations?

□ Yes □ No

52b. Tick the form of documentation that you carry out among the following:

□ Records of field operations; soil preparation through to harvest.

□ Records of pesticides, dates and rates of use.

□ Records of fertilizer, dates and rates of use.

□ Records of nature, quantities and consignees of all produce dispatched.

□ Records kept for minimum 2 years for audit purposes.

M. Technical Assistance

53. Have you been given any technical assistance by the following personnel.

□ Government extension officer □ Others

□ Exporter's extension officer

□ HCDA member

□ NGO's

□ Kenya Flower Council

N. Training

54. Have you received any kind of training regarding?

Flower production in general	□ Yes	□ No
Health and safety matters related to pesticide application	□ Yes	□ No

Pesticide storage practices	□ Yes	□ No
Fertiliser application practices	□ Yes	□ No
Irrigation practices	□ Yes	□ No
Waste management practices	□ Yes	□ No

55. If the response to any of the above is affirmative, name the institutions that carried out the respective training.

……..

O. Post Harvest Handling

56. How do you transport the flowers from the field to the grading shed?

□ On the farmer's back

□ Bicycles

□ Wheelbarrow

□ Others

57. How long does it take for the flowers to be graded and dispatched to the packhouse?

□ 1 to 6 hours □ 7 to 12 hours

□ 13 to 18 hours □ 19 to 24 hours

P. Financial Assistance

58. Do you receive any kind of financial assistance?

□ Yes □ No

59. If the response to question 57 is affirmative, name the financing institution.

Appendix 2: Checklist

1. Location of the grading shed:

District…….Division…….Location……

2. Number of farmers who use the grading shed.

……

A	POST-HARVEST HANDLING	YES	NO	COMMENT
	Construction of grading shed			
1	Building and interior:			
	• Floors are impervious, easy to clean, good drainage			
	• Hygiene maintained			
2	No smoking and eating signage			
3	Washable/cleanable tables			
4	Availability of water for post harvesting			
5	Water analysis from an accredited lab			
B	**WORKER CONDITIONS**			
6	Supervisors trained in emergency procedures (fire, accidents)			

7	Suitable clothing for the tasks performed			
8	Is lighting and ventilation adequate			
9	Are toilets and washing facilities sufficient			
10	Drinking water supplied at all times			
C	**PACKAGING STORE**			
11	Building rain proof			
12	Fire fighting equipment provided			
13	Is the store vermin proof (birds, insects, rats)			
14	Measures in place to avoid contamination by physical or chemical hazards			
15	Re-usable buckets and crates well cleaned			
D	**POST-HARVEST TREATMENT CHEMICAL DISPOSAL**			
16	Any post-harvest treatment			
17	Name the preservative used			

18	Documentation of the post-harvest chemical used including the geographical area, quantities used and the operator handling the treatment.			
19	Preservative chemicals disposed of safely			
E	**WASTE DISPOSAL**			
20	Organic waste generated from grading disposal:			
	• Composted and used on the farm			
	• Burned			
	• Neglected			
	• Others			
21	Cardboard and paper waste disposal:			
	• Recycled			
	• Burned at suitable site			
	• Others			
F	**TEMPERATURE**			
22	Flower boxes transportation:			

	• Refrigerated trucks			
	• Well insulated trucks			
	• Open trucks/ Pick ups			
	• Others			
23	Availability of cooling system awaiting transportation of produce to the pack house.			

Appendix 3: Experts Consulted

Name of expert	Organisation and contacts	Information sought
Mr. Charcles Tumbo	Export Promotion Council P. O. Box 40247-00100, GPO, Nairobi. Tel. No. +254-20-228534-8	Supply chain involving small scale farmers
Mr. Eric Mwaura	Kenya flower Council P. O. Box 56325-00200. Nairobi Tel. No. +254-20-3876597 / 3860612	The different standards administered in the flower sector and how large scale growers have responded to environmental requirements and the factors that favoured the easy response
Ms Carol Muumbi	Horticultural Crops Development Authority P. O. Box 42601-00100, GPO, Nairobi Tel. No. + 254-20-2088469	Mechanisms that have been put in place by the organization to facilitate small scale farmers market their produce effectively. Importance of contract forms and the contribution of small scale farmers production to the economy.

Mr. Timothy Mwangi	United States Agency for International Development (USAID)/Kenya Horticultural Development Programme P. O. Box 3074-00506, Nyayo Stadium, Nairobi Tel. No. +254-020-2023313	Current donor facilitation programmes
Mr. Philip Njoroge	Kenya Plant Health Inspectorate Service P. O. Box 19164-00501, Nairobi. Tel. No. +254-020- 822768	How information dissemination is carried out to small-scale farmers. Inspection procedures at airport and documentation.
Ms Luiza Munyua	Kenya Plant Health Inspectorate Service P. O. Box 19164-00501, Nairobi. Tel. No. +254- 020- 822768 / 3597207	Quarantine pests for the European Union. Rates of interceptions and rejection.

Mr. Cosmas Kyengo	Fresh Produce Exporters Association of Kenya P. O. Box 40312-00100 Nairobi. Tel. No. +254-20-4451488/9	The major cut flower exporters involved with small scale cut flower growers within Central Kenya. The contents of the local codes of conducts especially the KenyaGAP and the current intervention mechanisms that have been put in place to facilitate small scale farmers become compliant to the local standards.
Mrs. Margaret Masaku	Ministry of Agriculture. Horticulture Division P. O. Box 30028, Nairobi. Tel. No. 020-2718870	Small scale farmers distribution and acreage
Dr. Samuel Mwalili	Jomo Kenyatta University of Agriculture and Technology, P. O. Box 62000, Nairobi Tel: (067) 52711	Sample size determination
Mr. Wilfred Kamami	Wilmar Agro Limited P. O. Box 1682 Thika Tel. No. +254-067-30176	The different services offered by the exporter to the small scale farmers.

Ms Mercy Kinuthia	Wilmar Agro Limited P. O. Box 1682 Thika Tel. No. +254-067-30176	Number of small-scale farmers registered in the organization and their distribution. The price setting mechanism of flowers.
Ms Ann Mburu	Nature Grown Ltd, P. O. Box 2577, Thika. Tel. No. +254-067-31728	Number of out growers registered in the organization and their distribution.