From aid to sustainable trade: driving competitive horticulture sector development

A quick scan of the horticulture sector

Moses Sila Matui
Yeray Saavedra Gonzalez
Joyce Gema
Irene Koomen

WAGENINGEN
UNIVERSITY & RESEARCH

From aid to sustainable trade: driving competitive horticulture sector development

A quick scan of the horticulture sector

Moses Sila Matui[1]
Yeray Saavedra Gonzalez[2]
Joyce Gema[1]
Irene Koomen[2]

1 TradeCare Africa
2 Wageningen Centre for Development Innovation

This research was funded by the Dutch Ministry of Foreign Affairs

Wageningen Centre for Development Innovation
Wageningen, December 2016

Report 3RKenya-16-03/CDI-16-045

WAGENINGEN UNIVERSITY & RESEARCH

tradecare sustainability services provider

Matui, M.S., Saavedra Gonzalez, Y., Gema, J., Koomen, I., 2016. *From aid to sustainable trade: driving competitive horticulture sector development; A quick scan of the horticulture sector.* Wageningen Centre for Development Innovation, Wageningen University & Research. Report 3RKenya-16-03/CDI-16-045. Wageningen.

Abstract UK
This report provides an overview of how the Kenyan horticulture sector performs in three analytical domains: the robustness of the supply chains, the reliability of institutional governance and the resilience of the innovation system. Analysis is by literature review, stakeholder interviews and a validation workshop guided by a SWOT framework to identify strengths, weaknesses, opportunities and threats. The findings inform the existing opportunities and challenges that potentially impede growth in the sector. The report is a first step towards documenting and sharing insights that support the move towards a more Robust, Reliable and Resilient (3R) horticulture sector. The findings and recommendations presented will guide policy engagement and action in the transition of Dutch government bilateral engagement in Kenya from development aid–support to a trade approach in the agricultural sector, with a focus on partnering opportunities to drive competitive market-oriented horticulture sector development that attracts investments.

This report can be downloaded free of charge from www.wur.eu/cdi (“publications”).

Report 3RKenya-16-03/CDI-16-045

Contents

Foreword

This report has been produced within the framework of 3R Kenya, a project led by Wageningen Centre for Development Innovation. The project aims to assess and validate the lessons that can be learned from the Agriculture and Food and Nutrition Security programmes of the Embassy of the Kingdom of the Netherlands in Nairobi, in support of its transition strategy from aid to trade. This research report was made possible thanks to the support of many people and institutions. Of the five project partners, Wageningen Centre for Development Innovation and Tradecare constituted the study team, which benefitted from the cooperation of many parties. We would like to thank all these stakeholders who gave their time to share their perceptions of the horticulture sector in Kenya. We also thank the participants of the roundtable discussion (December 2015) and the validation workshop (July 2016) for their insights and reflections.

A special word of thanks goes to the HortIMPACT programme (SNV), the Unlocking Agriculture Potential through Medium-Sized Farms in Kenya Program (Equity Group Foundation) and the Telephone Farmers project (Latia Resource Center), representatives of which not only made time available for interviews, but also gave us access to internal reports on the respective programs and the Kenyan horticulture sector in general.

Finally, we wish to acknowledge some individuals: we thank Dr Fedes van Rijn – who provided the guidelines with the shared methodology for the three sectors within the 3R project – and Dr Phillip Musyoka, who also contributed to methodology development. We thank them and Dr Catherine Kilelu for their review of and helpful comments on an earlier version of this document. Special mention goes to Ann Kingiri for her valuable contributions, to the 3R Kenya team for feedback on this report and to Ruth Davies for excellent editing of the text.

It is our hope that this document will contribute to the further development of the Kenyan horticulture sector into a sustainable, inclusive, just and productive sector that will be able to forge international trade linkages – including with the Netherlands – to the benefit of all. We want to thank the Embassy of the Kingdom of the Netherlands for funding this work.

Joep van Mierlo, 3R Kenya Projectmanager,
Wageningen University & Research,
Centre for Development Innovation

List of abbreviations and acronyms

3R Kenya	Resilient, Robust and Reliable – from Aid to Trade project
AFA	Agriculture and Food Authority
ALVs	African leafy vegetables
ASDSP	Agricultural Sector Development Support Programme
CIG	common interest group
CIP	International Potato Centre
COMESA	Common Market for Eastern and Southern Africa
EKN	Embassy of the Kingdom of the Netherlands
EU	European Union
FNS	food and nutrition security
FPEAK	Fresh Produce Exporters Association Kenya
GAP	good agricultural practices
GDP	gross domestic product
HCAS	Horticulture Competent Authority Structure
HCD	Horticultural Crops Directorate
IPM	integrated pest management
ISTA	International Seed Testing Association
KALRO	Kenya Agricultural and Livestock Research Organization
KAVES	Kenya Agricultural Value Chain Enterprises
KEPHIS	Kenya Plant Health Inspectorate Service
KES	Kenyan shilling
KFC	Kenya Flower Council
JKUAT	Jomo Kenyatta University of Agriculture and Technology
MAPs	medicinal and aromatic plants
MESPT	Micro-Enterprises Support Programme Trust
MRL	maximum residue level
NGO	non-government organization
NICHE	Netherlands Initiative for Capacity development in Higher Education
NPT	national performance trials
Nuffic	Netherlands organisation for internationalisation in higher education
PTC	practical training centre
PCPB	Pest Control Products Board
SHoMaP	Smallholder Horticultural Marketing Project
SME	small and medium enterprise
SNV	SNV Netherlands Development Organization
SWOT	strengths, weaknesses, opportunities, threats
UPOV	International Union for the Protection of New Varieties of Plants

Summary

This quick scan of the horticulture sector in Kenya provides an overview of the supply chain, institutional governance and innovation support system in the sector based on a literature review and stakeholder interviews. The information collected was evaluated by means of a strengths, weaknesses, opportunities and threats (SWOT) framework to identify existing opportunities as well as challenges that could potentially impede growth in the sector. It is a first step towards documenting and sharing insights that support the move towards a more robust, reliable and resilient sector. Findings were validated with the stakeholders as well as peer reviewed and will be fed into the next phase of the 3R Kenya project to provide and share solid, evidence-based knowledge that supports the transition from aid to sustainable trade. The focus is on the domestic vegetable subsector owing to its important contribution to food security and income generation.

Horticulture in Kenya

The horticulture sector, which is the second largest foreign exchange earner within the agriculture sector after tea, contributes 36% to agriculture's share of GDP and continues to grow. The horticulture sector in Kenya offers many opportunities in international, regional and domestic markets. In 2014, the total domestic value of the horticulture sector amounted to 196 billion Kenyan shillings. The contributions of the main subsectors are as follows: exotic vegetables, Asian vegetables and African leafy vegetables (36% of the domestic value); fruit (30%); flowers (26%); nuts (5%); and medicinal and aromatic plants (2%).

Domestic market demand for vegetables

The development of the horticulture value chain, especially for vegetables, is driven by demand from both urban and rural households. About 95% of horticultural production, mostly vegetables and fruits, goes to the domestic market, while the other 5%, mainly flowers and French beans, ends up in the export market. The demand for vegetables in the Kenyan domestic market is closely linked to household income levels. The rate of increase of vegetable consumption, especially in urban households, is surpassing the increase in household incomes. Rural–urban wholesalers and brokers are at the heart of a complex market system whereby farmers' produce is retailed through five channels: open-air retail markets, kiosks, high-end greengrocers, supermarkets and hotels. Vegetables make up 85% of the volume and 79% of the value of fresh produce entering the city of Nairobi. To meet the demand, produce has to be transported from over 45 districts and occasionally from Uganda and Tanzania. Vegetable production is geographically concentrated, with 44% of volume coming from five counties: Bungoma, Meru, Muranga'a, Nyandarua and Nakuru.

Issues in the horticulture sector

The horticulture sector, particularly the vegetable and potato subsectors, suffers from several challenges. These issues, in turn, affect the sustainability of the supply chain, institutional governance and the innovation support systems along the value chain. Examining these three aspects of the value chain helps us to understand the robustness, reliability and resilience of the horticulture sector. Each aspect of the value chain has issues classified on the basis of two criteria: (a) Strengths–Opportunities and Weaknesses–Threats; and (b) the dimension of the issue most relevant to that part of the value chain.[1]

Robustness – supply chain

Robust supply chain integration refers to efficient and trusted interactions between supply chain partners that reduce transaction costs and the risks involved in enhancing product quality and safety and reinforcing sustainability. In this analysis, robustness is approached from the perspective of sustainability.

[1] Only a selected number of issues are included in this summary. The complete list is found in the body of the report.

STRENGTHS & OPPORTUNITIES

Economic dimension

- **Standards and certification in export markets:** A highly codified and regulated international market operates alongside an unregulated domestic market, presenting opportunities for diffusion of good practices to domestic production;
- **Formal and organic market segments are growing:** The fast-growing development of supermarkets is positively pulling the formalization of traders. This presents vertical growth of business enterprises that form a basis on which future sector developments can be anchored;
- **Integrated pest management (IPM) packages for domestic horticultural farmers:** IPM technology has been in use in the floriculture sector and in large-scale horticulture for several years. Recently, suppliers of IPM solutions have designed packages suitable for smallholders;
- **Value addition through processing:** A growing trend towards processing, driven by the need to prolong shelf life, has been observed. The potential growth of the potato-processing sector, as new processing varieties are introduced, could increase its market share.

Social dimension

- **Evidence of adoption of production technology among farmers:** There is increased demand from farmers for technology to improve their production. This is driven by their need to produce on small landholdings as well as by government and other agencies directly promoting use of technologies. High upfront investment costs mean that farmer expectations for returns are equally high;
- **Growing interest in hygienic, safe vegetables:** Price has been a dominant intrinsic motivation for consumers when deciding to purchase vegetables, because vegetables are a significant component of the urban diet in a highly price-sensitive market. Awareness and public interest, however, are now creating demand for traceability, quality and safety in fresh vegetable produce.

WEAKNESSES & THREATS

Economic dimension

- **Climate-related risks:** Farmers and stakeholders are not aware of or tend to ignore the economic effects of climate change in the horticulture sector;
- **Tough maximum residue level (MRL) requirements in the European Union (EU) market:** Farmers have to be very alert about the correct choice and use of pesticides, because levels of residues above the MRL immediately lead to economic losses.

Social dimension

- **Strong dominance by traders (wholesalers) – the inclusivity challenge:** Wholesalers are perceived to have substantial market power, which has implications for inclusive decision-making pertaining to setting of commodity prices as well as sourcing trends;
- **"Women crops" receive less attention than "men crops":** The majority of horticultural farmers in Kenya are women, most of whom lack options to own the land they are farming. While the laws surrounding inheritance, for example, are changing, issues about ownership of family land are cultural; change is occurring gradually.

Reliability – institutional governance

Reliable institutional governance refers to public–private cooperation, co-innovation and a public economic policy framework that supports private investment and enhances opportunities for (inter)national trade. This quick scan focuses on how policies (and standards) and markets are being supportive from a trade perspective, that is, the degree to which they support private investment and enhance trade opportunities.

STRENGTHS AND OPPORTUNITIES

Policy dimension

- **Enabling environment for foreign direct investment in Kenya:** Kenya operates a market-driven economy with limited state interference in business. The ease of doing business in any country is affected by several factors, among which are ease of registering a business; land laws; the skill level of the workforce; and the presence of infrastructure, including road and energy networks, among others;
- **Strong partnerships and platforms to discuss cross-cutting issues:** The Horticulture Competent Authority Structure (HCAS) – which includes members from the Ministry of Agriculture,

Kenya Plant Health Inspectorate Service (KEPHIS), Horticultural Crops Directorate (HCD), Kenya Agricultural and Livestock Research Organization (KALRO) and Pest Control Products Board (PCPB) and which is represented by the private sector through Fresh Produce Exporters Association Kenya (FPEAK) and the Kenya Flower Council (KFC) – provides the sector with an institutional network that facilitates the implementation of policy frameworks. There is, however, a need to harmonize the functions of the central and county mandates.

Market dimension

- **Continued interest by development agents to support horticulture in Kenya:** Horticulture is a priority sector for the Government of Kenya and for a number of bilateral and multilateral donors. USAID, the Embassy of the Kingdom of the Netherlands (EKN) and a number of other agencies have significant programs supporting horticulture. Counties in Kenya are motivated to directly increase value for farmers.

WEAKNESSES AND THREATS

Policy dimension

- **Weak product governance mechanisms to support food safety, traceability and respect for contracts in domestic markets:** Product governance mechanisms include how the country addresses issues such as traceability, quality, food safety, chain of custody and respect for contracts. Kenya has struggled with these issues for many years in both its export and domestic markets. The HCD, for example, is working on a national food safety and traceability mechanism that will enable the fresh fruits and vegetable sector to reduce the number of inceptions by the EU and improve domestic production as food safety regulations become stricter.

Market dimension

- **Contractual arrangements for farmers:** Contract farming can offer opportunities for smallholder farmers because the contractor provides the inputs and farmers gain access to the lucrative export market. However, farmers can be lured into binding contracts that give them very little return on investments.

Resilient – innovation support system

Resilience is the dynamic adaptive capacities that enable agents (research, extension and projects) and systems to adequately respond to changing circumstances. In this quick scan, we focus on how these agents and systems support technical, institutional and social innovations (the enabling conditions) or remove barriers that prevent these innovations from happening.

STRENGTHS AND OPPORTUNITIES

Social and technical dimensions

- **Opportunities for private sector extension are emerging:** Private sector extension in Kenya is not well developed where economies remain informal. Commercial sectors such as tea, dairy, coffee and avocado have already witnessed and are benefiting from the rise of private sector extension;
- **Development actors and counties are interested in supporting horticulture innovations:** Counties have demonstrated interest in supporting knowledge and innovation systems. KALRO supports technological innovation, as evidenced by reported high demand for appropriate seed varieties by counties that are supplying their farmers. Institutional innovation has also been reported. For instance, there is growing evidence that vegetables and potatoes are attractive sectors to development agencies and the public sector. Further, HortIMPACT, Latia Resource Center and Equity Group Foundation projects by EKN are examples of how donors are supporting the domestic horticulture sector. These projects have better interactive collaborations that encourage partnerships and provide knowledge, coaching and cumulative learning;
- **Social and organizational innovation for capabilities development:** Different projects address specific challenges. For instance, the SNV HortIMPACT project brings actors together to interact and learn from each other. This project is a good example of a learning project that builds capabilities as opposed to the traditional facilitator-based model;
- **New financial products that are tailored to the needs of vegetable farmers:** New financial products are entering the market. The Equity Foundation project provides tools tailored to assist medium-sized farming enterprises with financial management, which is a prime example of this form of financial innovation.

WEAKNESSES & THREATS

Social dimension

- **Focus by government and a number of development agencies still remains largely trained on pro-poor development:** The Government of Kenya and its agencies still promote smallholder agriculture. This is demonstrated by their research agendas being crafted around responding to the needs of smallholder farmers as opposed to the wide spectrum of farmers in the country. Large-scale farmers, for example, are importing knowledge because government policies mean they cannot get this knowledge inside Kenya;
- **Project-based interventions are based on push rather than pull factors:** Whereas support institutions such as non-government organizations (NGOs) perform needs assessments before developing projects, government projects are sometimes not well targeted and may be unwanted.

Technical dimension

- **Limited practical training infrastructure in the country:** Kenya lacks practical training infrastructure. Horticultural production requires a vast amount of knowledge and participation that can benefit from practical training infrastructure. The Netherlands organisation for internationalisation cooperation in higher education (Nuffic) is supporting a number of competency-based education projects and practical training facilities;
- **A continuing mismatch of technologies and knowledge systems:** A major threat to the resilience of the sector is the continued mismatch of technologies and knowledge systems. A prime example of this is how medium to high-tech covered horticulture is failing to deliver value due to the lack of knowledge systems to support farmers.

Recommendations

Based on the secondary and primary data analysis, this quick scan has put together ten questions for further interventions. These are clustered on the topics of governance, decision-making and effective learning, food safety, technology investment and adoption, value addition and climate change. These points for further action should be prioritized and developed with the relevant stakeholders for each of the issues.

#	Question	Intervention
Governance		
1	How can horticultural policy at county level be implemented without becoming restrictive/exclusive?	Develop good county policies and benchmarks to attract investment in one or two counties.
Decision-making and effective learning		
2	What is the role of the local government in driving mature systems for agricultural commercialization?	Foster strategic decision-making and learning through providing a platform where the public and private sector can meet.
Food safety		
3	How is the growing concern about food safety and quality of horticultural products in domestic markets creating new opportunities for investments across the value chain?	Promote a social dialogue and innovation platforms around food safety.
4	How can farmers be linked to new or existing markets that seek quality produce?	Work towards improved supply chain governance.
5	How can the intrinsic motivation of different supply chain actors be aligned to support implementation of a food safety and traceability system?	To support investment decisions, identify what motivates different supply chain actors to implement food safety regulations.
Technology investment and adoption		
6	What drives investment? What pulls adoption and application of technologies by local communities?	Assess, through a bottom-up approach, grassroots innovations and their relevance to the marketing system.
7	What are the main constraints for marginalized groups (women, youth) in accessing and adopting improved production techniques?	Prioritize the inclusion of the socially disadvantaged/marginalized in the value chain.
8	What are the necessary steps to enhance vertical growth and formalization of horticultural firms in domestic markets to create investment opportunities and improve chain governance?	Work with first movers in domestic markets to support the formalization of their business and take advantage of existing opportunities for growth.
Value addition		
9	What sound business ideas are the markets seeking? How can entrepreneurs tap into these opportunities?	Promote consumer-oriented and -targeted services and products connected to key markets.
Climate change		
10	What medium-term effects are expected in the horticulture sector? How can they be addressed?	Assess the resilience of the sector against climate-related shocks, and partner with other stakeholders to introduce and promote climate variability measures and practices.

1 Background

1.1 Introduction

This quick scan provides insights into the Kenyan horticulture sector with a focus on three main analytical domains: the supply chain, institutional governance and innovation support systems. Jointly, these are viewed as essential in understanding and guiding the transition towards a Robust, Reliable and Resilient (3R) sector (see Boxes 1 and 2). Since 2012, the Agriculture and Food and Nutrition Security (FNS) programme of the Embassy of the Kingdom of the Netherlands (EKN) has been supporting market-led agricultural development interventions of various agrifood sectors in Kenya, including dairy, horticulture and aquaculture (Netherlands Embassy Nairobi, 2012). This market-led approach provides opportunities for Dutch and Kenyan experts and investors to develop business solutions and innovate in knowledge development and application relevant to a growing and competitive agrifood sector in Kenya.

Box 1. Triple R: Robust, Reliable and Resilient

Robust refers to systematic interactions between agents that enable them to adjust to uncertainties within the boundaries of their initial configuration

Reliable refers to the ability of the system or its components to perform the required functions under changing conditions for a specified period

Resilient refers to the dynamic adaptive capacities that enable agents and systems to adequately respond to changing circumstances

Box 2. 3R Kenya

As part of the Dutch transition strategy from aid to trade in Kenya, Wageningen UR will implement a project that assesses and validates lessons learned from the Netherlands Embassy's Agriculture and Food and Nutrition Security programme and other related programmes that support competitive market-led agricultural development. The 3R (Robust, Reliable and Resilient) Kenya from Aid to Sustainable Trade project investigates whether the lessons from the aid era can be transferred and scaled up in the coming trade era. 3R Kenya focuses on the aquaculture, dairy and horticulture sectors. The overall aim of the 3R Kenya project is to have well-informed stakeholder actions supporting the transition from aid to sustainable trade (people, planet and profit) in the selected sectors.

This quick scan presents findings of a scan of the horticulture sector that was conducted as an initial analysis of the FNS programme and similar market-led interventions. It assesses and validates scalability of these lessons for a trade- and investment-focused approach to the sector's development. The study applied the 3R framework to three domains of the sector: the value chain, institutional governance and innovation support systems. The study is a first step for the 3R Kenya project towards assessing and documenting lessons from the FNS programme and sharing insights that will guide policy engagement and action in the transition from a development aid–supported sector to a competitive market-oriented dairy sector that attracts trade and investment opportunities.

The quick scan sought to describe **the performance of the Kenyan horticulture sector in terms of the robustness of the supply chains, the reliability of the institutional governance and the resilience of the innovation system.** Qualitative data collection and analysis were used to draw conclusions about the objectives of the scan. Secondary information was collected through literature review, and primary information was collected through interviews with sector stakeholders and group discussions organized through stakeholder workshops. This seven-chapter report is organized as follows: Chapter 1 introduces the research; Chapter 2 provides an overview of the horticulture supply chain, institutional arrangements and innovation system in Kenya. Chapters 3–5 describe the myriad of issues that the sector faces, in terms of strengths, weaknesses, opportunities and threats (SWOT), and in the context of the three thematic themes supply chain (Chapter 3), institutional governance (Chapter 4) and the innovation support system (Chapter 5). Chapter 6 outlines some conclusions and recommendations to promote a robust, reliable and resilient horticulture sector in Kenya.

1.2 Methodology

Data were collected through an extensive review of relevant literature, interviews with stakeholders, a stakeholders' round table and a stakeholders' validation workshop. A SWOT analysis was applied to better understand the data and help organize the analysis in a consistent way. van Rijn et al. (2016) includes a detailed description of the methodology used.

1.2.1 Literature review

A selection of key documents was made as the starting point for the quick scan of the sector (Table 1.1). These key documents were coded in ATLAS.ti, a software program that facilitates analysis of qualitative data. The most recent documents were analysed first. Appendix 1 (Overview of the regulatory environment of the horticulture sector), Appendix 2 (Overview of food safety policies with relevance to horticulture in Kenya) and Appendix 3 (Overview of horticultural projects in Kenya) provide an account of some of the (overview) documents used for the quick scan and which are deemed instrumental to understand the sector. To supplement the information from the key documents, additional "grey" information was obtained from team members and by searching the internet with Google. To elucidate issues that came up during analysis, scientific literature was obtained using a variety of search engines (see full list of references).

Table 1.1 *Key references used to analyse with ATLAS.ti*

Key references
CBI (2015a) Product factsheet – Fresh beans, peas, and other leguminous vegetables in Europe. CBI, The Hague pp. 15
CBI (2015b) Trade statistics: Fresh fruit and vegetables in Europe. CBI, The Hague pp. 16
Feedback Global (2015) Food waste in Kenya: Uncovering food waste in the horticultural export supply chain. feedbackglobal.org
HCD (2015) Horticulture Validated Report 2014. AFFA, Nairobi pp. 68
Irungu, C., Mburu, J.G., Maundu, P., Grum, M., Hoeschle-Zeledon, I. (2008) The effect of market development on-farm conservation of diversity of African leafy vegetables around Nairobi. http://purl.umn.edu/44452
Lagerkvist, C.J., Ngigi, M., Okello, J.J., Karanja, N. (2012) Means-End Chain approach to understanding farmers' motivations for pesticide use in leafy vegetables: The case of kale in peri-urban Nairobi, Kenya Crop Protection 39: 72-80
Lubinga, M., Ogundeji, A., Jordaan, H. (2014) East African community's trade potential and performance with European union: a perspective of selected fruit and vegetable commodities. European Scientific Journal 1: 430 – 443
Muendo, K.M., Tschirley, D. (2004) Improving Kenya's domestic horticultural production and marketing system: III Current competitiveness, forces of change, and challenges for the future. Tegemeo Institute of Agricultural Policy and Development, Egerton University, Kenya pp. 31
Muhanji, G., Roothaert, R.L., Webo, C., Stanley, M. (2011) African indigenous vegetable enterprises and market access for small-scale farmers in East Africa, International Journal of Agricultural Sustainability 9:194-202
Muriithi, B.W., Matz, J.A. (2015) Welfare effects of vegetable commercialization: Evidence from smallholder producers in Kenya. Food Policy 50: 80-91
National Horticulture Policy. Government of Kenya, Agricultural Sector Coordination Unit, Nairobi pp. 76
Okello, J.J., Okello, R.M. (2010) Do EU pesticide standards promote environmentally-friendly production of fresh export vegetables in developing countries? The evidence from Kenyan green bean industry. Environment, Development and Sustainability 12: 341-355
RSA (2015a) Report of A study on fresh vegetables market in Kenya – Desk review. Research Solutions Africa Ltd pp. 42
Tschirley, D.L., Ayieko, M.W. (2008) Assessment of Kenya's domestic horticultural production and marketing systems and lessons for the future. Tegemeo Institute of Agricultural Policy and Development WPS 32/2008 pp. 49. http://purl.umn.edu/202610
Ulrich, A. (2014) Export-oriented horticultural production in Laikipia, Kenya: Assessing the implications for rural livelihoods. Sustainability 6: 336-347
USAID (2007) Export markets for high-value vegetables from Tanzania - An AMAP BDS K&P task order study. pp. 130
Wachira, J.M., Mshenga P.M., Saidi, M. (2014) Comparison of the profitability of small-scale greenhouse and open-field tomato production systems in Nakuru-North District, Kenya. Asian Journal of Agricultural Sciences 6: 54-61

1.2.2 Interviews

Key actors – individuals or organizations – were selected using team knowledge of the horticulture sector. Actors were included who are involved with activities along the horticultural value chain and who are related to commercial, government, research and extension aspects of the sector. Most interviewees were Kenyan stakeholders; their information was supplemented by interviews with Dutch stakeholders who are involved in the Kenyan horticulture sector. The table in Appendix 4 lists the actors, all of whom were interviewed in May–June 2016. Interviews were semi-structured, using open questions and a checklist (see Appendix 5).

1.2.3 Workshops

During the conception of the project, round-table discussions were held with stakeholders to discuss approaches in the agrifood sectors in Kenya. Further, during the process of evaluating the issues that affect the horticulture sector, a stakeholder workshop was held in July 2016, in Nairobi, to validate the initial findings of the quick scan, share experiences and identify areas of action. Stakeholders invited included those who were interviewed, supplemented with other key stakeholders from the horticulture sector. Insights from both workshops are incorporated in this report which is available from the 3R website.

2 The horticulture sector in Kenya

2.1 Focus of this scan

The horticulture sector in Kenya comprises a large variety of crops: the aim of the quick scan would not have been achieved if all subsectors had been included. The focus of this scan is on vegetables and seed potatoes. For the FNS agenda, vegetables are an important subsector. African leafy vegetables (ALVs) have been given specific attention; these have seen a major increase in demand in the last few years and are especially popular with the urban consumer (Cernansky, 2015). The EKN in Nairobi has focused on seed potatoes, which provide an opportunity for trade. As such, the potato sector, and in particular the seed-potato sector, has been included in this scan. The flower sector has been excluded from the scan based on advice from EKN. The fruit subsector is considered to be a key and growing subsector but has not been given adequate attention in this phase. It might, however, be included in the subsequent steps in the project.

With regards to markets, three can be distinguished: the domestic market, the regional export market and the international export market. The main focus of this scan is the domestic market, since it is there that the opportunities for growth, for aid to trade between Kenya and the Netherlands, are deemed the largest.

The section below provides a broad overview of the production, markets and trends in the horticulture sector.

2.2 Horticultural production

Horticulture is the second largest agricultural subsector in Kenya

The horticulture subsector, which is the second largest foreign exchange earner within the agriculture sector after tea, contributes 36% to agriculture's share of GDP and continues to grow (KNBS, 2016). In 2014, the total domestic value of the horticulture sector amounted to 196 billion Kenyan shillings (KES) (HCD, 2015). The contributions of the main subsectors are as follows: exotic vegetables, Asian vegetables and ALVs (36% of the domestic value); fruit (30%); flowers (26%); nuts (5%); and medicinal and aromatic plants (MAPs) (2%) (Figure 2.1; HCD, 2015).

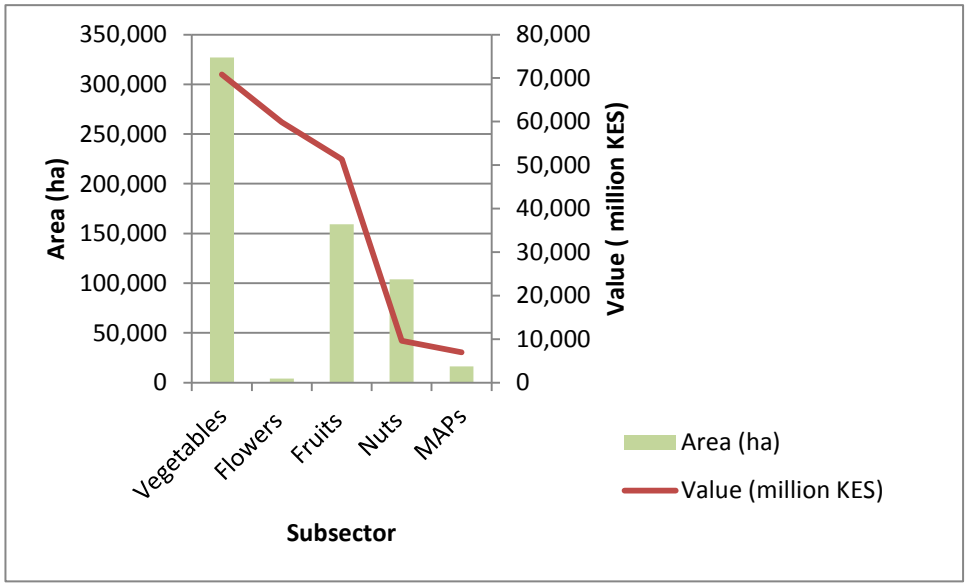

Figure 2.1 *Area under production and value of the horticulture subsectors (Source: HCD, 2015)*

Horticulture export earnings are well documented, as are the existing issues and opportunities in the export market (HCD, 2015; RSA, 2015a). The issues that shape the performance of the domestic and regional markets, on the other hand, have been less researched. This quick scan addresses the information gap about the domestic sector.

Vegetables

Potatoes (43% of the total value), tomatoes (19%) and cabbages (8%) are the leading subsectors in production and value (Figure 2.2). French beans also have good export potential, mainly to the European market, which provides high prices on relatively small volumes.

In recent years, ALVs have gained popularity in both rural and urban settings (Cernansky, 2015). There is a rich diversity of ALVs, but cowpeas, African nightshade, spider plant and leaf amaranth account for 86% of the horticultural volume produced (HCD, 2015). These vegetables are produced mainly in Western Kenya and Nyanza. Of the vegetables for export, 80% are produced around the Central Kenya region (ADF, 2007). Cabbage- and potato-growing areas have a strong presence in the region as well. On the contrary, vegetables retailed in the domestic market come from a variety of counties in Kenya.

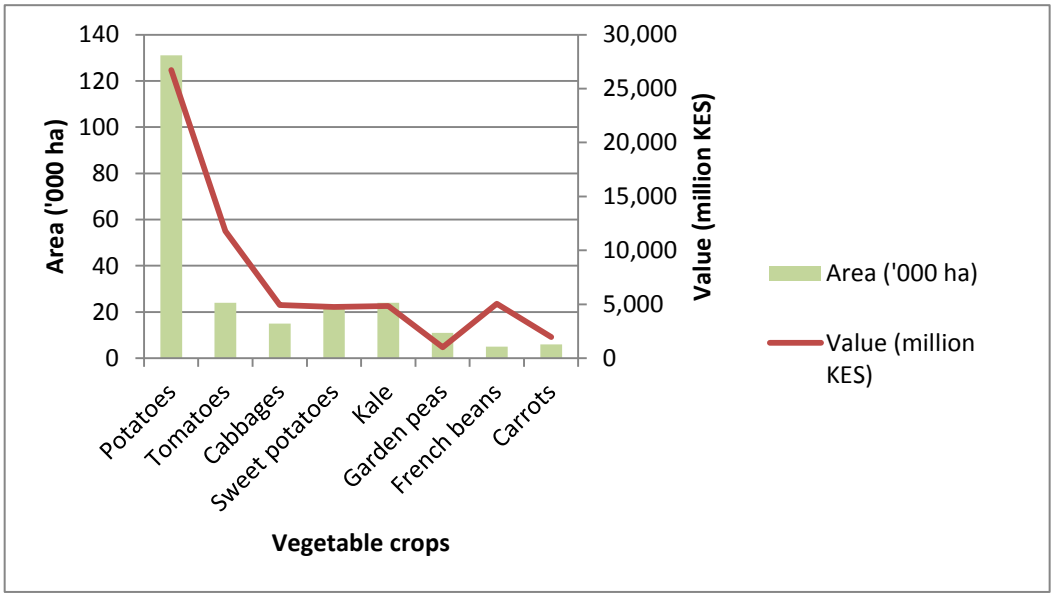

Figure 2.2 *Area under production and value of selected vegetables (Source: HCD, 2015)*

Fruit

In 2014, the fruit subsector contributed KES 51.4 billion, accounting for 30% of the domestic value of horticultural produce. Figure 2.3 shows the major fruits grown in Kenya by value and their respective area under cultivation. Avocados and mangoes are the major export fruits.

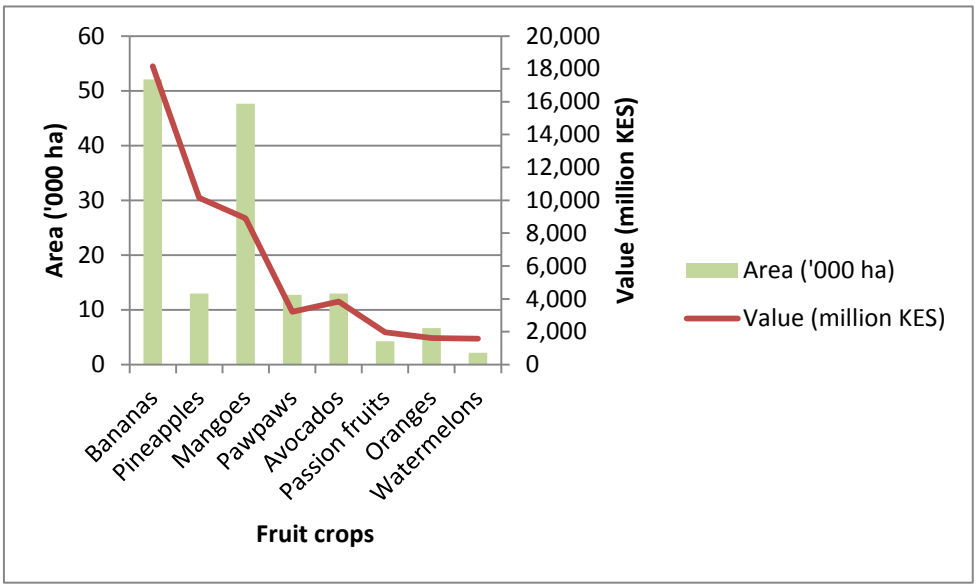

Figure 2.3 *Area under production and value of fruits in 2014 (Source: HCD, 2015)*

Farms are predominantly small and medium-sized

Over 80% of farms involved in horticulture are small and medium-sized enterprises (SMEs) (Soft Kenya, 2011). These SME farmers target all market segments, either as individuals, in cooperatives or as outgrowers for large export farmers. Large farms predominantly focus on export markets for vegetables, peas, beans, avocados, Asian vegetables, medicinal and aromatic plants, nuts and flowers. Large farms are characterized by high input and high investment compared to SME farmers, who often lack capital and knowledge (Muriithi & Matz, 2015).

2.3 Markets

The horticultural industry has been one of the most dynamic agriculture subsectors of Kenya's economy over the last 20 years. The subsector's organic growth, which differs from the evolution of other more government-supported subsectors such as coffee, tea and pyrethrum, has contributed to the economic development and entrepreneurial spirit of many Kenyans. Over 4.5 million people across Kenya have jobs in the horticulture sector (i.e. production, processing, and marketing). Another 3.5 million people are believed to benefit indirectly through trade and other associated activities (KDLC, 2010).

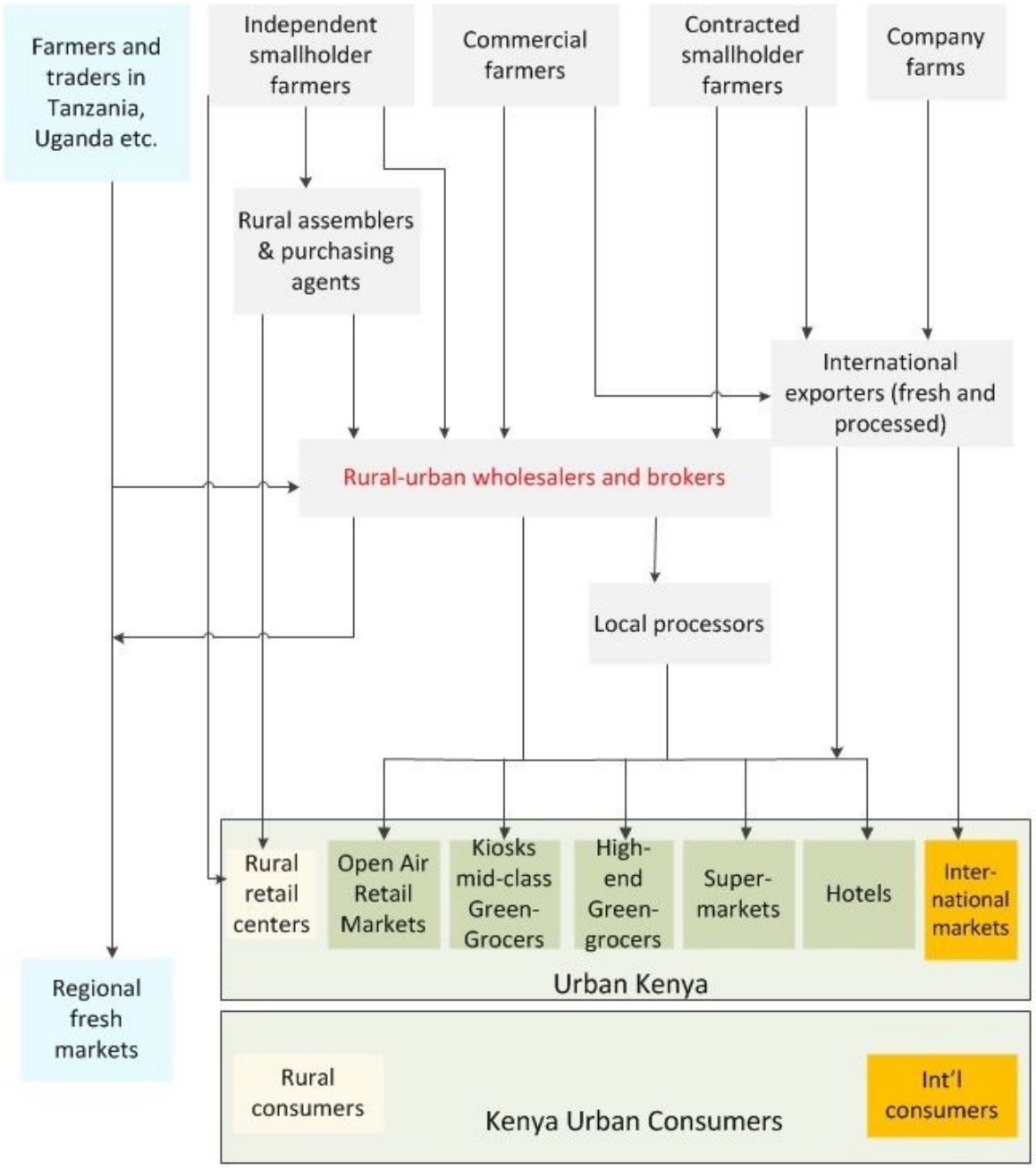

Figure 2.4 *Domestic, regional and international marketing channels for fresh horticultural produce in Kenya and the actors involved (Source: Tschirley et al., 2004)*

2.3.1 International markets

The European market purchases more than 40% of Kenya's horticulture exports (CBI, 2015a, 2015b. The dominant vegetables for the export market are beans, peas, medicinal and aromatic plants, Asian vegetables, and nuts; even so, there is still room for expansion for certain high-value niche vegetables (Lubinga et al., 2014). Many other African countries have entered the export market for vegetables and fruit, causing the competitiveness of the sector to increase dramatically (RSA, 2015a). The international export market remains dominated by cut flowers (KES 62.9 billion), followed by vegetables (KES 20.9 billion) and fruit KES 6.6 billion) (KNBS, 2016).

Most of the export subsectors already have a robust supply chain, reliable governance and a resilient innovation system. However, there are some issues that will need to be addressed to guarantee continuity of the market. One of these is traceability, which is increasingly important for the export market. This is affected by the lack of robust regulations in the domestic market, which in turn requires that institutions support good governance

2.3.2 Regional export markets

Regional export is in a nascent stage, and few data about it are available; export to Tanzania, Uganda and South Sudan present good opportunities (NAEB–PSF–AgriProFocus, 2016). This market segment is dominated by wholesalers who buy up vegetables all through the country (RSA, 2015a). The regional market involves both export from Kenya as well as import of crops such as potatoes, onions, passion fruits, pineapples, oranges, tomatoes, carrots or cabbages (Lenné & Ward, 2010). A few examples are:

- Potatoes and onions are grown in Kenya and partly exported to Tanzania (through Arusha, Tanzania)
- Passion fruits that are grown in Kenya are (partly) exported to Uganda. Likewise, some Ugandan pineapples are exported to Kenya (through Malaba)
- Some of the oranges and tomatoes grown in Tanzania are exported to Kenya (mainly to Mombasa and its environs, across Lunga Lunga); coconut from Kenya is exported to Tanzania
- Carrots and cabbages from Nakuru are exported to Uganda.

The lack of harmonized custom and border control efforts in the East-African Community is a major factor hampering the development of this opportunity. It is only when price differentials warrant payment of the heavy tariffs that traders are able to move. The liberalization that has taken place seems to favour import of low-value commodities into Kenya and therefore helps improve the balance of trade (RSA, 2015a). Also, Kenya continues to export manufactured goods to its neighbouring countries. In this sense, Kenya is seen as a leader in technology and innovations in its region, which increases the opportunities of moving from aid to trade.

Based on data analysis, it is clear that there are major opportunities for regional trade in the future. However, in the context of the 3R assessment, this market is too volatile and fragmented to include in this quick scan and further project activities.

2.3.3 Domestic markets

Rural–urban wholesalers and brokers are at the heart of a complex market system whereby farmers' produce is retailed through various channels: open-air retail markets; kiosks; supermarkets, including high-end greengrocers; and hotels. Vegetables make up 85% of the volume and 79% of the value of fresh produce entering the city of Nairobi (Tschirley & Ayieko, 2008). To meet the demand, produce has to be transported from over 45 districts and occasionally from Uganda and Tanzania. Vegetable production is geographically concentrated, with 44% of volume coming from five counties: Bungoma, Meru, Muranga'a, Nyandarua and Nakuru (HCD, 2015).

Open-air retail markets and their extensions, such as kiosks, account for more than 90% of the fresh fruit and vegetable market share in Nairobi. Much of the produce sold by wholesalers ends up in these

marketplaces, where women own nearly three-quarters of the businesses. High-end greengrocers (e.g. Zucchini greengrocers) and supermarkets (e.g. Uchumi, Nakumat) are increasing their market share. These types of supermarkets boast of having fresh vegetables on display. However, it has been observed that this trend is now percolating to smaller supermarkets such as Clean Shelf. Data sets to corroborate this trend remain scarce, however. Supermarkets have expanded their horticulture assortment substantially over the last few years (Neven et al., 2009; Riungu, 2011); even so, tomatoes and onions remain the vegetables that are most consumed (Figure 2.5; Ayieko et al., 2005; RSA, 2015b). Hotels and the upcoming home delivery schemes offer an alternative market for vegetables.

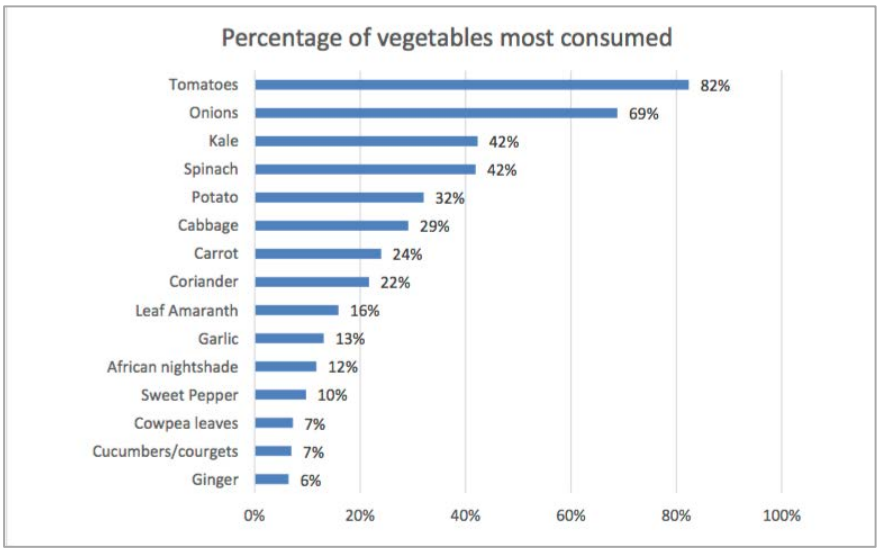

Figure 2.5 *Percentage of vegetables most consumed (Source: RSA, 2015a)*

The domestic market offers a good opportunity for the horticulture sector to transition from aid to trade, hence it has been selected as the focus of this quick scan. Important drivers that can be distinguished in the domestic market are:

- A growing middle class with a higher disposable income leads to an increase in vegetable consumption. Currently, the average expenditure on fresh produce is 21% of household income (Kamau et al., 2011), and consumer preference has shifted to ALVs (Chelang'a et al., 2013);
- Growing demand for local cuisine, requiring diversity in ingredients (e.g. growing consumption of salads and ALVs (Muhanji et al., 2011; Cernansky, 2015); growth in café culture and interest in experimenting with new ingredients;
- Falling dependence on dried cereals and increasing demand for fresh and faster to cook ingredients;
- Opportunities for processed vegetables (canned and dehydrated);
- Rising position of potatoes and rice as food security crops, replacing maize;
- Increasing knowledge in the food industry (hotels) on the characteristics and health aspects of different ingredients;
- A more health-conscious urban population;
- Growing horizontal demand for foods not earlier demanded as rural and urban cities grow (e.g. the cities of Garissa and Isiolo are growing fast and are becoming more important as terminal markets for fresh fruit and vegetables).

3 Robust supply chains

Robustness of the supply chain refers to systematic interactions between agents that enable them to adjust to uncertainties within the boundaries of their initial configuration and in the context of transition from aid to trade. This description of the robustness of the supply chain is based on the perception of stakeholders (van Rijn et al., 2016).

The vegetable supply chain is characterized by multiple stakeholders performing multiple and different functions. The different functions are intertwined (see Figure 3.1), resulting in challenges because of the sector's complexity and the embedded power dynamics. This complexity notwithstanding, market development of the domestic market is feasible through a market-, not a production-oriented, approach (USAID–KAVES, 2013).

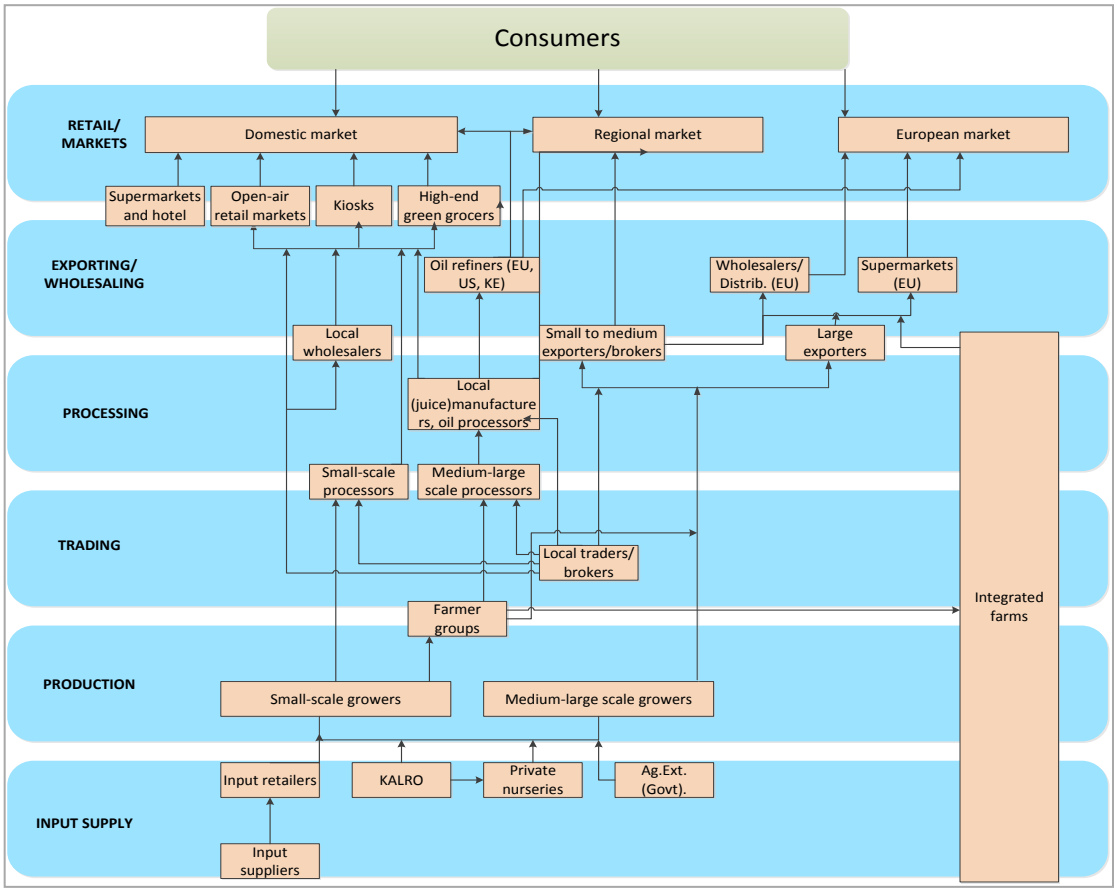

Figure 3.1 *Overview of the horticulture supply chain in Kenya: fresh fruits, vegetables and potatoes (Adapted from USAID–KAVES, 2013)*

A SWOT analysis has been used to assess the robustness of the vegetable and seed-potato supply chains, as these are where most opportunities for movement from aid to trade have been identified. This table provides an overview of the content of the chapter, which expands on the issues identified in the SWOT analysis (featured by category) and which are instrumental in understanding the robustness of the sector. The information presented is based on the interviews and the literature.

Table 3.1 *SWOT analysis of the Kenyan fresh vegetable and seed-potato supply chains*

Strengths	Weaknesses	Opportunities	Threats
Standards and certification in export markets: a diffusion model for domestic markets (3.1.1)	Strong dominance by traders (wholesalers): the inclusivity challenge (3.2.1)	Growing interest in hygienic, safe vegetables (3.3.1)	Climate-related risks: farmers and stakeholders tend to ignore the effects of climate change in the horticulture sector (3.4.1)
Formal market segments are growing (3.1.2)	Weak relations in the supply chain contribute to high price fluctuations and high incidence of food waste (3.2.2)	IPM packages for domestic vegetable farmers (3.3.2)	Tough MRL requirements in the EU market. Farms need continuous improvement and farmers need to be very alert (3.4.2)
There are known conventional practices in terminal markets for meeting year-round demand (3.1.3)	"Women crops" receive less attention than "men crops" (3.2.3)	Value addition through processing (3.3.3)	
A financially sound and organized input supply industry (3.1.4)	Limited knowledge about appropriate production systems coupled with a lack of appropriate extension services (3.2.4)	A new wave of young, enthusiastic and prepared medium-scale farmers with resources to invest are entering the horticulture sector with online businesses (3.3.4)	
Evidence of adoption of production technology among farmers (e.g. greenhouses, biological control agents (3.1.5)			

3.1 STRENGTHS

3.1.1 Standards and certification in export markets: a diffusion model for domestic markets

A highly codified and regulated market (GlobalGAP, Tesco's TNC certification, M&S's Field 2 Fork certification, etc.) operates alongside an unregulated domestic market (Ouma, 2010), which presents an opportunity for good agricultural practices (GAP) from the export market to diffuse to domestic production (Mithöfer et al., 2008; Lenné & Ward, 2010). Kenyan fresh produce destined to EU markets segments (French beans, peas, avocados, Asian vegetables) are increasingly cultivated by farmers who produce for domestic markets as well. Kenya has been an early adopter of GAP through development of KenyaGAP, which has been benchmarked against GlobalGAP. The adopters of standards generally do benefit from improved income and from non-financial benefits of the standards (Asfaw et al., 2010). Technical advisory services available to farmers for export production are used for production towards domestic markets, because often these services target whole-farm management practices. This interplay is a strength in the vegetable subsector as the knowledge is present; however, its connection to emerging opportunities locally is lacking. The duplication of international practices for the domestic market has been minimal (Schipmann & Qaim, 2010).

3.1.2 Formal market segments are growing

Vegetables for the domestic market are mainly traded through informal settings. However, the supermarket segment is growing fast, which is pulling the formalization of traders serving these supermarkets and mini-marts. This presents vertical growth of business enterprises that form a basis on which future sector developments can be anchored (Rao et al., 2011a).

3.1.3 There are known conventional practices in terminal markets for meeting year-round demand

The domestic market is structured to benefit from year-round production, as different regions produce in different seasons. Traders in Wakulima Market (Nairobi) have mastered an informal engagement process with on-farm aggregators, who move from region to region collecting and supplying produce to meet demand year-round. When the market demand cannot be met by regions to which they are connected, they source from the wider East Africa region. Examples are that oranges and onion can be brought from Tanzania to Kenya, and seed potato (particularly the Sherekea variety) and ware potatoes will go from Kenya to Tanzania. The system, though seemingly rudimentary, is grounded on solid trends that have been mastered by all actors over the years. In this environment, large-scale irrigated production of domestic vegetables by large exporting farms, for example, fails to recognize the underpinning characteristics of the sourcing trends, so large-scale producers are unable to predict and take advantage of market conditions. These sourcing conventions are a strength that the sector can build on by making them more visible to those seeking opportunities.

3.1.4 A financially sound and well-organized input supply industry

The vegetable seed and agrochemicals sector comprises large multinational and national firms that are financially resourced and diversified. The input supply industry is linked to research (e.g. KALRO at national level) as well as a countrywide network of agro-dealers. This network is an indicator of strong demand among farmers. The vegetable seed sector has continued to grow, with new entrants being attracted to the segment.

On the side of agrochemicals, open days by agro-suppliers and their dealers (Figure 3.2) have been noted as a common avenue through which increased awareness is created among farmers about inputs.

Figure 3.2 *Syngenta representative talking to farmers about crop protection products in Limuru Photo credit: Elizabeth Kyengo*

The strong demand in the sector is attracting product companies that do not exercise the right kind of stewardship, eroding gains made in increasing availability of quality inputs among vegetable farmers (i.e. these companies may supply counterfeit seeds and pesticides). The fact that vegetable crop cycles are short, and often farmers plant three times a year, means that seed and agrochemicals have a lucrative short turnaround time for agro-dealers.

While the vegetable seed supply is highly organized, the case of seed potato is very different. Seed potatoes are bulky, presenting a major challenge in the distribution channel, hence discouraging private sector investment. It is therefore a common practice among potato farmers to replant their farm stock. It is estimated that only 1–2% of potato seed in the market is certified seed. Poor quality seed potatoes is a main challenge in the development of a strong potato supply chain in Kenya (Janssens et al., 2013; Wang'ombe & van Dijk, 2013). In the past decade, initiatives have focused on increasing access to clean potato seed.

One such initiative is the 3G potato project (2009–2011) from the International Potato Centre (CIP).

3G seed revolution project
The three-generation (3G) seed strategy aimed to produce large numbers of mini-tubers through very rapid multiplication to yield sufficient high quality seed in three field generations (instead of seven). By-products of this strategy are reduced production costs and less build-up of damaging diseases in the field. For more information, consult: http://cipotato.org/research/integrated-crop-and-systems-research/3g-seed-revolution/

The project made it possible for the private sector to get into seed production in collaboration with relevant Government of Kenya agencies. Consequently, there is now, even after the end of the project, more capacity to produce seed potato by using private sector investment to source clean, disease-resistant seed potato. Such private sector included Kisima Farm in Timau; in our interviews, their representatives attributed their interest in potato seed to the 3G project. After the project, farmers who could access multiplication centres could still access quality seed. For example, an impact study released by CIP, Kisima Farm and other partners revealed that farmers in Meru region had benefited from access to clean seed and managed to double or triple their production (Rozemeijer, 2016).

Another initiative is the Seed potato sector development project, which aims to increase access to quality seed by ensuring local multiplication certification and commercialization of Dutch varieties within the shortest time possible. Through immediate availability of seed potato, Kenya can fast track its access to quality seeds while allowing smallholders to replant the seed 3–4 times. This not only reduces cost of access to quality seed but also improves on yield per unit area.

Seed potato sector development project
The aim of the project is to import Dutch seed potatoes annually and multiply this seed in Kenya with large-scale professional seed growers with the idea of making the seed available for local multiplication by smallholders. The Ministry of Agriculture is a key partner in this project, alongside KEPHIS. For more information, consult: http://www.wageningenur.nl/nl/show/Seed-Potato-Development-in-Kenya.htm

However, there is general opinion that these new varieties are far more expensive than local seed potatoes. Another issue is difference of opinion between the potato experts about which approach is best. CIP emphasizes the multiplication of mini-tubers rather than local multiplication of new varieties. For many years, often informal, cross-border trade of seed potatoes has existed between Kenya and its neighbours. Some of the varieties developed and released in one country differ from varieties released in a neighbouring country.

3.1.5 Evidence of adoption of production technology among farmers

There is increased demand from farmers for technology to improve their production. This is driven by the need to produce on small landholdings as well as by government and other agencies directly promoting use of technologies. Covered agriculture, for example, has been adopted by many farmers growing tomatoes and chillies for the domestic market. Farmers are also using organic methods to manage pests (e.g. pheromone traps in mangoes). Other technologies, such as biogas, are contributing towards improved production through use of bioslurry. Solar water pumps are now commonly sold and promoted to farmers, with many microfinance organizations offering loans for these kinds of products. For example, GrowPact is a group promoting horticultural production through better technology.

GrowPact is part of Viscon Group in the Netherlands. GrowPact is to respond to the increased demand by farmers in developing countries for simple and smart machinery and for supporting knowledge. The model offers turnkey solutions in the production of horticultural products. GrowPact provides people/organizations with a toolbox, supplied in a shipping container, with which they can start, or improve, their horticulture business. The toolbox contains all the required equipment a farmer needs to produce fruit and vegetables. To guarantee success, GrowPact supports farmers through their Academy, which provides the knowledge needed to help them start up and sustain the project.

The first GrowPact project will be in Kitale, where there will be a demonstration on how the Land Life COCOON can be used for sustainable production of fruits. The COCOON is a planting structure designed to support a seedling through its critical first year. The structure provides water and shelter while stimulating the seedling to produce a healthy and deep root structure by tapping into the subsurface water supply within its first year. This way, the COCOON produces independent, strong trees that are not reliant on external irrigation and can survive harsh conditions.

The fact that farmers are ready to invest and experiment with technology is an indicator of robustness in the sector; it shows that upfront investments get returns in local markets. However, there are still problems with the appropriateness of some technologies and lack of knowledge about how to use them, for example, in protected horticulture. According to a horticulture expert at Latia Resource Center, farmers are increasingly abandoning greenhouse technology because the management and support promised by the greenhouse providers has been poor, or even lacking (Wachira et al., 2014). Several challenges leading to abandonment of the greenhouse technology were identified by the Green Farming Solution project:

1. High upfront investment costs meant that farmer expectations for short term returns were equally high. In protected horticulture, profits tend to grow gradually. Overall, only after 4 or 5 years do farmers start earning significant net profits. Therefore, expectations on short term returns are often not realised;
2. Gap in information and production support system was at times filled in by opportunistic and uninformed providers. As a result, farmers become doubtful on how support services effectively improve their productive systems;
3. Greenhouse construction and structures were not appropriately matched with the local ecology, leading to high infestation of pests and diseases. Fusarium wilt is a significant disease, as witnessed on Lachuta farm in Nyeri. Pest and disease incidence can decrease greenhouse productivity significantly;
4. Consumer perception that greenhouse products, e.g. tomato, are unsafe, coupled with evidence of clear violations in how crop protection products are used in greenhouse production. The concern on production techniques and products used has attracted a bad press at the consumers end and is adding pressure to the farming system and its returns.

Thorough partnership with local businesses, Growing Solutions Kenya[2] are experimenting with advanced tunnels (referred to as greenhouses in Kenya) for SME vegetable producers (Figure 3.3).

Figure 3.3 *Tunnels at Latia Resource Center (as part of Green Farming Solutions project)*

Latia Resource Center Ltd. and the "Telephone Farmers" project
Latia Resource Center is an enterprise that aims to enhance capacity building in agricultural production. The Center provides training and business support services to farmers, pastoralists and agribusinesses in Africa. As part of the activities carried out, the Center works on the Unlocking Agriculture Potential through Medium-Sized Farms in Kenya program. This so-called "telephone farmers" project which is tailored for "telephone farmers", part-time or absentee farm owners with a will to invest commercially but who rely on farm managers to run their farms.
The overall objective is to improve profitability and sustainability of the farms. The program has two components: practical training and business support services. Upon course completion, farmers will have acquired skills and knowledge they can use for solving some of the problems encountered with greenhouse technology describe earlier. For more information, see http://www.latiaresourcecenter.org/?p=1744.

3.2 WEAKNESSES

3.2.1 Strong dominance by traders (wholesalers): the inclusivity challenge

A strong supply chain benefits from participation of different stakeholders. In an ideal supply chain traders are important actors and perform different tasks. There are two types of important traders when it comes to understanding the power relations in the supply chain: wholesalers from the aggregation side and wholesalers in terminal markets supplying the consumers and retailers. These traders together maximize their returns through information-sharing as well as through gatekeeping against new entrants (interview with trader at Wakulima Market). As a result, they have a substantial amount of market power, which affects the setting of commodity prices as well as sourcing trends. Price-setting collusion among wholesalers is common (Matui, 2014).

The power of traders in this supply chain is an important indicator of weakness, as traders with such power would usually be expected to grow vertically. However, as they remain unformalized in this case, they fail to benefit from the vertical growth that would characterize their entry into the formal economy. In addition, interventions in this segment are designed to diminish the power of traders rather than using their power and position to formalize their trade and benefit from vertical growth. Business enterprises that are starting to operate formally often institute procedures to deal with sustainability issues as a way of managing growth. The way traders and wholesalers currently use power stifles growth, not only of their own enterprises but also of those that feed into their businesses. Interventions that use traders' intrinsic motivations to try encourage them to function better have not gained traction in the domestic sector. This approach has been used with some level

[2] Growing Solutions Kenya is a s a program that aims at improving local entrepreneurship in Kenya on the theme of food security and food safety and is executed by a consortium of Dutch private partners in close co-operation with Latia Resource Center.

of success in the export segment, although the effects of the export businesses on the local community are not always positive (Ulrich, 2014).

3.2.2 Weak relations in supply chains contributing to high price fluctuations and high incidence of food waste

Weak relations in supply chains are contributing both to high price fluctuations and high incidence of food waste (Gustavsson et al., 2011; Hodges et al., 2011; FAO, 2014). This is compounded by the fact that about 80% of the fresh produce, particularly vegetables, come the rain-fed region of central Kenya. The level of production in other parts of the country is too low to meet demand. When the central parts of the country are hit by drought, the prices of vegetables rise sharply due to severe supply shortages. Highly productive land is also highly populated, and increasing land subdivision is limiting the amount of land available for horticultural production. As such, horticultural firms are switching to dry lands (arid and semi-arid lands) and using efficient water utilization technologies for irrigation.

Reducing waste through new potato varieties
One of the Dutch potato varieties that has reached the Kenyan market is the variety Jelly, marketed by Syngenta (Eurogrow). This variety is particularly good for processing. While the local processing potatoes result in 30% waste through removal of eyes and other irregularities, the Jelly variety has less than 10% waste, which provides both an economic as well as an environmental gain.

A number of factors also contribute to high incidence of food waste. Farmers are often discouraged from increasing produce quality through better post-harvest practices such as grading. Supply and demand do not match, and in the case of overproduction, produce is left to spoil. Poor road conditions and packaging, as well as a lack of cooling facilities, contribute to damage of produce during transport. As a result, there is a high level of food spoilage during transport to the market in Nairobi. Fresh markets tend to accept all qualities and quantities, which contributes greatly to farmers' discouragement for a quaity product. It is also important to note that steps taken towards structuring the market, such as standardization, could substantially contribute to food waste arising from changing cosmetic specifications. Restrictions that have nothing to do with food safety or quality, but are about shape and appeal, increase the volume of reject produce, mainly destined for the export market (Feedback Global, 2015).

This analysis attributes the price fluctuations, food waste and overdependence on the central Kenya region to weak relations in the supply chain. Where business relations exist, information flow is increased and alliances are formed; these are the characteristics of a maturing system. If information does not flow well between actors in the supply chain, farmers may decide what to grow in a given season going by prevailing prices. This can lead to oversupply at harvest time of a crop that had a high price during the planting season. In this situation of low information flows, relationship building is not a key component of trading practice and horizontal alliances do not grow.

Often there is a mismatch of available storage technology and farmers' needs; this is true for all perishable vegetables, but also for potato (Kaguongo et al., 2014). According to our interview with representatives from the Dutch company Omnivent:

> Technology for storing seed potato is already available. Omnivent offer technology tailored to small-scale farmers. Some may think that the investment is high, but the gains justify this and make it a sound and economically viable investment. Proper storage mitigates the quality decline between harvests and curbs food losses. Besides, it helps gain control in the horticulture value chain and facilities the entry into international markets.

The major challenge now seems to be the lack of awareness of farmers around storage solutions and how these can make a difference to the profitability of the business.

OMNIVENT
Omnivent specializes in crop storage solutions with tailored storage management systems. The company offers scalable solutions to a wide range of farmers and multinationals and for various crops. Omnivent's technical solutions are grounded in science and public research, as well as international experience acquired throughout the years. Also, it takes into account the local climatic and economic factors to deliver a tailored solution. Omnivent's basic principles are sustainability, reliability and energy efficiency.

3.2.3 "Women crops" receive less attention than "men crops"

The majority of horticultural farmers in Kenya are women (Dolan, 2001), most of whom lack options to own the land they farm (Dolan, 2001). Over the last ten years, laws and regulations have been amended to better include women. For instance, in the new constitution a daughter has a right to inherit parents' land. While the changes appear in law, issues about ownership of family land are cultural and change is occurring gradually. Awareness of gender issues and empowerment of women not only to own land but also to learn how to contribute to the labour market and compete for opportunities will develop both the horticulture sector and the nation.

Women often cultivate vegetables on their plots for both domestic consumption and local markets, but lack the resources and means to engage in commercial agriculture. While women crops such as leafy vegetables (Irungu et al., 2008; Gotor & Irungu, 2010) and ALVs have strong demand, supply is limited to the constraining conditions under which women cultivate them. Limited access to land, limited access to finance and the high demand on women's labour and time from productive and reproductive activities act as barriers to the growth of women enterprises (Mwaura et al., 2014). Wholesalers of women crops are also women who have lower capital to drive growth and are operating in markets that practise structural discrimination against this category of traders.

3.2.4 Limited knowledge about appropriate production systems coupled with a lack of appropriate extension services

Extension services are still provided by government through District Agriculture Extension Officers, now under the jurisdiction of the counties. These extension services are based on the model where government was involved in agricultural supply chains through parastatal and other interventions. There is a gap between the needs of the sector and what the extension services can deliver for commercial and high-tech horticulture farmers (Muyanga & Jayne, 2006). The Ministry of Agriculture recognizes that knowledge gaps exist within its extension system to support the sector.

Private sector extension services are expected to grow alongside the robust export-oriented horticulture sector. A number of leading companies, such as Muddy Boots, employ their own technical assistants and provide them with training. However, no knowledge system exists for the domestic sector.

3.3 OPPORTUNITIES

3.3.1 Growing interest in hygienic, safe vegetables

Vegetable price has been a dominant deciding factor in consumers' purchasing decisions, as vegetables are a significant component of the urban diet and the market is highly price sensitive. However, media coverage and health awareness are increasing the flexibility of consumers in how they choose their food. The growing middle class is more selective about where they buy their food (Lagerkvist et al., 2013a), opting to purchase vegetables that they consider to be fresh. The growth of the fresh vegetable category, even in small mini-marts and home deliveries, is a demonstration of how consumers are expressing demand. These outlets capitalize on freshness to attract consumers. The space allocated to fresh vegetables in supermarkets and mini-marts is also growing, which is another indicator of demand. However, consumers sometimes believe, erroneously, that fresh is synonymous with safe (Ngigi et al., 2010; Macharia et al., 2013). The level of consumer knowledge about food contaminants is still low (Lagerkvist et al., 2013b), and policy interventions are still weak. It can be argued that the complacency in public policy is also driven by the high levels of investment required for fresh food supply chains to reach acceptable standards. These investments will need to take place at all points in the chain. For example, Figure 3.4 shows a vegetable washing site where use of contaminated water can lead to microbial contamination of the fresh produce.

There is also a problem for the government in communicating concerns about food safety, because it raises the question of how to communicate what people should be eating instead. Policy is being brought up to date, such as the recent review of Horticulture Code of Practice KS 1758, but it seems to be moving only slowly. Recent trends that were validated through interviews suggest that public interest is pushing the demand for traceability, quality and safety in fresh vegetable produce. The Kenyan media, encouraged by the state to focus more on local content, has tried to inform the public more frequently about specific agricultural issues. Media often have a programme that focuses on agriculture – ranging from entrepreneurship to food safety.

Figure 3.4 Washing site for carrots (Mau Narok)

3.3.2 Integrated pest management packages for domestic horticultural farmers

Integrated pest management (IPM) technology has been in use in the floriculture sector and in large-scale horticulture for several years (Cook et al., 2007). Recently, several suppliers of IPM solutions, such as Real IPM and Dudutech, have designed packages suitable for smallholders.

It takes time to build success, especially in a production system that is not knowledge-driven. The fact that reputable companies such as Dudutech and Real IPM are investing in these packages shows that there is a market worth investment. Real IPM does not expect the technologies to drive sales for them immediately, but they are looking to the future business case, when more knowledge exists about IPM. An example is the successful fruit fly trap that mango farmers in Embu and other mango-growing areas have used, where farmers have learned how to use the traps appropriately. One of the main challenges mentioned by Real IPM is the long time it takes to register a new product (i.e. the active

ingredient). They felt that one cause of this problem is the outdated methods used by regulators and lack of labour resources at PCPB.

Figure 3.5 *On the left, a trap for mass trapping of flying insects. On the right, the cover of the Real IPM crop manual for mangoes (Source: Real IPM, 2016)*

At the time of the interview, Real IPM was in the process of publishing booklets about IPM (Figure 3.5) for smallholders for mango, tomato, kale, melon and capsicum. Real IPM has a dedicated team of field officers who provide support to farmers. By reducing the use of pesticides, which often kill non-target species as well as intended pests and diseases, IPM technology is one of the promising technologies that seek to conserve biodiversity. Real IPM technology is one of the SNV's HortIMPACT business cases. Through demonstration gardens and farmer visits, Real IPM can showcase the IPM technology.

HortIMPACT project, SNV
Together with entrepreneurial SME farms, and Kenyan and Dutch Agri-businesses, HortIMPACT promotes innovative solutions and technologies from the private sector that improve production and help build inclusive market growth. For more information, see: http://www.snv.org/project/hortimpact.

Dutch company Koppert also provides both technical solutions and support. In their view, IPM solutions have a long way to go in Kenya, especially in open-field farming systems. In an interview, the business development manager pointed to the lack of awareness about crop health and protection and their benefits as the single most important challenge faced by Koppert in Kenya.

Koppert
Koppert Biological Systems provides integrated biological solutions to improve crop health, resilience and production. Netherlands-based, Koppert has been active in Kenya for some years, helping the flower sector during the first stages of its development with solutions to fight pest and diseases. Now, Koppert has approximately 100 large-scale farmers operating in the Kenyan flower sector. The fruit and vegetable industry is also just starting to use, and demand, IPM strategies. As a result, the customer base in the sector is growing rapidly. More than 250 small-scale farmers in the fruit and vegetables sector have used a Koppert service to date.

3.3.3 Value addition through processing

A growing trend towards processing has been observed; this is driven by the need to prolong shelf life (Lenné & Ward, 2010) as well as by increased demand for convenience foods, such as pre-cut fruits (Figure 3.6) and vegetables. Food is a cultural artefact; with increased urbanization, people like to bring their favourite vegetables as they move from their rural homes to towns and cities. Dried vegetables can be found in the shelves of ethical shops, such as Healthy U, and a few West African shops stock dried cassava leaves. Grocery stores such as Chandarana can provide year-round supply of most seasonal vegetables either fresh or processed. As vegetable drying has a number of issues, including nutritive loss and problems with preservation, fermentation and other forms of vegetable processing need to be popularized. Concerns about food safety need to be addressed (Sawe et al., 2014).

Figure 3.6 *Featured products on Sweetunda.com: from left to right, mango roll, mixed dried fruits, dried pineapple and dried mango*

The potential growth of the potato-processing sector – as new processing varieties are introduced – could increase the market size from the current 2% share of the domestic market to 10% and beyond. Most potato processing is geared towards production of crisps and potato fries. There is a general consensus (Janssens et al., 2013) that with increased urbanization and a rising middle class, consumption of processed potato is likely to increase, but some question whether consumers will pay for quality, as highlighted in the following interview:

- Farmers rely on a very old variety called Dutch Robbin, which is the variety most grown in Bomet, and where farmers are just starting to produce Dutch Robbin seed. Some of the crisping companies have come and said, “Look, we need clean certified seed which will guarantee an increase in yield to farmers in Bomet who are producing it”. A viable processing endeavour requires a steady and reliable procurement model in which seed tubers become an instrumental part of the business. To give a response to the processing demands, farmers will need to be provided with clean seed (Dutch Robbin or other varieties) each year.

3.3.4 A new wave of young, entrepreneurial and prepared medium-scale farmers

Agriculture is attracting the knowledge class. While most traditional growers are farmers because they lack an alternative, a new farmer is emerging in Kenya: young, well educated, resourced and innovative. These farmers are driving demand for covered horticulture, irrigation and hybrid and exotic varieties. They are using IT as a tool for farming. This commercial attitude towards farming, for export as well as for the domestic market, has a positive effect on household income and assets (Muriithi & Matz, 2015).

3.4 THREATS

3.4.1 Climate-related risks: farmers and stakeholders tend to ignore the effects of climate change in the horticulture sector

Kenya is not adequately preparing itself for the reality that is climate change. People are accustomed to rain-fed agricultural cycles, which include periods of drought during the year. However, the Government of Kenya and Kenyan people have not recognized the need to adapt to climate-smart agriculture. For, example, water is a resource that is becoming scarce with time, and regions such as Mount Kenya have been experiencing rationing of irrigation water to contain tensions with pastoralist communities downstream. These scenarios are becoming more frequent.

The concept of drought-proofing agriculture is only now emerging, and a few companies are investing in this area. Unfortunately, there is a wait-and-see attitude towards addressing climate change; people still believe there is always the chance that the rains will be back.

3.4.2 Tough maximum residue level requirements in the EU market; farms need continuous improvement and farmers need to be very alert

During 2015, the Kenyan export sector saw a surge of EU interceptions of peas, beans and mangetout that exceeded the maximum residue levels (MRLs). The European Food Safety Commission reported the interception of 41 consignments of contaminated fresh produce sourced from Kenya in the first four months of 2015. This was almost a 10% increase compared to the same period in 2014; this trend puts Kenya's market share in the EU at risk (Otieno, 2015).

Kenyan authorities reacted quickly to the looming threat of being locked out of the market. The Kenya Plant Health Inspectorate Service (KEPHIS), the Fresh Produce Exporters Association of Kenya (FPEAK) and the Horticultural Crops Directorate (HCD) have since stated that the industry is intensifying efforts to ensure export farmers comply with the needs of the high-end European market.

As a side effect of stringent MRL requirements small-scale farmers tend to adapt better pesticide practices (Okello & Okello, 2010). However, pesticide use during production is high, for example, in peri-urban production of kale (Lagerkvist et al., 2012), and vegetables for the domestic market are rarely checked for MRLs. This raises food safety concerns for domestic consumers.

4 Reliable institutional governance

The legislative and regulatory framework of importance for the horticulture sector consists of various policies However, it is important to note that some of these policies are yet to be gazetted, although they are – by and large – being used for reference by the industry. The major policies for the horticulture sector are the *National Food and Nutrition Security Policy 2011* (RoK, 2011); the *National Horticultural Policy 2012 (*RoK, 2012*)*, which emphasizes development of the domestic market with regard to production, food safety and post-harvest handling facilities, and the development of physical market infrastructure; the *Agricultural Sector Development Strategy 2010–2020*, which identifies horticulture as an important subsector within the wider agricultural sector; and *Vision 2030* (see Appendix 1). With regards to food safety, many other policies and implementing bodies are relevant; these are summarized in Appendix 2.

The Horticulture Competent Authority Structure (HCAS), which includes members from the Ministry of Agriculture, KEPHIS, HCD (part of the Agriculture and Food Authority [AFA]), KALRO and the Pest Control Products Board (PCPB), and which is represented by the private sector through FPEAK and the Kenya Flower Council (KFC), provides the sector with an institutional network that facilitates the implementation of policy frameworks. These institutions also address cross-cutting issues and have a common mandate, which to some extent overlaps with the existing regulations that promote knowledge sharing, learning, co-innovation and a common purpose.

Table 4.1 *SWOT analysis of the institutional governance of the horticulture sector*

Strengths	Weaknesses	Opportunities	Threats
Enabling environment for foreign direct investment in Kenya with functional legislative instruments and governance structures in place (4.1.1)	Weak product governance mechanisms to support food safety, traceability, respect for contracts in domestic markets (4.2.1)	Strong engagement of research organizations to sharpen investment opportunities and models (4.3.1)	Competition between the central and county governments to regulate the sector (4.4.1)
Strong partnerships and platforms to discuss cross-cutting issues are in place (esp. through the HCAS) (4.1.2)	High business costs due to overlapping central and county government mandates in policy and regulation (4.2.2)	Use of multiple existing platforms to improve institutional governance in the sector (4.3.2)	(New) county regulations limiting the flow of raw materials for processing outside their borders (4.4.2)
Mutual recognition agreements between governments shortening burdensome seed testing and registration regulations (4.1.3)	Government subsidies for fertilizer and other inputs creating market distortion (4.2.3)	Continued interest by development sectors, e.g. Dutch Embassy, counties, to support horticulture in Kenya (4.3.3)	Political environment that disrupts business performance in continued electoral cycles coupled with institutionalized corruption (4.4.3)
Existence of data and statistics guidelines that support businesses in the horticulture sector (4.1.4)	Governance systems are ineffective in meeting competitiveness needs of the fresh produce sector (4.2.4)		Limited quality control on seed potato (4.4.4)

4.1 Strengths

4.1.1 Enabling environment for foreign direct investment (FDI) in Kenya

Kenya operates a market-driven economy with limited state interference in business. The ease of doing business in any country is informed by several factors, among which are ease of registering a business; land laws; the skill level of the workforce; and the presence of infrastructure, including road and energy networks, among others.

USAID (2007) notes the following as the Kenya's major competitive advantages:

- A strong and well-organized private sector;
- A variety of suitable climates for a large variety of species;
- A rather good main road infrastructure and good local supplies of inputs and implements;
- Access to good air cargo handling facilities and airport services, adequate cargo space to major destinations;
- A simple export documentation procedure;
- Incentives for exporters through repayments of VAT and duty free imports of most inputs and implements.

4.1.2 Strong partnerships and platforms to discuss cross-cutting issues

As mentioned above, the HCAS provides an institutional network that is formed of strong partnerships between government and private sector bodies. However, there is a need to align the functions and mandates of the central and county government. This can be achieved by developing an effective framework that enables all stakeholders to benefit from this mutual engagement. There is also an observed trend of inconsistencies in interventions between the central government and development partners, especially in broad national development policies, which shows that the objectives of government and development organizations differ.

4.1.3 Membership of Kenya to multiple treaties and agreements on seed systems

Kenya has a relatively well-developed seed market, yet only one third of seed currently comes from seed companies, while two thirds of seed is sourced from the informal sector (pers. comm. Syngenta Kenya). Most Kenyan seed companies produce cereal seed (especially maize, wheat and barley) and legumes (especially beans), which are under mandatory certification (Schedule II crops), and distribute imported vegetable seeds. The Seed and Plant Varieties Act, Cap 326 of the Laws of Kenya, one of the most stringent as well as arduous, in the region (Muendo et al., 2004) guides the registration, certification and production of seed. Variety release procedures are designed to evaluate and regulate the varieties of seed that can be produced and traded.

The seeds and plant varieties (National Performance Trials) Regulations 10 (2), however, allow for shortening of the registration process:

> Where a plant variety has already been officially released in any one of the East African Community Countries, the variety shall undergo both performance trial and distinctness, uniformity and stability tests for at least one season in similar agro ecological zones, provided that an applicant shall provide the date leading to release the plant variety in that other country to the authorized officer.

Within the East African Community, Kenya, Tanzania and Uganda agreed to more open trade of varieties approved in another country. The agreement, developed by the Association for Strengthening Agricultural Research in Eastern and Central Africa, provides that only one season of additional national performance trials (NPT) testing in the destination market will be required if data are submitted from the first registration and similar agro-ecological conditions exist. This agreement has enabled, for example, the registration of 4 CIP seed-potato varieties from Kenya in Tanzania in 2012, improving seed availability in that country.

Similarly, under the Common Market for Eastern and Southern Africa (COMESA), a variety registered in one member state could also be subjected to a streamlined NPT process. According to the COMESA

Seed Trade Harmonization Regulations of 2014, a variety registered in one COMESA member country can be entered into the COMESA Variety Catalogue following one season testing in the second member state's market and submission of relevant data from the first member state. If these regional frameworks are applied consistently and transparently, considerable time and cost savings could result.

With regard to international agreements, all seed imported into Kenya must fulfil requirements set by the International Seed Testing Association (ISTA) in addition to satisfying the relevant phytosanitary measures, including laboratory quality tests upon arrival. Kenya's adherence to the Organisation for Economic Co-operation and Development and ISTA standards should both create a more transparent process for seed entering and exiting Kenya and enable Kenyan-certified seed to more easily enter foreign markets. Kenya is also a signatory to other international treaties, including the World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights[3] and has been a member of the International Union for the Protection of New Varieties of Plants (UPOV) since May 1999. Conforming to UPOV requirements, Kenya adopted the Seeds and Plant Varieties (Plant Breeder's Rights) Regulation, subsidiary regulation to the Seeds Act (Cap 326) to grant and protect plant breeders' rights. KEPHIS is the recognized institutional authority for enforcing plant breeder's rights under the Seeds Act.

4.1.4 Existence of data and statistics that support businesses in the horticulture sector

Kenya's HCD, with support from development actors such as USAID and EKN, has created space for sharing of information and data about the horticulture sector. Information about the subsectors and their profile in international, regional and domestic markets is easily accessible from the HCD website and other Ministry for Agriculture resources. In addition, development actors such as USAID and EKN have commissioned studies aimed at increasing understanding of the functionality of the horticulture sector as well as the players in it.

This quick scan, for example, found many reports that mentioned the horticulture areas of focus for this study. The data are, however, fragmented and dispersed. Improving the availability of statistics about domestic markets has been noted in several studies as an area of improvement.

4.2 Weaknesses

4.2.1 Weak product governance mechanisms to support food safety, traceability, respect for contracts in domestic markets

Product governance mechanisms include how the country addresses issues such as traceability, quality, food safety, chain of custody and respect for contracts (Narrod et al., 2009; Waarts & Meijerink, 2010). Kenya has struggled with these issues for many years in its export sector, partly because of the involvement of multiple actors (Gachukia, 2016). The HCD, for example, is working on national food safety and traceability mechanisms that will enable the fresh fruit and vegetable sector to reduce the number of interceptions by the EU and improve domestic production as food safety regulations become stricter.

Regulations in the domestic markets are, however, not implemented or enforced. A renewed effort is underway to address product governance issues such traceability. One much-need intervention is the review of the Horticulture Code of Practice KS 1758, by HCD through HCAS, which aimed to standardize a traceability system for fresh produce. To achieve success with this initiative, both human and technological capacity, especially with regards to the public sector, will need to be strengthened.

[3] See https://www.wto.org/english/tratop_e/trips_e/t_agm1_e.htm

4.2.2 High costs to business due to overlapping central and county government mandates in policy and regulation

With the enactment of the new constitution, some central government functions were devolved; agricultural extension and training are now a mandate of the counties. National policies that were previously formulated and tested at the Ministry and central government agency level have not been readily embraced by the counties; for example, the process of domestication has been rebuffed by some counties in favour of local policies. Counties have not appreciated their limited capacity in policy formulation and the role of the central government in supporting capacity development at county level. In addition, the hierarchy that previously existed in the central government – for example, provincial agricultural offices, were abolished in favour of revised structures that are different for different counties. One example is that staff we interviewed who were seconded by the central government to the counties have found difficulties such as agricultural budgets being tokenistic in nature, with tangible facilities such as tractors, seed, fertilizers and irrigation kits replacing knowledge and extension.

Another example is the opportunity taken by Kiambu County to invest in 80 greenhouses. This was done because the Mombasa – Nairobi – Addis Ababa Road Corridor Project Phase II would potentially open up markets for horticultural produce from the county. However, while the hardware has been installed, the people who need to use it have not been supported with knowledge of how to manage greenhouses; most greenhouses are still standing idle.

The roles of AFA, the Ministry for Agriculture and a number of other agencies need to be clarified in order to increase efficiencies in the sector.

4.2.3 Government subsidies of fertilizer and other inputs creating market distortion

The central government, through the National Cereals and Produce Board, has been providing subsidized fertilizer to cereal farmers (Muendo & Tschirley, 2004). However, the fertilizer is distributed in such a way that it also reaches horticulture farmers, as long as they are connected to their local agricultural extension officers.

Agro-dealers interviewed by Tradecare in a separate project in Kwale reported this to be a major constraint for them (pers. comm. J. Gema). This is because farmers who know what the subsidized price is perceive the price offered by agro-dealers to be exploitative; subsidized fertilizer is therefore affecting agro-dealers' market share and damaging their business case.

Counties have also not helped, as they sometimes provide seed and fertilizers to farmers. Kilifi County, for example, provides tractor services to farmers at 60% of the market price, making it difficult for tractor service providers to compete. Kwale County provides tractor services to 30% of farmers in each subcounty free of charge, eliminating the incentive for farm machinery providers to invest in the county.

The underpinning principle behind the government providing inputs and services to farmers seems to be the need to show direct value to farmers and interest in providing some subsidies in agriculture. This will need to be carefully considered in future to ensure that distortions by these kinds of external factors do not cause the input and services industry to collapse.

4.2.4 Governance systems are ineffective in meeting competitiveness needs of the fresh produce sector

The fresh produce sector is characterized by its relatively short production cycle, supply chain and post-harvest window, as well as by changing knowledge needed to manage production systems. The way the government engages with and tries to create solutions for and interventions in this sector does not necessarily reflect understanding of these needs (Gachukia, 2016).

The sector is a significant consumer of inputs and services that need to be available within short windows to keep the sector competitive. The ability of government to respond in a timely manner has been tested in different settings that have profound challenges (Alila & Atieno, 2006). As such the ability to anticipate and respond to threats of pest and disease outbreak is still lacking, even where

early warning systems have been activated. The outbreak of white fly in 2006, which greatly affected the Kenyan export market for avocados and vegetables, is an example of how an ineffective system fails to support private sector competitiveness.

4.3 Opportunities

4.3.1 Strong engagement of research organizations to sharpen investment opportunities and models

The opportunity that exists in working with research and knowledge organizations to sharpen investment opportunities and models can support the domestic market. The HCAS is one of the institutional frameworks that demonstrate how engagement through private, public, civic and knowledge agents, the actors that make up the so-called “growth diamond”, can support sector growth.

This type of engagement, especially where research and knowledge organizations work directly with the domestic market actors, is needed to start creating examples of success and models around which the sector can grow. Often, the domestic sector depends on research and knowledge organizations in the areas of seed availability, dealing with outbreak of pests and diseases, farming systems and the like (Muendo and Tschirley, 2004). The relationships have, however, failed to grow towards markets and business models, which are essential for the sector.

Strong engagement on technical aspects of the business can be built on to support whole supply chain / value chain organization and development.

4.3.2 Use of multiple existing platforms to improve institutional governance in the sector

The horticulture sector is served by multiple platforms at different levels that seek to contribute to sector growth, for example, at the international level, the National Technical Working Group (NTWG) for Horticulture. Private sector platforms – including the Kenya Horticultural Council, FPEAK, the African Women Agriculture Network and the Kenya National Farmers Federation – seek to enhance the performance of the private sector.

In the public arena, a number of platforms exist at both national and county level. At national level, agencies of the central government – including HCD under AFA, KALRO, KEPHIS and PCPB – are important platforms with various programs that contribute towards horticulture. Agricultural universities also support the sector. A number of private sector platforms also exist, key among which is the HCAS, as well as market-based platforms that rally around terminal markets or specific supply chains. Development actors have also created a number of programme-based platforms, including HortIMPACT, Kenya Horticultural Competitiveness Project (KHCP) and Kenya Agricultural Value Chain Enterprises (KAVES).

4.3.3 Continued interest by development sectors and counties in supporting horticulture in Kenya

Horticulture is a priority sector for the Government of Kenya as well as for a number of bilateral and multilateral donors. USAID, EKN and a number of other agencies have significant programs supporting horticulture.

There is growing interest in the domestic market demonstrated through the number of research projects that are being commissioned in the area. Investors, for example, Dutch investors in seed potato, biological control and greenhouses, see how they can operate in domestic and regional markets. Counties in Kenya are motivated to directly increase value for farmers. Muranga County, for example, has been supporting farmers to gain GlobalGAP certification. The market infrastructure that is being constructed across the country is also an indicator of how horticulture is gaining prominence as an agenda for the counties.

4.4 Threats

4.4.1 Competition between the central and county governments to regulate the sector

County governments have a responsibility to raise funds from their operating jurisdiction, and business licensing and levies are one way to raise revenue. Counties are trying to expand the extent of their powers, intruding into areas that are the mandate of national government agencies such as AFA (HCD).

The Kenya Horticultural Council, for example, has been working with both the central government and the counties to reduce the cost of doing business by streamlining the levy system. However, counties are angling to control processes and implement systems such as promotion, which are undertaken by central government agencies.

This competition is eroding gains made in streamlining processes. It is increasing public costs through duplication of efforts in areas such as promotion and regulation.

4.4.2 (New) county regulations limiting the flow of raw materials for processing outside their borders

There are already new discussions in formative stages in different counties about the need to control the flow of raw material in order to support employment creation at the local level. Counties are seeking to limit the flow of coffee, macadamia, cashew and mango to other counties for processing. No single county has implemented regulations of this nature, but the discussion is ongoing. With regards to macadamia, for example, Tradecare has been in discussions where Kirinyaga and Ebu counties were informally cited as being amenable to this kind of regulation (pers. comm. J. Gema). One of the macadamia companies has already set up mini-processing facilities in every county in preparation for such regulatory change. If this gains traction, it may also have ramifications for the horticulture sector.

4.4.3 Political environment that disrupts business performance in continued electoral cycles coupled with institutionalized corruption

Kenya has experienced violence in three of the five most recent electoral cycles. Even the two cycles where violence was not experienced were characterized by electioneering-related tension that threatened to derail business efforts.

The strong link between politics and economics in the country indicates a lack of sector maturity and raises questions about the reliability of the operational environment to support sector growth. Transport disruptions and politically instigated blockades significantly affect the fresh produce sector. The lack of storage infrastructure causes significant losses during times of political instability.

4.4.4 Limited quality control on seed potato

Quality controls of seed potatoes present good opportunities for farmers. Smallholder farmers who meet or exceed quality control requirements for their produce are more likely to have good market access. In addition, quality controls increase the demand for quality inputs and promote competition between input suppliers. For instance, stakeholder interviews revealed that farmers sourcing potato seed from Kisima Farm had increased their uptake of certified seed potatoes. Kisima Farm demonstrated that certified seed trials on smallholder plots yielded 2–3 times the yield of non-certified seed potatoes.

5 Resilient innovation system

Resilience is the dynamic adaptive capacities that enable agents (research, extension and projects) and systems to adequately respond to changing circumstances. In this quick scan, we focus on how these agents and systems support technical, institutional and social innovations (the enabling conditions) or remove barriers that prevent these innovations in the horticulture sector.

Table 5.1 *SWOT analysis of the innovation system of the horticulture sector*

Strengths	Weaknesses	Opportunities	Threats
Market actors are ready to engage with research and knowledge organizations (5.1.1)	Focus by government and a number of development agencies still remains largely trained on pro-poor development (5.2.1)	Harnessing opportunities for diffusion of good practices from the export sector towards domestic markets (5.3.1)	Continuing the mismatch of technology and knowledge systems (5.4.1)
Opportunities for private sector extension are emerging (5.1.2)	SMEs have limited collateral / collateral instruments to support vertical growth (5.2.2)	Increasing opportunity for private sector extension and profile of horticulture in the country (5.3.2)	New pests and diseases outbreak without appropriate surveillance and early detection systems (5.4.2)
Development sectors and counties are motivated to support horticulture (5.1.3)	Compartmentalized knowledge diffusion models in common interest groups (5.2.3)	Shaping the agriculture policy in devolved units (5.3.3)	Development sectors and counties are motivated to support horticulture (5.4.3)
New financial products that are tailored to the needs of vegetable farmers (5.1.4)	Project-based interventions based on push rather than pull factors (5.2.4)	New financial products that are tailored to the needs of vegetable farmers (5.3.4)	
High level of education of youth; many public and private education institutes offering courses in horticulture (5.1.5)	Limited practical training infrastructure in the country (5.2.5)	Interest in horizontal expansion of production into new regions due to growing market opportunities beyond Nairobi (5.3.5)	
	Diploma and university degrees do not match the requirements of the sector (5.2.6)	Use of quasi-contract models in the transition to contract production (5.3.6)	
		Capacity-building initiatives support the education sector (5.3.7)	

5.1 Strengths

5.1.1 Market actors are ready to engage with research and knowledge organizations

Market actors in the domestic market are increasingly understanding the need to engage with research and knowledge organizations. This is demonstrated by the attendance of farmers at open days where technologies are demonstrated. In addition, common interest groups that have been promoted by the Ministry for Agriculture in different counties have high interest in the support provided through the Ministry.

Overall, supermarkets in Kenya have shown considerable interest in making contracts with farmers who can meet their demands. The Practical Training Centre (PTC) Horticulture, for example, has reportedly provided training to agents who look after the fresh category at Tuskies and Naivas

supermarkets (pers. comm. I. Koomen). This progress, albeit slow, is an indicator of the domestic market responding to the need for knowledge and research.

5.1.2 Opportunities for private sector extension are emerging

Private sector extension in Kenya is not well developed where economies remain informal. Real IPM, for example, offers fee-for-service training for horticulture farmers, and there are indications that farmers are willing to pay for knowledge.

Commercial sectors such as tea, dairy, coffee and avocado have already witnessed the rise of private sector extension. The USAID Horticultural Competitiveness Project, for example, supported private sector extension in the avocado sector, mainly in Muranga (2006–10); the extension officers who provide spraying services are still engaged with the sector. The tea and coffee sectors have also witnessed growth of private sector extension in middle- to large-scale farms. In the horticulture sector, farmers who are not contracted by individual companies rely on extension services from agrochemical companies. Bayer and Syngenta, for example, employ technical assistants who train farmers and support their farm management practices.

The amount of private sector extension that is linked to formal markets has been growing in horticulture with the growth of the export sector. These services are still needed by commercial horticulture growers supplying domestic markets.

Efforts to focus more on lead farmers are increasing, in order to provide them with an environment that is more conducive to innovation. Ideally, the resulting innovations would create a trickle-down effect in terms of production and processing technologies among smallholder farmers. The Equity Group Foundation is providing support to lead farmers and creating knowledge portals where best practices can be shared.

5.1.3 Development actors and counties are motivated to support horticulture

Counties have demonstrated interest in supporting knowledge and innovation systems. KALRO, for example, has reported high demand for appropriate seed varieties from those counties that supply seed to their farmers. Prioritization of vegetables and potatoes has been increasing, with Nyandarua County, for example, ranking potatoes as a key crop to support in the region. The Agricultural Sector Development Support Programme (ASDSP) is a national project supported by the Swedish government that is working on a number of vegetable subsectors.

In addition, a number of projects are geared towards supporting farmers who sell to domestic markets. KAVES, for example, is implementing testing of MRLs in order to understand the magnitude of the food safety problem. HortIMPACT, Latia Resource Center and Equity Group Foundation projects by EKN are also examples of how donors are supporting the domestic horticulture sector. The Micro-Enterprises Support Programme Trust (MESPT) is supporting horticulture farmers (mainly tomato and onion) at the coast and in Eastern Kenya to access irrigation, as there are supply gaps in the region. The Italian government, through Alma Limited, is working with West Pokot County to introduce horticultural crops (mainly vegetables) under the newly installed irrigation scheme. There is growing evidence that the vegetable and potato sectors are attractive to development agencies and the public sector (see the overview in Appenidix 3).

5.1.4 New financial products that are tailored to the needs of vegetable farmers

Inclusion has been the focus of an increasing number of programmes, which have been rolled out with varying success. A typical example is the Equity Group Foundation, which goes beyond just providing money, but instead builds capacity and provides mentorship to put farmers on the path to entrepreneurship. Though in its inception phase, the SNV HortIMPACT project aims to build business cases by bringing actors together and visualizing the application of different innovations and novel ideas side by side with the actors who can judge for themselves what works and what does not.

5.1.5 High level of education of youth; many public and private education institutes offering courses in horticulture

That agriculture is the backbone of the Kenyan economy can be seen in the focus on agriculture in higher education. Universities such as Jomo Kenyatta University of Agriculture and Technology (JKUAT) were set up to offer competitive technical courses on agriculture, among other courses. The focus of Egerton University since it was founded in 1939 has largely been on agriculture. The same focus applies to mid-level colleges, such as the Pwani University College, South Eastern Kenya University and Baraka Agricultural College. Regional and village polytechnics offering agriculture, and particularly horticulture, are few, and where they do exist questions are generally raised about whether their graduates will have the practical skills needed for the job market. For this reason, Latia Resource Center was started to help support the horticulture sector with hands-on graduates. Several other similar public sector initiatives are offered by KALRO and the PTC in Thika. Through the support of the Dutch government, the capacity of such institutions to remain relevant and competitive is being strengthened through a Nuffic-funded project.

5.2 Weaknesses

5.2.1 Focus by government and a number of development agencies still remains largely trained on pro-poor development

The Government of Kenya and its agencies still promote smallholder agriculture. This is demonstrated by their research agendas being crafted around responding to the needs of smallholder farmers as opposed to the wide spectrum of farmers in the country.

Large-scale farmers, for example, are importing knowledge because government policies mean they cannot get this knowledge inside Kenya. Central government programs such as the Smallholder Horticultural Marketing Project (SHoMaP), the National Agriculture and Livestock Extension Programme and the Kenya Agricultural Productivity and Agribusiness Programme are designed around reaching high number of farmers as opposed to targeting farmers who demonstrate capacity.

No Kenyan policies recognize the need to follow and support market systems. Where government has intervened in markets, it has done so as an operator, rather than as a promoter at the higher level. These kinds of intervention fail to recognize and work with businesses as they grow vertically and horizontally. A number of multilateral agencies that work with government seem to adopt this same approach. Projects such as ASDSP reach a large number of farmers, but provide minimal intervention per capita (pers. comm. J. Gema).

While pro-poor development may be attractive for a number of reasons, there is no evidence that it facilitates enterprises growing beyond the micro level (Vorley & Fox, 2004). An example is supporting farmers to become processors: training offered through SHoMaP aimed to train farmers on cottage processing, but only at the domestic level.

Seemingly, a two-prong approach operates:

- Link farmers to well-established and large exporters;
- Train farmers how to be processors and to market at the micro level.

There is a missing middle stage that is not supported by the pro-poor development logic.

5.2.2 SMEs have limited collateral / collateral instruments to support vertical growth

Financial inclusion has been discussed in many fora in Kenya. The Agriculture Finance Corporation is the main source of affordable credit toward farmers. However, land title remains the key form of collateral required. Many farmers either lack the collateral or the land titles are not in their possession, especially where land within families remains under single title or where land still remains to be demarcated. Women, who are the majority producers of vegetables, especially do not have access to collateral.

Where credit is available, financial institutions such as Savings and Credit Cooperative Organizations tend to favour dairy farmers or tea farmers because they have regular income, rather than horticultural farmers who require input financing and can only repay loans after harvest and sale their produce.

Most financial products are tailored to farmers' needs and are therefore not suitable in the horticulture sector. An example is where a grace period of only one month is given by most Savings and Credit Cooperative Organizations (e.g. Unitas, Tawa, Boresha). Horticulture farmers, however, typically require financing for the entire period of production and are only able to repay loans when they sell their products. The characteristics of available finance that exclude horticultural farmers are the one-month grace period, the necessity for a strong market partner, and requirements of market contracts and regular monthly income.

5.2.3 Compartmentalized knowledge diffusion models in common interest groups

Common interest groups (CIGs) are commodity based as opposed to producer based. As farmers often grow more than one product, they can be a member of more than one or two CIGs and receive the same kind of information/knowledge, which may sometimes even be conflicting. This is a clear duplication of resources and roles.

Produce-based interventions tend not to deliver the same level of success to the parts of farming enterprises that are not the target of the CIG. An example is where passion fruit exporters supported through the MESPT project in Kwale and Kilifi have failed to diversify the practices they learned in the project to other commodities due to the linear thinking behind the design of the learning models. Holistic support that enables farmers to grow their skills and apply them across their enterprises is more likely to promote growth.

5.2.4 Project-based interventions based on push rather than pull factors

Whereas support institutions such as NGOs perform needs assessments before developing projects, government projects are sometimes not well targeted and may be unwanted. For instance, stakeholder interviews revealed that the SHoMaP roadside markets constructed to improve market infrastructure for roadside traders (most of whom deal in fresh produce) were abandoned and unused after construction. The problem may be the result of having failed to consider these traders' market dynamics when intervening.

In contrast, the SNV HortIMPACT project brings actors together to interact and learn from each other. The SNV project is a good example of a learning project that builds capabilities as opposed to the traditional facilitator-based model.

5.2.5 Limited practical training infrastructure in the country

Kenya lacks practical training infrastructure, but horticultural production requires a vast amount of knowledge that can benefit from it.

Learning models have been more theoretical than practical, and trainers and extension officers often lack the right kind of knowledge. There is lack of connectivity between extension and new breakthroughs in technology, to the extent that extension officers often learn of new models from farmers. Interviews with farmers clearly brought out this gap where experimental learning is employed at farmer level. Practical infrastructure will reinforce the services rendered to farmers and provide a nexus between knowledge and extension.

The Nuffic programme is active in the field of education for impact and change. It intends to bridge the gap between theoretical and practical knowledge and supports competency-based education projects as well as practical training facilities.

5.2.6 Diploma and university degrees do not match the needs of the horticulture sector

The Higher Education Act (Cap 210B) has meant that universities can no longer offer courses that cover technical skills. This division, coupled with the moves to convert diploma and certificate colleges into universities, has left a shortage of courses that train the technicians needed in the sector.

In the agricultural sector, this is a real gap. Interviews with seed and agrochemical companies revealed the severity of the situation as most university graduates seek managerial positions as opposed to technical jobs and choosing to study horticulture is not an appealing option for prospective students.

During a JKUAT labour market needs assessment, Bayer, Syngenta, Kenya Seed and other input suppliers reported a significant gap in availability of needed labour, necessitating them to contract graduates from Kilifi and Bukura agricultural colleges before graduation. Notably, Kilifi has already been elevated into a university, leaving another gap to be filled.

5.3 Opportunities

5.3.1 Harnessing opportunities for diffusion of knowledge from the export sector

Most horticultural farmers have participated in export chains that encourage farmers to gain knowledge about GAP. There were several NGO programmes and government initiatives in the late 1990s and 2000s that aimed to integrate smallholders into the export markets and support them in complying with the numerous standards (Okello, 2011). The involvement of farmers in value chains supplying supermarkets also has led to increased technology adoption (Rao et al., 2011b). Knowledge and experience in the domestic market and learning from their neighbours provided farmers with a strong basis to make informed decisions about what to grow and how to grow it. Lead farmers adopted new innovations and were sometimes willing to share them with their neighbours. For instance, in the Molo area in Nakuru County, a farmer who learned about seed-potato multiplication began to multiply disease-free seed potato, ventured into certified seed production and acted as a source of knowledge for neighbouring potato farmers.

To enhance economies of scale in vegetable production, farmers have increasingly joined forces in producer marketing organizations and are aggregating their produce and entering into marketing contracts, thereby enhancing their bargaining power in the market. These farmer-producer organizations are becoming vehicles through which quality and standardization can be implemented, leading to better quality produce and consequently better market penetration and higher profits. A few marketing organizations were observed that confirmed this trend, such as the Sabasaba banana cooperative in Muranga, the Embarigo onion Community based organization in Nyeri, Musagro in Tharaka Nithi, and Mamu and Mawingu commercial villages in Nyandarua.

5.3.2 Increase opportunity for private sector extension

The extension system has collapsed or otherwise been privatized in horticulture-growing areas. Privatization has made extension expensive and difficult for farmers to access. In areas where extension has collapsed, horticulture farmers have been left at the mercy of agro-dealers who are largely untrained and are therefore likely to be unscrupulous when it comes to input adulteration and are unlikely to observe any kind of code of conduct when advising farmers what they should or should not buy.

5.3.3 Shaping the agriculture policy in devolved units

The agricultural policy at county level still has some way to go. The counties are assertive and seeking relevance, which presents opportunity but is also a threat if the opportunity is not approached in the right way. The central government prefers counties to apply the national policies to the county level (interaction with the central and selected county governments in agriculture); counties are seeking their own path.

A middle ground will have to be adopted if the counties and central government are to find a solution. Agricultural policy needs to be enacted in a way that makes sense at the county level while taking advantage of the existing knowledge and innovations from the central government. This is an area of intervention that will need to be a priority if the resilience of the sector is to improve.

5.3.4 Vertical growth of market traders

While clear opportunities exist for collaboration in the export sector due to the numerous medium-scale traders, traders in the local market are still small enterprises that are informal and need to grow (Mithöfer et al., 2008). Interventions that are targeted at institutionalizing trade in domestic markets present an opportunity for support structures. Economic theory views institutions as arrangements for cost minimization (Gachukia, 2015) and is an example of institutional innovation that can enhance the growth of this sector.

The wide gap between farm gate prices and market prices can be addressed through institutionalization of domestic trade (Tollens, 2006). Support agents and structures can play a significant role in this. Meru Greens, for example, has implemented this successfully in the fruit subsector where they are able to successfully build relations with banana and mango farmers, offer services and market information to fruit farmers supplying domestic markets and achieve significant recognition locally.

5.3.5 Interest in horizontal expansion of production

Central Kenya produces over 80% of the vegetables consumed in the country. Interviews with market traders revealed that the region remains their preferred sourcing cluster. However, Central Kenya is a saturated region due to the high demand for land and increasing land subdivision. Expansion of production requires horizontal expansion.

New attractive regions are emerging, and they require support systems to recognize and grow with them. The Mt Elgon region in the Rift Valley, for example, is known to produce high quality peas for export; it will need the necessary infrastructure to help it grow. Taita Taveta County has entered and entrenched itself in export horticulture with high capacity to participate in domestic markets. There are numerable examples of how production can be supported to grow horizontally.

Bungoma County is a new frontier for potato production and is actively looking at how to introduce potato production to serve the markets in the former Western and Nyanza provinces. These nascent opportunities present opportunity for growth.

5.3.6 Use of quasi-contract models in the transition to contract production

Verbal contracts are the most widely used form of contracting in the horticulture sector. In this form of contracting a buyer must establish, or have the prerequisites in place to establish, a business relationship. When farmers bring their produce directly to the open market without such a business relationship with a trader, they usually have to sell the produce below cost.

5.3.7 Capacity-building initiatives to support the education sector

While building the capacity of public institutions is important, there is also need to build the capacity of farm workers and commercial farmers who have the courage to take steps towards change (Babah et al., 2016). Latia Resource Center initiatives, specifically the telephone farming project, are trying to fill these neglected gaps.

Nuffic is implementing a number of Netherlands Initiative for Capacity development in Higher Education (NICHE) projects that support the higher education sector to implement competency-based curricula. Kenya is a beneficiary of a significant number of NICHE projects that provide support to various educational institutes, including PTC, JKUAT, Egerton, Latia, Wambugu Technical Training Institute, Baraka Agricultural College and Pwani University among others. This support is needed in order to support alignment of education curricula with the needs of the labour market.

5.4 Threats

5.4.1 Continuing the mismatch of technologies and knowledge systems

A major threat to the resilience of the sector is the continued mismatch of technologies and knowledge systems. We have already demonstrated, for example, how covered horticulture is failing to deliver value due to the gap in knowledge systems. This is also true for “exotic” technologies offered by companies from the Netherlands and the EU (NAEB–PSF-AgriProFocus, 2016).

Counties and development actors are more interested in demonstrating technology than in building knowledge systems. This is because knowledge systems are not immediately visible and require time to get established and deliver results; but also, there is a great demand for training (knowledge dissemination) without a clear pathway for adoption of the knowledge. Projects are often designed around getting a certain number of farmers trained rather than a certain number of farmers to adopt particular practices.

Experience by Tradecare has shown a significant disconnect between knowledge dissemination and its adoption. Often models that enable layering of new knowledge onto existing knowledge have longer lasting impacts. These models are yet to become established in Kenya.

The solar renewable sector has demonstrated that despite the technology being available for many years, it was only when interventions targeted user capacity building that the sector took off in Africa, with Kenya leading the way. Consumers had thought for many years that the technology did not work. Between 2009 and 2014 Lighting Africa turned the tide, through the Do It Yourself Campaign. Similarities exist between agricultural and solar technologies (and others) in the sense that they are shunned because of the disconnect between their functionality and the users’ knowledge.

5.4.2 New pests and diseases outbreak

CIP reported that there is lack of preparedness for any outbreak of pests and diseases that result from the Dutch-funded seed-potato project. The interviews for this quick scan revealed that this position may also be held by a number of other key players.

It is possible that any new outbreak of diseases in potatoes will be attributed, rightly or wrongly, to the introduction of seed potato, as key actors feel that this risk is not being actively tested for and anticipated.

The ability of the support system to respond is a weakness already addressed in Chapter 4, about reliability. This, coupled with a tendency to apportion blame, may lead to correct or incorrect conclusions that any outbreaks are related to the introduction of Dutch seed potato in Kenya.

5.4.3 Limited number of certificate and diploma colleges

There is a general shortage of skilled labour and well-trained agronomists as well as management level staff. Companies train their own staff, since well-trained staff are not readily available.

This is acceptable for the large companies, but is a constraint for SME exporters in the whole sector.

6 Conclusions and recommendations

This quick scan sought to describe **the performance of the Kenyan horticulture sector in terms of the robustness of the supply chains, the reliability of the institutional governance and the resilience of the innovation system.** Chapters 3, 4 and 5 analysed each analytical domain in detail.

Chapter 6 sets out the quick scan's key conclusions that emerge from previous chapters, by domain.

Ten questions for further interventions have been developed. These are clustered on the topics, or priority areas, of governance, decision-making and effective learning, food safety, technology investment and adoption, value addition and climate change. The priority areas are intended to provide focus for streamlining the performance of the Kenyan horticulture sector as tackled in this quick scan. These points for further action should be prioritized and developed with the relevant stakeholders for each of the issues.

#	Question	Intervention
Governance		
1	How can horticultural policy at county level be implemented without becoming restrictive/exclusive?	Develop good county policies and benchmarks to attract investment in one or two counties.
Decision-making and effective learning		
2	What is the role of the local government in driving mature systems for agricultural commercialization?	Foster strategic decision-making and learning through providing a platform where the public and private sector can meet.
Food safety		
3	How is the growing concern about food safety and quality of horticultural products in domestic markets creating new opportunities for investments across the value chain?	Promote a social dialogue and innovation platforms around food safety.
4	How can farmers be linked to new or existing markets that seek quality produce?	Work towards improved supply chain governance.
5	How can the intrinsic motivation of different supply chain actors be aligned to support implementation of a food safety and traceability system?	To support investment decisions, identify what motivates different supply chain actors to implement food safety regulations.
Technology investment and adoption		
6	What drives investment? What pulls adoption and application of technologies by local communities?	Assess, through a bottom-up approach, grassroots innovations and their relevance to the marketing system.
7	What are the main constraints for marginalized groups (women, youth) in accessing and adopting improved production techniques?	Prioritize the inclusion of the socially disadvantaged/marginalized in the value chain.
8	What are the necessary steps to enhance vertical growth and formalization of horticultural firms in domestic markets to create investment opportunities and improve chain governance?	Work with first movers in domestic markets to support the formalization of their business and take advantage of existing opportunities for growth.
Value addition		
9	What sound business ideas are the markets seeking? How can entrepreneurs tap into these opportunities?	Promote consumer-oriented and -targeted services and products connected to key markets.
Climate change		
10	What medium-term effects are expected in the horticulture sector? How can they be addressed?	Assess the resilience of the sector against climate-related shocks, and partner with other stakeholders to introduce and promote climate variability measures and practices.

7 References

ADF (2007) Small-scale horticulture development project appraisal report. African Development Fund pp. 54

Alila, P.O., Atieno, R. (2006) Agricultural policy in Kenya: Issues and processes. Future Agricultures Consortium Policy Brief 7 pp. 4

Asfaw, S., Mithoƒer, D., Waibel, H. (2010) What impact are EU supermarket standards having on developing countries' export of high-value horticultural products? Evidence from Kenya. Journal of International Food & Agribusiness Marketing 22:252–276

Ayieko, M.W., Tschirley, D.L., Mathenge M.W. (2005) Fresh fruit and vegetable consumption patterns and supply chain systems in urban Kenya: Implications for policy and investment priorities. Tegemeo Institute of Agricultural Policy and Development Working paper 16 pp. 52

Babah D.F., Ingenbleek, P.T.M, van Trijp, H.C.M (2016) Step-change: Micro-entrepreneurs' entry into the middle-class market. Journal of African Business 17:129-147

CBI (Centre for Promotion of Imports from developing countries) (2015a) Product factsheet: Fresh beans, peas, and other leguminous vegetables in Europe. CBI, The Hague pp. 15

CBI (Centre for Promotion of Imports from developing countries) (2015b) Trade statistics: Fresh fruit and vegetables in Europe. CBI, The Hague pp. 16

Cernansky, R. (2015) Super vegetables - Long overlooked in parts of Africa, indigenous greens are now capturing attention for their nutritional and environmental benefits. Nature 522:146-148

Chelang'a, P.K., Obare, G.A., Kimenju, S.C. (2013) Analysis of urban consumers' willingness to pay a premium for African Leafy Vegetables (ALVs) in Kenya: a case of Eldoret Town. Food Security 5:591–595

Cook S.M., Khan, Z.R., Pickett, J.A. (2007) The use of push-pull strategies in integrated pest management. Annual Review of Entomology 52:375-400.

Dolan, C. (2001) The 'good wife': struggles over resources in the Kenyan horticultural sector. Journal of Development Studies, 37:39-70

FAO (Food and Agriculture Organization of the United Nations) (2014) Food loss assessments: Causes and solutions - case studies in small-scale agriculture and fisheries subsectors. FAO Rome pp. 92

Feedback Global (2015) Food waste in Kenya: Uncovering food waste in the horticultural export supply chain. http://www.feedbackglobal.org.

Gachukia, M.K.W. (2015). A review of Kenya's six decade horticultural industry practise. Riara University pp 28.

Gachukia, M.K.W. (2016) Value chain governance and governmentality of horticultural exporters by developing economies: A perspective of Kenya's fresh fruits and vegetable export sector. Journal of Food System Dynamics 7:14-23

Gotor, E., Irungu, C. (2010) The impact of Bioversity International's African Leafy Vegetables programme in Kenya. Impact Assessment and Project Appraisal 28:41-55

Gustavsson, J., Cederberg, C., Sonesson, U., van Otterdijk, R. Meybeck, A. (2011) Global food losses and food waste: extent, causes and prevention. FAO Rome pp. 38

HCD (2015) Horticulture validated report 2014. AFFA Nairobi pp. 68

Hodges, R.J., Buzby, J.C., Bennett, B. (2011) Postharvest losses and waste in developed and less developed countries: Opportunities to improve resource use. Journal of Agricultural Science, 149 S1:37–45

Irungu, C., Mburu, J.G., Maundu, P., Grum, M., Hoeschle-Zeledon, I. (2008) The effect of market development on-farm conservation of diversity of African Leafy Vegetables around Nairobi. 2008 International Congress of European Association of Agricultural Economists, 26-29 August. Ghent, Belgium. http://purl.umn.edu/44452

Janssens S.R.M., Wiersema, S.G., Wiersma, H.G.W. (2013) The value chain for seed and ware potatoes in Kenya. Opportunities for development. LEI Wageningen UR Memorandum 13-080.

Kaguongo, W., Maingi, G., Giencke, S. (2014) Post-harvest losses in potato value chains in Kenya - analysis and recommendations for reduction strategies. GIZ pp. 80

Kamau, M., Olwande, J., Githuku, J. (2011) Consumption and expenditures on key food commodities in urban households: the case of Nairobi. Tegemeo Institute of Agricultural Policy and Development working paper 41a pp. 43

KDLC (2010) Smallholder farmers' involvement in commercial horticulture Kenya's perspective. Kenya Development Learning Centre (KDLC) 02nd November 2010 pp. 4

KNBS (2016) Economic Survey 2016. Kenya National Bureau of Statistics, Nairobi pp. 303

Lagerkvist, C.J., Ngigi, M., Okello, J.J., Karanja, N. (2012) Means-end chain approach to understanding farmers' motivations for pesticide use in leafy vegetables: The case of kale in peri-urban Nairobi, Kenya. Crop Protection 39:72-80

Lagerkvist, C.J., Hess, S., Okello, J., Karanja, N. (2013a) Consumer willingness to pay for safer vegetables in urban markets of a developing country: The case of kale in Nairobi, Kenya. The Journal of Development Studies 49:365-382

Lagerkvist, C.J., Hess, S., Okello, J., Hansson, H., Karanja, N. (2013b) Food health risk perceptions among consumers, farmers, and traders of leafy vegetables in Nairobi. Food Policy 38:92–104

Lenné, J.M., Ward, A.F. (2010) Improving the efficiency of domestic vegetable marketing systems in East Africa - Constraints and opportunities. Outlook on Agriculture 39:31–40

Lubinga, M., Ogundeji, A., Jordaan, H. (2014) East African community's trade potential and performance with European Union: A perspective of selected fruit and vegetable commodities. European Scientific Journal 1:430-443

Matui M.S. (2014) Baseline agricultural and marketing data for development of wholesale hub in Muranga. FAO Rome

Mithofer, D., Nang'ole, E., Asfaw, S. (2008) Small-holder access to the export market: The case of vegetables in Kenya. Outlook on Agriculture 37:203-211

Muendo, K. M., Tschirley, D. (2004) Improving Kenya's domestic horticultural production and marketing system: current competitiveness, forces of change, and challenges for the future Volume III: Horticultural research and input sector regulation in Kenya and Tanzania. Tegemeo Institute of Agricultural Policy and Development, Working Paper 8c pp. 31

Muhanji, G., Roothaert, R.L., Webo, C., Stanley, M. (2011) African indigenous vegetable enterprises and market access for small-scale farmers in East Africa. International Journal of Agricultural Sustainability 9:194-202

Muriithi, B.W., Matz, J.A. (2015) Welfare effects of vegetable commercialization: Evidence from smallholder producers in Kenya. Food Policy 50:80-91

Muyanga, M., Jayne, T.S. (2006) Agricultural extension in Kenya: practice and policy lessons. Tegemeo Institute of Agricultural Policy and Development, Working Paper 26 pp. 37

Mwaura, S.N., Muluvi, A.S., Mathenge, M.K. (2014) African leafy vegetables and household wellbeing in Kenya: A disaggregation by gender. Current Research Journal of Social Sciences 6:82-94

NAEB–PSF–AgriProFocus (2016) Draft Conference Report of the Promoting Innovation & Trade in Horticulture Conference, Kigali, Rwanda, 25-27 November 2015 pp. 36

Narrod, C., Roy, D., Okello, J., Avendaño, B., Rich, K., & Thorat, A. (2009). Public–private partnerships and collective action in high value fruit and vegetable supply chains. Food Policy, 34:8-15

Netherlands Embassy Nairobi (2012) Strategic Plan 2012–2015 for Kenya, Somalia, the Seychelles and UNEP pp. 21

Neven, D., Odera, M.M., Reardon, T., Wang, H. (2009). Kenyan supermarkets, emerging middle-class horticultural farmers, and employment impacts on the rural poor. World Development 37:1802-1811

Okello, J.J. (2011) Exit, voice and loyalty in Kenya's French bean industry: what lessons can we learn from smallholder farmers' past response to international food safety standards? African Journal of Food Agriculture Nutrition and Development 11:1

Okello, J.J., Okello, R.M. (2010) Do EU pesticide standards promote environmentally-friendly production of fresh export vegetables in developing countries? The evidence from Kenyan green bean industry. Environment, Development and Sustainability 12:341-355

Otieno, J (2015) Kenya at risk of losing EU market for peas, beans due to falling standards. The East African. Saturday 25 April. http://www.theeastafrican.co.ke/news/Kenya-at-risk-of-losing-EU-market-for-peas--beans-standards/-/2558/2697230/-/5n3ayez/-/index.html

Ouma, S. (2010) Global standards, local realities: Private agrifood governance and the restructuring of the Kenyan horticulture industry. Economic Geography 86:197-222

Rao, E. J.O., Qaim, M. (2011a) Supermarkets, farm household income, and poverty: insights from Kenya. World Development 39:784-796

Rao, E. J.O., Brummer, B., Qaim, M. (2011b). Farmer participation in supermarket channels, production technology, and efficiency: The case of vegetables in Kenya. Global Food Discussion Paper 6 pp. 53

Real IPM (2016) Mangoes: IPM Crop Manual. http://realipm.com/wp-content/uploads/2016/07/IPM-Mango-Manual_July-2016_.pdf.WEB_.pdf

RoK (2012) National Horticulture Policy. Nairobi: Agricultural Sector Coordination Unit, Republic of Kenya pp. 76

Riungu, C.K. (2011) The effects of supermarket value chains on fresh fruit and vegetables small-scale farmers in central Kenya. MSc Thesis, Egerton University pp. 81

RoK (2012) National Horticulture Policy. Nairobi: Agricultural Sector Coordination Unit, Republic of Kenya pp. 76

Rozemeijer, N. (2016) Seed Potato Development in Kenya - Progress report 2015: 31st January 2015 - 31st January 2016. Internal, unpublished document; available from the author pp. 30

RSA (Research Solutions Africa) (2015a) Report of a study on fresh vegetables market in Kenya – Desk review. Research Solutions Africa Ltd pp. 42

RSA (Research Solutions Africa) (2015b) Report of a study on fresh vegetables market in Kenya – Retailer's survey. Research Solutions Africa Ltd pp. 31

Sawe, C.T., Onyango, C.M., Njage, P.M.K. (2014) Current food safety management systems in fresh produce exporting industry are associated with lower performance due to context riskiness: Case study. Food Control 40:335-343

Schipmann, C., Qaim, M. (2010) Spillovers from modern supply chains to traditional markets: product innovation and adoption by smallholders. Agricultural Economics 41:361-371

Soft Kenya (2011) Horticulture farming in Kenya. http://softkenya.com/farming/horticulture-in-kenya/

Tollens, E.F. (2006) Market information systems in sub-Sahara Africa challenges and opportunities. In International Association of Agricultural Economists Conference, Gold Coast, Australia, 12-18 August.

Rijn, F. van, Koomen, I., Lee, J. Van der, Klerkx, L., Bolman, B., Rademaker, C., Vonk, R. (2016) 3R Kenya Quick Scan Guidelines. Internal, unpublished document; available from the author pp. 15

Tschirley, D.L., Ayieko, M.W. (2008) Assessment of Kenya's domestic horticultural production and marketing systems and lessons for the future. Tegemeo Institute of Agricultural Policy and Development. WPS 32/2008 pp. 49

Ulrich, A. (2014) Export-oriented horticultural production in Laikipia, Kenya: Assessing the implications for rural livelihoods. Sustainability 6:336-347

USAID (2007) Export markets for high-value vegetables from Tanzania - An AMAP BDS K&P task order study pp. 130

USAID–KAVES (2013) Value chain analysis pp. 152

Vorley, B and Fox, T (2004) Global food chains — Constraints and opportunities for smallholders. Final Version (IIED) Prepared for the OECD DAC POVNET Agriculture and Pro-Poor Growth Task Team Helsinki Workshop 17-18 June

Waarts, Y., Meijerink, G. (2010). The HCDA Code of Conduct in Kenya: Impact on transaction costs and risks. Netherlands' Ministry of Foreign Affairs Government and Wageningen UR pp. 31

Wachira, J.M., Mshenga P.M., Saidi, M. (2014) Comparison of the profitability of small-scale greenhouse and open-field tomato production systems in Nakuru-North District, Kenya. Asian Journal of Agricultural Sciences 6:54-61

Wang'ombe, J.G., van Dijk, M.P. (2013) Low potato yields in Kenya: do conventional input innovations account for the yields disparity? Agriculture & Food Security 2:14 http://www.agricultureandfoodsecurity.com/content/2/1/14

Appendix 1 Overview of the regulatory environment of the horticultural sector

Legislative and regulatory framework

There are various policies that have been produced and documented. These provide a framework and direction for the agro-food chain in Kenya. However it is important to note that some of these policies are yet to be gazetted although they are by and large being used for reference by the industry [P11].

a. The National Food and Nutrition Security Policy (FNSP) 2011

The FNSP addresses the synergy that links food and nutrition security with poverty eradication. It outlines the range of priority areas and principles for government interventions to ensure all citizens' right and access to food. It is formulated with a purposefully broad scope at a level that provides a policy basis for seeking resources, advocating higher priority interventions and developing operational and management strategies. These in turn are expected to allow action and intervention plans to not only be innovative and technically strong, but also to establish and maintain the necessary linkages within and across sectors, including the role of the private sector, to ensure effective and cost-efficient implementation. This is viewed as the best approach to achieving a healthy, agriculturally productive and hunger-free country with all sectors and citizens, on national, county and community levels, playing an active role.

The broad objectives of the FNSP are:

1. To achieve good nutrition for optimum health of all Kenyans;
2. To increase the quantity and quality of food available, accessible and affordable to all Kenyans at all times;
3. To protect vulnerable populations using innovative and cost-effective safety nets linked to long-term development.

Priority areas 1: Food production

Priority issues	Proposed intervention
Input provision including Financial inclusion	Establish an Agricultural Development Fund that will focus on strategic issues and areas stipulated in vision 2030;
	Increase funding to the food and agriculture sectors to 10% of the national budget
	Support the role of markets and the private sector to provide agricultural inputs and financial services at affordable prices and favourable terms to farmers
Sustainable production	Promote sustainable food production systems with particular attention to increasing soil fertility, agro-biodiversity, organic methods and proper range and livestock management practices
	Support and promote agro-forestry, afforestation and re-afforestation to enhance livelihood systems and Kenya's environmental resources;
	Improve forecasting of climatic change and support communities to respond to new opportunities and challenges
	Promote integration of climate change adaptation in agricultural development programmes and policies;
Nutrition	Promote the production of nutrient-rich foods (crops, livestock, fisheries) by promoting diversification and exploring bio-fortification options;
Water and irrigation	Promote and support sustainable irrigation and water management systems;

Programming	Develop special programmes to support those experiencing food insecurity through targeted subsidization of critical production inputs using appropriate mechanisms;
Infrastructure	Support investments in infrastructure, including roads, water, power, communications and markets, throughout Kenya to increase production;

Priority area 2: Storage and agro-processing

Priority issues	Proposed intervention
Post-harvest losses and waste	Promote and support safe and effective storage of foodstuffs by the private sector at national, county, community and household levels;
Bulking	Put in place measures that facilitates renting of underutilized public storage facilities;
Capacity building and strengthening	Enhance the capacity of the institutions involved in product development, standards establishment and monitoring of quality
Village processing	Promote safe, small-scale rural and home processing and preservation of various farm produce

Priority area 3: Access to and quality of markets

Priority issues	Proposed intervention
Market information	Enhance farmer access to timely market information services
Guaranteed market integration	Support the establishment and strengthening of warehouse receipt systems and agricultural commodity exchange
Planning and infrastructure	Ensure that the urban development plans provide for additional and better functioning wholesale and retail markets
	Ensure that counties invest an appropriate proportion of the revenue collections on market infrastructure development

A brief review of the FNSP

1. The FNSP adopt a value chain approach to tacking food security and nutrition. Perhaps with the intention to convert food loss and waste into food;
2. The policy can be read to imply, adoption of sustainable practices will reduce food loss and waste at the production level while storage and processing at the value addition level;
3. In line with the vision 2030 this policy relies on functional wholesale market to feed the ever growing urban population. The policy thinks that better planning will solve the current shortcomings with the present state of the wholesale market;
4. Financial inclusion/economic transfer appear to be identified as being central to solving input related issues. Alternatives such as advanced/alternative technologies such as bio-controls are not considered;
5. The document in these priority areas is silent on the issues of traceability. From our interviews, food quality concerns are on the rise while a lot of knowledge and mechanisms are in place for the export channels and can potentially be transferred to the domestic;
6. Sustainable production should also be linked to sustainable consumption. Emphasis should be on supplying local markets through local food production with a view to ensuring year-round availability of fresh and diversified foods limit transactions costs and provide a reliable market to local farmers;
7. Market space and facilities to handle food products in many markets in both urban and rural areas are insufficient, resulting in high levels of waste and spoilage. Many markets have insufficient management and maintenance structures, although local authorities often collect fees or levies. Despite recent improvements, market information systems remain inadequate to serve the needs of various users of agricultural information.

b. **National Horticultural Policy 2012**

The overarching policy direction on the horticulture sub-sector is contained in the National Horticulture Policy of 2012. Other documents that support this policy direction are the **Agricultural Sector Development Strategy 2010–2020** which identifies horticulture as an important sub-sector within the wider agricultural sector. National Horticulture Policy of 2012 puts emphasis on the **development of the domestic market with regard to production, food safety and post-harvest handling facilities**, and the development of physical market infrastructure. Policy intervention areas are based on the past experience characterised by a sub-sector that has not adequately addressed issues along the value chain thereby affecting Kenya's competitiveness in international horticulture markets, among other things.

Broad objective: to accelerate and sustain growth and development of the horticultural industry in order to enhance its contribution towards food security, poverty reduction as well as employment and wealth creation.

Specific policy objectives

1. Facilitate increased production of high-quality horticultural produce;
2. Enhance provision of the sub-sector's support services like finances, insurance and technical advisory services;
3. Promote value addition and increase domestic and external trade;
4. Develop and improve infrastructure to support the horticultural industry particularly in major production areas;
5. Establish, strengthen and entrench institutional, legal and regulatory framework in the horticultural industry;
6. Promote mechanisms for socio-economic and environmental sustainability while addressing cross-cutting issues;
7. Promote horticultural investment in the ASALS.

Priority areas 1: Planting Material

The subsector is characterised by imported and mostly unaffordable planting materials and inadequate locally produced certified material due to low investments. Indigenous materials are often of low quality in comparison to the imported varieties. Breeding programmes undertaken by local research institutions are constrained by financial, human and physical resources.

Priority issues	Proposed intervention
Partnership – public private	Collaboration in research programs among institutions will be enhanced
Enhanced breeding	The Government will explore innovative systems that include best practices of producing and bulking planting material, and promote the up-scaling of successful systems
Co-sourcing and funding	Partnerships with relevant public and private institutions will be promoted to increase funding for germplasm conservation and to protect plant varieties with potential for commercial value.
Seed multiplication	The private sector will be provided with incentives to enhance accessibility of planting material
Procedures/ protocols	Certification processes will be streamlined through improving the capacity of the Kenya Plant Health Inspectorate Service (KEPHIS), and promoting use of clean material while embracing international standards and best practices

Priority area 2: Input

The sub-sector also suffers from poor quality of inputs attributed to counterfeiting and adulteration; high cost of agricultural inputs; high percentage of untrained input dealers that are not able to

adequately support farmers; under-utilisation of technologies such as organic farming; and dependence on imported fertiliser, pesticides and herbicides.

Priority issues	Proposed intervention
Partnership – public private	) The Government will continue to offer incentives to the private sector to enhance distribution of farm inputs.
Economic transfer	Mechanisms will be put in place to reduce the cost of inputs through appropriate programmes such as bulk purchasing and local manufacturing and subsidy to schedule horticulture commodities.
Accessibility	The Government and private sector will continue to undertake measures that will make inputs more accessible to farmers.
Transparency	The Government will enforce compliance with quality standards for farm inputs.
Reliability	Strengthen surveillance institutions such as pests and products Board, KEPHIS to ensure regulatory frameworks are monitored and enforced

Priority area 3: Extension services

Extension services are served by both the public and private extension services, this sector is still highly underserved as it requires specialised extension approaches and skills due to its dynamism and industry needs. The numbers of extension service providers is also small and often have low awareness of quality requirements for horticultural produce and few guidelines for good agricultural practices.

The policy seeks to promote pluralism in extension service delivery and institute mechanisms to coordinate extension services from both public and private sectors for improved quality. The National Horticulture Policy (2012) proposed extension services anchored on the National Agriculture Sector Extension Policy (NASEP) and in line with the devolved governance system under the Constitution

Priority issues	Proposed intervention
Capacity building and strengthening	The Government will strengthen and harmonize public extension services to offer specialized extension services.
	Government will build capacity of staff, farmers and farm input suppliers to improve and update their skills and knowledge. Due to the dynamic nature of the horticultural sub-sector, staff will be constantly updated on new technologies, market regulations and consumer demands.
	The Government will encourage farmers, extension agents and suppliers to build quality into the products throughout the value chain.
	Capacity will be built among extension service providers on agribusiness and preparation of business plans. Refresher programs for extension staffing
Farmer clustering	The Government will facilitate the formation and strengthening of producer business groups and commodity associations to enhance technology transfer and marketing of produce
Partnership	To improve partnerships and collaboration, the value chain approach in extension will be encouraged
Economic transfer (to county government?)	The Government will improve funding to extension services to cover all commodities and areas, and catalyse demand-driven extension.
Frameworks	Support development and regulation of private extension

Priority area 4: Marketing

Domestic Market

Domestic trade is an important source of livelihood for players in the horticultural value chain. The major actors involved in trade are producers, traders, middlemen, transporters and local authorities.

The margins between farm gate prices and consumer prices are wide and indicative of suppressed profitability for the producer. Many markets have inadequate physical facilities and do not therefore provide facilities like storage and cold rooms, weighing equipment, loading /unloading and social amenities.

Regional and International Markets

With the local market opening up to horticultural imports, more so from COMESA and EAC member countries, there is risk of spread of diseases and pests that can be detrimental to local horticultural production. Kenya is a signatory to and has been implementing a number of international protocols. In the recent past, there has been increasing shift of horticultural investment to other competing countries and an increase in the number of non-tariff barriers to trade. Between 2007 and 2009, horticultural exports declined and imports of horticultural produce from the region increased.

Priority issues	Proposed intervention
Strategy	A national marketing strategy of Kenyan horticultural products will be developed in an effort to consolidate existing markets and growth in emerging markets. Monitoring and analysis of trade flows will be encouraged so as to establish Kenya's comparative advantage.
Promotion	The Government will have the Kenyan embassies aggressively promote the trade of horticultural produce in their countries of representation.
Incentives	The government will give incentives to marketing bodies like FPEAK and KFC to play a more proactive role in marketing Kenyan horticulture regionally and internationally.
Capacity building and strengthening	The government will strengthen capacity of institutions such as HCDA and EPC to effectively promote horticultural products in both domestic and export markets. Incentives will be provided to facilitate competitiveness of local produce. The Kenya Plant Health Inspectorate Service (KEPHIS) and other regulatory agencies will be strengthened to effectively implement sanitary and phytosanitary regulations and curb substandard imports
Value addition and diversification	Enterprise diversification and value addition will be encouraged to broaden the product range to make Kenyan produce more competitive. The Government will explore direct flights to non-traditional export destinations
Negotiation	The Government will negotiate for and implement favourable trade protocols.
Data	A national data validation committee is in place involving many stakeholders

A brief review of the NHP

1. Partnership mostly between public and private sector is recognised and invited;
2. The policy recognises the need to capacity build and strengthen public institutions and regulators;
3. The policy appears silent on transfer of experience and lesson learnt in the governance of the export chain particularly on issues of traceability;
4. While the document takes a value chain approach such like the FNSP, it borrows from the FNSP with an intention of becoming more specific.

4.1.2 Other policy frameworks relevant to the Kenya's horticulture sector

Policy	Relevance to horticulture
Agricultural Sector Development strategy 2010-2020	1. Developing and managing key factors of production 2. Increasing productivity, commercialization and competitiveness of agricultural commodities and enterprises
Vision 2030	1. Increasing productivity of crops 2. Improving market access for smallholders through better supply chain management 3. Adding value to farm products before they reach local, regional and international markets
Kenya Protocol for Good Agricultural Practice (KenyaGAP)	1. Strengthen linkages between farmers and exporters 2. Involvement in production through advising farmers on input use e.g what and how much pesticides to use.

Code of conduct

Due to stringent export requirements, Kenya has progressively implemented traceability measures that have included the development of internationally recognised local standards, such as KenyaGAP, KFC Silver Standard, HEBI Base Code and others, with effective certification procedures. Further, segmented markets that require value-added products have led to some farms specializing in organic farming. The Government will:

1. 1Promote the adoption of modern technologies through improved provision of advisory services by the public and private sector extension service providers
2. Enhance compliance with standards and product safety through sensitization;
3. Promote use of integrated pest and disease management;
4. Facilitate the development of long-term plans and suitability maps/profiles for various eco-zones for horticulture investment.

Encourage the development and use of appropriate production packages for organic farming.

Appendix 2 Overview of food safety policies with relevance to horticulture in Kenya.

Source: RSA, 2015a.

Laws	Agency	Relevance
Agricultural Act Cap 318	Kenya Plant Health Inspectorate Services (KEPHIS)	An Act of Parliament to promote and maintain a stable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry
Plant Protection Act Cap 324	Kenya Plant Health Inspectorate Services (KEPHIS)	An Act of Parliament to make better provision for the prevention of the introduction and spread of disease destructive to plants
Agricultural Produce Act (Export) Cap 319	Kenya Plant Health Inspectorate Services (KEPHIS)	An Act of Parliament to provide for the grading and inspection of agricultural produce to be exported, and generally for the better regulation of the preparation and manufacture thereof
Agricultural Produce Marketing Cap 320	Kenya Plant Health Inspectorate Services (KEPHIS)	An Act of Parliament to control and regulate the marketing of agricultural produce, to enable Marketing Boards to be established for marketing such produce and to provide for the powers and functions of the Boards, and for matters connected therewith
Crop Production and Livestock Cap	Department of Crop production	An Act of Parliament to make provision for the control and improvement of crop production and livestock, and the marketing and processing thereof [Cap. 205 (1948), Act No. 47 of 1949,
320 Seed and Plant Variety Act Cap 326	Kenya Plant Health Inspectorate Services (KEPHIS)	An Act of Parliament to confer power to regulate transactions in seeds, including provision for the testing and certification of seeds; for the establishment of an index of names of plant varieties; to empower the imposition of restriction on the introduction of new varieties; to control the importation of seeds; to authorize measures to prevent injurious cross-pollination; to provide for the grant of proprietary rights to persons breeding or discovering and developing new varieties; to establish a national centre for plant genetic resources; to establish a Tribunal to hear appeals and other proceedings; and for connected purposes
Suppression of Noxious Weeds Act Cap 325	Kenya Plant Health Inspectorate Services (KEPHIS)	An Act of Parliament to provide for the suppression of noxious weeds
Fertilizer and Animal Feedstuff Act Cap 345	Kenya Plant Health Inspectorate Services (KEPHIS)	An Act of Parliament to regulate the importation, manufacture and sale of agricultural fertilizers and animal foodstuffs and substances of animal origin intended for the manufacture of such fertilizers and foodstuffs, and to provide for matters incidental to and connected with the foregoing
Standards Act Cap 496	Kenya Bureau of Standards (KEBS)	An Act of Parliament to promote the standardisation of the specification of commodities, and to provide for the standardisation of commodities and

		codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for it
Biosafety Act 200 9 (CAP 321 A)	The National Biosafety Authority	An Act of Parliament to regulate activities in genetically modified organisms, to establish the National Biosafety Authority, and for connected purposes
Crops (No.16 of 2013)	Horticultural Development Authority	An Act of Parliament to consolidate and repeal various statutes relating to crops; to provide for the growth and development of agricultural crops and for connected purposes
Public Health Act Cap 242(Rev.2002)	Department of Public Health	An Act of Parliament to make provision for securing and maintaining health
Food Drugs Chemical Substances Act Cap 254(Rev. 2002)	Department of Public Health Government Chemists Department National Public Health Laboratories	An Act of Parliament to make provision for the prevention of adulteration of food, drugs and chemical substances and for matters incidental thereto and connected therewith
Science and Technology (Amendment) Act, Cap 256, 1979	KEMRI/KEPHIS/ National Council for Science and Technology	An Act of Parliament to establish machinery for making available to the Government advice upon all matters relating to the scientific and technological activities and research necessary for the proper development of the Republic; and for the co-ordination of research and experimental development; and for matters incidental thereto and connected therewith
Pest Control Products Act (Cap 346)	Pest Control Products Board	An Act of Parliament to regulate the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic function of plants and animals and for connected purposes
Environmental Management and Coordination Act) (EMCA) (CAP 387No. 8 of 1999	NEMA	An Act of Parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto

Appendix 3 Overview of horticultural projects in Kenya

Project	Implementer/Donor	Summary Objectives	Partners	Commodities	Key Documents
EKN Food Security Projects					
HortImpact	SNV / EKN http://www.snv.org/project/hortimpact	Together with entrepreneurial small and medium size farmers, and Kenyan and Dutch Agri-businesses, HortIMPACT promotes innovative solutions and technologies from the private sector that improve production and help build inclusive market growth.	DLV, Hivos, Solidaridad Kenya Highland Seed Company, Soil Cares. Maji Milele, Koppert.	Vegetables, potato	http://www.snv.org/public/cms/sites/default/files/explore/download/snv_hortimpact_factsheet.pdf
Telephone Farmers	Latia/EKN http://www.latiaresourcecenter.org/?p=1744	This program is tailored for 'telephone farmers' (part-time or absentee farm owners with a will to invest commercially but majorly rely on farm operators). The overall objective of incubation is to improve profitability and sustainability. The program has two components i.e. Practical training and Business support services		Multitude	
Agriculture Growth Accelerator	Equity Group Foundation / EKN http://equitygroupfoundation.com/our_pillar/agriculture/	The three-year project aims to assist over 2,000 medium-size farms, each between 5-70 acres, to increase profitability and achieve sustained growth by: Increasing agriculture production and incomes through technical assistance; Reducing the risks of farming through irrigation and insurance products; Improving farm efficiency through management systems, technology, and training; and Increasing incomes through agriculture sales and marketing strategies.		Multitude	http://equitygroupfoundation.com/wp-content/uploads/2015/04/EGF-Fact-Sheet-Agriculture.pdf

Other EKN Funded projects				
2Scale	IFDC /EKN http://2scale.org. 32 agribusiness clusters Over 29,000 farmers 68 private firms	2SCALE is one of the largest agribusiness incubators in Africa, working with farmers and small-scale entrepreneurs in 8 countries. We build networks that connect farmers, buyers and intermediaries, enabling them to create and grow new businesses. We also enable private firms to find business opportunities for sourcing products from, or selling agro-inputs to, smallholder farmers in Africa.	IFDC, BoPInc, ICRA	potatoes, chilies, rice, sorghum, dairy, vegetables and Stevia
Niche	- PTC Horticulture - PTC Potato - Latia Horticulture - ?		CDI KIT MSM, CDI	Capacity development
Seed Potato Sector Development	WageningenUR (CDI)/EKN https://www.wageningenur.nl/en/show/Seed-Potato-Development-in-Kenya.htm	CDI is managing a Dutch-Kenyan public-private partnership initiative to support seed potato development in Kenya. With potato being the second most important food crop in Kenya, and being an efficient growing crop, support to seed potato development is strategic for the sector's further development, for its potential to address food security, and for its wider linkages to agribusiness development.	NVWA/NAK KEPHIS	Potatoes
Other Dutch Funded projects				
Utilizing the genome of the vegetable species Cleome gynandra for the development of improved cultivars for the West and East African markets	Wageningen UR/ NOW http://www.nwo.nl/en/research-and-results/research-projects/i/59/12559.html	The project focus: collecting and analysing germplasm for testing variation in nutritional characteristics, productivity and drought, as a basis for the re-sequencing effort. The results will be used in breeding programmes to develop planting material for a crop with improved nutritious value and optimal adaptation to a warmer and drier climate.		
Other initiatives				
Kenya Agricultural Productivity and Agribusiness Project (KAPAP)	Federal Government /WorldBank http://www.kapp.go.ke/#	Envisages an integrated approach in order to synchronize research, extension and farmer empowerment and other stakeholders initiatives.		

Local Government	Machakos County		i.e. Mango	
Kenya Horticulture Competitiveness Project	/ USAID http://www.growkenya.org	Increase incomes for 210,000 small farmers and strengthen the businesses network around them by improving and creating local, regional and global market opportunities. This project will help Kenyans feed themselves by building a countrywide horticulture distribution network that provides a year-round supply of high-quality, nutritious products grown by Kenyan farmers.		
Smallholder Horticulture Marketing Programme	IFAD http://operations.ifad.org/web/ifad/operations/country/project/tags/kenya/1330/project_overview	This programme aims to improve farm productivity and incomes, and the health and welfare of rural Kenyans, by increasing the quality and consumption of fruit and vegetables.		http://operations.ifad.org/web/ifad/operations/country/project/tags/kenya/1330/documents
Japanese supported initiatives				
ICIPE	http://www.icipe.org			
Private Sector				
Biological control • Koppert • Real IPM • DuduTech				
Green Farming and sub-project Growing Solutions Kenya	Consortium of 12 Dutch horticultural technology providers http://www.greenfarming.nl http://www.greenfarming.nl/node/400	Green Farming is a program that aims to connect the horticultural networks of The Netherlands, Kenya and Ethiopia by setting up joint activities, projects or co-operations in the areas of research, development and production. Growing solutions - aims to support Kenyan growers on how to produce healthy vegetables with minimum use of pesticides.		

Appendix 4 List of interviewees for the quick scan horticulture

Name of interviewee	Sector	Organization/business name	Title
Francis Muthami	Govt	KAPAPlGOK/WB	Coordinator
Nehemiah Chepkwony	Govt	Horticulture Unit MOA	Snr. Asst. Director of Agriculture
Robert Koigi	Govt	KEPHIS	Testing services
Philip Njoroge	Govt	KEPHIS	Trade & Standards
James Wachihi Muturi	PS - Training	Latia Resource centre	Agribusiness solutions manager
Arim Ogola	NGO	Fintrac - KAVES project	Technical Director - Horticulture
Ann Gikonyo	Govt	HCD	Marketing Manager
Frida Kagwiria	Private - processing	Meru Green	Extension officer
Judith Chebari	NGO	IFDC- 2-SCALE	Project coodinator
Henry Wainwright & Louise Labuschagne	Input suppliers	Real IPM	Directors
Jonathan Bamber	Private - processing [F&V drying]	Burton and Bamber	Directors
Patrick Maina	County Government	Embu county	County Director of Agriculture
Danstan Kaburu	County Government	Meru county	County Director of Agriculture
Janathan Moss	Large Farm	Kisima Farm	Managing director
Ann Mbugua	Small scale farm	Lead Farmer – Potato multiplier	Molo
Wagui Gatia	Medium scale farm	Lachuta farm	Director
George Nyagisere	Medium scale farm	Kisaju Fresh Limited	Director
Haron Wachira	Aggregator	Akili holding ltd.	Director
Klaas de Vries	NGO	SNV	Advisor-HortImpact
Jacqueline Chepkoech	NGO	Equity Group Foundation	Senior Program manager
Moses Nyongesa	Research	KALRO	Centre Director Tigoni
Githaiga Wagate	Govt	PCPB	Compliance division
Esther Kimani	Risk	Acre Africa	Communication officer
Nsinazo Warrakah	Financial inclusion	Financial inclusion	Consultant financial inclusion
Elmer Schulte	International organisation	CIP	Senior Scientist
Ben Burgers	Private – import fresh produce from Kenya into EU market	ROVEG	Food safety manager
Ard van der Maarel	Private – biological solutions	Koppert	Business development manager
Jan Willem Sepers	Private – seed potato	Europlant	Area director
Omnivent	Private – storage solutions	Omnivent	Chief Commercial Officer

Appendix 5 Template semi-structured interview

The table below provides an overview of the various questions that will be used for the semi-structured interview. Please note that this table is not fully comprehensive but rather outlines the most relevant questions to be addressed. They are generic and can be used by the sector teams as departure points for more sector and theme specific issues.

Theme	Details	Example questions
Introduction	Short "history" or background of the stakeholder in the sector	**1.1** What is your position/role in this sector? **1.2** When did you start working in this sector? **1.3**. What did you do for a living before you started worked at this plantation?
Robust Supply Chains	Perception of the robustness of the sector according to the stakeholder in terms of economic, social and environmental sustainability of the supply chains.	**2.1** What are in your view the sectors main strengths in terms of economic, social and environmental sustainability of the supply chains? How did they come about? **2.2** What are in your view the sectors main weaknesses in terms of economic, social and environmental sustainability of the supply chains? How did they come about? **2.3** What are in your view the sectors main opportunities in terms of economic, social and environmental sustainability of the supply chains? How did they come about? **2.4** What are in your view the sectors main threats in terms of economic, social and environmental sustainability of the supply chains? How did they come about?
Reliable Institutional Governance	Perception of the reliability of the sector in terms of the regulations, incentives and soft instruments that support private investments and opportunities for regional and (inter)national trade.	**3.1** What are in your view the main strengths of the sector in terms of regulations, economic and financial instruments and soft instruments that enhance trade and investment opportunities? **3.2** What are in your view the main weaknesses of the sector in terms of regulations, economic and financial instruments and soft instruments that enhance trade and investment opportunities? **3.3** What are in your view the main opportunities of the sector in terms of regulations, economic and financial instruments and soft instruments that enhance trade and investment opportunities? **3.4** What are in your view the main threats of the sector in terms of regulations, economic and financial instruments and soft instruments that enhance trade and investment opportunities?
Resilient Innovation Support Systems	Perception of the resilience of the supply chain in terms of its innovation support system: how can we evaluate the presence and quality of its	**4.1** What are in your view the sectors main strengths of the supply chain in terms of the actors, institutions, interactions and infrastructure that enable innovation? **4.2** What are in your view the sectors main

	actors, institutions, interactions and infrastructure	weaknesses of the supply chain in terms of the actors, institutions, interactions and infrastructure that enable innovation? **4.3** What are in your view the sectors main opportunities of the supply chain in terms of the actors, institutions, interactions and infrastructure that enable innovation? **4.4** What are in your view the sectors main threats of the supply chain in terms of the actors, institutions, interactions and infrastructure that enable innovation
Next steps		**5.1** What are in your view the major issues that need to be addressed from those we discussed? **5.2** What would they require?

To explore the potential of nature to improve the quality of life

Wageningen University & Research
Wageningen Centre for Development Innovation
P.O. Box 88
6700 AB Wageningen
The Netherlands
www.wur.eu/cdi

Report 3RKenya-16-03/CDI-16-045

The Wageningen Centre for Development Innovation works on processes of innovation and change in the areas of food and nutrition security, adaptive agriculture, sustainable markets, ecosystem governance, and conflict, disaster and reconstruction. It is an interdisciplinary and internationally focused unit of Wageningen UR within the Social Sciences Group. Our work fosters collaboration between citizens, governments, businesses, NGOs, and the scientific community. Our worldwide network of partners and clients links with us to help facilitate innovation, create capacities for change and broker knowledge.

The mission of Wageningen UR (University & Research) is 'To explore the potential of nature to improve the quality of life'. Within Wageningen UR, nine specialised research institutes of the DLO Foundation have joined forces with Wageningen University to help answer the most important questions in the domain of healthy food and living environment. With approximately 30 locations, 6,000 members of staff and 9,000 students, Wageningen UR is one of the leading organisations in its domain worldwide. The integral approach to problems and the cooperation between the various disciplines are at the heart of the unique Wageningen Approach.