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Quarantine Interceptions & Transparency in Horticultural Supply Chains: Causes and outcomes in Uganda, A Qualitative Case Study

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Abstract

The horticultural industry in sub-Saharan Africa (SSA) has witnessed unprecedented growth in recent years, fuelled by increased demand for temperate fruits and vegetables in the European market. In Uganda, the introduction of Non-Traditional Agricultural Exports (NTAEs) in the post-civil war era (mid 1980s onwards) as an export diversification strategy was met with limited success attributed to agronomical, logistical, and institutional challenges that resulted in a relatively small and fragile horticultural industry, serving a limited market specialised in the ethnic/exotic food trade. However, in recent years, increased demand from the diaspora has created new opportunities for Uganda´s ethnic/exotic horticultural exports in a buoyant industry that has increased fourfold over the last two decades. Meanwhile, this renewed opportunity is threatened by EU/UK legislation targeting the introduction and spread of organisms considered harmful to the environment. The threat is manifested in the interception and destruction of consignments found to be infested by (regulated) organisms (notably the false coddling moth (FCM)). While being common to all SSA countries infested by the FCM, interceptions have been particularly high for Uganda over the last seven years, a period coinciding with the boom in its horticultural industry.

Based on an instrumental case study design consisting of semi-structured interviews, document reviews, and participant observations, this research investigates the cause of interceptions in the Ugandan Horticultural Export Supply Chain, (fresh fruits & vegetables) and their relationship to the concept of transparency, which is increasingly core to agri-food chains. In line with the Global Value Chain (GVC) approach (Gereffi, 1999; 2005), it examines the response and outcomes resulting from attempts to comply with international public standards governing agricultural supply chains.

Findings indicate that a combination of environmental (e.g., regulatory), people (e.g., literacy levels of Outgrowers), process (e.g., bureaucracy) and technological (e.g., lack of IT infrastructure) factors working together as inhibitors of transparency are to account for the rising wave of interceptions.

Uganda´s response to interceptions, described in this study as the regulated integration (backwards) of supply chain relationships through the mandatory registration of producers is yielding results. This is in terms of enhanced capability development and supply chain transparency in a process described by the GVC literature as *process upgrading*. In so doing, the research contributes to the literature on supply chain transparency while suggesting a renewed focus of GVC research on the role of public standards (as opposed to private governance) in the upgrading and integration of developing countries in the world economy. The research is limited by the lack of a quantitative approach to validating findings that are essentially qualitative in nature. Future research involves the validation of transparency inhibitor matrix for the prioritisation of improvement initiatives in a quantitative study as well as an investigation of

opportunities for improving Uganda´s phytosanitary certification process with distributed ledger technology.

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Chapter 1

INTRODUCTION

This chapter outlines the research background, states the objectives and the research scope, the ways in which this research was planned and conducted are briefly explained, and the outline of each chapter in the thesis is described.

1.1 Background

1.1.1 Plant Health Concerns and International Trade

This dissertation attempts an explanation of interceptions in the Ugandan horticultural (fresh fruits & vegetables) export supply chain (UHESC). The context is a developing world agricultural production system experiencing compliance difficulties with the phytosanitary requirements of the EU.

Certainly, if it is today possible to buy fruits, vegetables, and flowers in places where they neither grow nor have ever been seen before, the international trade of plants and plant products comes with the risk of introducing organisms considered harmful to other plants and the environment of importing countries. (Henson and Loader, 1999 ; Jensen, 2002 ; Brazier, 2008 ; Roques et al., 2010 ; Macleod et al., 2010 ; EC, 2016).

For instance, the accidental introduction of Phylloxera from North America into Europe in the 1860's led to an important devastation of much of Europe's grape-growing regions (Downie, 2002; Campbell, 2004; Macleod et al., 2010). Similarly, the agricultural economy and traditional landscape of Apulia, the heart of Italy's olive production area has been seriously damaged by an outbreak of a bacteria (Xylella fastidiosa) that causes stunting in leaves, fruit, and overall plant height (Bucci, 2018; Brunetti et al., 2020). Further, the Portuguese timber industry has suffered significant economic loss due to the pine wood nematode (Vicente et al., 2011; Valadas et al., 2012). These examples illustrate another dimension of risk in agri-food chains beyond traditional notions of food safety that have frequently occupied news headlines (e.g., the horsemeat scandal). According to the FAO (Sustainable Approaches for Plant Health, 2020), up

to 40% of crops worldwide are lost to pests, primarily insects, diseases, and weeds.

The False Coddling Moth (Thaumatotibia Leucotreta)

With regards to the research context, the false codling moth (Thaumatotibia leucotreta), is a pest indigenous to sub-Saharan Africa that infests a large number of commercial and wild fruit-bearing plants (Hofmeyr et al., 2019). It is a pest of high phytosanitary concern known to impact the export of fresh fruits and vegetables from sub-Saharan countries (Stotter, 2009). Described as highly polyphagous (i.e. feeds on a variety of economically important crops), the FCM is an important threat to the production and marketing of a wide range of agricultural crops, reducing their yield and quality. For instance, Hofmeyr (2003) in Adom et al. (2021) reported an infestation of citrus in South Africa with a yield loss of up to 80% within five months. An EU factsheet (EPPO, 2013) on a pest risk analysis for FCM reports 4059 UK interceptions of consignments of peaches and nectarines originating from South Africa in 2009. Table 1 below is a summary of FCM infestations and crop losses in affected countries.

Country	Host Plant	Yield Loss
South Africa	Citrus	80%
South Africa	Macadamia	30%
Israel	Macadamia	30%
Kenya	Capsicum	90%
Cameroon	Capsicum	43.8%
Uganda	Capsicum	No data
Uganda	Cotton, citrus, peach, macadamia	20%
Rwanda	Capsicum	No data
Cote D'Ivoire	Capsicum	No data
Togo	Capsicum	No data

Table 1: Sub-Saharan Countries affected by the FCM, host plants and yield loss (Adapted from Adom et al., 2021)

As can be inferred from table 1 above, the FCM is a pest native to sub-Saharan Africa and Israel. As previously mentioned, being polyphagous, it has the potential to feed on a range of crops of economic importance and therefore poses a phytosanitary risk in the international trade of plants and plant products from these regions. Also worthy of notice is the fact that

plants of the capsicum family (hot pepper, bird eye chilli) are most concerned. Gobie (2019) reports that Hot Pepper is the world's second most important vegetable ranking after tomatoes and also the most produced type of spice flavouring and colour to food. It can be

argued that its demand in the EU has risen over the last decades fuelled by the Afro Caribbean diaspora making it a high-risk import product from the EU's point of view. In this regard, it has been classified as a quarantine insect pest, restricting the trade of susceptible agricultural produce on international markets (Adom et al. 2021).

A quarantine pest is a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2019). Notice the distribution of FCM in the world as of 2020 on figure 1 below, reported by Adom et al.

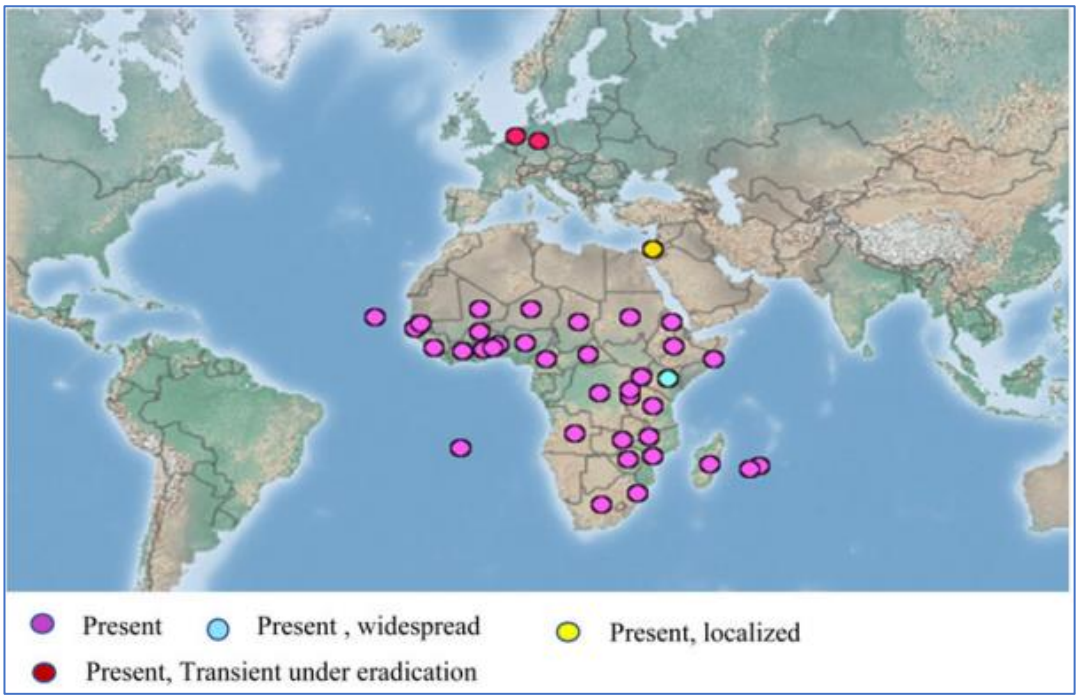

Figure 1: Distribution of the false Coddling Moth (FCM) (Adapted from Adom et al., 2021)

The FCM is noted as present, transient under eradication meaning it is present in the EU (most likely as a result of international trade) but not widely distributed and officially controlled. Hence, it is considered an economic threat to the EU and therefore subject to regulation may represent a barrier to trade (or market access challenge) for sub-Saharan African countries. Because these economies depend for most on

agricultural exports, they are highly vulnerable to interceptions and restrictions resulting from the plant health regulations of trading partners in developed nations.

"Plant Health" in simple terms, refers first of all to the well-being of individual plants and their associated organisms in both natural and cultivated ecosystems (Macleod et al., 2010). That said, Doring et al. (2012) have developed a conceptual framework with philosophical underpinnings for the concept based on naturalist and normative approaches. However, like Macleod et al. (2010), this research adopts a biosecurity perspective to the term with *Plant Health* referring to the legislative and administrative procedures used by governments to prevent plant pests from entering and spreading within their territories. For instance, as a result of plant health inspections, regulated pests (quarantine or non-quarantine) are frequently intercepted at import, especially insect pests on cut flowers, branches, fruit, and vegetables (van der Gaag et al., 2019).

1.1.1.2 Pesticide Residues – Sanitary Concerns & International Trade

The risk of introduction and spread of quarantine pests is not the only challenge facing the agricultural exports of developing countries. Assuredly, chemical control of quarantine pests has equally resulted in interceptions creating a real conundrum for the exporting supply chains. To elucidate, excessive pesticide residues are a sanitary concern for regulators of importing trading partners fuelled by consumer health and environmental concerns.

In effect, pesticides are considered indispensable for the production of an adequate food supply for an increasing world population (Prodhan et al., 2018). According to Islam and Haque (2018), pesticides are the only toxic substances released intentionally into our environment to kill living things (pests). These pesticides (Organophosphates and Carbonates) are known to affect the nervous system while others may irritate the skin or eyes (Sarwar, 2015; in Islam and Haque, 2018). Inappropriate use of pesticides can have negative effects on human health and agro-ecosystems, damage wildlife habitats, create pesticide resistance of insects and diseases, and pollute ground and surface water resources (Islam and Haque, 2018). It is

a common problem that most farmers who use pesticides also tend to lack the education required to ensure proper usage in terms of following prescribed dosages at the right time (stage of the crop) and awareness of residues and their effects on health. The conundrum referred to above is the requirement to control pests of which chemical control (use of pesticides) is the most economical means available to producers. However, an excessive or untimely use of pesticides by inexperienced producers will in a like manner result in interceptions (with excessive residues on produce) being the non-conformity. Thus, failure to control a quarantine pest (e.g., the FCM) may just as well result in an interception as trying to control the pest.

1.2 Problem Definition: Evidencing Measures and Compliance

Article 16 (1) and (2) of Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community, requires Member states to notify the European Commission and other EU countries of the presence of harmful organisms in their territory and measures taken to eradicate them. Not only so, but Member states are also equally required to notify all other member states of the interception of consignments imported from non-EU countries due to the presence of harmful organisms or organisms presenting a phytosanitary danger.

Agricultural production systems, meanwhile, are required to establish procedures for the collection, analysis and dissemination of data evidencing the sustainability and compliance of production processes (Schnackenberg and Tomlinson, 2016; Gardner et al., 2019). For instance, from 1 September 2019, Directive 2019/523/EC (replacing 2000/29/EC) requires non-EU countries using cold treatment or any other effective treatment against the FCM to provide documentary evidence of the effectiveness of treatment procedures prior to export, for trade to continue. In terms of market access therefore, being transparent (i.e., evidencing compliance), is a key requirement and a market access strategy.

If the World Trade Organisation (WTO) has been instrumental promoting international trade for developing world agriculture, the tightening of

Sanitary and Phytosanitary (SPS) measures regulating the introduction and spread of regulated pests has led to compliance difficulties on the part of developing world countries.

In effect, the WTO Agreement on the Application of Sanitary and Phytosanitary Measures recognises the right of Member states to pass legislation protecting plant resources while ensuring that such measures are scientifically justified and not used as trade barriers. Also, while Article 7 of the WTO-SPS Agreement requires Member states to notify changes to plant health legislation, Downes (2012), observes that these notifications alone provide little indication as to extent of members' commitment to transparency and the real contribution made by these notifications to facilitating international trade. Also, Henson and Loader (1999) observed that while issues facing developing country exporters (of plants and plant products) and their representatives are not different from those facing a typical developed economy, the scale and magnitude of the problems may differ as well as the potential for response. Jensen (2002) maintained that although developing countries have a high demand for an effective agreement such as the SPS, they face a lot of difficulties in its usage; most do not possess the financial, human, and technical resources necessary to use it with especially least developed countries being excessively burdened by its implementation costs.

Transparency in Agricultural Supply Chains is therefore a question of evidencing phytosanitary measures and verifying compliance at two Levels:

1. At the Regulatory (Legislative) Level where Plant Health Regulation may be used as a disguised form of trade protectionism (i.e., Institutional Transparency - Fox, 2007; Hollyer et al., 2013; 2014)
2. At the Implementation (Production) Level where Supply Chain operators have to substantiate claims made with regards to production, processing, and handling conditions (Hofstede, 2003; Manning, 2018; Gardner et al., 2019) otherwise known as supply chain transparency.

As far as institutional transparency is concerned, as mentioned above, the WTO SPS agreement requires Members to notify changes in a timely

manner enabling trading partners to comment and adapt production systems to import requirements. They are also required to set up inquiry points for traders to obtain information on market entry requirements. Governments are also expected to undergo a process of harmonisation which involves establishing national phytosanitary measures consistent with international standards, guidelines, and recommendations. The principle of equivalence imposes an open-door policy for Members to inspect the phytosanitary control systems of trading partners who in their opinion do not provide the required level of protection from the introduction and spread of harmful organisms. It is the case of the EU auditing the Ugandan export control system which was found to be ineffective in preventing EU interceptions. Figure 2 is an illustration of the key institutional and supply chain aspects of transparency in agricultural supply chain from a plant health perspective.

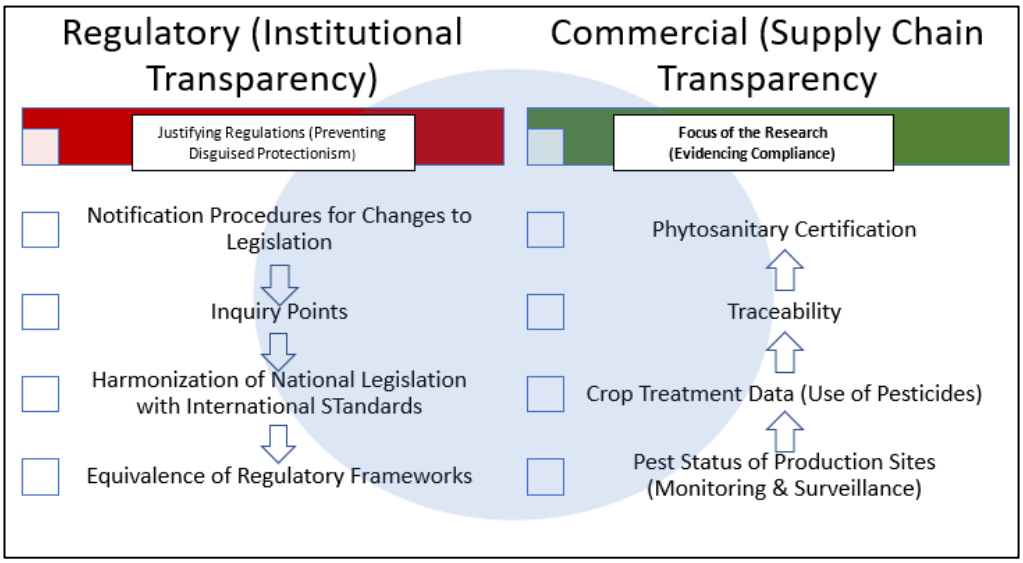

Figure 2: Illustrating the focus of the research

This study is concerned with the second dimension (i.e., supply chain transparency) where interceptions have intervened as a result of the presence of harmful organisms in consignments, irregularities on phytosanitary certificates, pesticide residues, and also for lack of comprehensive data on the pest status of production sites, resulting in what the EU considers to be unreliable declarations on phytosanitary certificates. The Ugandan horticultural export supply chain features a combination of economic and non-economic actors with the latter being responsible for export control and certification processes. The certification

process requires traceability data that includes crop treatment and pest status data which is not always available or reliable.

The study is set in a context of international trade of agricultural products and involves the study of a production system impacted by phytosanitary regulations that are increasingly shaping the landscape of supply chains in developing world countries.

It was motivated by the observation that an increasing number of horticultural product consignments, inbound from sub-Saharan producing countries (notably Uganda) were being intercepted in the EU, owing to the presence of organisms, classified as harmful to the environment, and thereby representing a phytosanitary risk. Hence, the study is geared towards an understanding of factors contributing to interceptions, i.e., reduced market access for the agricultural products of developing world countries based on the Ugandan experience.

At a higher level, it is a question of whether or not interceptions (i.e., supply chain disruptions) are caused by a real deficiency in underdeveloped agricultural systems, or by protectionist measures aimed at EU domestique interests. This is based on the institutionally founded assumption that transparency leads to enhanced market access (especially) for the agricultural produce of developing world countries (Henson & Loader, 1999; Jensen, 2002, Downes, 2012).

For instance, back in 2003, Mugyenyi & Naluwairo (2003) concluded that the last three decades of trade between Uganda and the EU did not benefit Uganda with factors both internal, external, and structural contributing to the unprofitable situation. They listed as internal factors poor trade policies, inadequate support to the private sector, a narrow export base, reliance on export of raw materials and high-level corruption. External factors included non-tariff barriers, protectionist policies, subsidies, and tariff peaks. Structural challenges were related to poor infrastructure, poor product quality, poor and obsolete technology, poor marketing techniques and insufficient knowledge summarised as supply side constraints.

The problem therefore is threefold: A) Considering the importance of the agricultural sector to the economies of developing countries and the

economic importance of the FCM to the EU as a quarantine pest, how do these factors (external, internally, and structurally speaking), in the case of Uganda, account for the rising wave of EU interceptions? B) How are they related to, and/or do they contribute to a lack of transparency (or opacity) in the evidencing process of phytosanitary regulations and C) How did Ugandan authorities respond in terms of measures to improve transparency and therefore compliance ?

1.2.1 Outcomes: Supply Chain Governance Implications

The dynamic character of relations and interdependencies between the members of agribusiness chains notably with regards the emergence of private and public standards is a challenge in today's international business society and supply chains more specifically. It can be argued that the choice of a sound governance structure is critical success factor in the face of these challenges which as shall be discussed are rather imposed than chosen by compliance requirements. Doubtlessly, Gereffi & Fernandez-Stark (2018) state that the global economy is increasingly structured around Global Value Chains (GVC) accounting for a rising share of international trade, GDP, and employment. The value chain describes the full range of activities undertaken by firms and workers to bring a product from its conception to end use (Gereffi & Fernandez-Stark (2018). The authors argue that because local production is increasingly embedded in a global economy, these transnational value chains have significant implications in terms of how developing country firms, producers, and workers integrate the wider economy. The ability to effectively integrate into international value chains has emerged as a vital condition for development gains which come in terms of capability building (upgrading) and job creation. Szabo & Bardos (2006) in Gellynck & Molnar (2009) posit that not all governance structures are equally well suited for supply chains with members having to select the most appropriate one from a continuum with spot market and vertical integration as the two extremes. Further, whereas Gulati & Singh (1998) in the same discussion argue that this selection depends on a number of variables such as relationship duration or the state of technology applied between parties, it is increasingly obvious that international private and public standards (such as those targeting the introduction and spread of harmful organisms due to the

international trade of plants and plant products) are having a major role to play in the governance outcomes of horticultural supply chains in sub-Saharan Africa. Gereffi & Fernandez defines governance as authority and power relationships that determine how material and human resources are allocated and flow within a chain. This has been observed in a tendency to shift from traditional spot market-oriented operations to vertically integrated supply chain management structures as exporters seek enhanced compliance and access to high value European markets (Jaffe, 1995;2003). Even as these standards impose a higher level of coordination for enhanced transparency on the part of supply chain operators, the Global Value Chain (GVC) framework (Gereffi, 1999;2005) enables one to holistically examine outcomes from a bottom-up perspective in terms of strategies employed by countries to maintain or improve their positions in the international economy (Gereffi & Fernandez-Stark (2018). For instance, If sub-Saharan horticultural export supply chains are to sustain access to high value export markets, there is a need to examine factors within existing governance or control structures that may operate as inhibitors or facilitators of transparency in the supply chain (with regards to plant health regulations) and to have these prioritised and managed for enhanced compliance with export market requirements. This has been observed to operate in terms of resource and capability upgrades aimed at facilitating supply chain coordination and information sharing practices between key operational and institutional stakeholders (Dolan et al., 1999; Asfaw et al., 2015; Ajwang, 2019)

1.3 Research Questions

As mentioned above, there are three issues warranting an investigation in the Ugandan horticultural export supply chain; these include factors contributing to interceptions, their relationship to transparency in the supply chain, and the response of Ugandan authorities to improve the compliance of the horticultural export control system. In this regard, three research questions were developed to guide the study.

1) What are the factors contributing to interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) ?

2) How do these factors contribute to a lack of transparency in the Export Supply Chain (SC) ?
3) How did the supply chain respond to regulatory requirements for transparency and what are the outcomes?

An embedded single case study design consisting of twelve semi-structured interviews, participant observations, and official document reviews was the preferred approach to tackling the research questions.

1.4 Research Objectives

In order to address the above research questions, four related objectives were defined and outlined as follows.

1. To identify factors and processes through which interceptions are caused in the Ugandan horticultural export supply chain
2. To examine their role as inhibitors of transparency in the supply chain
3. To evaluate the response of the supply chain to demands for greater transparency and compliance from of the EU
4. To make recommendations for improving transparency in the supply chain.

1.5 Research Approach

1.5.1 By Focus

Considering the dynamic nature of the problem (interceptions), its currency in a highly volatile regulatory environment, and its scope in terms of those affected (mostly sub-Saharan countries), this research adopts a single instrumental embedded case study design aimed at an understanding of the phenomenon of interceptions in relation to transparency in agricultural supply chains.

Focus is on the Ugandan horticultural export supply chain (specifically with regards to capsicums i.e., hot peppers) conceived as an organisation comprised of economic actors (i.e., exporters) and non-economic actors (i.e., official inspectors, associations, state agencies) working together under a regime of EU phytosanitary regulations.

1.5.2 By Intent

The research approach can also be justified by intent. To illustrate, based on Stake (2005), the instrumental case study, is borne from a research question, a puzzlement, a need for a general understanding, and the feeling that the researcher may get insights into the question by studying a particular case. The "case" is instrumental in that it sheds light on the research question (the issue) or in that it is used to either answer the research question or illustrate the research problem.

This research is concerned with the issue of phytosanitary interceptions in the EU and how they may be caused by failures in the supply chain dimension of transparency as illustrated in figure 2 above. The intention is to use the Ugandan horticultural export supply chain, victim it can be argued of interceptions, to illustrate, and understand the problem.

As it happens, if interceptions which constitute a market access challenge were specific to Uganda, my interest would be intrinsic and specific to Uganda. However, as illustrated in table 1 above, plant health interceptions motivated by the presence of the FCM are a common problem to sub-Saharan countries, a fact which is further illustrated in figure 3 below.

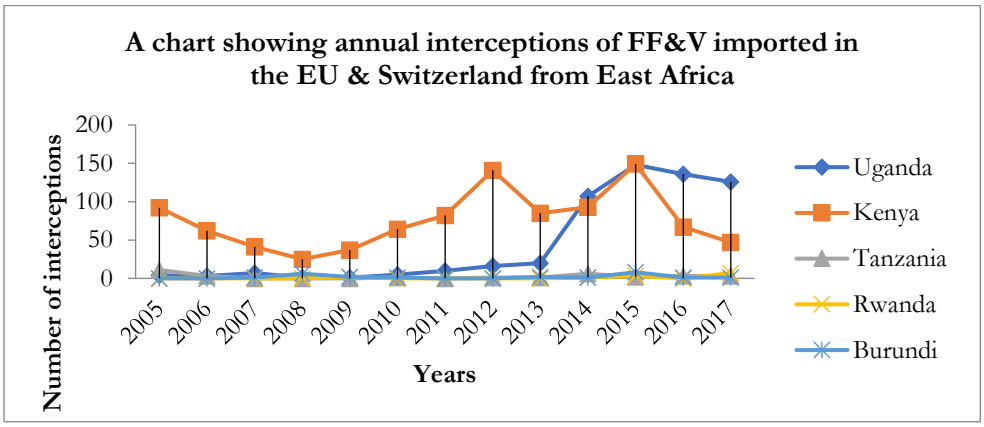

Figure 3: Comparing interceptions of horticultural produce from East Africa (Source: Europhyt, 2018)

In the East African region, Uganda, Kenya, and Rwanda are all exporters of capsicum to the EU. As illustrated in figure 4 below, because export volumes are generally and significantly higher for Kenya than they are for the other trading partners, one will expect a higher volume of interceptions of consignments coming from Kenya, but such isn't the case.

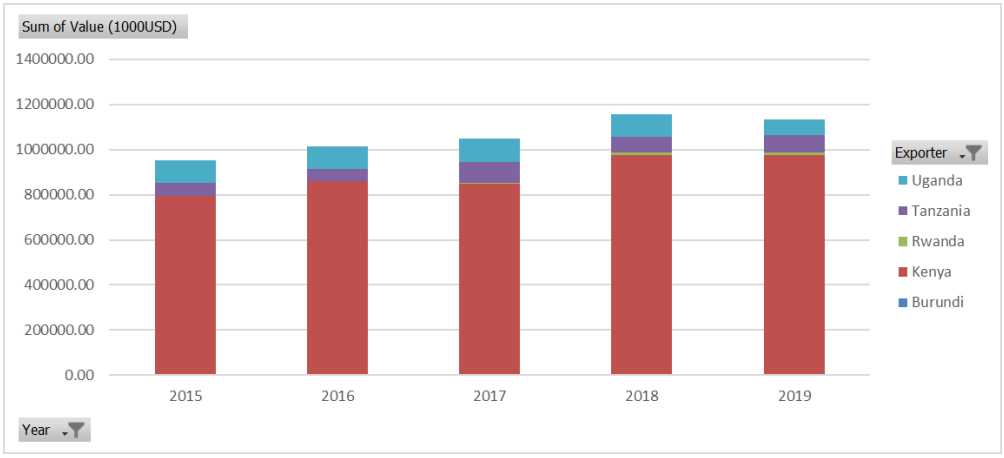

Figure 4: Evolution of East African Horticultural Exports to the EU: Source: Chatham House, 2020)

Even though it can be argued that Kenya is technologically more advanced and infrastructurally more equipped than Uganda to deal with the issue of quarantine pests, the explanation warrants an in-depth investigation of why and how interceptions are caused in the Ugandan horticultural export supply chain. Hence, an instrumental single case study aimed at illustrating and explaining the phenomenon of interceptions is the preferred approach.

1.5.3 By Data Collection Methods.

Yin (2014) recommends a variety of data collection methods in case study research of which semi-structured interviews (based on a purposeful sampling procedure designed to cover key supply chain actors), participant observations, official document reviews and trade data were relied on for information and triangulation purposes.

1.5.4 By Analysis

A thematic analysis partly informed by the literature (deductive) but mostly informed by data collected (inductive) was used to identify and relate factors in processes leading up to interceptions. Considering the embedded nature of units (exporters, inspectors) within the single case study, the analytic strategy was to identify issues within each unit and then focus on themes that transcended all units. For instance, outgrower literacy levels contributing to interceptions through the inability to read and follow crop treatment recommendations was recurrent theme across all exporters interviewed. Hence, it is possible to speak of a "cross unit" analysis within an embedded single case study as opposed to a cross case analysis which would be the situation in a multiple case study.

1.6 Research Contributions

This study contributes to literature exploring changes in the structure of internationally dispersed but functionally integrated supply chains. These have been analysed under the Global Value Chain (GVC) framework that explores the different ways through which countries or regions reorganise themselves in order sustain or increase benefits from participation in these international production systems (Gereffi & Fernandez-Stark, 2011; 2016; 2019). However, predominant approaches to GVCs have not yet provided a full account of the structural outcomes and trends featuring trade in agricultural products. They have mainly focused on the role of private sector actors (Lead Firms) in the governance and transformation (upgrading) of GVCs. To illustrate, most studies in the agricultural sector, notably in sub-Saharan Africa, have either focused on value distribution (Dolan et al., 1999; Kaplinsky & Fitter, 2001) or on a firm level input/output analysis (Jaffe, 1995, Gereffi & Fernandez-Stark, 2016;2019) to explain structural orientations in GVCs. Nonetheless, as mentioned by Keane (2008), although understanding the division of economic surplus across nodes in the GVC approach is fundamental to determining chain drivers, this cannot be a unique point of interest to researchers. Assuredly, governance and structure is determined by actors and factors other than lead firms and value distribution in the chain. It is to say that external governance structures (e.g., international standards) and most notably the state have a bigger role to play in governance and structural outcomes than captured in the literature. For instance, although Jaffe (2003) acknowledges the role of the regulatory environment in the determination of structural outcomes, the role of the state (national and supranational) is often restricted to rule setting and enforcement (i.e., penalties).

Moreover, even though the role of transparency (e.g., through mandatory traceability systems) in preserving consumer confidence (by establishing accountabilities and responsibilities for breakdowns in international food chains) has been extensively discussed in the literature (Opara & Mazaud, 2001; Trienekens et al., 2001; Hofstede, 2003; Manning, 2006;2018; Knowles & Moody, 2007; Wognum et al., 2010; Whitworth et al., 2017), there is a persistent bias towards sanitary (as opposed to phytosanitary) concerns. In addition, the role of transparency as a determinant of both

governance and upgrading outcomes in GVCs warrants further investigation. This is evident in the study by Faisal (2015) where inhibitors of transparency notably at a regulatory level is to blame for food safety concerns but there again, focus is on the sanitary aspects of the agro-food supply chain.

Based on this assessment, this research conceptualises transparency within the framework of a GVC bottom-up analysis to illustrate outcomes of external governance structures in the form of phytosanitary interceptions. It also examines and illustrates the role of the state in the determination, coordination, and success of upgrading in a domestic horticultural value chain. Building on a supply chain transparency inhibitor matrix (Faisal, 2015), it discusses the impact of phytosanitary concerns in the Ugandan horticultural export organisation and makes the argument that governance/structure does not only reflect the economic distribution of value but also, the information requirements (or the need to evidence the compliance) of the supply chain. Thus, in addition to GVC research, it contributes to the literature on SC transparency in illustrating its role in facilitating and/or impeding the market access of high value horticultural products from SSA.

1.7 Outline of the Thesis

Chapter two surveys the literature to establish a background to developments in the horticultural industry of SSA

Chapter three considers the debate on transparency in supply chains with the objective of introducing a framework used in chapter 7 to analyse transparency and prioritise recommendations for improvements in the supply chain

Chapter 4 presents the research methodology applied in this research as a basis for the analysis in chapter 5 and 6,

Chapter 5 explores why and how Interceptions are caused in the UHESC.

Building on chapter 5, chapter 6 discusses how interceptions are related to transparency in the SC, as well as measures taken to enhance compliance

Chapter 7 discusses research findings in the context of a broader literature while making suggestions for improving supply chain transparency notably with regards to digitisation.

Overall, the study concludes that the state has an important and often underestimated role to play in the organisation and success of upgrading activities in a developing world context. It also observes that institutional transparency which is aimed at preventing disguised trade protectionism is a necessary but insufficient condition for the continued access of horticultural products from SSA to high value European markets. This is owing to the need supply chain operators have to evidence compliance with regulations that institutionally, are themselves in principle transparent (i.e., justified). Consequently, it makes the point that supply chain transparency which requires a shift from arm's length spot market-oriented structures, to supply chain management structures (notably in terms of integration and coordination) has a bigger role to play in the sustained market access of SSA's horticulture.

Chapter 2

The Horticultural Industry in Sub-Saharan Africa: Trends & Outcomes

Introduction

This chapter presents a background to the Sub-Saharan horticultural export industry as the basis for future discussions on the issue of interceptions and transparency in developing world agricultural supply chains. It also presents a background to international plant health regulations that contributes to an understanding of the context of the study especially with regards to the issue of harmful organisms (HOs) in agricultural supply chains.

While the term plant health is generally used to refer to the well-being of individual plants and their associated organisms in both natural and cultivated systems (Doring et al., 2012), this dissertation adopts a biosecurity perspective to the concept and defines plant health as the legislative and administrative procedures used by governments to prevent plant pests from entering and spreading within their territories (Macleod et al., 2010.). As noted in the previous chapter, the accidental introduction of Phylloxera from North America into Europe in the 1860's led to an important devastation of much of Europe's grape-growing regions and laid the foundations for plant health regulations governing the international trade of plants and plant products (Downie, 2002; Campbell, 2004; Macleod et al., 2010).

As shall be discussed in more detail, these legislative and administrative procedures are operationalised in what the International Plant Protection Convention (IPPC) classifies as "Plant Quarantine" activities – designed to prevent the introduction and spread of pests or to ensure their official control (FAO, 2019).

To illustrate, in an evaluation of the performance of European border controls in the detection and interception of harmful organisms, Bacon et al. (2012) concluded that European countries with gaps in border controls have been invaded by higher number of quarantine alien insect species. The authors argue that this is an indication of the importance of proper inspections to prevent insect invasions.

The implication of tightening plant quarantine inspections during border control has been a rise in the number of interceptions of horticultural produce inbound from developing world countries. Note that these for most are heavily dependent on the export agricultural commodities. The False Coddling Moth (FCM - Thaumatotibia leucotreta) for instance, mostly endemic to sub-Saharan Africa has been responsible for significant crop losses and represents a phytosanitary risk to the EU in terms of imports from sub-Saharan Africa (SSA).

In what is to follow, a general background to the sub-Saharan horticultural industry is presented alongside trends that are shaping the industry. Next, a brief background to international plant health regulations is presented alongside the regulatory framework under which horticultural supply chain operators are bound. This sets the scene for a discussion on the role of transparency in agricultural supply chains which is the focus of the next chapter.

2.1 Trends in the Horticultural Export Industry of SSA

The last two decades have been characterised by a noticeable boom in horticultural exports from sub-Saharan Africa with countries like South Africa, Kenya, Ivory Coast, Cameroon & Ethiopia leading in exports towards the EU. Export horticulture has been one of the bright spots of African development (Jaffe & Masakure, 2005). It has raised production standards in agriculture, created supporting industries, and provided considerable employment in rural areas. While three countries – South Africa, Côte d'Ivoire, and Kenya – account for the majority of this success, in the past decade Zimbabwe and Zambia have also experienced rapid horticultural export growth (Jaffe & Masakure, 2005). According the Chatham House database (Chatham House, 2020), the region accounts for 2.2% of international horticulture trade. Figure 4 below is a summary of key trade statistics for horticultural exports from SSA towards Europe over the last two decades.

As can be inferred from figure 5 below, horticultural exports from SSA to the EU have increased by 225% over the last two decades growing from $1.6bn in 2000 to $5.2bn in 2019. Top destinations include the UK, France, Belgium, and Germany mostly fuelled by increased demand for exotic fresh

produce in developed markets as well as by a growing diaspora population. What this also illustrates, is the ability of horticultural supply chains in SSA to consistently meet rising demand in the EU over the last two decades although this has come with added challenges as shall be discussed in the case of Uganda.

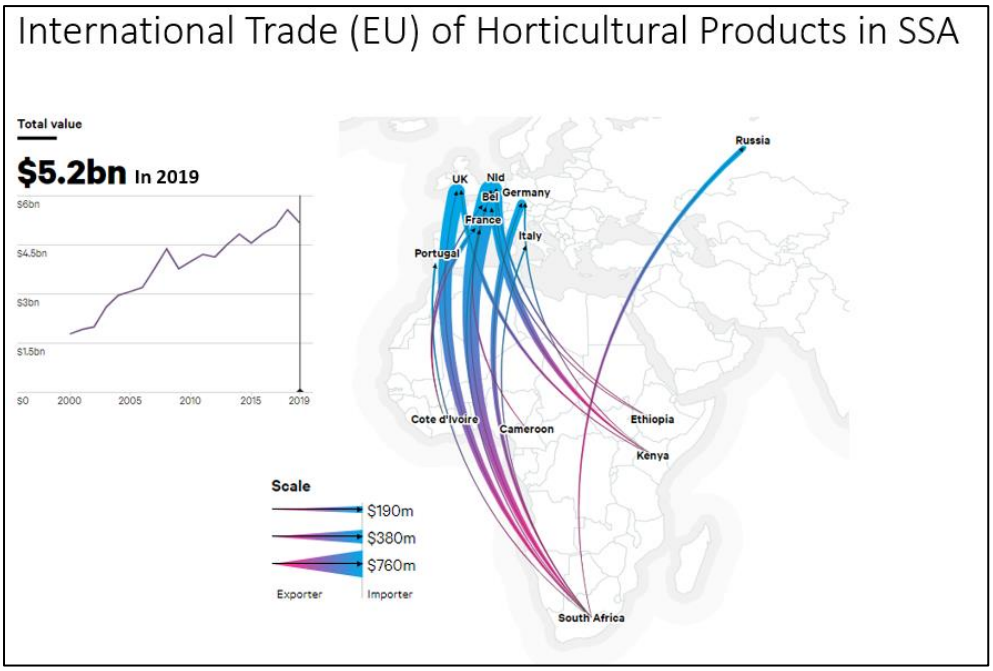

Figure 5: Overview of SSA exports to the EU 2000-2019. (Source: Chatham House, 2020)

This expansion in international trade has been equally accompanied by an exponential growth in regional trade albeit at a lower scale as illustrated in figure 6 below.

In effect, trade with the EU ($5.2bn) was six times more important than regional trade ($820m) which is mostly dominated by outflows from South Africa. An observation which leaves one with the conclusion that the horticultural industry in SSA is mostly driven by the export market. This is even more evident considering the fact that over 20% ($1.1bn) of total trade ($5.2bn) in horticultural produce with the EU in 2019, originated from the East African Community as illustrated in figure 7 below.

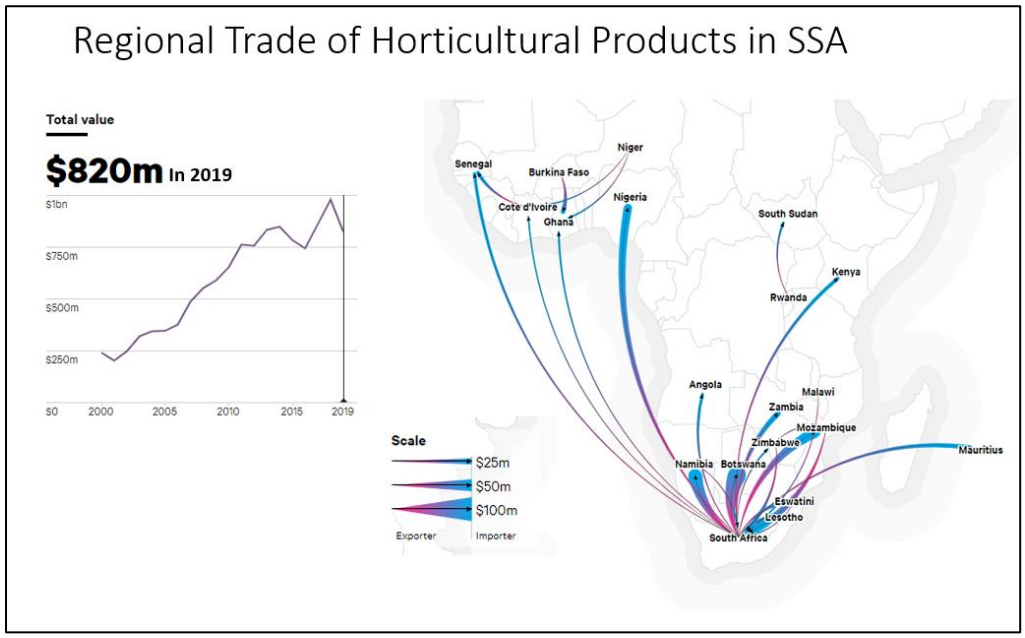

Figure 6: Overview of Regional Trade of Horticultural Produce in SSA (Source: Chatham House, 2020)

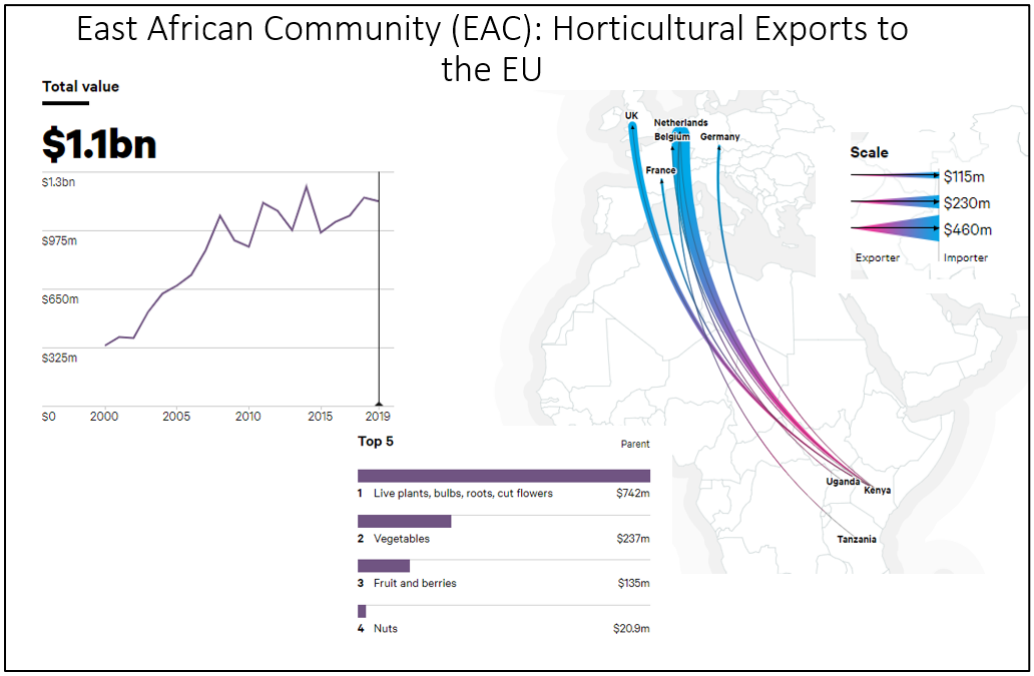

Figure 7: Overview of EAC Trade in Horticultural Produce with the EU (Source: Chatham House, 2020)

Whereas export driven horticulture has significantly contributed to poverty alleviation in SSA through the inclusion of small-scale growers, the emergence of stringent private and public standards regulating the industry is threatening their sustained presence in the value chain. In point of fact, Ernest Akobuor Debra, former Ghanaian Minister of Food & Agriculture in a foreword to a UN Conference report (Unctad.org., 2008)

summarised the context as well trends that have characterised the horticultural industry in SSA over the last two decades. In his words,

"Export-driven growth of horticulture has been impressive in a number of countries in sub-Saharan Africa (SSA). The involvement of small-scale growers in the production of fresh fruit and vegetables (FFV) exported mainly to the European Union has contributed to poverty alleviation and rural development. However, the emergence of stringent public and private sector standards as well as the growing power of large supermarkets have resulted in fundamental changes in international trade in FFV. Spot markets for exportable FFV are being increasingly replaced by supply chain management. Exporters need to coordinate closely with producers, traders, and processors to ensure proper documentation and compliance with the requirements of powerful retailers in international markets. This includes conformity with process-related requirements of private sector schemes for good agricultural practices (GAPs). There is also a trend towards increased vertical integration: integrated producer-exporters source a larger share of their exports from their own production. These trends undoubtedly present a huge challenge for small-scale growers who have so far participated in value chains through contract farming" Ernest A. Debrah, Minister of Food and Agriculture, Ghana (Unctad.org., 2008)

Back in 2008, the former Ghanaian Minister of Agriculture hinted on a turning point in the horticultural industry of SSA involving a shift from traditional spot market operations to vertical integration and supply chain management.

Beyond doubt, compliance requires enhanced coordination of supply chain processes which is preferably achieved through vertical integration and/or in-house production capabilities.

The need for proper documentation points to requirements for traceability in critical production processes in order to authenticate compliance claims. This is an implicit reference to the role of transparency in the transformation of horticultural supply chains in SSA, an observation that shall be dealt with in chapter 5 & 6. In the meantime, it is worth building on some of the key aspects brought up in the passage above.

2.1.2 Export-driven growth of horticulture

As observed above in figures 5, 6, & 7, international trade in horticultural products from SSA has witnessed a rapid increase over the last four two decades. Two decades ago, changes in dietary habits stemming from increased health awareness, together with demand for convenience foods were observed to have accelerated year-round consumption of fresh fruit and vegetables as well as the sale of an increasing variety of prepared foods in industrialised countries (Dolan & Humphrey, 2000). Growth in horticulture driven by the export of fresh fruits and vegetables to the EU has therefore significantly contributed to poverty reduction and rural development in Sub-Saharan Africa notably in Ghana, Ivory Coast, Kenya, and Uganda. To illustrate, Fukase & Martin (2018) report that between 1988 and 2014, world agricultural exports grew from US$83.4 billion to US$1,532 billion while SSA's agricultural exports increased from US$2.7 billion to US$44.3 billion. The authors report that if horticultural products accounted for 12 percent of world agricultural exports in 2014, Africa's share of horticultural exports rose from 10 percent in 1988 to 22 percent in 2014. During the same period, the share of horticultural exports (as opposed to bulk and semi-processed products) rose from 10 percent in 1988 to 22 percent in 2014. Harrison (2002) had already observed a quiet revolution in world agricultural trade patterns with a decline in the growth of cereal production (6 percent increase between 1985 and 1995) as opposed to vegetables and melons production which jumped by 47 percent over the same time period. The author argues that the worldwide move towards free market policies, reduced trade barriers and free trade agreements have resulted in a rapid expansion in horticultural product trade. For instance, Dolan & Humphrey (2000) noted amongst key factors driving SSA's horticultural boom in exports:

- The Non-interference by government in the commercial dimensions of the business.
- Preferential trade agreements such as the Lomé Convention.
- The achievement of sub-regional/cross-border economies of clustering, which provides a critical mass of activity for technical learning, market information flows, the development/spread of trained manpower.

- International technical and marketing strategic partnerships which have assisted in technology transfer, logistics, market penetration, and the creation of a market identity for African products.
- The effective coordination of internal and international logistics at the industry level, involving intra-firm co-operation

African exporters are therefore seizing new opportunities in becoming integrated into global agricultural value chains notably in flowers and horticultural crops (Fukase & Martin (2018). This must be the case because Minot & Ngigi (2004) in the introduction to their book notice the success story of the Kenyan horticultural industry which at the time had increased fourfold in constant US$ since 1974 to reach US$ 167 million in 2000. The authors attributed this growth to a significant participation by smallholder farmers who account for about half of Kenyan horticultural exports.

2.1.3 Standardisation & Harmonisation

However, this growth in export-oriented production of FFVs in SSA has been accompanied the emergence of stringent public and private sector standards with the latter increasingly driven by consolidation in the European Supermarket sector.

The Role of Supermarkets

Dolan & Humphrey (2000) observed that one of the most striking features of the retailing of fresh food in the United Kingdom observed over the previous three decades was the increasing dominance of large supermarkets. The authors report that whereas specialist and greengrocers had a 46% market share in the UK in 1980, it fell to 26% by 1991 with supermarkets and major retail chains accounting for 76% of UK fresh fruit and vegetable (FF&V) sales by the turn of the decade. In terms of consolidation in the food industry as a whole, Jaffe & Masakure (2005) advise 35% or less for Southern Europe, 50 – 65% for France and Germany, and 70 – 85% in Scandinavia and Switzerland. Dolan & Humphrey (2000) argue that the horticultural value chain linking UK consumers and supermarkets to export organisations in Africa was directly affected by this process of consolidation across Europe in the FF&V retail industry. With the largest UK retailers controlling 70 - 90% of fresh produce imports from Africa, standardisation was bound to impact the

structure and organisation of horticultural supply chains in SSA (Dolan & Humphrey, 2000). For instance, Jaffe & Masakure (2005) reported that by 2005, 84% of fruit and vegetables were sold in the UK through large supermarket chains, 10% through green grocers, & 3% through market stalls and others 3%.

Changing Consumer Patterns

Also, as consumers in Europe became increasingly concerned about food safety as well as the ethical and environmental conditions under which food is produced and distributed, regulators and supermarkets were bound to adapt regulations and standard operating procedures. Jaffee & Masakura, (2005) argued food scares and related events in the 1990s and early 2000s shook the trust that many European consumers had in the safety of their food while raising concerns about the credibility and effectiveness of food safety regulatory systems. This trend has continued to date with consumers increasingly integrating the transparency of agri-food supply chains into their buying decisions. demand information on the safety of their food, its origins, and the environmental conformity of processes that produced and delivered them (Trienekens and Beulen, 2001; Wognum et al., 2011; Gardner et al., 2019). Coupled with the consolidation process previously hinted and in response to consumer demands for increased transparency in the sourcing process, explained that supermarkets increasingly bypassed wholesale importers to negotiate directly with exporters in Kenya and other countries. To them, This created a more direct link between consumer demand in the importing countries and producers in the exporting countries. Seeking to protect their reputation, they resolved to imposing new restrictions and organizing production in developing countries (Dolan & Humphrey, 2000; Minot & Ngigi 2004)

2.1.4 Tightening of Regulations in the EU & UK

The consolidation that resulted in more direct relationships between EU supermarkets (notably in the UK) and SSA exporters was in actual fact, driven by regulatory requirements.

The 1990 Food Safety Act & Due Diligence

Jaffee & Masakura (2005) argue that the deepest reforms and the most elaborated efforts to bring greater transparency to food safety management have taken place in the United Kingdom, stimulated by a series of food safety crises and scandals (e.g., the BSE) which provoked disruptions to the food system. The 1990 Food Safety Act was a response that requires retailers to demonstrate their "due diligence" in the production, transportation, storage, and preparation of food products (Dolan & Humphrey, 2000). Jaffe & Masakure (2005) report that the act radically transformed quality management systems in the UK's food sector while establishing greater clarity in control, enforcement, and responsibilities for food safety. As due diligence made supermarkets responsible for the conduct of their suppliers, there was a need to develop systems to account for the documentation and traceability of produce from the fields to the shelves. Table 2 Below is a summary of the evolution of private and public standards regulating the EU food industry over the last 30 years.

	1990 – 1995	1996 – 1999	2000 – date
Official	Food Safety Act (UK) (1990). EU Directive on Pesticide Residues (1990). EU Directive on Food Hygiene (1990). EU Harmonized Framework on Pesticides (1991, 1993).	Community-wide Pesticide Minimum Residue Levels (MRLs) Monitoring Program Launched (1996). Council Regulations promoting the Application of Good Agricultural Practices (1996, 1999)	EU Harmonized Phytosanitary Regulation (2000, 2002, 2016, 2019) EU Harmonized Quality Inspection Regulation (2002) EU General Food Law Regulation (2002) European Food Safety Authority created (2002) Many agro-chemical active substances removed from approved list (2003)
Private	Individual Supermarket Codes of Practice + Audits. Assured Produce Scheme (UK)	Formation of EUREP (1997) and launch of EUREPGAP fresh produce standard (1999).	EUREPGAP fresh produce standard revised (2003). Ethical Trading Initiative launched plus other requirements for 'ethical'

	Safe Quality Food standard created	British Retail Consortium (BRC) Food Technical Standard (1998). Ethical Trading Initiative Founded	audits International Food Standard launched in France and Germany (2003) Global Food Safety Initiative launched
International	WTO SPS Agreement (1995)		FAO Develops a framework for GAP

Table 2: evolution of private and public standards regulating the EU food industry over the last 30 years: Adapted from Jaffe & Masakure (2005)

On the Evolution of Private Standards

Hensen & Reardon (2005) observe that these private food safety and quality standards operate alongside regulatory systems (e.g., plant quarantine) and while not being legally binding, they have the potential to be mandatory for suppliers. This has sparked a debate on the increasing role of private standards in the governance of food safety, quality, and the wider social and environmental impacts of agri-food systems (Hensen et al. (2011). The authors report concerns that private standards can have detrimental impacts on developing countries who struggle to meet the increasingly exacting food safety/environmental requirements of industrialised countries. This they argue, has only fuelled accusations that private standards diminish the ability of developing countries to gain access to and/or compete in contemporary agri-food value chains. Similarly, while establishing that small-scale producers in developing countries can benefit substantially from adopting private sector standards at farm level, Asfaw et al. (2010) note that compliance entails costly investments in variable inputs and long-term structures. For instance, Jaffee & Masakura (2005) attribute the success of Kenya to substantial investments in improved production and procurement systems, upgraded pack house facilities, as well as quality assurance/food safety management systems. With regards to the concept of Good Agricultural Practices mentioned above, during its 17th session in Rome (March 2003) which saw the development of a framework for GAP, the Committee on Agriculture (COA) of the Food and Agriculture Organisation (FAO) argued that "a broadly accepted framework of GAP principles, indicators and practices may provide a reference point to guide debate on national policies and actions. It may also ensure that stakeholders at all levels of development

benefit from the application of GAP in on-farm agricultural production and post-production systems. Such a framework they argue, would also provide transparency among all actors along the food chain and promote harmonization of approaches and their indicators of achievement".

Amongst the key regulatory changes that have affected the EU/EEA/UK food distribution industry and consequently SSA horticultural export supply chains summarised by Jaffe & Masakure were:

- An EU-wide initiative to apply stronger health and environmental criteria to the assessment and registration of agro-chemicals, to reduce the tolerance levels for pesticide residues in foods, and to strengthen the monitoring and enforcement of such regulations (e.g. (EC) No 396/2005 & (EC) No 1107/2009)
- An EU-wide initiative to harmonize and strengthen protective measures against the introduction and spread of plant pests and diseases (e.g. (EC) No 2000/29, (EU) 2016/2031, (EU) 2019/2072)
- Regulations to strengthen and (later) harmonize quality inspection arrangements for fruits and vegetables and other selected products. (Jaffee & Masakure, 2005)

2.2 Plant Health and International Trade in Horticultural Products.

According to Macleod et al. (2010), internationalisation through trade is the fundamental human cause of invasive non-native pest introductions. Eschen et al. (2015) refer to international trade, notably trade in live plants for planting nursery stock), as a major pathway for the introduction of alien plant pests with evidence being a strong increase in volumes as well as changes in the origins of plants. In effect, the authors attribute this trend to an increasing tendency to move nursery operations to countries with lower costs of production as well as to an increase in the importation of retail ready plants.

As discussed earlier, "Plant Health" in simple terms, refers first of all to the well-being of individual plants and their associated organisms in both natural and cultivated ecosystems (Macleod et al., 2010). Although Doring et al. (2012) have developed a conceptual framework with philosophical underpinnings for the concept based on naturalist and normative

approaches (amongst others), the definition adopted in this study is that proposed by Macleod et al. (2010) which looks at Plant Health from a biosecurity perspective. In this sense, the term refers to the legislative and administrative procedures used by governments to prevent plant pests from entering and spreading within their territories. These legislative and administrative procedures are operationalised in what the International Plant Protection Convention (IPPC) classifies as "Plant Quarantine" activities – designed to prevent the introduction and spread of quarantine pests or to ensure their official control (FAO, 2019).

Transparency in Plant Quarantine Activities is of utmost importance as they have a key role to play in the market access of Agricultural Products. Yamamura et al. (2016) advise that while the establishment of import quarantine systems is the best-known method for preventing the unintentional introduction of invasive alien pests, they are sometimes judged as non-tariff barriers against trade by the WTO. Eschen et al. (2015) advise of an urgent need to understand the efficacy of existing measures as well as the identification of new measures to reduce and mitigate the risk of introducing pests through intercontinental trade.

Lakin et al. (2003) advise that through greater transparency in Plant Quarantine services, better information (e.g., provision of a regulated plant pest list) is made available and unjustified phytosanitary trade barriers are revealed, challenged, and eliminated. Thus, while on the one hand, through incoming good inspection processes, quarantine services enable regulators to verify that products and documents are in conformity with Plant Health regulations and to take action when necessary, on the other hand, plant quarantine systems are also under scrutiny for conformity with WTO rules aimed at facilitating market access for agricultural products. There are three key components to quarantine systems (Yamamura et al., 2016; Dubey and Gupta, 2016):

- Import Sampling and Inspection
- Early Detection Procedures
- Emergency Control

In the context of agricultural trade, transparency is a principle that is fundamental to not only managing the risk of introduction (pests) but also to anticipating and mitigating regulatory obstacles especially as phytosanitary regulations can be used as a disguised form of trade protectionism. According to Downes (2012), while WTO members are increasingly notifying trading partners of changes to domestic legislation under Article 7 (dealing with transparency) and annex B of the SPS Agreement, these notifications are neither sufficiently indicative of the extent of members' commitment to transparency nor of any real contribution to the reduction of technical barriers to trade.

To understand the role of Transparency in Agricultural Supply Chains from a Plant Health perspective, it is important to consider the evolution and background to Plant Health regulations and international agreements.

2.2.1 Evolution of Plant Health Regulations.

Year	Event
17th Century:	France: Legislative authorities of Rouen pass a law requiring the destruction of barberry bushes in wheat growing areas to protect wheat from black stem rust. Destruction of Barberry is voluntary in the UK (less infestation).
1807	Isaac-Benedict Prevost experimentally demonstrates that plant diseases are caused by microorganisms as opposed to spontaneous generation from diseased plant issue
1840	Irish Potato Famine: Marks the emergence of Plant Pathology. Famine caused by potato blight, 200 years after the introduction of potatoes from South America. Simultaneous occurrences on a lower scale in the Netherlands and elsewhere in Europe.
1862	1862: Phylloxera is accidentally introduced into Europe when a French wine merchant accidentally imports infested US vines for hybridization. Infestations are also registered in Australia, South Africa, New Zealand & Peru. 1 million acres of French vineyards were destroyed, and 0.6 million hectares were infested.
1878	International Convention on Measures against Phylloxera is signed in Berne (7 affected countries) - Switzerland. Measures include: - Written assurance of pest free status of internationally traded host material - Establishment of a government body to implement measures

1881	A revision of the 1878 convention is done due to lack of clarity in the definition of terms used. The convention was revised to include definitions.
1889	Australia begins port inspections of cargo (in Sydney) including plants. The 1878 convention is again revised.
1890	Call for an international Phyto - pathological committee during the International congress of Agriculture + Forestry
1903	Special International Committee for Plant Diseases formed at the 7th International Agricultural Congress. It was mostly comprised of academic scientist
1905	Rome: Formation of the International Institute of Agriculture (IIA). First joint effort by governments at international action on plant diseases. Published studies on international agriculture (techniques, statistics, economics, legislation)
1914	Rome: International Plant Pathological Conference (30 countries represented). Second effort at International Cooperation by governments to act on plant diseases Attending parties signing up to the convention were required to set up Plant Health Procedures including: - Establishment of Inspection services for businesses trading in plants and plant products - Issuance of Health Certificates to plants inspected and found to be free of pests - Control of plant movements, packaging and transport - Organisation of a service for the suppression of dangerous diseases.
1929	International Convention for the Protection of Plants (46 countries represented): Extension of concerns over Phylloxera to other species. The convention was only ratified by 12 countries and was ineffective due to WWII events.
1945	Establishment of the FAO as a permanent organisation for food and agriculture. This follows a dissolution of the IIA and its replacement by the FAO as a specialised agency of the United Nations (UN). Proposals for an International Plant Protection Agreement are made by FAO members in its early days.
1951	International Plant Protection Convention (IPPC) is established in November during the sixth session of the FAO conference in Rome. International Treaty securing action to prevent the international movement of pests of plants and plant products and to promote appropriate measures for their control. - Standard Setting (trade facilitation through harmonization of SPS measures) - Information Sharing (Countries share information on phytosanitary regulations and the distribution of quarantine pests in their territories) - Technical Assistance (training, workshops, supplements to standards)
1992	Convention on Biodiversity (CBD). Concerned with preventing

	the introduction of pests (invasive alien species) whose introduction threatens biological diversity. Invasive alien plants or weeds are of mutual concern to the IPPC and the CBD
1995	Agreement on Sanitary and Phytosanitary Measures (SPS): Provisions for Plant Protection (from pests) within a trade agreement. Concerns with the movement of the movement of non-native species

Table 3: evolution of International Plant Health Regulations: Adapted from Macleod et al. (2010)

A few remarks relative to the evolution of international plant health legislation are worth noting as they already provide some indications to the importance of transparency in plant health controls.

Clarity in Rule Making

As noted above, the first international agreement preventing the spread of a plant pest was designed to contain the effects of the Phylloxera Vestatrix, an insect pest of grape vines that resulted in the destruction of over 1 million hectares of French vines by 1884 (Macleod et al., 2010). Following the outbreak, it was noted that seven European countries affected met in Berne to discuss tackling the problem; an initiative that resulted in the International Convention on Measures to be taken against Phylloxera signed in September 1878. In effect, while reference is commonly made to 1881 as the year the first international agreement preventing the introduction and spread of a pest was signed (IPPC 65th anniversary - International Plant Protection Convention, 2020), (Macleod et al. (2010) argue that it was only a revision of the 1878 agreement which at the time of its signature used terms that were not clearly defined. It was a lack of clarity in rules that led to a revision of what is now considered as the first international plant protection agreement. Air (1999) noted that in spite of the long discussions that preceded the adoption of the IPPC, its implementation principles lack clarity and to some extent, raised more questions than answers.

Creating Awareness: Creation of the IIA in 1905

The first step taken jointly by governments was in June 1905 with the formation of the International Institute of Agriculture (IIA) in Rome. The IIA made studies of international agriculture with particular reference to

agricultural techniques, statistics, economics, and legislation. It published monographs, monthly bulletins, and international yearbooks

1914 or The Genesis of Plant Quarantine Services

The International Phyto-pathological conference held in Rome in 1914 was the first instance of international cooperation between governments to ensure liberal trade of plant products does not undermine the sovereign right to protect national territories from invasive pests. Organised and run by the French government (France having been severely impacted by Phylloxera), Macleod et al. (2010) list five proposals made by the British delegation to be included in any international convention resulting from the meeting and four requirements imposed on signatories at the end of the meeting. Proposals made by the British delegation included A) the official inspection and establishment of the pest free status of plants traded internationally B) the need for consignments of plants to be accompanied by an official health certificate C) the mandatory specification of diseases for which examinations were done D) the selective inspection of consignments and D) accelerated clearance procedures for consignments with health certificates (no inspections).

Points A and B are the basis of official plant health controls or plant quarantine activities. The proposals made by the British delegation interestingly reflect some of the dimensions of disclosure discussed in chapter two. To illustrate, for information to be transparent, it has to be useful in a decision-making process. In requesting for health certificates to specify the diseases for which an examination has taken place, the British delegation was drawing attention to the very essence of a phytosanitary certificate – to certify that a consignment meets phytosanitary import requirements preventing the introduction or spread of quarantine pests or to limit the economic impact of regulated non-quarantine pests (FAO, 2018). It also illustrates the sensitivity dimension of information transparency in that the information of interest to the importing party is the pest and/or disease for which the consignment is free of. This also represents an element of risk significant enough for the importing party to invest in detection and prevention mechanisms (Yamamura et al., 2016; Eschen et al., 2015; Dubey and Gupta, 2016) The plant health certificate also raises the question of verification in the

process of disclosure. Macleod et al. (2010) note that the 1914 convention did not achieve point D (that consignments with health certificates should not be delayed at the border). The authors report that signatories did not agree to entirely give up the right to examine consignments on arrival. They were however required to A) establish official inspection services for businesses B) issue health certificates to plants inspected and free from specified pests C) control the movement of plants through packaging and transportation and D) organise services for the suppression/eradication of dangerous diseases. The underlying process implies disclosure and verification followed by validation (clearance). Point C is also bearing the semblance of a logistics requirement to track and trace produce through the supply chain, illustrates the very important fact that transparency in the agricultural supply chain is more than traceability especially when relates to issues of environmental sustainability as is the case in this instance (Gardner et al., 2019). In effect, a phytosanitary certificate can be said to reflect the disclosure dimension of transparency (Hollyer et al., 2013; 2014) while point C reflects the traceability dimension in agricultural supply chains.

Evidencing phytosanitary measures: First Initiatives

As reported by Macleod et al. the agreement was reached that countries compose their own list of quarantine pests on the condition that A) the list will only feature pests for which hosts plants were present in the country B) the pest cannot be widespread C) the pest must survive on a trade pathway and D) it must be injurious to the plant (i.e., destructive to the commercial value of the crop). The underlying need is for phytosanitary measures to be justified but the need for justification is symptomatic of a much bigger problem that has shaped the evolution of plant health regulations, with numerous implications for developing world agricultural supply chains. It is a question of market access for agricultural products representing a phytosanitary risk and the ongoing concern that phytosanitary regulations are counterproductive to international trade.

Appropriate Measures: Birth of the International Plant Protection Convention (IPPC).

As seen above (Table 3), the IPPC is the outcome of a process that started in the late 19th century in response to an outbreak of Phylloxera which devastated much of Europe's grape-growing regions (Downie, 2002; Campbell, 2004; Macleod et al., 2010).

The IPPC is an international treaty on Plant Health that aims to secure action to prevent the introduction and spread of pests of plants and plant products, and to promote appropriate measures for their control (Macleod et al., 2010). Established in 1951, it provides a framework for international cooperation in this regard and was last reviewed in 1997 to account for the increasing cross-border nature of trade in plants and plant products. The 1997 revision also considered the adoption of the Agreement on the application of Sanitary and Phytosanitary Measures (SPS Agreement) by members of the World Trade Organisation in 1995 (Hensen and Loader, 1999; Jensen, 2002; Schrader and Unger, 2003).

According to its website, the IPPC is an intergovernmental treaty signed by over 180 countries with the aim to protect world's plants resources from the spread and introduction of pests as well as promoting safe trade. Note the emphasis on the promotion of Safe Trade. The International Standards for Phytosanitary Measures (ISPMs) introduced by the Convention as the main tool for achieving its goals, grants the IPPC status as the sole organisation responsible for setting global (international) standards on Plant Health. The standards were first adopted in 1993 by the Commission on Phytosanitary Measures (CPM), governing body of the IPPC and last revised as mentioned above in 1997. They are prepared by the Secretariat of the International Plant Protection Convention as part of the United Nations Food and Agriculture Organisations global programme of policy and technical assistance in plant quarantine (FAO, 2019). Alongside guidelines and recommendations, the standards aim to achieve international harmonisation of phytosanitary measures in order to facilitate trade. They form the basis for phytosanitary measures adopted by members of the World Trade Organisation (WTO) under the Agreement on the Application of Sanitary and Phytosanitary Measures.

The WTO Agreement on Sanitary and Phytosanitary Measures (SPS)

The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) entered into force with the establishment of the WTO on January 1st, 1995 concerning the application of food safety and animal and plant health regulations (WTO, 1998). It seeks to provide solutions to the problem of ensuring that a country's consumers are being supplied with food that is safe to eat by appropriate standards while ensuring that strict health and safety regulations are not being used as an excuse for protecting domestic producers (regulatory protectionism).

While allowing countries to set their own standards, it emphasises that regulations should be drafted based on scientific evidence and applied only to the extent that they protect human, animal, or plant life or health (WTO, 1998). These measures (regulations) should not arbitrarily or unjustifiably discriminate between countries where identical or similar conditions prevail. It is recognised that while Sanitary and Phytosanitary measures may result in trade restrictions, there is the possibility for governments to exceed requirements for health protection in use of sanitary and phytosanitary measures to shield domestic producers from economic competition (WTO, 1998; Jensen, 2002). According to the WTO (1998), a sanitary or phytosanitary restriction which is not actually required for health reasons can be a very effective protectionist device, and because of its technical complexity, it has the potential for use as a particularly deceptive and difficult barrier to trade.

In effect, in the transition from the GATT to the WTO in the mid-1990s, as tariffs were being lowered and the use of other traditional barriers to trade were being disciplined by the agreements of the WTO, there was a growing concern that these were being substituted by technical measures such as sanitary and phytosanitary (SPS) (Jensen, 2002).

Hence, Article 4 of the Agreement requires Members states to accept the sanitary or phytosanitary measures of other Members as equivalent, even if they may differ from their own or from those used by other Members trading in the same product as long as the exporting Member objectively demonstrates to the importing Member that its measures achieve the importing Member's appropriate level of SPS protection. The implication is an open-door policy which requires for reasonable access to be given, upon

request to importing Members for inspection, testing and other relevant procedures (WTO | SPS - equivalence decision, 2001).

Further, the agreement recommends for members to base SPS regulations and compliance on the health and safety standards of three key relevant International Organisations.

- The International Plant Protection Convention (IPPC) which drafts Standards related to Plant Health
- The Codex Alimentarius Commission whose Standards cover Food Safety requirements
- The World Organisation for Animal Health (formerly known as the Office International des Epizooties (OIE)) whose standards cover animal health and animal diseases transmittable to humans.

Henson and Loader (1999) advised that while the SPS Agreement (which was considered in the 1997 revision of the IPPC) should provide a means for developing countries to overcome some of the inherent problems faced by them in international Agri-trade, evidence at the time seemed to suggest that developing countries were in fact adversely affected by measures which for various reasons they are unable to implement or by processes and institutions in which they are not effectively able to participate. In effect, they maintain that while participation is a key metric of the ability of developing countries to benefit from the Agreement, evidence showed low participation in areas such as notification, adoption of international standards, and attendance at meetings (Henson and Loader 1999).

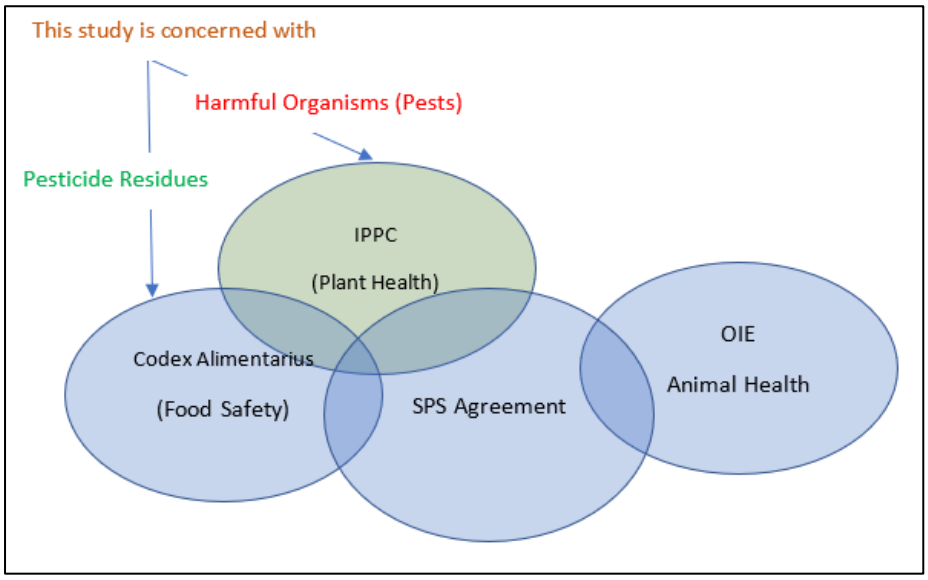

Figure 8: Regulated Standardisation (Public Governance) in the Horticultural Supply Chain

In addition, Henson, and Loader (1999) advised that while issues facing developing country exporters (of plants and plant products) and their representatives are not different from those facing a typical developed economy, the scale and magnitude of the problems may differ as well as the potential for response. Jensen (2002) maintained that although developing countries have a high demand for an effective agreement such as the SPS, they face a lot of difficulties in its usage; most do not possess the financial, human, and technical resources necessary to use it with especially least developed countries being excessively burdened by its implementation costs.

However, using the preceding rules of the General Agreement on Trade and Tariffs (GATT) as a basis for the restricted use of unjustified phytosanitary measures, the SPS agreement seeks to maintain the sovereign right of any government to implement phytosanitary measures while ensuring that these do not result in damaging barriers to international trade. It does this by ensuring that measures to ensure food safety and plant health are based on the analysis and assessment of objective and accurate scientific data (WTO, 1998; Jensen, 2002; Eschen et al., 2015).

Governments are expected to undergo a process of harmonisation which involves establishing national Phytosanitary Measures consistent with international standards, guidelines, and recommendations. (While these

international standards tend to be higher than national requirements, the SPS agreement allows governments to choose not to use international standards but to provide scientific justification in the event that national requirements result in increased restrictions to trade. This justification should demonstrate that relevant international standards would not achieve the desired or required level of health protection.

EU Plant Health Regulation

Council Directive 2000/29/EC (replaced in Dec 2019 by 2019/2072/EC) and 2005/396/EC provide a legal basis for the interception of consignments of agricultural produce from third countries (non-EU member states) due to the presence of harmful organisms or use of unregulated and/or excessive pesticide residues. In effect, articles 7, 8, 9 21 and 22 of council directive 2000/29/EC make provisions for controlling the introduction of harmful organisms present in plants and plant products into the EU. These controls include:

- Listing particularly dangerous harmful organisms whose introduction into the Community must be prohibited
- Listing harmful organisms whose introduction into Member States when carried by certain plants or plant products must also be prohibited
- minimum provisions for bans on the introduction of certain plants and plant products,
- Provisions for special checks to be made in the producer countries,
- Checks on consignments originating from non-member states and on cases where there is strong evidence that plant health provisions have not been observed [(e.g., Uganda)].

Articles 21 also states that "It is appropriate to provide in certain cases that the official inspection of plants, plant products and other objects coming from third countries should be carried out by the Commission in the third country of origin.

With regards to pesticide usage on agricultural produce, according to article 5 of council directive 2005/396/EC, states "one of the most common methods of protecting plants and plant products from the effects of harmful organisms is the use of active substances in plant protection products.

However, a possible consequence of their use may be the presence of residues in the treated products, in animals feeding on those products and in honey produced by bees exposed to those substances". (include reference – online)

The regulation therefore gives priority to public health over crop protection interests. In so doing, it seeks to keep pesticide residues on fresh produce at a minimum as these are considered to present an unacceptable risk to humans. Article 8 refers to Council Directive 79/117/EEC of 21 December 1978 which prohibits the placing on the market and use of plant protection products containing certain active substances. It recommends that residues of active substances in products of plant and animal origin arising from unauthorised use or from environmental contamination or from use in third countries should be carefully controlled and monitored.

The Directorate General – Health and Safety

Under these legal provisions, consignments of agricultural produce are systematically inspected for the presence or not of harmful organisms as well as to assess the use of pesticides during upstream production processes. These inspections are done by the Directorate – General for health and food safety (DG Sante). The DG Sante is a department of the EU Commission responsible for EU policy on food safety and health and for monitoring the implementation of related laws. It makes sure that EU laws on food and product safety, consumer rights or public health are applied by manufacturers and food producers. The goals of the DG Sante include "making Europe a healthier, safer place, where citizens can be confident that their interests are protected. While a zero-risk society may not be possible [they] are doing as much as [they] can reduce and manage risks for [EU] citizens" (DG, 2018).

The DG Sante develops and publishes an annual work programme whose priorities are identified following a careful consideration of risks, legal requirements, as well as trade and policy considerations (EU, 2018). The preferred approach is a work programme consisting of audits, fact finding, and follow up visits to both member and non-member states to ensure compliance to EU legislation. There is a team of about 170 professionals

from most EU Member States who conduct audits or inspections to ensure national (EU) and international (third-countries) authorities are fulfilling obligations with respect to EU legislation. This is achieved through on-the-spot audits, or by desk-based exercises or collation of Member States data. The audit focuses on the control system rather than individual premises and culminates in a written report. The audit team is typically composed of two auditors as well as the presence of a national expert from a Member State authority. Prior to the audit, information is gathered by sending out an audit plan and pre-audit questionnaire. The audit programme involves visits to the control authority (NPPO in Uganda), a number of regional and local authorities, laboratories, and a number of accompanied site visits (e.g., to export pack houses in Uganda). The information is gathered to provide a series of findings which are presented at a closing meeting. Audit reports involve recommendations to assist local competent authorities in taking corrective measures. Proposed actions taken are up either administratively, in general follow-up audits, or by on-the-spot audits. If non-compliances are sufficiently serious, stronger actions may be taken by the European Commission in agreement with Member States, these include legal action, restrictions or even bans on the movement of goods or animals (EU, 2018).

2.3 Outcomes of regulation in SSA Horticultural supply chains

The need for compliance with international standards be they private or public is changing the landscape of international trade in FFVs. This change is manifested in terms of:

A) A shift from spot market operations to supply chain management structures requiring improved coordination between value chain actors (Jaffee & Masakura, 2005; Asfaw et al., 2010; Hensen & Reardon, 2005; Hensen et al., 2011)

B) Increased vertical integration with producer-exporter sourcing own produce is challenging the small-holder contract farming model (Jaffe, 1995; Jaffe & Masakure, 2005).

In 2007, the Secretary General of the United Nations Conference on Trade & Development (UNCTAD) advised that "the production and export of fresh fruit and vegetables from developing countries offers a number of opportunities for economic and social development gains. The volume of

global fresh fruit and vegetables trade has grown more than that of any other major category of agricultural products, and many developing countries are striving to expand their market shares. However, this is far from easy, because of the perishable nature of the produce and the capital and skills intensive nature of production. What is more, new requirements for accessing the global supply chains of large retailers often entail a transition to high precision production methods" (Panitchpakdi, 2007).

To illustrate, Mithofer et al. (2008) argued that even though export production contributes directly and indirectly to increases in rural and urban incomes and the alleviation of poverty, production standards such as the European Retailer Produce Working Group for Good Agricultural Practices (EurepGAP) pose a challenge to the Kenyan export sector.

Hensen & Reardon (2005) observe that agricultural supply chains are increasingly cutting across borders facilitated in part by new food, communications, and transport technologies. They note a concentration of ownership along agri-food chains such that a diminishing number of key economic players have power over international agri-food markets. In other words, there is an observable shift from spot market competition between individuals or organisations to a more (certification) quality centred competition between integrated and therefore concentrated supply chains.

2.3.1 Decline of Small Holder Suppliers

As discussed above, concentration or consolidation in the European food industry has been observed to result in a like process in SSA horticultural supply chains notably Kenya for instance. The institution of private standards as well as regulatory developments such as those highlighted above created a need for investments in the development of supply chains aimed at enhanced monitoring and control of suppliers.

Dolan & Humphrey, (2000) analysed trade linkages between producers and exporters of fresh vegetables in Kenya and Zimbabwe and UK supermarkets based on the concept of global commodity chains developed by Gereffi (1994) and concluded that the competitive strategies supermarkets have led to particular governance structures that determine not only the types of product to be produced, but also production and

quality systems, the extent and location of post-harvest processing and the structure of the horticulture industry in Kenya and Zimbabwe (Dolan & Humphrey, 2000)

They argue that in a bid to reduce the risk of exposure to supplier failure, supermarkets sort to acquire greater knowledge of production and processing systems which was achieved through a reduction in the number of suppliers and the tightening linkages in the chain. While actors remained the same (in terms of African growers, exporters & UK importers), the distribution of functions between them and the relations between them changed (Dolan & Humphrey, 2000). Hence, concentration in the European food industry was bound to be translated into a similar concentration in the exporting organisations of SSA countries.

Jaffe (2003) as well as Jaffe & Masakure (2005) observed that structural changes in the Kenyan industry resulted in a decline in the share of smallholders in the volume of fresh vegetables exported from an estimated 45% in 1989 to 27% in 2002. Similarly, Dolan & Humphrey (2000) report that whereas close to 75% of fruit and vegetables were grown by Kenyan small holders in 1992, by 1998, four of the largest exporters in Kenya sourced only 18% of produce from smallholders.

This must be the case because Mithofer et al. (2008) argued that while export production contributes directly and indirectly to increases in rural and urban incomes, production standards such as the EurepGAP are a challenge to the Kenyan sector and to the ability of smallholders to participate in export production. Similarly, while concluding that smallholders (in terms of responsive regulation) have the agency to influence the regulatory process thereby increasing their chances of remaining in the value chain, Ajwang (2019) recognised challenges faced by Kenyan small holders in complying with stringent food safety protocols leading to their exit from the export value chain.

However, the case against smallholders as advised by Dolan & Humphrey involves transaction and supervision costs of sourcing from a large number of It is easy to make a case against smallholders. For example, it can be argued that the transaction and supervision costs of sourcing from a large number of producers which tend to be greater than sourcing from a small

number of large producers. Furthermore, Jaffe (2003) as well as Jaffe & Masakure (2005) attribute the reduced use of smallholder producers to the need for traceability imposed by both private and public production standards. In effect, traceability requires proper document management of interphases and handoffs in the supply chain that is rendered complicated by sourcing from multiple partners. Hence, as argued by Dolan et al. (1999) private and public regulatory requirements act as an effective barrier to the participation of small producers and to some extent exporters. In effect, Dolan & Humphrey (2000) explain that supermarkets remain wary of sourcing from small producers as failure to meet food safety, environmental and ethical standards can be damaging to their reputation and position in the marketplace. Concentration in the grower base therefore reduces exposure to risk through the provision of greater control over production and distribution processes. Hence, vertical integration has been the dominant feature in successful horticultural supply chains south of the Sahara.

2.3.2. Vertical Integration

Vertical integration in the SSA horticultural export supply chain notably in Kenya involves large exporters investing in inhouse production capabilities or preferring to work with larger farmers. According to Dolan et al. (1999) the argument was that increasing concentration in European retail markets and rising concern over the environmental and labour conditions at the farm-level are pushed exporters to work with larger farmers, who can more easily document their production practices.

In addition to the need for more control and traceability, Jaffe & Masakure (2005) equally attribute integration in SSA horticultural supply chain to a marketing incentive whereby some exporters use inhouse production (own farms) as a good communications instrument aimed at potential new customers.

Further, Dolan & Humphrey (2000) explained that as competition in the export market intensified, many small and medium-sized exporters realigned operations to grow crops for larger exporters as opposed to shouldering the risk of exporting. The example of Radville Farms in the

Gambia founded in 1985 to whom a third of export farms (as of 20 years ago) of export farms sold a majority of their produce.

Despite the increase in large commercial farms, exporters still source at least some of their produce from their own farms. As one Zimbabwean exporter claimed, 'It is absolutely imperative to control your own production' to attract business from the multiples. There are three main reasons for this. First, control over one's own production guarantees continuity of supply and reduces the risk of losing suppliers to competitors. Secondly, possessing at least some land for growing crops provides the exporter with knowledge about production issues and innovation and problem-solving capabilities. In an industry increasingly characterised by innovation and the need for rapid problem-solving, these are important. (Dolan & Humphrey, 2000)

2.3.3 Product Segmentation

With the proliferation of private standards and the tightening of regulations in the backward integration as described above is accompanied by a certain degree of segmentation in the procurement processes of SSA exporters. In Kenya for instance, Jaffe & Masakure identified product segmentation as a strategy used by exporters in instances where full traceability is problematic. They observed that produce directed towards buyers requiring full traceability is normally obtained from exporter owned or leased farms while that which is directed towards buyers less stringent on quality and traceability requirements can be sourced from elsewhere with limited control over production processes.

At this point, it is important to make the distinction already made by Jaffe (1995, 2003) as well as Jaffe & Masakure (2005) regarding a similar market segmentation in the EU market for horticultural produce.

2.3.4 Market Segmentation

In reality, existing parallel to the traditional supermarket fresh fruit and vegetable supply chain, is a large and growing market for specialty vegetables consumed by first- or second-generation immigrants from Africa, Asia, and the Caribbean. The authors argue that purchasing arrangements for this segment of the market tends to be less stringent on

matters of traceability, GAP, and to a large extent, the monitoring of pesticide residues.

It is this segment of the horticultural market that is mainly of interest to this study, judging from the rate of interceptions of consignments by which it is concerned in the EU due to excessive pesticide residues and/or presence of harmful organisms. Assuredly, if the horticultural industries of countries like Kenya, Ghana, the Ivory Coast and Cameroon have witnessed significant developments in quality and infrastructure through the implication of EU supermarkets and the introduction of private quality standards, (Dolan & Humphrey, 2000; Jaffe, 1995; 2003; Fukase & Martin, 2018), such has not been the case for Uganda. In effect, crops like sweet potatoes, cassava, cocoyams (Eddoes) listed by Agona & Muyinza (2008) in addition to hot peppers, bird eye chilli, white aubergines, etc. are for most consumed by the Asian/Afro-Caribbean diaspora and sourced from wholesale market importers and continental food stores to whom price has always weighed in more than quality.

It is to say that changes in the Ugandan horticultural supply chain discussed in the latter chapters of this dissertation have for most been driven by public standards (or regulation) targeting plant health concerns as opposed to direct pressure from the EU private sector.

2.4 Background to Uganda´s horticultural industry

Agriculture in Uganda has traditionally thrived on a favourable climate, and a cheap labour force. Kasente et al. (2002) maintain that the bulk of Uganda´s exports consist of agricultural crops which except for tea, are primarily grown by smallholders. Rios et al. (2009) report that Uganda enjoyed significant prosperity in the 1960s, based on traditional exports of coffee, tea, cotton, and tobacco. However, this was short lived by a civil war that lasted throughout the 70s and mid-80s. The authors maintain that agricultural production, marketing, and infrastructure was deteriorated during the war with coffee featuring as the only export commodity accounting for 95% of exports by 1988. Kasente et al. (2002) report that heavy taxes in the 1970s and early 1980s provoked a

substantial decline in the output of export crops as well as the outright disappearance of most exports from official statistics due to smuggling.

However, after the war, development assistance efforts sort to revive and diversify agricultural exports as a means of accelerating growth, reducing poverty, and vulnerability associated with an extreme dependence on one export commodity – coffee.

To illustrate, Kasente et al. (2002) report that between 1989 and 1993, coffee prices fell 56% from USD 1.8 to USD 0.8 per kg, with coffee earnings falling from USD 311.2 to an all-time low of USD 92 million in 1992. This signalled a need for diversification into non-traditional exports (NTAEs) aimed at reducing exposure to just one main export commodity (coffee). Hence, with selected donor interventions targeting NTAEs, entirely new supply chains were formed with the intention of introducing and expanding the production of non-traditional crops for the export market (Rios et al., 2009).

NTAEs in Uganda refer to agricultural, livestock and fisheries products that re-introduced after the war as export commodities with the coming to power of President Yoweri Museveni in 1986 (Dijkstra, 2001). The author identifies amongst the most important ones, flowers (mainly roses), fresh and frozen fish (Nile perch), fresh fruit and vegetables (cooking and apple bananas, hot pepper, chilli, okra, green beans, passion fruit, etc.), hides and skins (raw and wet blue), vanilla, sesame seed, and maize and beans.

Further, Kasente et al. (2002) explained that a 1998 Government of Uganda (GoU) report argued that the Ugandan agricultural sector had to move from a predominantly subsistence sector to a commercially oriented one in acknowledgement of the fact that poverty in Uganda is predominantly local. In this light, government placed all commercial activities connected with agricultural production in the hands of the private sector limiting its role to setting rules and regulations.

Hence, fuelled by donor led initiatives involving experimentation with new crops and/or varieties, a few Ugandan firms in the 1980s – 1990s made tentative efforts to enter the EU Fresh Fruit & Vegetable Market (FF&V) following in the footsteps of Kenya. Rios et al. (2009) identified two

models of export-oriented development involving lead firms towards whom development assistance was often directed:

- Companies with their own farms and some Outgrowers who were required to compete with established Kenyan exporters in the EU market for temperate vegetables. These were expected to invest in farms and modern packhouses to sustain competitiveness.
- Entrepreneurs already working with Outgrowers were expected to consolidate their position and expand exports directed at the ethnic or immigrant community markets in Europe.

Kasente et al. (2002) report that seeing as most crops targeted for NTAE expansion were produced by smallholder farmers in rural areas, projects aimed at increasing production were implemented by the GoU throughout the 1990s. For instance:

- The National Research Organisation (NARO) intensified research into drought and disease resistant planting materials
- The Investment in Developing Exports in Agriculture (IDEA) project was launched to provide high-yielding planting materials and to encourage farmers to form business and financial linkages to access markets.
- An Agricultural extension project was put in place in 1992/1993 to disseminate research findings produced by the NARO with scattered smallholders encouraged to form groups to access extension services.

Further, attempts to adjust to a changing regulatory landscape in Europe which saw the development of private standards aimed at guaranteeing food safety and other environmental concerns (Jaffe, 1995) were largely supported by donor activities and the Government of Uganda (GoU). Based on the observation that standards compliance was both an opportunity to maintain a foothold (however limited) in the European market, as well as an opportunity for differentiation, support for compliance with standards such as the GlobalGAP was given to lead firms in the form of trainings, technical assistance, and financial support to cover certification costs (Rios et al., 2009). The authors maintain that these lead firms were expected to

provide the signalling and incentives required for producers and other firms to adopt good agricultural practices and be compliant with regulatory requirements.

However, at the turn of the century, policy initiatives aimed at developing NTAEs were not considered successful due to a lack of investors with the experience, managerial capacity, and access to financial resources for sustained progress. Rios et al. report that NTAEs were a new industry facing numerous start-up problems in terms of institutional, agronomic, and logistical capabilities. They claim the industry remained weak with problems at all levels in the supply chain. Limited field trials went commercial with little sustained investment in an industry considered to be risky and not too profitable.

To illustrate, Dijkstra (2001) argues that while non-traditional exports provide income and employment, they are not the solution to poverty reduction in rural Uganda. Ugandan coffee he maintains, generates income and employment for nearly five million people, with more than 100 times as many people involved in non-traditional exports. In comparison with horticultural exports, data from Chatham House (2020) indicates that whereas Uganda exported USD 185 million worth of coffee in 2000, horticultural exports were valued ten times less (USD 18 million). In 2019, however, horticultural exports were only four times less in value (USD 82 million) than coffee exports (USD 390 million) which still occupies a dominant position on Uganda´s agricultural exports. This indicates that to date, significant progress in the export diversification strategy engaged in the post war era had been.

However, early attempts to grow and export temperate vegetables failed in the face of competition from Kenya with the bulk of horticultural trade consisting of capsicums and vegetables directed to distribution channels in the UK and elsewhere in Europe serving the ethnic/minority immigrant communities (Rios et al., 2009). The authors explain that the increasing focus from the early 1990s on food safety matters and regulatory oversight (especially with regards to pesticide residues) in the EU market for fresh produce filtered only slowly into distribution channels for more exotic and ethnic fruits and vegetables. Consequently, while African suppliers of

temperate vegetables (e.g., Kenya) were being put under pressure to upgrade food safety and other standards, these were largely missing through the early 2000s in the ethnic food trade. A situation that today explains the infrastructural and capability gap between Uganda and neighbouring Kenya in terms of horticultural exports and a rising wave of interceptions to which the country has to respond if continued access to the EU market remains a priority as mentioned above.

2.5 EU Interceptions of Ugandan Horticultural Produce

Interceptions of consignments of horticultural produce from SSA are a key outcome of the tightening of phytosanitary regulations in the EU as discussed above. Uganda's horticultural exports for instance are made up of not only fruits and vegetables but also flowers (floriculture) that have been subject to an increasing wave of interceptions as illustrated in figure 9 below.

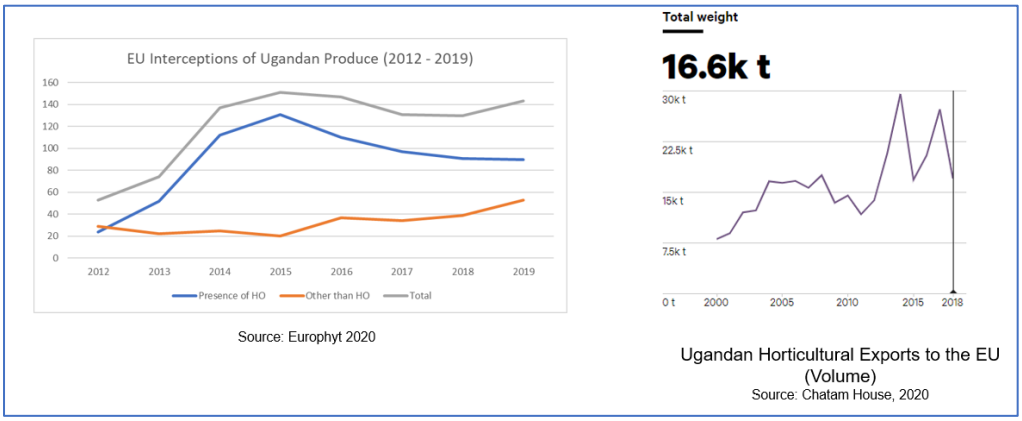

Figure 9: Evolution of Interceptions & Export Volumes in the Ugandan Horticultural Supply Chain

Chege et al. (2021) report that the following a rising number of interceptions mainly of Uganda's floriculture in recent years, the EU issued Uganda a notification of an impending loss of access to the EU market, due to non-compliance with International Standards for Phytosanitary Measures (ISPMs). The interceptions showed the presence of pests (e.g., the African cotton leafworm & the false coddling moth (FCM)) regulated in the EU.

The authors argue that increasing interceptions due to the FCM for instance, points to the need for the country to institute a robust integrated systems approach to pest management, inspection, and certification so that the country is ready to tackle existing and other emerging pests in future Chege et al. (2021). The implication is that unlike the case of Kenya

where supermarkets influenced the progress and structure of the export supply chain, developments in Uganda seem to point to a greater influence and participation of public sector actors in supply chain developments. For instance, Chege et al. (2021) report on a multisectoral approach supported by a presidential initiative addressing both the horticulture and the floriculture sectors in response to the threat of restricted market access from the EU.

This chapter has presented trends in the horticultural industry of SSA which has witnessed tremendous growth over the last three decades. While stringent private and public standards have led to questions on the ability of developing world agricultural supply chains to sustain access to high value markets in advanced countries, in the case of Kenya as presented by Jaffe (1995, 2003), such has not quite been the case. In effect, the tightening food safety regulations coupled with the emergence of private standards driven by Supermarkets was seized as an opportunity for an extensive development of its horticultural export supply chain.

Meanwhile, concentration in the EU retail industry has led to a similar concentration in the SSA horticultural export sector that threatens the continued participation of smallholders in the value chain. Compliance with regulatory requirements for due diligence and traceability requires tighter coordination and integration of upstream production process. This has been translated into the development of in-house production capabilities and segmented sourcing strategies aimed at enhancing compliance with market requirements.

Further, a brief distinction was made between private standards (e.g., EurepGAP) and public standards (e.g., ISPMs) shaping the horticultural sector in SSA. In the case of Uganda, which is the focus of this study, failure to comply International Standards for Phytosanitary Measures (ISPMs) has led to interceptions in the EU with threats of restricted EU market access for Ugandan horticulture. This study is therefore concerned by an understanding of how interceptions are caused in the Ugandan horticultural export supply chain; it also explores steps taken to improve compliance in the export control system in terms of pest monitoring and phytosanitary inspection & certification processes.

As illustrated in figure 9 above, Chege et al. (2021) equally reported interceptions of Ugandan horticulture in the EU for reasons other than the presence of harmful organisms notably owing to the absence of, or non-conforming, phytosanitary certificates (PCs). A PC is defined by the International Plant Protection Convention (IPPC) as an official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (FAO, 2019). This attestation is supposed to be evidenced by verifiable information which doesn't always seem to be the case with Uganda.

Hence, as was the case with Kenya where the need for effective monitoring and traceability imposed by supermarkets led to structural changes in the export supply chain, similar requirements this time around from EU regulating authorities seem to be operating in a like manner. Thus, fundamentally speaking, the need for transparency in the supply chain is the driving force behind change in SSA agricultural supply chains.

It is therefore important to conceptualise supply chain transparency (or the lack thereof), which is the object of the next chapter.

Chapter 3

The relevance of Transparency in Agricultural Supply Chains

Introduction

The previous chapter presented a background to developments in the Sub-Saharan African (SSA) horticultural export industry. The notion of transparency was introduced in terms of monitoring and traceability requirements exporters are obliged to comply with as set out in a range of private and public standards. These were noted to be accountable for structural changes in the SSA horticultural industry. Fundamentally, this dissertation is based on the hypothesis that a lack of transparency in the Ugandan horticultural supply chain is to account for the observed rate of plant health interceptions. This is derived from the institutionally founded assumption that transparency leads to enhanced market access (especially) for the agricultural produce of developing world countries (Henson & Loader, 1999; Jensen, 2002; Downes, 2012).

To recall, two key research questions were developed to assist with the investigation of how interceptions are caused and the response of Ugandan authorities in terms of improving transparency for enhanced market access.

1) What are the factors contributing to interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) ?
2) How do these factors contribute to a lack of transparency in the Export Supply Chain (SC) ?
3) How did the supply chain respond to regulatory requirements for transparency and what are the outcomes ?

This chapter examines the current status of transparency in agribusiness supply chains and attempts to situate plant health concerns within the wider discussion of sustainability in agricultural supply chains. It also surveys the literature to establish a definition and conceptual framework for understanding transparency in supply chain relationships. This will be useful in subsequent chapters for an understanding of plant health controls notably in the context Ugandan Exports of horticultural produce to the EU/EEA.

3.1 Transparency in Agribusiness Value Chains: Fact or Fad?

The discussion on transparency in Agricultural Supply Chains has evolved alongside food safety, environmental, and food security concerns (Hofstede, 2003; Kalfagianni, 2006; Diemel et al., 2008; Trienekens et al., 2001; 2012; Wang and Yue, 2017; Pant et al., 2015; Gardner et al., 2019). It has been driven by attempts to improve the sustainability and accountability of transnational commodity supply chains (Wognum et al., 2011; Mol, 2015; Gardner et al., 2019). Gardner et al. observe that agri-food chains increasingly cross multiple regional and regulatory borders, with the resulting complexity of material flows having the potential to precipitate a myriad of unintended effects.

For instance, numerous authors (Trienekens et al., 2001; Opara & Mazaud, 2001; Hofstede, 2003; Kalfagianni, 2006; Mol, 2015; Manning, 2018) have observed the response of national and international governments to several crises (e.g., BSE, dioxine, swine fever, hoof, and mouth disease) experienced by agri-food chains in the last 20 years to be the introduction of new legislation and transparency requirements (e.g., mandatory labelling) aimed at preserving animal & human health.

Further, Mol (2015) advises that the rise of transparency on public and political agendas is not due to accident or fad but will remain a key topic in international trade out of a real concern to improve the sustainability of value chains. Substantiating this claim, Manning (2018) advises that agri-food and agribusiness companies are under economic, environmental, and social pressure owing to for instance, a danger of losing biodiversity due to genetic code modifications, degradation of agricultural land, water scarcity and the use of anti-biotics in pork and chicken supply chains.

Also, it would seem that consumers are increasingly integrating the transparency of agri-food supply chains into their buying decisions as they increasingly demand information on the safety of their food, its origins, and the environmental conformity of processes that produced and delivered them (Trienekens and Beulen, 2001; Wognum et al., 2011). Further, Trienekens et al (2012) argue that agri-food chain operators have to develop capabilities for responding to changing and varying consumer demands with respect to food safety, animal welfare, and the environment.

The authors argue that transparency in the food supply chain is essential to guarantee food quality and provenance to all users of food and food products.

In a related development, agri-food operators are leveraging rapid advances in ICT (e.g., Internet of Things (IoT) and blockchain technology) to provide unprecedented levels of transparency to stakeholders (Tian et al., 2016; Caro et al., 2018; Lin et al., 2018). Manning (2006) predicted instant access to information through traceability and centralization of data verifying product and process integrity to be standard practice in the years following publication. In effect, compliance with new regulations involves the obligation for agri-food companies to introduce information systems focusing on the identification, registration, tracking, and tracing of products through the value chain (Hofstede, 2003; Kalfagianni, 2006; Wognum et al., 2011). Gardner et al. (2019) observe that rapid advances in processes to collect, monitor, disclose and disseminate information have contributed towards the development of new ways to manage sustainability in global commodity supply chains. The sustainability information that is disseminated revolves around three key areas namely: human health and safety (people), economic information (profit), and environmental impact information. Intensified information exchange and integrated information systems involving all chain actors are powering transparency with respect to a multitude of product properties (Trienekens et al., 2012).

It can thus be inferred that transparency in the agri-food and agribusiness industry is more than just a fad. It is in effect real concern based on observable structural (legal arrangements) and infrastructural (technology) evolutions in the industry. Why this is the case is examined below in terms of how transparency is designed to foster agricultural supply chain integrity and sustainability.

3.2 Integrity in the Food Chain

It can be argued that the majority of food scares and/or safety crises that have characterised agri-food chains have eroded consumer trust and led stakeholders to question the integrity of food/agricultural products (Opara & Mazaud, 2001; Van der Vorst, 2006; Folinas et al.,2006; Resende-Filho

& Hurley, 2012: Bosana & Gebresenbet, 2013). Whitworth et al. (2017) places food scares into five main categories:

- Information: Involves the provision of information to consumers concerning the ingredients and processes which are used in the production of a food item
- Deception: Involves the fraudulent substitution, addition, or subtraction of ingredients to food items
- Technology: Involves technological processes such as genetic modification of food crops (GMOs)
- Contaminants: Involves the contamination of food items with anything that is not naturally found in the food item
- Microbiology: Involves the contamination of food items by microorganisms found in the air, food, water, soil, animals, and human body.

In a like manner, Manning (2006, 2018) opposes food supply chain integrity to food supply chain fraud and describes fraud as the intentional misrepresentation of fact by one person solely, or acting on behalf of an organisation, in order to erroneously part with something of intrinsic value. Fraud is therefore the result of a failure in the supply chain to deliver its promises. The intentional misrepresentation of fact in a transaction is an instance of information failure that creates a premise for transparency. In economic terms, this has been described as a situation of information asymmetry (Eisenhardt, 1985; 1989) which is a situation of market failure due to the absence or shortage of information to one party in a relationship.

In effect, Manning argues that misrepresentations or deceit in the agricultural supply chain can be related to the intrinsic integrity of the item (Product Integrity), the processes involved in its production (Process Integrity), the people employed in the value chain (People Integrity) and/or the data accompanying the item (Paperwork Integrity). These dimensions of supply chain integrity are illustrated in figure 10 below.

Product Integrity: Opara and & Mazaud (2001) attributed the emergence of traceability (as an important policy issue in food quality & safety) to a decline in public confidence in agri-food chains due to an increase in food

scares notably outbreaks of the human form of "mad cow disease" and microbial contaminants. Winning back consumer trust involved the introduction of regulations increasing food traceability.

Figure 10: Dimensions of Supply Chain Integrity (Manning, 2006)

Knowles & Moody (2007) note that the foodborne pathogen (present in eggs and cheese) in the late 1980s and throughout most of the 1990s (UK, FR, It, Gr) was one of the first major microbiological-related "food scares" reported to have had an adverse effect on consumer perceptions and consumption behaviour throughout Europe. Coupled with other incidents such as BSE, these incidents which highlight the product integrity dimension of agricultural supply chains resulted in the introduction of new regulations making labelling and traceability systems mandatory in EU/EEA agri-food supply chains. Manning makes the remark that product verification often involves high product testing costs and may involve inappropriate sampling turnover times. As a result, agricultural supply chain operators tend to focus more on verifications of process integrity.

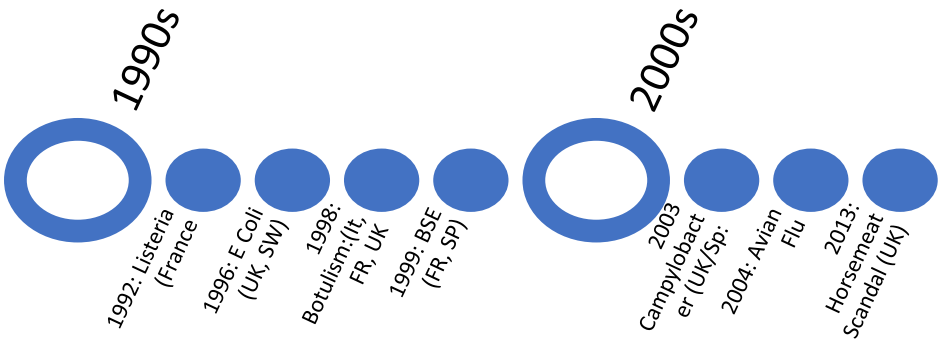

Figure 11: Chronology of sample food scares and crisis: Adapted from Manning, 2006; Knowles & Moody (2007); Whitworth et al., 2017)

Process/People Integrity: These two dimensions are discussed together as processes do not run independently of the people running them. According to Manning, process integrity is related to the extrinsic characteristics of methods of production such as Organic or Halal products, labour and animal welfare standards, provenance, etc. It is not uncommon for products to be mislabelled or for geographic origins to be incorrectly identified on products. The Spangero horsemeat scandal (Ibrahim & Howarth, 2016; Walker, 2019) is a classic example of process/people integrity issues in agri-food chains (discuss further).

Paperwork Integrity: It can be argued that misrepresentation in anyone of these dimensions could be an indicator of integrity issues in other dimensions as well. For instance, a falsified phytosanitary certificate is a process integrity issue that equally indicates issues with the people (issuing authority) involved in the process and may equally cast doubt on the integrity of the product. Manning advises that process verification measures (e.g., inspection and audit procedures) need to be in place to preserve supply chain integrity in such instances.

Because verification is designed to inform the party with missing or doubtful information, it is obvious that transparency in operation through verification is borne from the need to preserve supply chain integrity. Besides inspection and auditing procedures, traceability has also emerged as a means for the verification of supply chain integrity. Verification could come at a cost determined by the sensitivity of the fact risking

misrepresentation as well as its importance to the user (Lamming et al., 2004). This fact may be some element of risk requiring mitigation.

Manning proposes four types of traceability systems working towards integrity preservation in agri-food supply chains:

- Certificate based integrity systems
- Track and trace-based integrity systems
- Segregation based integrity systems
- Mass – balance or volume-based integrity systems

Even then, these systems do not entirely guarantee the integrity of the supply chain in terms of products, processes, or data. Thakur & Donnelly (2010) identify supply chain information types subject to verification or at risk of misrepresentation. A few of these are summarised in table 4 below for the farming stage of an agricultural supply chain. These enable operators to assess the integrity of the agricultural supply chain.

Location	Product Information	Process Information	People Information
Farm	Field Lot Seed Variety Chemical Name	Time of Planting Lots Planted Time of Application (chemicals) Quantity Applied (Chemicals) Lots treated Soil Moisture Time of Harvesting	Farmer ID Seed Supplier Chemical Supplier

Table 4: Agricultural Supply Chain Traceability Information (Adapted from Thakur & Donnelly, 2010)

Inaccurate data collection and reporting on these key product and process attributes can lead to a wrongful assessment of product integrity with important implications for food safety. For instance, it is critical for a farmer to inform on when pesticides were applied on crops in order for a proper assessment of the level of pesticide residues on produce after harvest. This is called a preharvest interval (PHI). As discussed below, the excessive use of pesticides in agricultural production is not only a health concern, but also has impacts on the environment. In this regard, plant

health issues have a bearing on the sustainability of agricultural supply chains.

3.3 Sustainability in agricultural supply chains

Related to the concept of integrity discussed above, is that of supply chain sustainability. In effect, product integrity issues in the agricultural supply chain (e.g., presence or not of pesticide residues) are directly related to food safety concerns and therefore to sustainability concerns.

Three key dimensions have been attributed to the notion of sustainability including: people (in terms of health and food safety), profit (in terms of who benefits from supply chain activities) and the environment in terms of the environmental impact of agricultural supply chains. Misrepresentations of agricultural product or process characteristics (e.g., pre-harvest intervals related to the application of pesticides) could result in pesticide contaminants finding their way further downstream towards the consumer which is clearly a food safety and therefore a sustainability concern (Islam and Haque, 2018).

In effect, Bastian & Zentes (2013) comment on a widely shared opinion that transparency plays a major role in agricultural supply chains and especially in sustainable supply chain management. In a study of the antecedents and consequences of supply chain transparency (SCT) in sustainable agri-food supply chain management, the authors found that SCT positively impacts the social and ecological dimensions of sustainable supply chain management as it lays a burden of accountability on the shoulders of agri-food supply chain operators.

This must be the case because numerous researchers (Hofstede, 2003; Awaysheh & Klassen, 2010; Wognum et al., 2011; Manning, 2018; Gardner et al., 2019) have examined the role of transparency in managing the environmental and health impacts of agribusiness supply chains. For instance, Gardner et al. (2019) propose a framework for understanding the relationship between supply chain information, transparency, and sustainability governance in global commodity chains. Wognum et al., (2010) examine the role of information systems supporting sustainability in food supply chains as well as communications towards key stakeholders. Manning (2018) examined the degree and nature of disclosure of

information to supply chain stakeholders in relation to sustainability claims. Awaysheh & Klassen (2010) argue that consumers, governments, and non-governmental organisations (NGOs) are demanding that companies be held more accountable for what happens in their supply chains. As posited by Hofstede (2003), improving transparency in the agribusiness sector is of paramount importance due to its impact on the environment and public health

The common denominator to these studies is the role of transparency in enabling supply chains to substantiate sustainability claims made about their products especially in terms food safety but also with regards to environmental impacts.

What is Sustainability? Manning (2018) argues that while sustainability has multiple definitions, aspects, methodologies, and interpretations, it describes the capacity of a system within a given degree of variability, to maintain output at a level approximately equal to or greater than its historical average (Manning, 2018). This is of course an elaboration of a well-known definition which describes sustainability as a situation in which meeting the needs of the present generation does not compromise meeting those of future generations (Wognum et al., 2011). Yet, the definition proposed by Manning (2018) seems to fit in more with the reality of agri-food supply chains. In effect, numerous factors some of which are Environmental (McCool et al., 1999; White et al., 2000; Emadodin et al., 2012; Azadi et al., 2015) Economic (Binam et al., 2004), Technical (Smith, 1998; Tilman et al., 2002), and Social (Pender, 1998; Carolan, 2005) have been identified that can affect the ability of agricultural production systems to maintain production at historic levels or higher.

For instance, infestations of local habitats by quarantine pests owing to the international trade of plants and plant products is an environmental factor impacting the sustainability of agricultural supply chains. A quarantine pest is a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2019).

To illustrate, the accidental introduction of Phylloxera into Europe in the latter half of the 19th century from North America, ruined much of Europe's

vineyards (1 million acres of French Vineyards destroyed according to Macleod et al., 2010) and demonstrated the first need for international cooperation to achieve sustainability in agricultural supply chains as it made way for what is today known as the International Plant Protection Convention (IPPC). Similarly, the agricultural economy and traditional landscape of Apulia, the heart of Italy's olive production area has been seriously damaged by an outbreak of a bacteria (Xylella fastidiosa) that causes stunting in leaves, fruit, and overall plant height (Bucci, 2018; Brunetti et al., 2020). The European Commission estimates a potential economic loss of 5.5 billion euros in a scenario of a full spread of the bacteria across Europe (EC, 2016). These events have shaped and continue to shape International Plant Health Regulations with a need for early detection, monitoring, and communication mechanisms on the compliance of agricultural production systems.

Some authors ((Jensen, 2002; Downie, 2002; Campbell, 2004; Macleod et al., 2010) have argued that internationalisation through trade is the fundamental human cause of invasive non-native pest introductions. The international movement of plants has increased alongside growth in international trade and with this, new pathways for the introduction of plant pests. Yu et al. (2013) as referenced by Gardner et al. posit that local consumption patterns of agricultural and other commodities (in for instance, US, Europe, China) are increasingly met by international supply chains as opposed to local producers. Gardner et al. argue that because drivers of environmental and social change in producer countries tend to be cut-off from places where impacts materialise there is need for international cooperation in the management of sustainability issues. This will not be possible without systems and mechanisms supporting the timely sharing of critical supply chain sustainability data.

Similarly, related to the quarantine pest risk, is the risk of human and environmental contamination from the use of pesticides in crop protection activities. Crop protection activities are activities aimed at managing plant diseases, weeds and other pests damaging agricultural crops.

In effect, pesticides are considered indispensable for the production of an adequate food supply for an increasing world population (Prodhan et al.,

2018). According to Islam and Haque (2018), pesticides are the only toxic substances released intentionally into our environment to kill living things (pests). These pesticides (Organophosphates and Carbonates) are known to affect the nervous system while others may irritate the skin or eyes (Sarwar, 2015; in Islam and Haque, 2018). Inappropriate use of pesticides can have negative effects on human health and agro-ecosystems, damage wildlife habitats, create pesticide resistance of insects and diseases, and pollute ground and surface water resources (Islam and Haque, 2018). It is a common problem that most farmers who use pesticides also tend to lack the education required to ensure proper usage in terms of following prescribed dosages at the right time (stage of the crop) and awareness of residues and their effects on health. As shall be seen, transparency in agricultural supply chains plays a key role in creating awareness amongst operators on compliance with phytosanitary regulations which are equally designed to safeguard health and the environment. In effect, pesticide residues on harvested crops could have adverse effects on human health and the environment (Prodhan et al., 2018). These environmental, health, and food safety concerns are all key to assessing the sustainability of agricultural supply chains and transparency is required to ensure that risks are properly mitigated. To this end, sanitary (human, animal health) and phytosanitary (plant health) measures have been designed to protect both animal, human, and plant life from adverse effects due to international trade

Moving forward, while this is not meant to be a thesis on the concept of sustainability it can be easily inferred that the current status of transparency in agri-food chains is intricately connected to sustainability concerns (Hofstede, 2003; Kalfagianni, 2006; Wognum et al., 2011; Manning, 2018; Gardner et al., 2019) in response to demands for more accountability from agri-food supply chain operators.

While research on transparency in agri-food chains has mostly focused on food safety issues as a direct consequence of numerous crisis and scandals that hit the sector, there has been a tightening of phytosanitary regulations governing trade in agricultural produce notably in the horticultural sector (e.g., fruits and vegetables) which has been less subject to similar events.

However, defining attributes of agricultural products from a compliance perspective is a complex initiative as these do not only vary across the range of agricultural products but are driven by regulatory processes that are equally complex, dynamic outcomes.

Table 5 presents an overview of the different types of supply chain sustainability information contributing disclosure compiled from the literature based on a framework suggested by Gardner et al., 2019.

Information Type	Description
Traceability information (Product, Process, Quality Information)	Provides transparency around associations among actors and between actors and places. Information related to product flow from source of origin to point of consumption (e.g., seed variety, time of planting, pesticide residue levels)
Transaction Information	Informs on who benefits from value chain activity and in what proportion. Facilitates the attribution of accountabilities. (e.g., Procurement and Sales Data, Investment data)
Impact Information	Informs on the socio-environment impacts of production as well as associated risks at different stages in the supply chain. Pictures Also sets a baseline for assessing the performance of the actors involved (e.g., crop loss due to plant health issues)
Regulatory/Policy and Commitment Information	Informs on changes, differences, levels, and strengths of policies adopted by actors in the supply chain. (e.g., notifications to changes in phytosanitary regulations) Also informs on sustainability commitments
Activity Information	Evidences type and form of action taken by actors in support of changed behaviour Activity information provides transparency on the type and extent of new actions that actors are taking to change their behaviour (e.g., response to audit reports)
Effectiveness Information	Effectiveness information provides transparency around how much (or little) progress is being made by a given actor or place (e.g., progress reports)

Table 5: Supply Chain Sustainability Data (Adapted from Thakur and Donnelly, 2010; Mol, 2015; Gardner et al., 2019)

There is a case for the argument that systems for the handling of these different types of supply chain information exist independently of each other. However, as posited by Gardner et al., developments shaping efforts to improve the sustainability of commodity supply chains have been influenced by rapid changes in information technology with profound implications for how information (e.g., the pest status of production sites) relevant to the sustainability of supply chains is collected, used, and interpreted. One of these implications is the need to leverage digital intelligence (or the ability to understand and utilize IT - Mithas & McFarlan, 2017) to consolidate data from these different sources/systems using distributed ledger technology (e.g., blockchain database) for reliable and timely data sharing between supply chain stakeholders (Lin et al., 2017; Tse et al., 2017; Caro et al., 2018; Wang, 2019; Kamilaris et al., 2019; Kamble et al., 2019).

3.4 Dimensions of Supply Chain Transparency

Mol (2015) provides a typology of supply chain transparency that summarises the information types summarised in table 5 above into four main categories.

Management Transparency which has its origins in the management sciences and logistics aimed at tracking and tracing product, process and quality characteristics and/or outputs through different stages in the supply process. This is commonly referred to as traceability in in the agroindustry where it has emerged as an important policy issue in food quality and safety owing to the incidence of safety hazards such as the BSE (mad cow disease) and illnesses, deaths, resulting from contamination of fresh and processed food (Opara & Mazaud, 2001; Van der Vorst, 2006; Folinas et al.,2006; Resende-Filho & Hurley, 2012: Bosana & Gebresenbet, 2013). From this perspective, management transparency in the agribusiness sector has evolved into a more regulatory form of transparency. In effect, based on remarks by Opara & Mazaud in 2001, it can be argued numerous policy changes have intervened over the last 20 years designed specifically to incorporate traceability into existing food safety regulations and trade agreements.

Regulatory Transparency which relates to requirements of public authorities based on policy and legislation regarding food safety and phytosanitary standards. As mentioned above, an argument can be made for collapsing the management transparency dimension proposed by Mol (2015) into the regulatory transparency category seeing as traceability in one form or another has evolved into a regulatory norm especially in advanced and developed markets. The EU for instance has mandatory track and trace requirements defined under EU Law as the ability to track any food, feed, food-producing animal, or substance that will be used for consumption, through all the stages of production, processing and distribution (Official Journal of the European Communities, 2002). However, regulatory transparency can also be viewed in terms of compliance with for instance non-discriminatory principles governing international trade in the application of sanitary and phytosanitary regulations. (e.g., Henson & Loader, 1999; Neelia et al. 2010;2011; Downes, 2012)

Consumer Transparency which involves disclosure of production and product information through public or private labelling and certification schemes (De Boer, 2003; Waide, 2008; Grover & Bansal, 2019). Gardner et al. argue that this type of transparency is designed disclose information for consumers and public and private certification bodies is a consumerist turn associated with has been termed the alternative food economy (Glin et al., 2013 in Gardner et al.)

Public Transparency which is the disclosure of information on the sustainability of production processes and product characteristics for scrutiny by the wider public in order to legitimate claims made and to substantiate claims made in different media. Examples given include the carbon disclosure project as well as activities by transparency international.

So far, if the rational for transparency in agricultural supply chains has been discussed and its current status justified by the requirement to evidence sustainability in the value chain, there is still a need to understand what transparency is and what it is not as well as the role it plays supply chain relationships.

In effect, transparency in agricultural supply chains is a key determinant of market access in terms of evidencing compliance with Plant Health regulations. Traditionally, in the context of agribusiness supply chains, transparency is often associated with systems or strategies for tracking and tracing food whereas it also includes elements like orientation, participation, and communication (Deimel et al., 2008). This is particularly true in the context of Plant Health controls where transparency is not only a question of compliance in terms of track and trace capabilities, but also of ensuring that phytosanitary regulations are not used as disguised forms of trade protectionism.

However, seeing as regulators of agricultural supply chains are constantly exploring how to identify, assess, and monitor supplier-related issues and practices, it is important to understand the integration of disclosure issues in the management of supply chains especially in developing countries that are highly dependent on agricultural exports. For instance, EU evaluations (through audits) of the Ugandan System of Official Controls for the export of plants and plant products have resulted in noticeable changes in the alignment of supply chain activities which are now designed to disclose more on export agricultural production practices. In order to understand why and how changes have been effected in Uganda's horticultural export industry, it is important to attempt a formalisation of the concept of transparency which is the object of the next section.

3.5 Indicators of Transparency

According to Fox, 2007, Transparency has a conceptual problem in that it is rarely defined with precision, tends to mean all things to all people, and has received more practical than conceptual attention. In addition, Deimel et al. (2008) advise anecdotal evidence suggests degrees of transparency vary remarkably between different supply chains. However, the authors maintain that when trying to measure these differences, measurement problems arise owing to the fact that transparency is a latent variable that can neither be directly observed nor measured directly.

Below, the literature on information transparency is surveyed with a focus on identifying its role, determinants, indicators, and outcomes.

These would then be examined within the context of official plant health controls in Uganda as a basis for understanding measures designed to improve transparency and minimise interceptions in the horticultural export supply chain.

The Oxford English Dictionary defines transparency as the quality of something (a situation, an argument) that makes it easy to understand (for instance transparency in legal documents). It is also defined therein as the quality of something such as glass that allows you to see through it or again, the quality of something (e.g., a statement), that allows someone to see the truth easily. For transparency to operate from this perspective, there must be visibility (i.e., light to see or be seen), understanding, and clarity (truth) in operation. Thus, it may be more appropriate to describe transparency as the *quality of information* shared as indicated by the amount of visibility, understanding, and clarity it provides to the situation in question.

To Gardner et al (2019), Transparency is a collection of processes designed to collect, monitor, disclose, and disseminate information. They describe it as a state in which information is made apparent and readily available to certain actors. It is also a set of concrete criteria necessary to improve […] practice and standards relating to observation, monitoring, surveillance, mandatory and voluntary disclosure, dissemination, reporting, and compliance.

Turilli & Floridi (2009) describe transparency as the process of disclosing a certain amount of information or data generated by an organisation. According to Schnackenberg & Tomlinson (2016), disclosure implies that information must be openly shared for it to be considered transparent. The authors define transparency as the perception that relevant information is received in a timely manner. The issue of openness coupled with that of relevance implies that disclosure is more than the open transfer of all available information. It warrants a careful consideration of the most relevant information to disclose (Schnackenberg & Tomlinson, 2016). Choosing what type of information to disclose requires an understanding of the characteristics of the entity that is to be disclosed (Turilli & Floridi, 2009). Behind the idea of generating data for disclosure purposes and

ensuring that such data is relevant and received in a timely manner is the notion of a process. This is to say that disclosure is a process that can be clearly identified with inputs, and outputs that can in some way be measured or assessed (by indicators e.g., for relevance and timeliness).

For instance, Williams (2008) proposes four specific processes associated with disclosure:

- Analysis (Target Audience Identification)
- Interpretation (Determination of Relevant Information)
- Documentation (Encoding of Information)
- Communication (distribution of information to internal and external sources).

Commenting on these, Schnackenberg & Tomlinson suggest that Documentation and Communication only are associated with the open release of information while Analysis and Interpretation are needed to differentiate relevant information from irrelevant information. This process is similar to the process of semantic elaboration described by Turilli & Floridi (2009) involving the transformation of raw data into meaningful and verifiable information. In effect, the authors make a distinction between Data (which may be produced by interactions between physical objects (e.g., Internet Of Things – IoT), or between operators and the environment), and Information which is produced through the elaboration of data. Such elaborated data they argue, is called Semantic Information and it is the output or result of a process that involves taking raw data as input, and producing well-informed, comprehensible, accessible, truthful, and useful data.

Disclosure is essentially a perception that firms openly share all relevant information and a stakeholder's ability to gather needed information about an organisation. The premise is that information that is inaccessible delimits the stakeholder's ability to gain a full picture of the organisation (Schnackenberg & Tomlinson, 2016).

If transparency is conceptualised as a process with inputs (data) and outputs (semantic information), it is important to identify the criteria or indicators by which information may be classified as transparent. The definition of semantic information advanced above already provides a clue

as what some of these indicators may be (e.g., comprehensible & accessible). Previously, relevance and timeliness were equally identified as indicators of transparency in the definition provided by Schnackenberg & Tomlinson (2016). These are discussed in more detail below as a basis for understanding the creation of transparency in the context of plant health controls. By indicator, I refer to a characteristic, a sign, or a symptom of transparency indicating its presence, absence, or change in state.

3.5.1 Indicators of Information Transparency

In effect, while the term indicator is often used to denote measurable characteristics of supply chain processes (Cai et al., 2009; Chae, 2009; Schaltegger, 2014), economic growth (OECD, 2010; World Bank, 2014), or again progress towards environmental and/or sustainability goals (Robert et al., 2005; Bell and Morse, 2012), the measurement of transparency is elusive as it comprises many dimensions with distinct effects (Hollyer et al., 2014). Also, as mentioned above, Deimel et al. maintain that measuring transparency is complicated owing to the fact that transparency is a latent variable that can neither be observed, nor measured directly.

However, it would seem that information can only be considered transparent under certain conditions as perceived by the user of the information. What this implies is that transparency is formatively constituted that is to say, as a latent construct, it can be measured through an identification of the elements (manifest variables) that cause it to happen (Cohen et al., 1990; Dunn et al., 1994; Little et al., 1999). These will be discussed after a review of indicators or signs of transparency in supply relationships.

This dissertation defines transparency as the intentional disclosure of sensitive information that has been semantically elaborated rendering it available, accessible, comprehensible, and verifiable. This is based on a survey of the literature as discussed below. The objective of the literature survey is to identify indicators of information transparency and their determinants for later use in an analysis of Plant Health controls.

Availability of Information

In effect, for information to be transparent, it must first and foremost be available. Availability it can be argued, is the first construct of transparency in a relationship. Awaysheh & Klassen (2010) define transparency as the extent to which information is readily available to both counterparties in an exchange and also to outside observers. In a supply chain context, transparency refers to information available to companies involved in a supply network (Francisco and Swanson, 2010).

In economics, transparency implies a complete and detailed overview of all market conditions available to all market partners at the same time (Deimel et al., 2008). Some authors (Jensen and Meckling, 1976; Eisenhardt, 1985; 1989) have conceptualised the absence or shortage of information to any one party in a relationship as a situation of information asymmetry. Eisenhardt (1985; 1989) describes a situation of information asymmetry as an instance of information failure that results in the need to design a contract or monitor the activities of parties involved in cooperative relationships. These instances of information asymmetry can either be ex ante (prior) to a transaction (adverse selection) or ex post (after) a transaction (moral hazard). Resolving the imbalance, lack, or shortage of information in these situations is synonymous to creating transparency or semantic information.

In supply chain management and logistics terms, *supply chain visibility* is the term frequently used by authors like Francis (2008) who define visibility as the identity, location and status of entities transiting the supply chain, captured in timely messages about events, along with the planned and actual dates/times for these events. While this is a desirable state of transparency, such information is not always available (hence the need for integration and coordination) or accessible as discussed below.

Accessibility of Information

For information on the location and status of entities transiting the supply chain to be transparent, it must be accessible. Turilli & Floridi (2009) lay an emphasis on the term "information" in "information transparency" to denote that which is made accessible (transparent) to the user. The very notion of disclosure implies revealing something that was previously concealed and therefore inaccessible. For instance, in a study of variations in the reported frequency of use of four information sources by decision makers, O'Reilly (1982) found that reported frequency of use was primarily a function of the rated accessibility of the sources. That is to say there was found to be a relationship between how often a source of information was used and how accessible it was. Similarly, Culnan (1985) propose perceived accessibility to information as a unifying concept for the design and evaluation of information systems and services. Not only so, but the author also advises that accessibility is a multidimensional concept that is itself determined by physical access to the source, interface to the source, and the ability to retrieve relevant information from the source. Hence, for information to be transparent, it does not only have to be accessible, but it also has to be relevant to the decision-making process.

In addition, Caridi et al. (2014) maintain that despite significant interest in the matter (of supply chain visibility), having access to accurate and timely information is a challenging issue in international supply chains. They argue that Information & Communications Technologies (ICTs) play a key role in improving access to supply chain information.

Furthermore, in a more practical and contextual sense, it is worth noting comments made by Aguolu (1997) regarding challenges faced by developing countries in accessing information. In effect, in discussing the importance of information to personal and national development, the author concludes that access to most of the world's wealth of information will remain a myth for developing countries until they overcome prevailing obstacles including high rates of illiteracy, unawareness of the relevance of information, poverty and lack of infrastructural facilities (Aguolu, 1997). Literacy levels for instance, can be related to the concept of shared understanding and clarity in information sharing processes, that it can be argued, is another indicator of transparency.

Shared Understanding & Clarity

For information to be transparent, both parties involved in the exchange must share a common understanding of the information. The literature defines transparency as the degree of shared understanding of and access to product related information as requested by a supply chains' stakeholders without loss, noise, delay, or distortion (Hofstede, 2003; Wognum et al., 2011). For there to be a shared understanding, there must be clarity. Clarity is a focus on the seamless transfer of meaning from sender to sender as opposed to the volume or relevance of the information shared (Schnackenberg & Tomlinson, 2016). The authors define clarity as the perceived level of lucidity and comprehensibility of information received from a sender. Thus, for information to be considered transparent, it must be understandable (Street and Meister, 2004) and clear (Winkler, 2000). Incomprehensible information is not classified as transparent information if it has no meaning for the receiver.

Exchange of Verifiable (Semantic) Information

For information to be transparent, it must be verifiable. That is to say it has to be unbiased and founded (Schnackenberg & Tomlinson, 2016). The authors argue that verifiable (and therefore transparent information) is the perception that information is correct and therefore true to the highest extent possible, given the relationship between sender and receiver. To Deimel et al. (2008), transparency means clearness and lucidity and implies honesty and openness. Turilli & Floridi (2009) argue that information disclosed when implementing information transparency is supposed to be meaningful, comprehensible, veridical, and useful. The authors qualify information that fulfils these properties as Semantic Information. The exchange of semantic information is the outcome of a process that involves the transformation of raw data (inputs) into meaningful, verifiable, and exploitable information (outputs) called "semantic elaborations" (Turilli & Floridi, 2009). A phytosanitary certificate for instance, is a semantic elaboration or the outcome of a process that involves the transformation of raw data (from farms, packhouses) into useful information, attesting to the conformity of products with plant

health regulations. If the information is biased or inaccurate, it defeats its intended purpose (e.g., the accountability of the sender) and might expose the receiver to some sort of risk that accurate information would otherwise mitigate.

Transparent information should therefore enable users to make meaningful inferences (Michener & Bersch, 2013). The authors for instance argue that false transparency and unintelligible disclosures have been the norm in agri-food supply chains which means transparency is no longer determined solely by the visibility of information but also by its Inferability. In effect, the complexity of (food) supply chain networks which consists of different layers of actors operating in concealed conditions raises questions of effective and secure monitoring.

Selective Exchange of Sensitive Information

Transparency has been conceptualised as a light that is analogous to sensitive information or knowledge in a relationship (Lamming et al., 2004). To them, the term denotes a two-way selective exchange of sensitive information between a buyer and a seller, the former sharing sensitive information about its operations and expecting the latter to do the same. This definition assumes that the exchange of sensitive information and/or knowledge is only worthwhile if both parties can gain as a result. Gardner et al. (2019) are of the opinion that transparency in itself is neither inherently good nor bad but depends essentially on what information is being made transparent, how, to whom, and for what purpose. The selective sharing of information is indicative of its sensitivity. This selective sharing of information according to Lamming et al. (2004) does not have to be symmetrical as long as each or at least one party considers that the value of information and knowledge received (or shared) and the potential benefit it may reap is worth the investment of revealing its own sensitive data. It could also be that while one party has nothing to gain financially, the value of the information requested may be assessed in terms of exposure to some risk factor in the absence of the information.

3.5.2 The Quality of Shared Information

The indicators reviewed above it can be argued, point to the level of transparency in a supply relationship. Some authors (Bushman et al., 2004; Rawlings, 2008; Schauer, 2011; Schnackenberg & Tomlinson, 2016), perceive transparency as the quality of information shared. By implication, transparency goes beyond the mere act of sharing information. What this means is for information to be classified as transparent, it must fit certain criteria. As mentioned above, it must be available (Bushman et al., 2004; Schauer, 2011), accessible (Zhu, 2004; Schauer, 2011), and enable actors to see elements critical to their decision-making process – clarity (Flood, 1999; Schnackenberg & Tomlinson, 2016).

Manning (2018) suggests that transparency as a construct arises from the desire of supply chain stakeholders to be in a position to make informed decisions on the basis of information provided.

Other qualitative determinants of transparency have been identified in the literature. For instance, Turilli & Floridi, 2009 argue that the term "information" in "information transparency" is a qualification that indicates what is made accessible, that is to say transparent to the user. Thus, for information to be transparent it must be accessible, but it must also be meaningful and comprehensible (Turilli & Floridi, 2009).

According to Schnackenberg & Tomlinson (2016), the quality of information has been treated in terms of increased disclosure of information, enhanced visibility and accessibility of information, increased clarity and understandability of information, reduced information concealment, and enhanced timeliness of information. These criteria constitute the different qualitative measures that can be used to assess the quality of information or again, the level of transparency in an organisation. Lamming et al. (2004) argue that the exchange of sensitive information can be used as a proxy to assess value add for at least one party in the relationship. The more transparent (or qualitative) the information, the greater its value will be to the receiver. it is normal to have mechanisms in place to assess the quality of the data.

Based on the above indicators of transparency, one can argue that sharing information is a necessary but not a sufficient condition for transparency to happen. What indicators point to, are levels or degrees of transparency identifiable across different supply relationships.

3.6 Degrees of Transparency

Lamming et al (2004) identify three different modes of transparency in SC relationships based on a geological metaphor involving the amount of light transmitted through an object. From this perspective, the level of information sharing (qualitatively speaking as discussed above) can either be characterised as opaque, translucent, or clear. These states are summarised in table 6 below

	Opaque	Translucent	Clarity
In Geology: light shining on or through a piece of mineral	Light cannot penetrate the surfaces nor pass through the structure of the substance	Light can enter and exit the surfaces of the substance and pass through its structure but is distorted or partly obscured in the passage.	Light enters and exits the surfaces or the substance and passes through its structure without alteration
In supply management: (information existing in or shared between two organizations)	For any of a variety of reasons, information cannot be shared between the parties, but this constraint is acknowledged by both parties	Restricted information may be shared, e.g., interface conditions or partial data. If used tactically, it may be akin to 'cheating	Information is shared candidly, on a selective and justified basis. Development of information may lead to shared knowledge and collaborative abilities.

Table 6: Degrees of Supply Chain Transparency: Based on Lamming, Caldwell, & Harrison (2001;2004;2006)

In effect, in the framework developed by Lamming et al. transparency is conceptualised as a manageable element of supply chain relationships as opposed to being a general property of the relationship. The implication of this conceptualisation is that supply chain relationships can be illustrated as combining points in the scale from opaqueness to clarity. Also, the authors argue that the exchange of sensitive information and knowledge is only worthwhile if both parties gain value as a result. Hence, nurturing (if not creating) value operates as the incentive to share information and by implication, actors compare the benefit to be obtained from sharing sensitive information to the cost of providing the information. This process can result in any of the three modes identified in the framework.

Opaque Relationships

In opaque relationships, neither side has a clear view of the other party's costs, tactics, or goals. Negotiations are fraught and intense involving a take it or leave strategy from either party. Lamming et al. posit that an opaque relationship can only survive where there is no interdependency. They claim opaqueness should not be viewed as a problem in itself unless it becomes a pressing issue for a customer or supplier when linked to value creation, nurture, and delivery. In their opinion, opaqueness may be a candid response to a request for sensitive information to be dealt with honestly rather than providing distorted data. Lamming et al. equally identify three modes of opaqueness illustrated in figure 12 below.

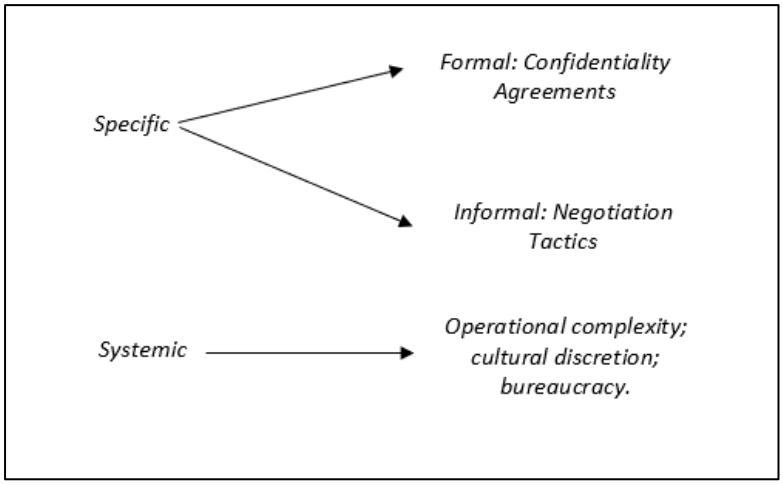

Figure 12: Modes of Supply Chain Opacity: Adapted from Lamming et al. (2001;2004;2006)

According to Lamming et al. (2004), an interesting variant of cultural systemic opaqueness is that employed in many parts of the world for dealing with importers. This involves local customs and habits of business, as well as negotiation, not practiced elsewhere, which may be called upon to slow down or even block the transfer of information, for a variety of tactical purposes. To Fox (2007), opaque transparency involves the dissemination of information that does not reveal how an organisation actually behaves in practice whether in terms of how they make decisions or the results of their actions. It also refers to information that is divulged only nominally or which is revealed but turns out to be unreliable.

Translucent Relationships

A translucent relationship is a mix of opaqueness and transparency. (Lamming et al., 2001; Lamming, 2004). With light representing sensitive information, it can be expected that there will be some elements of

common and shared understanding even though goals and motives as well as the value creation process remain opaque. This degree of transparency allows for sufficiently informed judgements and actions with acceptable levels of confidence.

Clarity or Clear Relationships

According to Fox (2007), clear transparency refers to both information access policies and to programs that reveal reliable information about institutional behaviour and/or performance which will permit interested parties to pursue strategies of constructive change (e.g., certifications of compliance with environmental standards). To Lamming et al. (2004) this state (total clarity) describes a very high degree of access to sensitive information. Relationships with areas of clarity are more likely to be the case than relationships with total clarity. According to Lamming et al (2004), such areas of clarity are fissures of light formed through experience as well as knowledge built through personal relationships, secondary sources and so on.

Providing clarity in one part of a relationship could potentially expose opaqueness in other areas that had previously been concealed behind normal operating procedures. What this means is that as clarity is implemented, areas of opaqueness can become targets for further clarity or translucency. Thus, the systemic opaqueness of an organisation can be dealt with either as a deliberate strategy on the part of the organisation itself or as a target for another organisation.

So far, it has been established that if transparency cannot be directly measured, its presence or absence can be detected through a number of indicators discussed above. Moreover, it can be argued that the perceived degree of transparency in a supply relationship is determined or conditioned by a number of factors that will now be examined. These determinants can either be conceptualised as facilitators or inhibitors of transparency. Two studies (Deimel et al., 2008; Faisal, 2015) were relied on for a review of facilitators and/or inhibitors of supply chain transparency

3.7 Determinants of Supply Chain Transparency

Theuvsen (2003, 2004) as well as Deimel et al. (2008) argue the level of transparency in any given supply relationship is determined by factors that can either be structural, or behavioural.

Structural determinants of transparency include supply chain, product and transaction characteristics while behavioural determinants include the cultural and social embeddedness of the transactors' behaviour as well as the quality of business relationships between suppliers and customers. Put together, these provide a framework for understanding some of the factors contributing to interceptions in the Ugandan horticultural export supply chain.

3.7.1 Structural Determinants

Supply Chain Characteristics

With regards to supply chain characteristics, Theuvsen (2003) in Deimel et al. argue that supply chains are characterised by a division of labour resulting in interdependencies that are to account for coordination problems. Because interdependencies are points where information is exchanged between supply chain partners, Theuvsen (2004) posits that a high number of process interdependencies representing an intense division of labour will have a negative impact on information transfer and therefore on supply chain transparency. The number of process interdependencies in turn depends on supply chain characteristics such as the length of the supply chain, number of potential transaction partners, frequency of transactions, and geographical distance.

Product Characteristics:

Deimel et al. (2008) argue that food products are often characterised by credence attributes that are not easily controlled by customers unless at high cost. This is the case for agricultural products whose qualitative attributes do not only evolve with legislation but are often difficult to discern even after purchase. Equipment for testing pesticide residues for instance tends to be expensive and not easily accessible for smallholder producers or exporters in most SSA countries, as shall be discussed in the case of Uganda.

Transaction Characteristics

The characteristics of a transaction in terms of complexity and uncertainty have been observed to have an influence on information sharing tendencies in business relationships (Williamson, 1985; Eisenhardt 1985; 1989; Winterstein, 1996; Slater & Spenser, 2000; Boerner & Macher, 2001;2008; Deimel et al., 2008). For instance, Winterstein (1996) suggests that complexity and uncertainty have a positive impact on transparency as transaction partners always need to make informed decisions under such circumstances. In other words, faced with uncertainty and complexity in a transactional situation, the tendency is to search and collect information in order to circumvent information dissemination problems.

Governance Structures

Further, transactions are embedded within governance structures which in turn condition the information sharing behaviours of partners (Van Dijk et al., 2003 in Deimel et al., 2008). The argument is that less cooperative governance structures are characterised by opportunistic behaviour and power asymmetries leading to information asymmetries that negatively impact transparency

Information Characteristics

Nonaka & Takeuchi (1996, 2006) in a discussion of knowledge creation in Japanese organisations make the distinction between tacit and explicit knowledge with the former being more difficult to communicate than the latter. The authors define explicit knowledge as that which is formal, systematic, and can easily be shared (e.g., product specifications, scientific formulas, etc.). On the other hand, tacit information (e.g., a skill set acquired through an apprenticeship) they claim, tends to be highly personal, hard to formalize and therefore difficult to communicate. Even though Deimel et al. like Nonake and Takeuchi argue that "explicit information is easier to communicate than implicit information because easier to express and in need of less additional interpretation", the underlying assumption is that all parties to the transaction are able to understand and interpret the information being communicated.

3.7.2 Behavioural Determinants

Culture

Several studies (Jiang, 2000; Kim, 2003; Elmes, 2013) have established a relationship between culture and language across different disciplines. Based on the definition of transparency suggested by Hofstede above, it is a logical conclusion to make that the cultural embeddedness of a supply chain has a role to play in the perceived level of transparency between stakeholders. A shared understanding can only be achieved if supply chain actors share a common language (or culture). However, as previously highlighted, even though exporters may speak the same language (English) and therefore share a cultural similarity with a majority of trading partners in the export market, outgrowers are either unable to communicate or access critical compliance information only available in the English language. It is also for this reason that Aguolu (1997) concluded that access to most of the world's wealth of information will remain a myth for developing countries until they overcome the prevailing obstacles, which include high rate of illiteracy,

Social Embeddedness

Granovetter (1985, 2006) defines social embeddedness the extent to which economic action is linked to or depends on action or institutions that are non-economic in content, goals, or processes. He argues that when economic and non-economic activity are intermixed, non-economic activity affects the costs and techniques available for economic activity. Tensions in the supply chain owing to a lack of clarity on inspection fees as well as EU interceptions resulting from fake phytosanitary certificates identified during the course of this study can be explained by the concept of social embeddedness developed by Granovetter (1985, 2006).

Relationship Quality (Loose Relationships)

The looseness of relationships in the horticultural supply chain can be explained by a lack of trust and commitment between supply chain operators. In effect, Schulze et al. (2006a) defines relationship quality as the overall assessment of the strength of a business relationship which affects the willingness of transaction partners to cooperate and determines their information exchange behaviours. Further, the authors cite trust and

commitment as key components of relationship quality and expect the level of transparency (information sharing) to reflect the quality of supply chain relationships (Deimel et al., 2008).

Trust

Kwon & Suh (2006) establish a relationship between trust and commitment in supply chain relationships by concluding that trust is a critical factor that fosters commitment among supply chain partners. They argue that the presence of trust improves measurably chances of successful supply chain performance. Rousseau et al. in Deimel et al. define trust as a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviours of another' (1998: 395). The very notion of vulnerability suggests exposure to some form of risk that at least one party is willing to accept in the hope of a better outcome.

Commitment

However, to the credit of outgrowers, is the level of commitment from exporters who may not be willing to buy excess produce in times of abundance or who may delay payments to outgrowers limiting their ability to procure pesticides for pest control. Schulze et al. define commitment as the 'belief of a business partner that the relationship with another partner is important enough to maintain even if problems occur (Schulze et al., 2006 in Deimel et al., 2008).

Irrespective of the context or supply chain, a natural thing to do once facilitators or inhibitors and therefore determinants of transparency have been identified is to prioritise initiatives for improvements. The "control power" "reliance" framework developed by Faisal (2015) in a survey-based research (below) can be a useful means of directing supply chain transparency improvements.

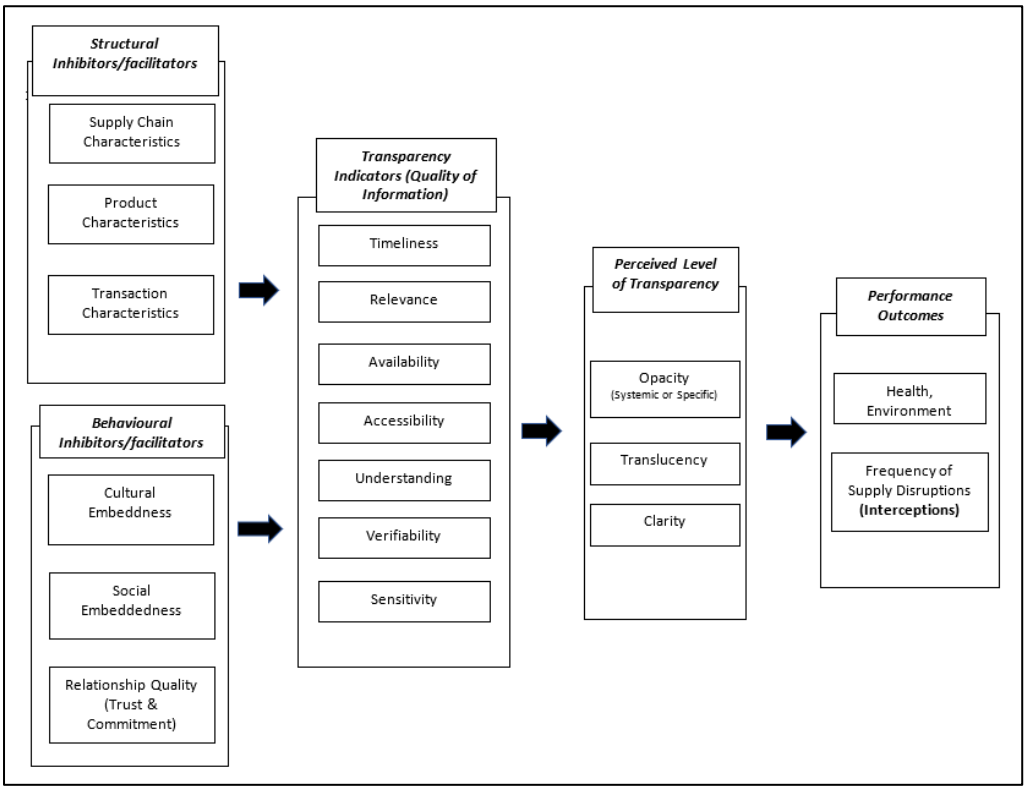

Figure 13: A conceptual Model of Transparency in the Agricultural Supply Chain in relation to Interceptions. (Adapted from Theuvsen, 2003; Deimel et al., 2008; Lamming et al., 01;04;06)

Note: There is no assumed hierarchy in the layout of variables.

Figure 13 is a summary of the discussion above as it illustrate transparency in terms of its determinants (structural and behavioural), indicators, levels (or degrees) and outcomes.

As shall be further discussed in chapters 6 and 7, poor relationship quality evidenced in a lack of trust and commitment in outgrower-exporter relationships restricts the availability and verifiability of information on production practices. This it can be argued, results in opaque transparency which will in turn accentuate the number/frequency of interceptions during plant health inspections.

3.7.3 Improving Transparency: The Control Power/Reliance Framework

In a study involving a survey targeting inhibitors of transparency in red meat supply chains, Faisal (2015) identified factors that were classified into three main categories based on their power to sway or be swayed by other variables. This hierarchy-based model is comprised of two main dimensions ("control power" and "reliance") indicating both the existence and dominance of interactions between variables (factors) that can be prioritised in the channelling of scarce resources for improvement actions.

Based on the two dimensions of "control power" and "reliance" four groups of inhibitors were identified:

- *Independent inhibitors* having strong control power but low reliance. Examples given include regulatory and ethical frameworks supporting transparency. It was discussed in chapter two and above how the evolution of regulatory frameworks in the EU had a bearing on the structure and organisation of horticultural supply chains in SSA with regards to due diligence and monitoring.

- *Dependent inhibitors* rank low on the control power dimension but high on the reliance dimension. Examples include the lack of IT infrastructure to support data collection and dissemination as well as the fragmented nature of the supply base. It was also obvious from the previous chapter that traceability systems have become a mandatory requirement in agricultural supply chains owing to regulatory requirements specified for instance in the 1990 Food Safety Law (UK) as well as in EU wide food safety/environmental regulations. This in turn had a bearing on integration driven by consolidation in the supply chain. Hence, IT infrastructure is a dependent (on the regulatory framework) determinant of transparency.
- *Associative inhibitors* are neither dependent nor independent but form a bridge between independent and dependent inhibitors. Examples given are lack of commitment from top management or again, the lack of a supply chain wide strategy. Faisal (2015) argues that these variables form a link between those variables that have a high control power and those with low control power but high reliance. For instance, commitment from top management (or public authorities in some instances) to support IT infrastructure (a high reliance variable) could have an impact on the ethical framework underlying operations (e.g., in terms of managing fraud).
- *Self-directed* inhibitors are inhibitors with low "control power" and "reliance." These inhibitors can be considered as redundant in the whole system in that they neither influence other variables nor are influenced by these.

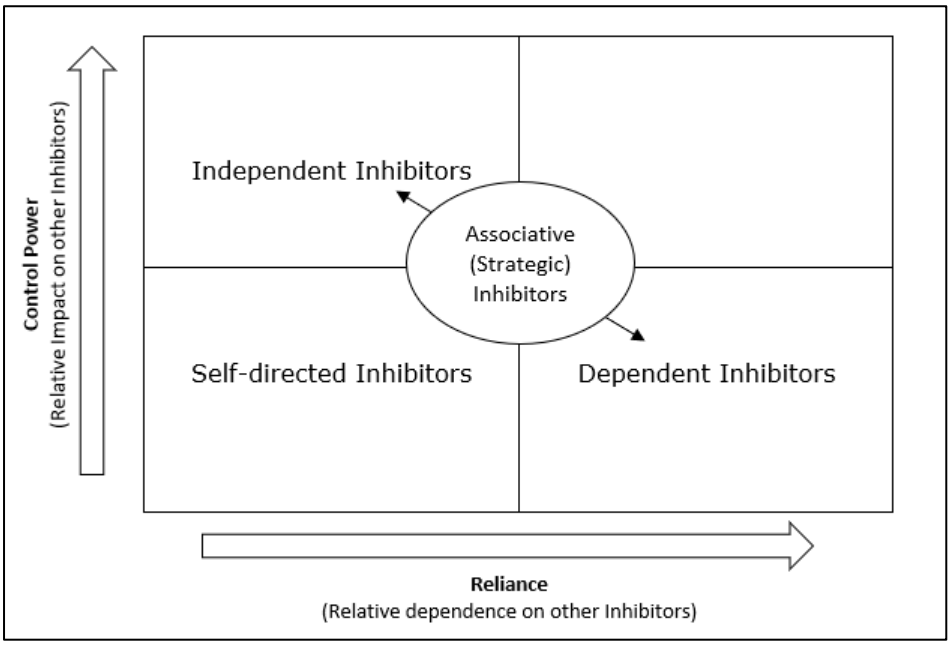

Figure 14: The Control Power/Reliance matrix of supply chain transparency inhibitors. (Adapted from Faisal, 2015)

3.8 The Role and Outcomes of Transparency

The role of Transparency can be understood in terms of what it aims to achieve. According to Fox (2007) it can serve to limit abuse of power (e.g.in instances of regulatory protectionism), tackle corruption, or encourage improved institutional performance.

Generating Accountability

Numerous research (Fox, 2007; Manning, 2018; Gardner, 2019) has established a close link between Transparency and Accountability with a widely held assumption that transparency generates accountability. Some researchers like Fox (2007) have sought to establish the conditions under which transparency leads to accountability based on a conceptualisation of what is termed "clear" and "opaque" transparency. While the aim of this dissertation is not to establish the conditions under which Transparency leads to Accountability, it nevertheless describes how it leads to accountability. For instance, Turilli & Floridi (2009) argue that disclosed information may contain details that publicly indicate whether companies 'activities are consistent with principles of equality, fairness, informational privacy, social welfare or environmental care. As shall be discussed in the context of plant health, transparency enables stakeholders to verify that phytosanitary regulations do not have a negative impact on international

trade. This is brought about through the ability it confers on stakeholders to demand answers as well as the capacity to sanction, which are two key dimensions of accountability (Fox, 2007). It is also important to identify who is targeted by Transparency in terms of Accountability. Strategies targeting the individual will differ from strategies targeting organisations (or institutions) provided the former can be clearly identified and distinguished from the latter (Fox, 2007). Gardner et al. (2019) observe a growing recognition of the need for actors involved in every step of global supply chains to share responsibility for the sustainability of production systems. This view is even more important in the context of plant health as it suggests an integrated approach to managing the risk of introduction and spread of harmful organisms due to international trade.

Behavioural Change

Fox (2007) states that Transparency in its dimension of clarity will influence both individual and institutional behaviour. In effect, he argues that Transparency informs on the behaviour of institutions (composed of individuals) allowing stakeholders to follow strategies that will bring about desired change. For Transparency to influence behaviours, it must shed light on activities (who does what?) and rewards (who gets what?) (Fox, 2007). This is particularly true of Agri-Food value chains. This view is supported by Turilli & Floridi (2009) who suggest a dependence relationship between information transparency and ethical principles such as accountability. In effect, the authors argue that information transparency is ethically enabling when it provides information necessary for the endorsement of ethical principles (i.e., ethical principles necessitate information) or when it provides details on how information is constrained (i.e., ethical principles regulate transparency). If false or inadequate information is provided, then ethical principles become impaired. In revealing sensitive information about the ethical behaviour of individuals and/or organisations, information transparency influences behaviour but only when the information provided is true or verifiable.

Change Catalyst

By informing on the behaviour of institutions and/or individuals, Transparency therefore acts as a catalyst for change. For instance, Gardner et al. (2019) argue that transparency can have a positive transformative effect on interventions seeking to strengthen sustainability outcomes in global commodity supply chains. Gardner et al. (2019) argue that increased supply chain transparency can help transform the sustainability of commodity production systems. They suggest that it can demystify complex supply chains and help different actors identify and minimise risks, improve conditions, and inform whether and where progress is being made.

Knowledge Sharing

Transparency is viewed as a critical element of knowledge sharing such that increased transparency brings increased awareness, coherence, and comprehensibility to information exchanged between two parties (Pagano & Roell, 1996). To be transparent is to have the capacity of being seen without distortion (Schauer, 2011). The development of transparency within the relationship may be concerned with the exchange of many different valuable things, including technical know-how, cost information, operational data (e.g., spraying records in the case study) and strategic intent (market entry and continuity) (Lamming et al., 2004).

Risk Management

According to Lamming et al. (2004;2006), employing transparency reduces the one-sided nature of risk embodied in traditional open-book negotiations which typically leads to opportunistic behaviour. Agricultural supply chains are inherently characterised by uncertainty (climate, weather, yields, pests, and disease infestations) and therefore by risk. Transparency is expected to help rebalance deeply entrenched information asymmetries in agricultural supply chains (Gardner et al., 2019).

Building Trust

Transparency is an important element in the value creation and delivery process in Agribusiness Value chains (Lamming et al., 2004). It is often

cited as essential to trust stakeholders' place in organisations. In a much wider sense, it is invoked as a remedy to situations that accompany distressed relationships between an organization and its stakeholders through the ability to re-establish stakeholder trust in the organisation (Schnackenberg & Tomlinson, 2014). It plays a vital role in creating, maintaining, or repairing trust explicitly and implicitly.

In the next chapter, I discuss how a case study approach was used to investigate why and how interceptions are caused by a lack of transparency in the Ugandan horticultural export supply chain (UHESC).

3.9 Summary and Theoretical Shortcomings

In the previous chapter, the concept of plant health and plant quarantine was introduced in a bid to contrast previous developments (e.g., EU Market Concentration and Private Standards) shaping the horticultural industry in sub-Saharan Africa from current trends, notably plant health interceptions and the resurgence of public standards. From a Global Value Chain (GVC) perspective, this is indicative of a shift from governance through private structures or lead firms as discussed in Jaffe & Masakure (2005) as well as in Dolan et al. (1999; 2000) to governance through public structures or the state as discussed in this dissertation, owing to biosecurity concerns in the agro-food chain. Assuredly, upgrading in these sub - regional value chains is driven by a need for closer coordination between producers and traders to ensure proper documentation, and compliance with private and now, public sector schemes. Also, behind the notion of documentation and compliance is the need to evidence adherence to market entry specifications. This it can be argued, places transparency at the core of structural changes in the horticultural landscape of the industry.

It is to say that the extant research is yet to account for the role of public governance mechanisms, notably plant health regulations in the structural transformations experienced by producers and traders in a country like Uganda. Also, whereas the common approach (e.g., Dolan et al., 1999; Fitter & Kaplinsky, 2001) has been to focus on the distribution of economic surplus to explain structural outcomes in terms of upgrading, this dissertation focuses on the distribution of information requirements to explain the same.

Moreover, even though the role of transparency through the establishment of mandatory traceability systems aimed at preserving consumer confidence has been extensively discussed in the literature (Opara & Mazaud, 2001; Trienekens et al., 2001; Hofstede, 2003; Manning, 2006;2018; Knowles & Moody, 2007; Wognum et al., 2010; Whitworth et al., 2017), there has been a persistent bias towards sanitary (as opposed to phytosanitary) concerns.

This is evident in the study by Faisal (2015) where inhibitors of transparency notably at a regulatory level are to blame for food safety concerns. However, Faisal's focus, like the focus Deimel et al. (2008) in their study of the determinants and outcomes of transparency in the German meat industry is on the sanitary aspects of the agro-food supply chain. Yet, phytosanitary concerns are increasingly shaping governance outcomes in agro-food supply chains.

Owing to these explanatory shortcomings, this research conceptualises transparency within the framework of a GVC bottom-up analysis to illustrate and explain the outcomes of external governance structures in the form of phytosanitary interceptions. It also examines and illustrates the role of the state in the determination, coordination, and success of upgrading in a domestic horticultural value chain.

In the next chapter, I discuss how a case study approach was used to tackle these issues through an investigation of why and how interceptions are caused by a lack of transparency in the Ugandan horticultural export supply chain (UHESC).

Chapter 4

Research Methodology

4.1 Research Questions

As introduced in chapter 1, there are two issues warranting an investigation in the Ugandan horticultural export supply chain; these include factors contributing to interceptions and their relationship to transparency in the supply chain as well as the response of Ugandan authorities to improve the compliance of the horticultural export control system. This is based on the observation that there have been an increasing number of interceptions of horticultural produce inbound from Uganda found to be non-compliant for reasons related to both the quality of the produce (i.e., its phytosanitary status) and accompanying paperwork (i.e., phytosanitary certificates).

In this regard, three key research questions were developed to guide the study.

1) What are the factors contributing to interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) ?
2) How do these contribute to a lack of transparency in the Export Supply Chain (SC) ?
3) How did the supply chain respond to regulatory requirements for transparency and what are the outcomes ?

In order to address the above research questions, four related objectives were defined and outlined as follows.

1. To identify factors and processes through which interceptions are caused in the Ugandan horticultural export supply chain
2. To examine their role as inhibitors of transparency in the supply chain
3. To evaluate the response of the supply chain to demands for greater transparency and compliance from of the EU
4. To make recommendations for improving transparency in the supply chain.

4.1.2 Research Rational

First, the underlying assumption (in the WTO framework governing sanitary and phytosanitary regulations applicable to international trade) is that transparency facilitates market access for agricultural products. In effect, the question of market access for agricultural products notably from developing world countries has been a key concern for researchers (Shrader & Unger, 2003; Henson & Loader, 1999; 2001; Jensen, 2002) following the establishment of the WTO Agreement in 1995. In fact, "*the WTO Agreement on Agriculture provides a framework for the long-term reform of agricultural trade and domestic policies aimed at leading to fairer competition and a less distorted sector. The overall aim is to establish a fairer trading system that will increase market access and improve the livelihoods of farmers around the world*" (WTO | Agriculture - gateway, 2020). To further illustrate, from a plant health perspective, the WTO SPS Agreement on Sanitary and Phytosanitary measures acknowledges the right of Members to take measures necessary for the protection of plant life or health, provided that such measures do not serve as a disguised restriction to international trade (WTO | Sanitary and Phytosanitary Measures - text of the agreement, 1995; Scott, 2009; Rigod, 2013). The principle of transparency is therefore of paramount importance to both regulator and regulatee in agricultural supply chains.

However, in the context of international trade, it is important to identify which form of transparency is more likely to guarantee improved access for the agricultural exports of developing world countries considering existing power asymmetries.

While it is true that institutional transparency (also called trade transparency – ITC, 2010) as outlined above within the context of WTO Trade Agreements been the focus of both practice and research, (Shrader & Unger, 2003; ITC, 2010; Bacon, 2012; Hlasny, 2012; Yamamura et al., 2016), supply chain transparency in terms of monitoring (including traceability), and evidencing compliance with International SPS standards seems to be condition sine qua non for enhanced market access for the agricultural exports of SSA.

In other words, institutional transparency while being important (for instance, in terms of the right and the capacity to participate in decision making processes) only has a limited bearing on market access opportunities for least developed countries.

The role of private standards in the restructuring of horticultural supply chains in Kenya (Jaffe, 1995, 2003) was noted with the International Trade Center (ITC, 2010) noting that standards produced by private bodies complement and sometimes replace technical regulations or governmental standards. Producers in developing countries often face difficulties in complying with such private standards and thus in gaining market access (ITC, 2010).

However, as with private standards, recent evolutions involving the tightening of government standards (e.g., technical regulations governing the import and distribution of plants and plant products) while being operated under highly institutionally transparent conditions, have resulted in market access issues for developing world producers due to compliance difficulties.

Secondly, as discussed previously in chapter 2, developing world economies are increasingly dependent on agriculture to sustain growth and combat poverty through employment in the sector which contributes significantly to the GDP of some least developed countries (e.g., up to 24% in the case of Uganda). This is to say that increased demand for exotic produce (at least in part attributed to the ethnic diaspora) has driven positive change in the horticultural export supply chains of countries like Ghana, Ivory Coast, Kenya, and Uganda, through unprecedented growth in exports to the EU. However, EU market access for these countries is threatened by non-compliance with phytosanitary import regulations evident in a growing trend of interceptions at border control. To illustrate, Martin (2004) observed that finding a balance between flexibility and discipline in trade negotiations has been most difficult to achieve in terms of market access that holds the highest potential gains for developing countries. The importance attached to understanding and explaining market access challenges faced by developing world agricultural exporters cannot be overestimated

This research therefore seeks to address these issues by providing answers to the questions stated above.

4.1.3 Conceptual Assumptions and Research Strategy.

Conceptual Assumptions

This study is aimed at an investigation of how interceptions (or supply disruptions) in the Ugandan horticultural export supply chain are caused by a lack of transparency in supply chain relationships. Seeing as interceptions (which eventually lead to market restrictions) are a market access challenge, the study therefore assumes a relationship between transparency and market access with a focus on the supply chain (as opposed to institutional) aspects of the concept.

Furthermore, from a literature review perspective, even though transparency is a latent variable (Deimel et al., 2008) that tends to mean different things to different people (Fox, 2007) there is a consensus across all disciplines that transparency builds trust and improves relationships (Hofstede, 2003; Islam, 2006; Fox, 2007; Deimel et al., 2008; Hollyer et al., 2013; da Cruz et al., 2016; Islam & Haque 2018; Gardner et al., 2019). This can be extrapolated in the light of international trade to mean enhanced market access. The WTO SPS Agreement defines transparency as the principle making available (open to scrutiny) at the international level, phytosanitary measures, and their rationale (FAO, 2019). While it is true that this view of transparency is institutionally embedded, it also has a direct bearing on supply chain operations considering the need to evidence compliance with phytosanitary regulations. Some authors (Lamming et al., 2001; 2004) have posited that too much transparency can be counterproductive notably in a context of agricultural trade where there is a constant pressure on profit margins (Wall, 2007; Duffy, 2009; Jackson, 2009) and some agents may be incentivised to conceal or falsify information unless there is a clearly identified mutual benefit (Lamming et al., 2001; 2004; Gardner et al., 2019).

Therefore, as mentioned above, the objective is not to assess the transparency of regulatory bodies but rather, to explore factors in the supply chain contributing to interceptions and how these may operate as inhibitors of transparency.

Research Strategy

Working under the assumption that transparency contributes to enhanced market access (less interceptions) and seeking to understand "how?" in a developing world context (Uganda), I opted for an *Instrumental Case-Based Inquiry* (Stake, 1995) involving a *Thematic Analysis* (Braun & Clarke, 2006; 2013; Guest & Namey, 2012) of factors contributing to interceptions and how they relate to transparency in the Ugandan horticultural export supply chain. As shall be subsequently discussed, thematic analysis is applied in this research as an integrated method of analysing data that helps with explaining interceptions (events) in relation to information transparency (a theoretical concept) and outcomes in the UHESC. This is based on an investigation of the conditions under which transparency contributes to enhanced market access (or reduced interceptions).

The case study is instrumental in the sense that it sheds light on two key issues/

1. The issue of interceptions which are on the rise in Sub-Saharan African (SSA) horticultural supply chains (following an inductive bottom-up approach to the analysis).
2. The creation of transparency in the supply chain as strategy for enhanced market access of Uganda's horticultural exports.

It is therefore a question of using the framework of a case-based inquiry to explore factors contributing to interceptions, how they relate to transparency in the supply chain, and the response of the supply chain. Below, the philosophical assumptions that underpin the research strategy (a case-based methodology) and design.

4.2 Philosophical Assumptions and Research Methodology

Schwandt & Gates in Denzin & Lincoln (2017: 341) define social science methodology as the study of how a particular kind of investigation should proceed. They explain that methodology is the philosophical examination of suppositions and principles and the resultant justification of methods and techniques associated with a specific approach to investigating the

social world. Further, case study methodology is the examination of the philosophical assumptions and principles that relate to case-based inquiry (Schwandt & Gates in Denzin & Lincoln, 2017). The authors explain that because case-based inquiries are open to both quantitative and qualitative methods of inquiry, it is important to specify the philosophical assumptions that explain the choice of methods for data collection and analysis.

4.2.1 The Philosophical Paradigm

This dissertation is informed by a *constructivist-interpretivist philosophical paradigm*.

In effect, questions about reality and the study of reality have been embodied in philosophical paradigms defined as *a set of interrelated assumptions about the social* world providing a philosophical (cognitive) and conceptual framework for the organised study of that world (Ponterotto, 2005); or again, as a set of assumptions and perceptual orientations shared by members of a research community that determine how they view the study of phenomena and the research methods employed in the study (Given, 2008).

These perceptions (beliefs) or assumptions are with regards to ontology (the nature and reality of being), epistemology (the study of knowledge as well as the relationship between the researcher and participants), axiology (the role and status of values in the research process) and methodology or the process and procedures of research (Ponterotto, 2005).

Ontological Assumptions

The ontological question relates to whether objects of investigation (institutions, people, processes, systems) are viewed as objective entities existing apart from and independent of social actors or as constructions emanating from the beliefs, meanings, and actions of individuals through their interactions.

Realist perspectives (also referred to as realism in the natural sciences) are a long-standing position that adopts a view of the world as concrete and external (Easterby-Smith et al., 2015: 48) in which social phenomena confronts us as external facts that are beyond our reach or influence (Bryman, 2015:29). On the opposite end of the spectrum are *Nominalist* perspectives which posit that there is no truth with the implication that

interesting questions should seek to understand how people establish different versions of truth.

Ontology	Realism	Internal Realism	Relativism	Nominalism
Truth	Single Truth	The Truth is real but obscure	There are many "truths"	There is no Truth
Facts	Because facts exist, they can be revealed	Though concrete, facts are not directly accessible	Facts depend on the observer	Facts are created by humans

Table 7: Four Ontological Positions (Adapted from E-Smith et al., 2015)

4.2.2 A Relativist Perspective

From an ontological perspective, qualitative research such as this one embraces the idea of multiple realities (Creswell & Poth, 2014) or "many truths" (E-Smith et al., 2015) that are socially constructed through the actions and interactions of individuals and institutions. For instance, based on the Global Value Chain (GVC) approach to explaining the outcome of interceptions in the UHESC, it can be argued that international supply chains are a construction resulting from an international division of labour that has evolved over time. While certain power asymmetries remain the same and are even reified institutionally (e.g., international standards setting institutions like the IPPO), outcomes and therefore realities can be expected to vary from one country to another. To illustrate, Uganda's history including a prolonged civil war in the 1980s has considerably impacted its ability to compete or even exist sustainably with neighbours like Kenya in the horticultural export industry. Its ability to effectively participate in the international horticultural value chain is a function of how well resources and capabilities can be upgraded. Upgrading (as an outcome of interceptions) is best perceived through a case study methodology that seeks to understand "how" it was done in acknowledgement of experiences and meanings attributed to interceptions that are unique to Uganda.

4.2.3 Epistemological Implications

As indicated above, epistemology "is the study of theories of knowledge; how we know what we know. As with the ontological continuum that pitched realism and nominalism at opposite ends of the scale, the

corresponding epistemological assumptions of positivism and constructionism are equally at opposite ends.

Ontologies	Realism	Internal Realism	Relativism	Nominalism
Epistemology / Methodology	Strong Positivism	Positivism	Constructionism	Strong Constructionism
Aims	Discovery	Exposure	Convergence	Invention
Starting Points	Hypothesis	Propositions	Questions	Critiques
Designs	Experiments	Large Surveys; multi cases	Cases and Surveys	Engagement and reflexivity
Data Types	Numbers and facts	Mainly numbers with some words	Mainly words with some numbers	Discourse and experiences
Analysis/ Interpretation	Verification/ falsification	Correlation and regression	Triangulation & comparison	Sense-making. understanding
Outcomes	Confirm theories	Theory-testing/ generation	Theory generation	New insights & actions

Table 8: Methodological Implications of different epistemologies (Adapted from E-Smith et al., 2015)

Commenting on a quote by the nineteenth century French philosopher Auguste Compte who claimed, "all good intellects have repeated, since Bacon's time, that there can be no real knowledge but that which is based on facts", E-Smith et al. see in this assertion the ontological assumption that reality is external and objective as well as the epistemological assumption that knowledge can only be valid if based on observations and measurements of this external reality (2015: 51). To a realist therefore, positivism is the best way to go about investigating human and social behaviour. However, the social world can be perceived as a construct, the output of a process whereby people continuously create through their actions and interactions, a shared reality that is experienced as objectively factual, and subjectively meaningful.

A Constructionist Epistemology

As earlier mentioned, in tandem with a relativist ontology, this study adopts a constructionist epistemology. Kuhn (2012) compared paradigm revolutions to the holistic shifts in perspective demonstrated by gestalt psychologists whose subjects could *interpret* pictures in two different ways – either as an antelope or as a bird. Therein one can argue, is the fundamental difference between philosophical assumptions guiding positivist research (i.e., what we see is reality) and qualitative (interpretivist) research (i.e., what we see is a mere perspective of reality). Authors like Lincoln & Guba (1985) argue that knowledge is constructed, not discovered. In effect, Berger & Luckmann (1966) in *The Social Construction of Reality* attempt an understanding of the reality that forms the subject matter of social scientific research. They make the argument that that a proper understanding of the reality of everyday life can only be achieved if account is taken of its intrinsic character. They argue that everyday life presents itself as a reality interpreted by men and subjectively meaningful to them as a coherent world. Reality is therefore perceived in qualitative research as a social construct whereby people continue to create through their actions and interactions, a shared reality (e.g., an international division of labour) that is experienced as objectively factual and subjectively meaningful (in terms of roles attributed along the value chain. A constructivist epistemology therefore seeks to capture the perspectives of different participants with a focus on how their different meanings illuminate the research topic.

It implies a need to get as close as possible to participants in order to report multiple realities (Creswell & Poth, 2016). The social world is neither given, natural, revealed, nor is it fully determined. It is made up and transmitted by people and can only be understood by considering the perspective of individuals in the study. According to Dr. Dennis Hiebert (Professor of Sociology at the Providence University College) the sociological question is not about what is real, neither is it about how we know what is real, but about how anything comes to be accepted as real (What *does 'The Social Construction of Reality Mean'* |2014). Subjective evidence therefore has to be assembled based on individual views and hence, knowledge is obtained through the subjective experiences of

people. Conducting studies in the field where participants live, and work is important for understanding what participants are saying.

4.3 The Research Design

Based on the ontological assumptions discussed above, this research adopts a case study approach to investigate the relationship between supply interceptions (a rising phenomenon) and transparency (an important concept in international trade relations) in SSA horticultural export supply chains.

As advised by Chun Tie et al. (2019), the design opted for in this research, was conceived as a strategy aimed at answering the research questions stated above. That is to say:

1) What are the factors contributing to interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) ?
2) How do these contribute to a lack of transparency in the Export Supply Chain (SC) ?
3) How did the supply chain respond to regulatory requirements for transparency and what are the outcomes ?

Yin (2017) advises that case studies are ideal for "how" and "why" questions when relevant behaviours still cannot be manipulated and when the desire is to study some contemporary event or set of events.

Not only are interceptions a contemporary issue experienced by SSA horticultural supply chains, but there is also limited coverage of the phenomenon in the Agri-Food supply chain literature. Hence, a case study seems appropriate for the tracing of operational processes leading up to interceptions as well as for examining the response of the organisation to the issue. Yin also suggests that the case study relies on a direct observation of events being studied and interviews of persons who may still be involved in those events. Figure 15 below is a summary of the methodological approach taken in this research.

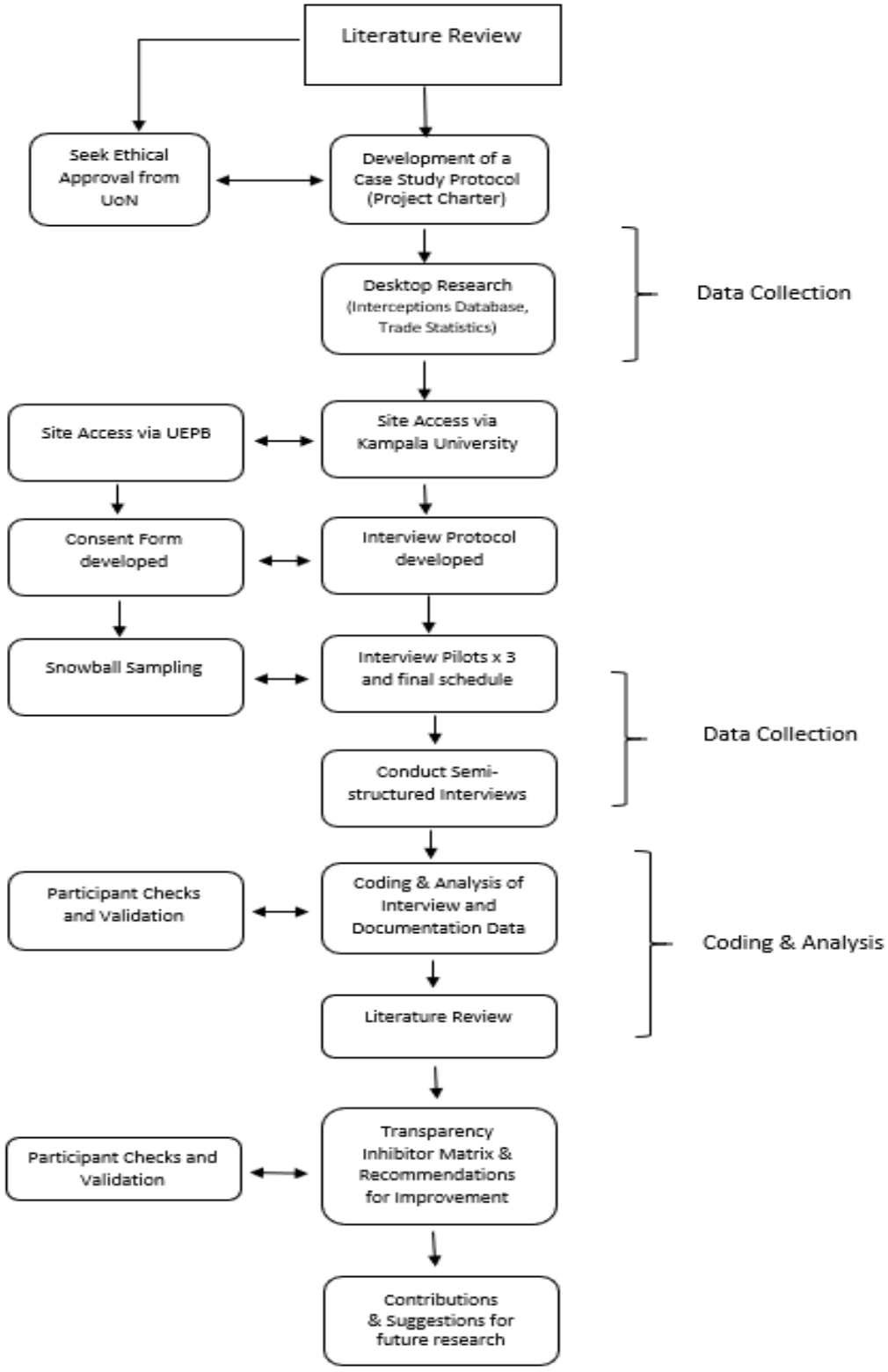

Figure 15: The Methodological Approach

4.3.1 The Case Study Approach

Like Yin, Creswell & Poth (2016) define case study research as a qualitative approach in which the investigator explores a real life, contemporary bounded system (i.e., a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audio-visual material, documents, etc.), and reports a case description and case themes (Creswell & Poth, 2016: 96-97). The authors also indicate that a case study seeks to explore an issue or problem using the case (culture sharing group) as a specific illustration (Creswell & Poth, 2016).

This research is focused two related contemporary issues i.e., *interceptions* and *food supply chain transparency*, examined in the context of a developing world fresh fruit and vegetable export supply chain. Based on Stake (1995), the choice was for an instrumental case study as described in table 9 below.

Case Marker	Single		Multiple
	Intrinsic	Instrumental	Collective
Focus	Focus is on the case due to an intrinsic interest	Focus is on an issue which is "the research question" (Stake. 1995:18-20)	Focus is on an issue which is "the research question" (Stake. 1995:18-20)
Intent	The researcher seeks to shed light on the case	The case is instrumental to elucidating the issue. The intent is to shed light on the issue	The researcher uses more than one case or participant to elucidate the issue

Table 9: Types of Case Studies (Adapted from Stake (1995)

An Instrumental Case Study

From the three types of case studies described by Stake (1995:3) above, as already mentioned above, this dissertation adopted an instrumental case study approach to answering the research questions. The "case" is instrumental in that it sheds light on the issue of interceptions and therefore illustrates the research problem. The distinguishing factor between the intrinsic case and the instrumental case is the focus on "issues" in the latter case. If interceptions which constitute a market access challenge were specific to Uganda, my interest would be intrinsic and specific to Uganda. However, in assuming that all systems (trading

partners & supply chains) are under the same stress, issues can be used as good research questions for organising (an instrumental) case study (Stake, 1995: 17).

4.3.2 Case Design

The development of a design is a difficult part of doing case studies owing to the lack of a comprehensive catalogue of research designs for case studies which is an often-criticised aspect of the methodology (Yin, 2003). To mitigate this weakness, a series of measures suggested by Morse et al (2002) including sampling adequacy, simultaneous data collection and analysis, thinking theoretically, and validating findings with research participants were applied in this research. Yin also suggests using evidence from more than one source, a case study database, and a chain of evidence linking questions asked during interviews to the data collected. These are summarised in more detail in the last section of this chapter.

Embedded Single-Case Design

This thesis is an instrumental case study focused on the *issue* of interceptions in agricultural supply chains. Uganda was chosen on the basis of a significantly high number of horticultural product interceptions in the EU that prompted an EU audit of its export control system in 2016. Seeing as participants were all exporters of fresh fruits and vegetables (notably hot peppers which are subject to interceptions) and all having to undergo similar checks and controls in the export process, the lines between a single and a multiple case study were blurred. However, based on these commonalities which were not only operational but also cultural, I opted for an embedded, single-case design incorporating more than one unit of analysis (Yin, 2014: 50).

In this case, it was clear that interceptions are common to all third-party trading partners seeking to access the EU market which also warranted treating Uganda as a single case in view of future (research) comparisons. In addition, all participants (systems) in the Ugandan supply chain organisation are expected to be operating under the same conditions and therefore investigating the cause and response to interceptions from multiple perspectives or units of analysis (farmers, exporters, inspectors,

support agencies, associations) embedded within the case contributes to a better understanding.

Further, Swanborn (2010) in Denzin & Lincoln (2017: 342) explain that cases can be located at the micro (persons and interpersonal relations), meso (organisation, institution), and macro (communities, democracies, societies) levels and may involve one or multiple actors. Based on this categorisation, my thesis is located at the meso level seeing as it involves a supply chain organisation operating under the "Produce of Uganda" brand.

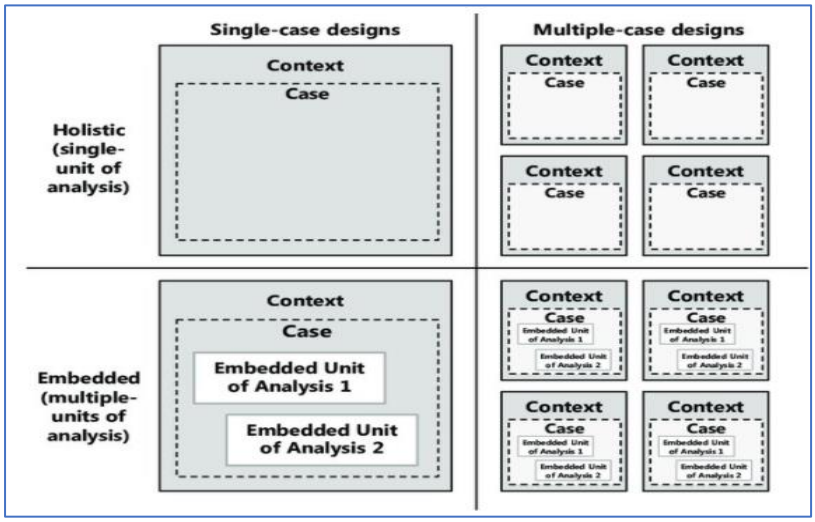

Figure 16: Case Study Types (Yin, 2014: 50)

4.3.3 Case Selection: Site or Individual

Stake (1995) makes a distinction between selection conditions and/or criteria for intrinsic case studies and those for instrumental case studies. In the former case he argues, the case is pre-selected while in the latter case (this one), some cases would do a better job than others. He maintains that "the first criterion should be to maximise what we can learn; given our purposes, which cases are likely to lead to understandings and assertions, considering our time and access for fieldwork are almost always limited" (1995: 4). It was noted above that this thesis is based on an instrumental embedded single-case design. As mentioned previously, this choice was motivated by operational (all exporting perfectly identical fresh fruits and vegetables under the same brand produced under similar conditions) and cultural (language, infrastructure) commonalities shared by research participants. From this perspective, a collective (or multiple

case study) would imply comparisons between Uganda, Kenya, and Ghana for instance (especially as these supply chains compete in the EU/EEA market) but this was impossible considering resources available research. The choice of Uganda was principally motivated by its economic situation (least developed) in relation to the other options and also because Ugandan exporters seemed to be experiencing more interceptions than their Kenyan and Ghanaian counterparts.

The choice was to therefore treat Uganda as a Site involving purposefully sampled research participants (farmers, exporters, inspectors, support agencies) who would help elucidate the research question. Key points to note:

1) The type of case study (instrumental) is driven by the research problem (transparency in relation to interceptions (or market access)
2) The case design (single - embedded) of the case is driven by the (common) characteristics shared by the participants are all related to the research problem.

Boundaries of the Case

Yin suggests that the boundaries of a case are determined by its definition which can be a more or less abstract. When a case considers an event or entity (other than a single person), such as the study of a specific program, it becomes difficult to establish a definition in terms of the beginning or end points of the "case" (2017: 29). He advises to determine the boundaries of the case based on research questions and propositions. In the context of this case study, the boundaries of the case were defined by the scope of the problem (interceptions) and therefore related to participants and/or organisations exporting to the EU impacted by interceptions. This called for a focus on exporters and phytosanitary inspectors who are at the core of the study, as well as on state agencies (e.g., the UEPB) and exporters associations who are placed in the immediate periphery of the study.

Thus, based on the recommendations of Yin (2017) research questions helped clarify the boundaries of the case also with regards to the time period (post 2015 when interceptions spiked) the organisation (fresh fruit and vegetable supply chain notably for capsicums (hot peppers), the

geographical area (Uganda), and the type of evidence to be collected (interviews, document reviews, field observations, & official trade statistics).

4.4 Research Methods

Procedures

Yin advises that case studies are preferred when the relevant behaviours still cannot be manipulated and when the desire is to study some contemporary event or set of events (contemporary meaning a fluid rendition of the recent past and the present, not just the present) (2017: 12). Interceptions are a contemporary phenomenon shaping both the landscape and opportunities for the horticultural exports of SSA warranting an investigation that preferably considers ongoing experiences and outcomes. Similarly, because transparency is a dynamic, multifaceted (institutional, operational, financial, etc.) and recurrent topic both with regards to food and environmental safety concerns in a context of international trade, its appreciation in relation to interceptions is best apprehended by a case-based inquiry that accounts for complexity in processes and behaviours. The case study relies heavily on interviews, document reviews and direct observations of supply chain operations as discussed below.

4.4.1 Sampling

Stake (1995) makes the argument that case study research is not sampling research and that a case is not studied primarily to understand other cases but rather, the researcher's first obligation is to understand this one case. A single case is understood in the context of this research to be the Ugandan Horticultural Export Supply Chain, specifically for fruit and vegetables. It is a case of interceptions that can be compared to others (e.g., the Kenyan or Ghanaian fresh fruit and vegetable export supply chain). Within this case, are embedded units of analysis (or sub-cases) purposefully chosen to provide data relevant to the research question.

Purposeful Sampling

Unlike a probability sample that enables the researcher to determine statistical inferences to a population, a purposeful sample intentionally samples a group of people that can best inform the researcher about the research problem under examination (Bryman, 2015:408). Rather than sampling research participants on a random basis, the goal of purposive sampling is to sample strategically so that those sampled are relevant to the research questions under consideration. Purposive sampling allows us to choose a case (an embedded unit of analysis in this instance) because it illustrates some feature or process in which we are interested; cases are chosen such that the processes being studied are most likely to occur (Silverman, 2013:148). Creswell & Poth recommend determining a strategy for the purposeful (or purposive) sampling of individuals or sites.

Snowball Sampling

As a variant of purposeful sampling, Naderifar & Ghaljaie (2017) identify snowball sampling as a strategy applied when samples with the target characteristics are not easily accessible.

Maximum Variation in Sampling:

Creswell & Poth suggest maximum variation as a sampling strategy to represent diverse cases and to fully describe multiple perspectives about the cases (embedded units of analysis in this instance). The research question created a premise for maximum variation in sampling as a proper understanding of the research problem would require respondents who are chronologically and operationally aligned in the value chain. Document reviews (EU Audit Reports, legal documents (e.g., the Ugandan Plant Health Act), and initial interviews provided the information necessary to establish an organigram of the supply chain.

4.4.2 Data Collection

Creswell & Poth define data collection as a series of interrelated activities aimed at gathering good information to answer emerging research questions (2017: 148). They maintain that typically, the qualitative

researcher will collect data from more than one source. They describe the data collection process as a cycle, represented in figure 15 below.

Access and Rapport

Access to the case study participants was initiated through the School of Natural Sciences & Agriculture of the University of Kampala to whom a letter was written asking for assistance with introductions to local businesses. In response, the department recommended a staff member to assist with introductions and data collection. This assistance proved to be invaluable in terms of rapport building and familiarisation with the research context and population. For instance, the assistant was instrumental in approaching the Ugandan Export Promotion Board ahead of my first field trip to Uganda. The board provided us with a list of eighty-two exporters exporting to the EU. However, the list needed updating as some exporters were no longer in operation due to costly interceptions representing a risk in the export market.

Figure 17: The Data Collection Cycle (Adapted From Creswell & Poth, 2017)

In effect, even though we had a list of exporters and contact details, most of these exporters do not own facilities to which we could render ourselves nor were they always available. Following the meeting with the UEPB, we proceeded to call and email exporters on the contact list introducing the project and its objectives. We also rendered ourselves to packhouses we could easily locate. Interestingly, one of the very first exporters approached was helpful in recommending acquaintances who could help

with our questions. In his opinion, there were many "cowboys running around" some of whom did not know anything about the export market. His recommendation was to interview exporters who had been in business for at least two years as these would have acquired enough experience related to my research.

Selection Criteria

Based on these and other recommendations from the export promotion board, interview participants had to satisfy a few conditions including:

1) Exporting to the EU
2) Having a direct or indirect experience of interceptions
3) In operation for at least two years (time enough to be confirmed as an operator)

A total of fifteen interviews (10 exporters (7 retained), 3 inspectors, and 2 officials from the export promotion board) were conducted between July 2018 and November 2019). A second group of four exporters (one of whom had been previously interviewed), and one Inspector (not previously interviewed) was convened to an online focused group activity in August 2020 (due to Covid and travel restrictions) to discuss progress with managing interceptions as well as the feasibility of some recommendations (digitalization) that were emanating from the research.

The approach discussed below was to sample participants concerned with and impacted by interceptions in the supply chain. These involved exporters, inspectors, support agencies (UEPB). Two outgrowers (farmers) were accessed for field observations through the network of one of the exporters described below.

4.4.2.1 Interviews

According to Yin (2017), one of the most important sources of case study evidence is the interview. The author explains that interviews can help by suggesting explanations (i.e., "hows" and "whys") of key events, as well as the insights reflecting participants relativist perspectives (2017:118). In this case study, I sort to understand how interceptions are related to transparency in the supply chain, through the use of in depth semi-structured interviews to holistically explore challenges faced by exporters and inspectors in the supply chain. As opposed to structured interviews

requiring pre-determined questions that minimise variance and irrelevant information, or again, unstructured interviews driven by responses to open questions from the interviewee, I chose the middle ground (semi structured). This involved pre-determined questions aimed at directing the conversation while leaving enough margin for an open discussion that provides more depth into unexpected insights.

Interview questions were derived from a desktop research phase which involved a review of the literature on horticultural production in Uganda as well as on the implications of transparency agribusiness supply chains. Knowledge gained from this review led to a further review of the European Notification System for Plant Health interceptions (Europhyt) from which Uganda was identified for further investigation.

Interviews were based on a purposive sample of 15 participants done between April 2018 and August 2019. Of these, twelve were retained for analysis in this study. The first three interviews were used as pilot interviews to gain a better understanding of the research setting, as well as to refine both research objectives and interview questions. The interview protocol was designed to cover the following key areas:

- Background Information
    - Years in operation
    - Export products and destinations
- Sourcing Practices
    - Capability development practices
        - Contracting
    - Control & Monitoring Practices
    - Challenges
- Information Sharing practices
    - Types
    - Formats
    - Frequency
    - Challenges
- Network Relationships
    - Public – Private
    - Private – Private (B2B)
    - Challenges

- Logistics
    - Post-Harvest Handling & Transportation
    - Packhouse Operations
    - Inspection Procedures

A sample of interview transcripts (Appendix 1, 2 & 3) is provided for reference purposes. These are representative of information that has been triangulated and presented in this dissertation and cover inputs from the most important value chain actors (Exporters & Inspectors) interviewed.

Also, considering the remoteness of the research setting and limited resources for a prolonged stay to conduct interviews, it was economical for the collaborator working in and suggested by the University of Kampala's department of Natural Sciences & Agriculture to carry out and transcribe interviews moving forward from the pilot phase. Hence, the pilot phase executed together was crucial as it provided an opportunity for him to fully understand and assimilate research objectives.

In addition, considering the delegation of interviewing activity, the pilot phase equally served to establish a consistent line of inquiry (focused on challenges) while leaving room for fluidity in the interview process. For instance, during the pilot phase, we learned that interceptions peaked in the winter months (as opposed to the summer months), an issue that needed further investigation as illustrated in the extract below when brought up by another exporter in a subsequent interview.

Q: Talk more about the winter and the festive seasons how the demand is very high please talk more about that. Is there an increase in interceptions?

A: That's when the level of interceptions increases because the prices of produce are high during winter. For example, I might be selling hot pepper at 9 pounds a box but someone is offering 18 or 20 pounds so it means people who are in business would not be thinking about tomorrow they would be wishing to make that money that week but exposing themselves at a risk.

In the extract above, the interviewer is prompting the participant for their input on why interceptions increase during the festive seasons. This was an important point to follow up on as shall be discussed in the next chapter seeing as the opportunism of outgrowers was seen to be a contributing factor. Table 10 is a summary of the profile of participants who were interviewed.

With regards to exporters, while no objection was given to revealing their identities (in fact some even saw it as an advertising opportunity), for

ethical reasons, the decision was made to have them anonymised and so they shall be presented with the labels indicated below.

As mentioned above, exporters were purposefully sampled following a snowball approach. But for one, all were managing directors on average in business for over seven years, and therefore experienced the boom in the industry as well as the onset of interceptions.

Participant	Details	Activity
Exporter (E1) – Managing Director	In operation for over 10 years, mostly exports pineapples, passion fruits, avocados & hot peppers. Middle East is a preferred destination.	Semi-structured interview
Exporter (E2) - Managing Director	In operation for 6 years and was the first company to be intercepted. Exports plantains, aubergines, hot peppers & avocados to the EU.	Semi-Structured interview
Exporter (E3) – Managing Director	has been in the business for 25 years, but only for 12 years in Uganda. He previously operated in the UK as an importer of specialty Vegetables and then moved to Uganda in the early 2000s to do exports. Like E1, his supply chain is fairly integrated (backwards and forwards).	Semi-Structured interview
Exporter (E4) – Managing Director	E4 was part of an organisation that had been in business for over 12 years but whose CEO is of late, leaving behind a divided family that was unable to run the business. Seeing as outgrowers were left stranded, she pulled them together and created her own business one year earlier (2017) to resume the export activity. Her inputs highlighted competitive tensions (for	Semi-Structured Interview

	produce) in the exporter community that do not always favour outgrowers.	
Exporter (E5) – Managing Director	The company that at the time of the interview had been in operation for five years. His main focus is on the Nordic markets which in his option is more accessible than the UK due to controls but also because of a growing ethnic community in Sweden for instance.	Semi-Structured Interview
Exporter (E6) – Operations Manager	probably the biggest Ugandan exporter of specialty FF&V to the UK and EU. The company started off in the early 2000s as a freight forwarding organisation but then saw the opportunity in horticultural exporters and then diversified into the sector. It probably has the largest pool of outgrowers but is now considering in-house production capabilities due to recurrent interceptions. A good number of Ugandan exporters have learned their trade working for the organisation.	Semi-Structured Interview
Exporter (E7) Managing Director	The least experienced of all, having only just started his own business (at least officially). His approach was to travel to the UK in search of customers as opposed to having them come to him. This tends out to be a good hedge against fraudulent importers who have forced a good number of exporters out of business due to delayed or missed payments.	Semi-Structured Interview

Inspector (I1) (NPPO)	I1 is an experienced phytosanitary inspector working for under the MAAIF. He works in export control and is responsible for validating and issuing phytosanitary certificates. He provided a much-needed perspective to the issue of interceptions considering the culture of blame that is systemic in the supply chain. His inputs on resource limitations at the NPPO were invaluable to an understanding of the role and contribution of non-economic actors towards interceptions and/or in preventing these from happening.	Semi-Structured Interview
Inspector (I2) (NPPO)	12 like I1 works for the MAAIF. However, this is at the level of import controls. It was important to have a perspective on import controls as Uganda is equally empowered to intercept and place under quarantine, incoming consignments that do not comply with local phytosanitary regulations. While her inputs proved useful, she would only respond to certain questions in return for a compensation. Consequently, there was a lack of depth in her contributions.	Semi-Structured Interview
Inspector (I3) (NPPO)	I3 was interviewed over the phone in 2020 during the Covid pandemic. I had multiple telephone conversations with him which were summarised as notes and returned to him for comments and approval. The same is true of four additional exporters who in addition	Semi-Structured Interview

	to himself were part of an online focused group activity.	
FA1 (Coordinator of the Ugandan FF&V Association	FA1 is coordinator of the Uganda Fruits and Vegetable Exporters Association (UFVEA). Located within the same premises as the Ugandan Export Promotion Board (UEPB) the association in cooperation with the UEPB is responsible for onboarding exporters and providing them with information on export market requirements. It also represents the interests of exporters with regards to public authorities (collective action).	Semi-Structured Interview
PB1 (Trade Promotion Officer – UEPB)	PB1 is Trade Promotion Officer at the UEPB in charge of trade information and statistics. Like FA1, he too is responsible for onboarding exporters and providing them with information on export market requirements. Both were interviewed first as I sort access to the exporter community at the beginning of this study owing to role and knowledge of the environment surrounding the UHESC.	Semi-Structured Interview

Table 10: Description of Interview Participants and their labels

In total, interviews of seven exporters, three inspectors, and two officials from the Ugandan Export Promotion Board were retained for the study.

Focused Group Interview

Four additional exporters were invited to a focused group activity (Zoom) in August 2020 to provide an update on changes the export supply chain

had undergone resulting from an EU audit of the export control system one year earlier. Due to technical difficulties, the call could neither be video, or audio recorded. However, my notes were summarised and returned to participants for validation and comments. This group was comprised of exporters who had been in business for at least 6 years, exporting to the EU, having experienced interception, and for some, I had met personally during field trips in Uganda.

4.4.2.2 Participant Observations

Creswell & Poth (2016) define observations as the act of noting a phenomenon in the field setting through the five senses of the observer, often with a note taking instrument, and recording it for scientific purposes. They can be *direct* (in which case actions are covered in real time) or *participatory* (in which case insights are obtained into interpersonal behaviour and motives (Yin, 2017: 114). One Exporter labelled *Alpha FFV* was used throughout study for an observation of export and import operations. Alpha FFV has been in operation since 2017 and was thus relatively new in the business. He was mostly chosen for the ease of access he granted to his operations. Also, I felt it would be interesting to perform observations of his organisation in complement to interviews as the organisation owing to a lack of experience would be more vulnerable to interceptions and other quality non-compliances that could be observed in real time. Also, it was an opportunity to observe in real time the impact of changing regulations on supply chain operations.

About 10 export/import operations were monitored and followed up from the farm to retail stores including an observation of import clearance, warehousing, and distribution activities in the UK. This was helpful in terms of mapping the supply chain and following up on developments in the supply chain owing to a dynamic regulatory environment. As a participant observer I was copied into emails and participated in meetings with freight forwarders and all other communications related to his shipments in the supply chain. He also granted access to his outgrowers (for farm visits) and network of collaborators (e.g., agronomist and clearing agents) throughout the study. As mentioned, observational field notes, and shipping documents were used to elaborate an organigram of the export

control system as well as a map of the supply chain which was seen to change during the course of this study. Although the exporter did not experience any interceptions, a lot was learned from measures he introduced in his sourcing and logistics practices to keep these from happening. While some of the observational data is confidential to the organisation, photo, and video recordings of some farm visits and packhouse operations are available upon request.

4.4.2.3 Document Reviews

Yin (2017) argues that in a record keeping society, documentary information in all its forms (material and immaterial or electronic) is a relevant source of information to every case study. He explains that for case study research, the most important use of documentation is to corroborate and augment evidence from other sources (2017: 115). Creswell & Poth (2017: 163) classify documentary sources as personal (e.g., letters, emails, private blogs), organisational (e.g., reports, strategic plans), or public (e.g., official memos, records). However, Yin (2017: 115) advises that though useful, documentation may not be always accurate or lacking in bias both in terms of selectivity (if collection is incomplete) and reporting (i.e., unknown bias on the part of the documents author). To mitigate these issues, choice of documents was restricted organisational documents describing plant health controls (quality control processes and audit reports) that could be observed and/or triangulated through parallel data collection processes (interviews, participant observations).

4.5 Ethical Issues:

Creswell & Poth explain that regardless of the approach to qualitative inquiry, a qualitative researcher faces many ethical issues that may arise during data collection, analysis, and dissemination (2017: 149-151). The authors locate these in relation to three key principles guiding ethical research which are 1) respect for persons, 2) concern for welfare and 3) justice. I discuss these successively in relation to this thesis.

4.5.1 Respect for persons

Respect for persons is perceived in terms of *privacy* and *consent.* With regards to consent, an information sheet was prepared, approved by the

supervisor, and forwarded to research participants prior to interviews, field observations, and focused group activities. In every instance, the purpose of the study was presented, and participants were informed of their right to leave the study at will. Also, it was not required of them to disclose any personal information (beyond business contact details) as these were not relevant to the study. They were also notified that data of any personal nature would not be included in the final thesis. Personal details present in data obtained from participant observations for instance used in the dissertation have been redacted to preserve privacy and anonymity. Further, the anonymity of participants was protected through the attribution of aliases in the presentation of data. Where necessary (e.g., interview data), participants were advised that for the purpose of being contacted concerning research findings, information gathered (i.e., personal details) was going to be kept for seven years after which these would be deleted.

4.5.2 Concern for welfare

This ethical principle was respected prior to conducting interviews by the completion of an online course (Protecting Human Research Participants - PHRP) with a certificate of completion, a product of PHRP Online Training Inc., This was equally in line with ethical research guidelines suggested by the Uganda National Council for Science & Technology. The course covered key issues associated with human subject research and current regulatory and guidance information.

4.6 Data Analysis

Thematic Analysis

Thematic Analysis was used to analyse the data collected above. Thematic Analysis (TA) is a method for systematically identifying, organising and offering insight into patterns of meaningful data (Braun & Clarke, 2006). Through focusing on meaning across a data set, TA allows for the researcher to make sense of collective or shared meanings and experiences. The authors describe thematic analysis as a rarely acknowledged and yet widely used method of qualitative data analysis and recommend TA as the first qualitative method to be learned owing to the core skills it provides for conducting many other kinds of analysis. It is a flexible approach that can be used across a range of epistemologies and

research questions (Braun & Clarke, 2006). The implication is that unlike many qualitative methodologies, it is not tied to a particular epistemological or theoretical perspective (Macguire & Delahunt, 2017). The purpose of thematic analysis is to identify patterns relevant to answering the research question (Braun & Clarke, 2006). They argue that with TA, you can legitimately focus on analysing meaning across the entire data set, or you can examine one particular aspect of a phenomenon in depth (e.g., what causes it).

A Thematic Analysis consisting of 6 steps as advised by Braun & Clarke (2006; 2013) was used to analyse the data. The key steps are outlined below: The preferred approach was to start on a clean slate without any a priori coding which was an inductive approach to the data analysis.

Gaining Familiarity with the data

Although interview data had been transcribed by the time I got to this stage, considering that the transcription was done by the research collaborator from the University of Kampala, my approach was to first of all listen to the interviews, and then read through transcripts while making notes. The objective was to familiarise myself with the interview data, which was already facilitated by field work in terms of observations and informal conversations with supply chain actors both in Uganda (exporters) and in the UK (importers). An idea of codes to further explore was starting to form in this stage. This stage involved listening through interviews several times to gain a first understanding of issues covered It also involved reading through interview transcripts without any predetermined coding system, just for the purpose of gaining an overall understanding of "what is actually going on" Preliminary ideas for codes were generated in this phase.

Coding the Data

Preliminary codes were assigned to the data in the second phase of the analysis. As the study is also exploratory in nature (“how”) and considering that direct questions were asked related to the export market, my preferred approach was to let the data speak for itself in order to discern how interceptions are related to failures in information sharing practices. This involved assigning "labels" or "phrases" to passages that summarised

or indicated the meaning contained in them (Give an example). Use was made of memos (as illustrated in figure 16 below) describing the "labels" or "phrases" i.e., codes representing data segments found to be interesting especially with regards to the research questions. Using the MAXQDA software for analysis, a total of 1684 segments were coded across twelve interviews and four official documents (audit reports).

Code System

Code System	Memo	Frequency
Code System		1684
Legal Requirements		1
The State Minister for Animal Industry, Hon. Bright Rwamirama e		1
The Minister for Trade, Industry and Cooperatives, Hon. Amelia		1
Incentives		1
Actor Characteristics	Distinctive features of the exporter community	5
Export Products	Products exported	7
Destinations	Export destinations	7
Access	Access to Systems, Markets, Resources, etc	3
Challenges	Challenges in the export process	31
Difficult	A difficult experience in a relationship	4
Importer	All segments including word Importer	16
Information		107
Formats	Information Sharing Formats	7
Types	Types of Information Shared	10
Market Information		2

Figure 18: Sample Extract of the Preliminary Coding System

Coding the Codes: Identifying patterns and themes across interviews

Whereas codes were designed to identify information in data, themes are broader and involve an active interpretation of the codes and the data. The process involved combining the codes and their extracts into broader themes saying something relevant about the data. I see this process as coding the codes at a higher level. To illustrate, in the passage below (box 1), in which the participant was asked to discuss challenges faced as an official Inspector, he makes explicit reference to logistical challenges which in the pure sense of the word, includes late night deliveries, improper lighting for inspections and inadequate compensation or financial support for inspectors.

"Q: What are some of the challenges you face as exporters?

A: At times exporters work in the night during the day they are organizing produce from the gardens so we have a challenge of moving from one pack house to the other especially in the night they are security challenges but even when you inspect the pack house should have good lighting conditions so there are challenges like poor visibility, you have to have good lighting in order to check for harmful organisms. But also, logistical challenges what they give isn't much and you're supposed to move (around a lot). I think the government needs to look at this issue seriously. Late deliveries by farmers, at times you go to the pack house and you don't find all the produce that you have to inspect and you can't keep there for the entire time you have to go to another pack house which inconveniences the inspector".

Note that the analysis becomes increasingly interpretative analysis is reinforced in this step as it involves combining codes under categories that eventually become themes. Braun & Clarke (2006; 2012) argue that a theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set. With respect to the example in Box 1 above, elsewhere, another exporter mentioned post-harvest transport conditions as flawed with opportunities for cross contamination by harmful organisms (pests). These raw data codes (as illustrated in figure 19 below) were collated across interviews and placed in categories (first order themes) that were further refined and defined in the next step of the process.

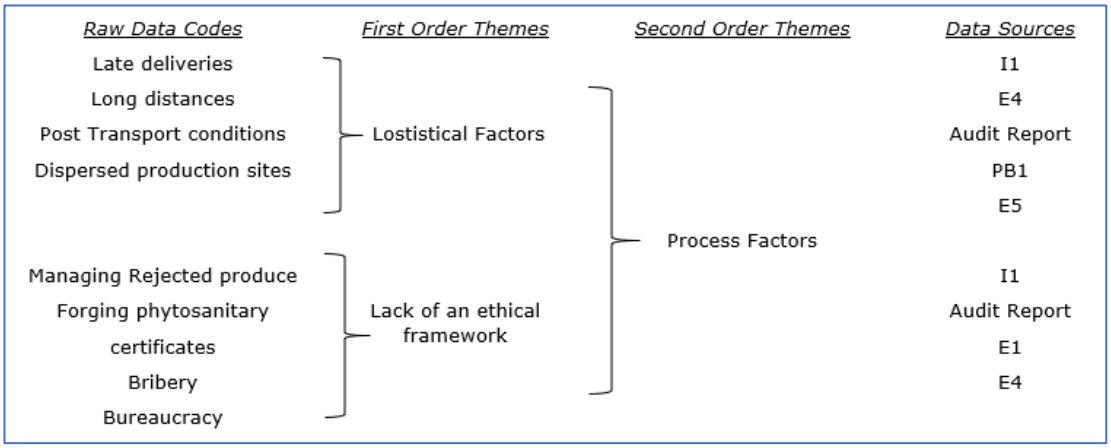

Figure 19: Illustrating the Pattern Identification & Thematic Construction Process

Reviewing & Defining Themes

This phase was dedicated to testing the relevance of themes developed in stage two and three. As illustrated in fig 19 above, the preceding steps

involved the creation of labels or the construction of raw data codes from which first order themes were derived. It was an iterative process that involved going back and forth between passages, codes, and themes checking for accuracy, distinctiveness, and coherence. Braun & Clarke (2006; 2013) point out that data within themes should not only cohere meaningfully together but also, care should be taken to maintain clear and identifiable distinctions between them. As it was not uncommon to find codes that could fit under multiple themes, the preferred approach was to create a second (or higher) order of themes as illustrated in figure 17 above. Hence, Process factors for instance, is a category that embodies all challenges contributing to interceptions related to the process (i.e. of how) goods are produced, sourced, and expedited to the EU.

Producing the report

The report that is presented in the following chapters, is structured around themes that provide a background to interceptions, factors contributing to interceptions, and measures taken in the supply chain to improve transparency as a strategy aimed at enhanced EU market access.

4.7 Research Reliability & Validity

Reliability & Validity in this research are perceived as indicators of the rigor with which the research was conducted. Morse et al. (2002) argue that without rigor, research is worthless, becomes fiction, and loses its utility.

This research has acknowledged the anchorage of qualitative research to the notion of trustworthiness (e.g., confirming results with participants) developed by Guba (1980) and expanded by Lincoln & Guba (1982), while embracing suggestions made by Morse et al (2002). In effect, the authors argue that by focusing on strategies to establish trustworthiness at the end of the study, rather than focusing on processes of verification during the study, the investigator runs the risk of missing serious threats to the reliability and validity of the study until it is too late to correct them. Hence, below is a summary of what was an attempt to reinforce trustworthiness at the end of the study, through verification processes embedded in the data collection and analytical processes described above.

Morse et al (2002) define verification as:

the process of checking, confirming, making sure, and being certain. In qualitative research, verification refers to the mechanisms used during the process of research to incrementally contribute to ensuring reliability and validity and, thus, the rigor of a study.

Within the conduct of inquiry itself, verification strategies aimed at preserving the reliability and validity of findings as suggested by Morse et al. (2002) include methodological coherence, sampling sufficiency, developing a dynamic relationship between sampling, data collection and analysis, thinking theoretically, and theory development. These are discussed in succession.

Methodological Congruence

Methodological congruence is aimed at ensuring coherence between the research question and components of the method. As discussed above, Yin (2017) argues that case study methodology is best adapted to "how" questions that seek to uncover processes in relation to observed regularities requiring an explanation. The role of transparency in agri-food chains cannot be over emphasised. However, what remains to explained in numerous cases in order for improvements to remain sustainable is "how" a lack of transparency can lead to costly supply disruptions. It involves not only identifying factors inhibiting transparency (which is procedurally deductive), but also understanding "how" this factors are contextually related to each other. Hence, in terms of congruence, my research question, which was iteratively refined, requires methods (Interviews, participant observations, document reviews), that provide enough depth to uncover processes not immediately obvious to the researcher.

Sampling Adequacy

With regards to sampling adequacy, Morse et al. (2002) argue that the sample retained for the study must be appropriate and consisting of participants who most adequately represent or have knowledge of the research problem. They maintain that this will ensure an efficient and effective saturation of categories. As discussed above, the snowball variant

of a purposeful sampling technique was used to identify participants who were both shipping to the UK and had experience of an interceptions. This technique led us to the very first organisation to have been intercepted from which a great deal was learned in terms of how the organisation restructured in procurement processes to manage the risk of noncompliance. Care was also taken to interview an organisation that had never been intercepted in order to see what was done differently. This is comparable to a negative case (or embedded unit of analysis). The sample also included inspectors who are directly concerned by EU interceptions from an export control perspective as it is their duty to prevent non-compliances from being detected in the EU. Support Agencies like the UEPB who are in charge of on-boarding and providing exporters and out-growers with market information were equally sampled. Outgrowers were approached through video recorded field observations as were workers in packhouses. Hence, information collected through interviews and participant observations was rich enough to gain a full understanding of EU interceptions of Ugandan horticulture and related outcomes for the supply chain.

Simultaneous data collection and analysis

Third, the idea behind collecting and analysing data concurrently is aimed at forming a mutual interaction between what is known and what one needs to know. Morse et al. (2002) argue that the pacing and the iterative interaction between data and analysis is the essence of attaining reliability and validity. In a dynamic environment where regulatory changes affect supply chain operations in real time, it was almost an imperative to integrate these changes in the data analysis process. There was a telephone line open between myself, the exporter labelled Alpha whose operations served as a basis for observations, and other exporters whom I periodically called up to discuss export operations in the face of changing regulations. This enabled me to keep track of changes and have them integrated in real time with the picture unfolding from the analysis. By implication, findings were continuously verified with participants to ensure alignment with changes in the field.

Theoretical Thinking

Related to simultaneous data collection and analysis, theoretical thinking involves confirming ideas emerging from the data with new data such that a solid foundation of explanations can be provided. Morse et al. (2002) advise that thinking theoretically requires going between macro and micro perspectives and inching forward without making cognitive leaps. This aspect is best illustrated by an example that involved a packhouse operation. As a matter of fact, I observed one exporter who was always in the vicinity during the packing operation of another exporter especially towards the end when he came in to collect boxes that had been left behind. It turned out these could either be rejects or over packaged produce. Considering the boxes were going to be sold and that there was an issue with traceability in the supply chain, I thought to find out more about these proximity sourcing operations between exporters in subsequent interviews. This led to the revelation finding that inspectors faced challenges with enforcing rejected produce that could even be expedited by other exporters using forged phytosanitary certificates. These were identified as a factor contributing to interceptions and further compounded by the lack of a verification mechanism in the next stage of the process (at the airport). This example illustrates how data from an observation was confirmed in new (interview data) that contributed to an explanation of interceptions.

4.7.1 Other Steps to preserve reliability & validity.

Confirming results with participants

Findings and recommendations were confirmed with research participants throughout the analysis and write up phase of the thesis. Illustratively, in discussing recommendations with respect to digitalising the phytosanitary certification process, I was informed by a research participant that Uganda recently adopted the WTO ePhyto solution backed by the International Plant Protection Convention (IPPC). The participant advised that while this has significantly reduced chances of fraud and forgery in the certification process, there are still challenges with regards data collection and monitoring in the fields. This input reinforced a research recommendation aimed at complementing resources available for the collection and

monitoring of field data required for the phytosanitary certification process. It also backed up research findings that attributed interceptions to the lack of IT infrastructure that has now been upgraded in compliance with international transparency requirements.

These issues are now the subject of discussion in the subsequent chapters. Chapter 5 presents a background to plant health interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) as well as a thematic presentation and analysis of factors contributing to interceptions. Chapter 6 shall discuss how interceptions are related to the concept of transparency and the response of the supply chain organisation in terms of outcomes. Finally, Chapter 7 discusses research findings in the context of a broader literature, makes recommendations for supply chain transparency in the UHESC, highlights research contributions, limitations, and suggestions for future search in conclusion to the thesis.

Chapter 5

Deconstructing Plant Health Interceptions in the UHESC: Why and How?

Introduction

Building on an embedded single case study design, this chapter is aimed at understanding why and how interceptions or supply disruptions occur in the Ugandan Horticultural Export Supply Chain (UHESC). This is first of all aimed at exploring market access challenges faced by a developing world country and secondly, at explaining the response of the supply chain in terms of enhanced transparency in export controls (chapter 6).

In order to achieve this, three research questions were developed.

1) What are the factors contributing to interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) ?
2) How do these contribute to a lack of transparency in the Export Supply Chain (SC) ?
3) How did the supply chain respond to regulatory requirements for transparency and what are the outcomes ?

This chapter is aimed at the first question and seeks to uncover factors contributing to interceptions in the supply chain. Data was obtained from semi-structured interviews involving a total of seven exporters, three inspectors, two officials from the Ugandan export promotion board, as well as from document reviews of two audits of the Ugandan Export Control system by the representatives of the European Commission. Notes from field visits to production sites (outgrowers) were equally relied on for the analysis. Themes identified from the analysis can be placed under four key categories: Environmental (e.g., pest & product attributes), People (e.g., literacy levels, ethics) Process (e.g., quality of inputs), and Technological (e.g., lack of IT infrastructure) factors contributing to interceptions. The chapter is organised in two main sections.

In the first section, I present a general background to the organisation of horticultural exports from Uganda as well as to

plant health interceptions in the supply chain. It also involves a general description of the export supply chain and key actors. By interceptions,

reference is made to supply chain disruptions owing to phytosanitary (plant health) non-compliances.

In the second section, findings on factors contributing to interceptions are presented in prelude to next chapter which looks at the management of transparency for enhanced compliance with regards to export market requirements.

5.1 Background to Plant Health Interceptions

As discussed in chapter 2, the last ten years have witnessed considerable growth in the export of horticultural produce from Uganda. In effect, the EU Audit Team during its first inspection (2016) of the Ugandan System of official controls for the export of plants and plant products to the EU noted that:

"Uganda was the fifth largest exporter in 2015 of live plants (plants for planting) and cut flowers, supplying about 8% and 4% of the plants for planting and roses imported by the EU.

Local media (reference here) claims the horticulture sector alone accounts for 85% by quantity of the total agricultural products shipped out of Uganda almost annually. The sector is estimated to benefit 2.5 million people while 1.5 million households benefit from exports, border trade and domestic trade of fruits and vegetables". Figure 20 is an organigram of relationships in the horticultural export supply chain with regards to the European Union.

The Directorate General for Health and Food Safety (DG Sante) represents consumer interests on the marketplace where consumers have no direct means of controlling quality characteristics (e.g., phytosanitary requirements) of interest to public authorities. The relationship between producers and exporters of agricultural produce on the one hand, and importers and distributors of the same on the other, is mediated by the DG Sante who carries out checks at border inspection points and follows up with audit inspections in the exporting countries where non-conformances are consistently detected.

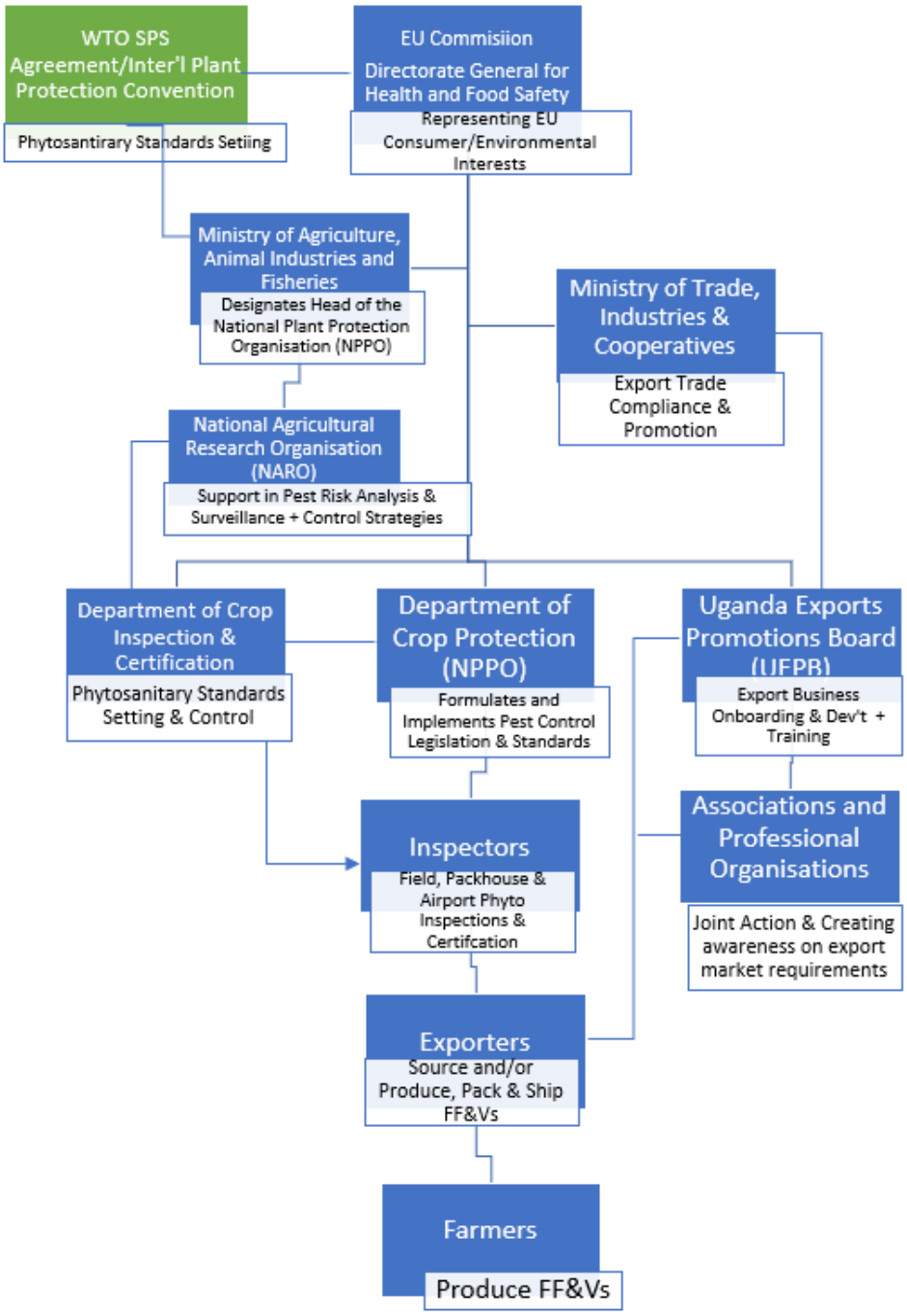

Figure 20: An Organigram of Relationships in the Ugandan Horticultural Export Supply Chain (Source: The Author)

The National Plant Protection Organisation (NPPO) is the Department of Crop Protection of the Ugandan Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)

It is the Competent Authority (CA) for plant health and headed by a Commissioner.

- The Commissioner supervises the activities of the Phytosanitary and Quarantine Services, which belong to MAAIF and is headed by an Assistant Commissioner.
- Export related inspections are carried out by inspectors working for the Phytosanitary and Quarantine Services. They are empowered by law to initiate sanctions in the case of identified non-compliances, such as rejecting the export consignment or ordering appropriate corrective actions)

- The department of Crop Inspection & Certification (DCIC) has shared responsibility with the Department of Crop Protection for

    - Drafting legislation,
    - Enforcement of phytosanitary standards
    - Promotion of awareness of regulations, laws and policies governing official controls.

The enforcement of issues such as offences and penalties is supported by the Plant Protection & Health Act (PPH) No. 6 of 2016 (updated in response to interceptions), the Seed & Plant Act of 2006, as well as the Agricultural Chemicals Control Act of 2006.

The Ministry of Trade, Industry and Cooperatives (MTIC) issues trading licences to exporters and monitors trade practices as well as sectorial polices. It also oversees the activities of the Ugandan Export Promotion Board (UEPB).

In addition to onboarding and providing orientation to exporters, the UEPB undertakes market research, creates awareness about Uganda's exports, monitors, and analyses export policy development, and advises government on possible intervention areas. It is summarily responsible for the continuous training of exporters enabling them to plan and manage export trade operations in compliance with ever-changing market regulations. The DG Sante noted in its first audit report that:

"Since 2014 a monthly Alert List is published, which indicates combination of countries, groups of commodities and Harmful Organisms (HOs) with interceptions above a defined level in an annual period preceding the date of publication. Audits are planned to those countries, where the interception figures raise doubts that the official export controls carried out by the National Plant Protection Organisation of the exporting country ensure full conformity with EU import requirements. The audit to Uganda

was carried out due to the total number of interceptions with HOs and especially of chillies since 2014".

The increase in export volumes was accompanied by an increasing number of non-compliances registered in the EU. To the EU, this was indicative failures in the control system to detect non-compliances and signalled a need for improvements. Recall Figure 9 from chapter 2, an illustration of trends in the interception of Ugandan horticultural produce in the EU, relative to export volumes over the same time period. As can be recalled, the sharp rise in horticultural exports from Uganda beginning 2012 with a peak in 2014 was matched by an increase in the number of interceptions and followed by a sharp decline in exports in 2015. A similar phenomenon is observed in 2018 (decline in exports moving into 2019) following another spike in interceptions. As illustrated in figure 3 below presenting interceptions data for the years up to 2017, Uganda leapt to the forefront of interceptions of horticultural produce from East Africa from 2015 onwards making imports from the country a main concern for the EU. 2015 therefore marked a turning point in the organisation of exports from Uganda due to frequent interceptions. Although challenges notably with regards to pest control are common to both exporters of live plants for planting including flowers and exporters of fruits and vegetables, the focus of this study is on the fruit and vegetable (hot peppers) export supply chain (as opposed to flowers) that is relatively less developed and having to adapt to export market requirements.

5.1.2: The Export Supply Chain

With regards to fruits and vegetables, the main export item is chillies (Hot Pepper) produced for ethnic communities in the EU market. A range of other vegetables (e.g., eggplants, bitter gourds, and basils) are equally produced for export to the EU. Production is mostly in the hands of smallholders but has increasingly witnessed larger operations by exporters seeking to gain more control of the sourcing process.

At the start of this study, harvested vegetables were generally sourced from numerous small and medium sized farms either directly or through agents (brokers) who transport these to packhouses in Kampala for packaging and export to the EU. Figure 21 is an illustration of the supply

chain prior to initiatives designed to enhance compliance in the export process.

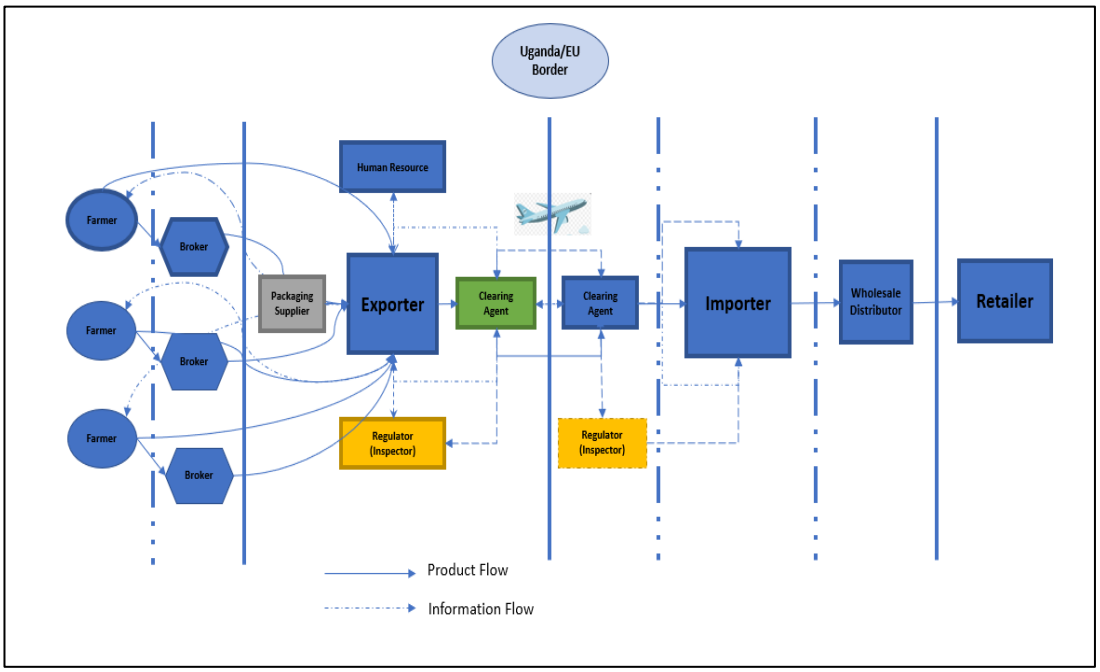

Figure 21: Former Layout of the Horticultural Export Supply Chain (Hot Peppers)

While sourcing practices were observed to differ between research participants a notable change observed in the export supply chain has been the disappearance of brokers from the value chain for hot peppers in a move designed to improve the traceability of exports. To illustrate, it was noted in the first EU Audit of the Ugandan system of official export controls in 2016 that

"The current system provides limited possibilities for tracing back non-compliant cases or to combat fraud"

In effect, the presence of brokers or agents in the supply chain as shall be discussed, complicated the process of tracing back non-compliances as they consolidate volumes from different (and often unidentified) sources for the export market. The fraud referred to by the audit team is with regards to phytosanitary certificates which as shall be seen, were often issued without prior inspection of consignments. Figure 22 below is an illustration of the current supply chain in response to EU compliance initiatives.

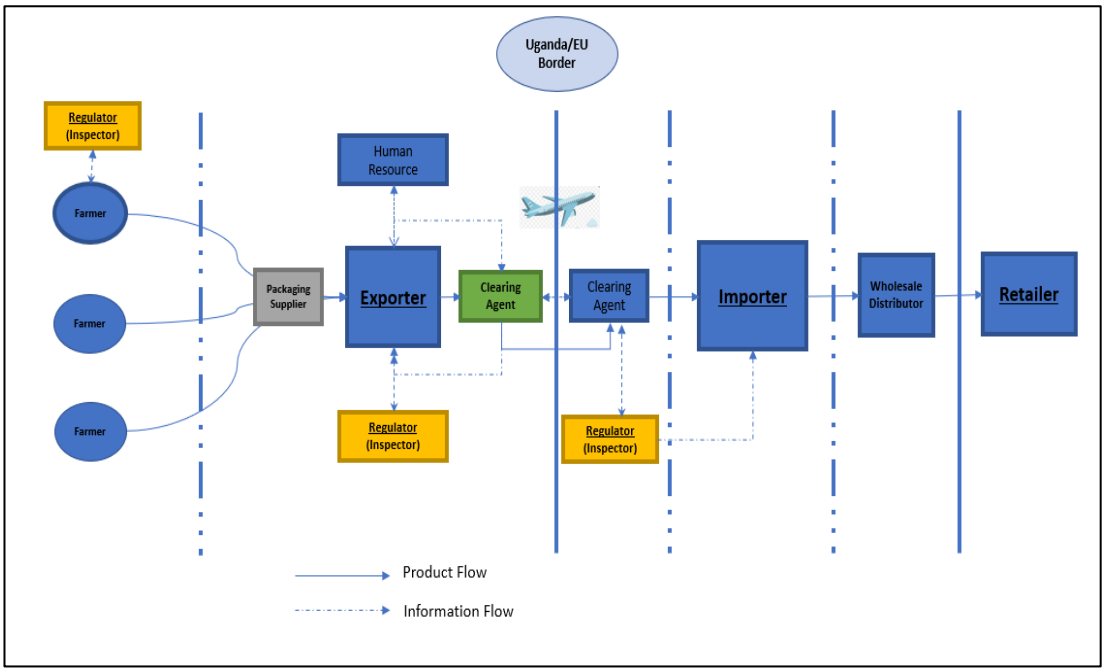

Figure 22: Current Layout of the Horticultural Export Supply Chain (Capsicums – Hot Pepper)

As mentioned above, a noticeable change that has intervened notably in the hot pepper supply chain is the absence of brokers in the supply chain and the presence of NPPO inspectors on production sites for enhanced monitoring of production practices. In effect, one of the NPPO inspectors (I3) interviewed advised that:

back in 2015, the EU was not too stringent on hot peppers but rather on flowers. However, increasing interceptions of fruits and vegetables due to FCM and Fruit flies' infestations led to a first Audit by the EU of the Export Production System (in 2016) which a few years later have resulted in some changes tackling the sourcing of hot peppers by exporters.

Agricultural production for the export market is challenged by fruit fly and false coddling moth infestations. In effect, in 2018 – 2019, local legislation was enacted regulating the production of sensitive products (hot peppers & eggplants) for the export market (e.g., mandatory inspection and licensing of product sites). These changes while being focused on products considered sensitive as a result of quarantine pest infestations, can be described as a house cleaning initiative aimed at improving the compliance of Ugandan exports. Providing more detail, figure 23 below is an illustration of the export process for hot peppers that present a pest control challenge and therefore a risk of interception in the EU.

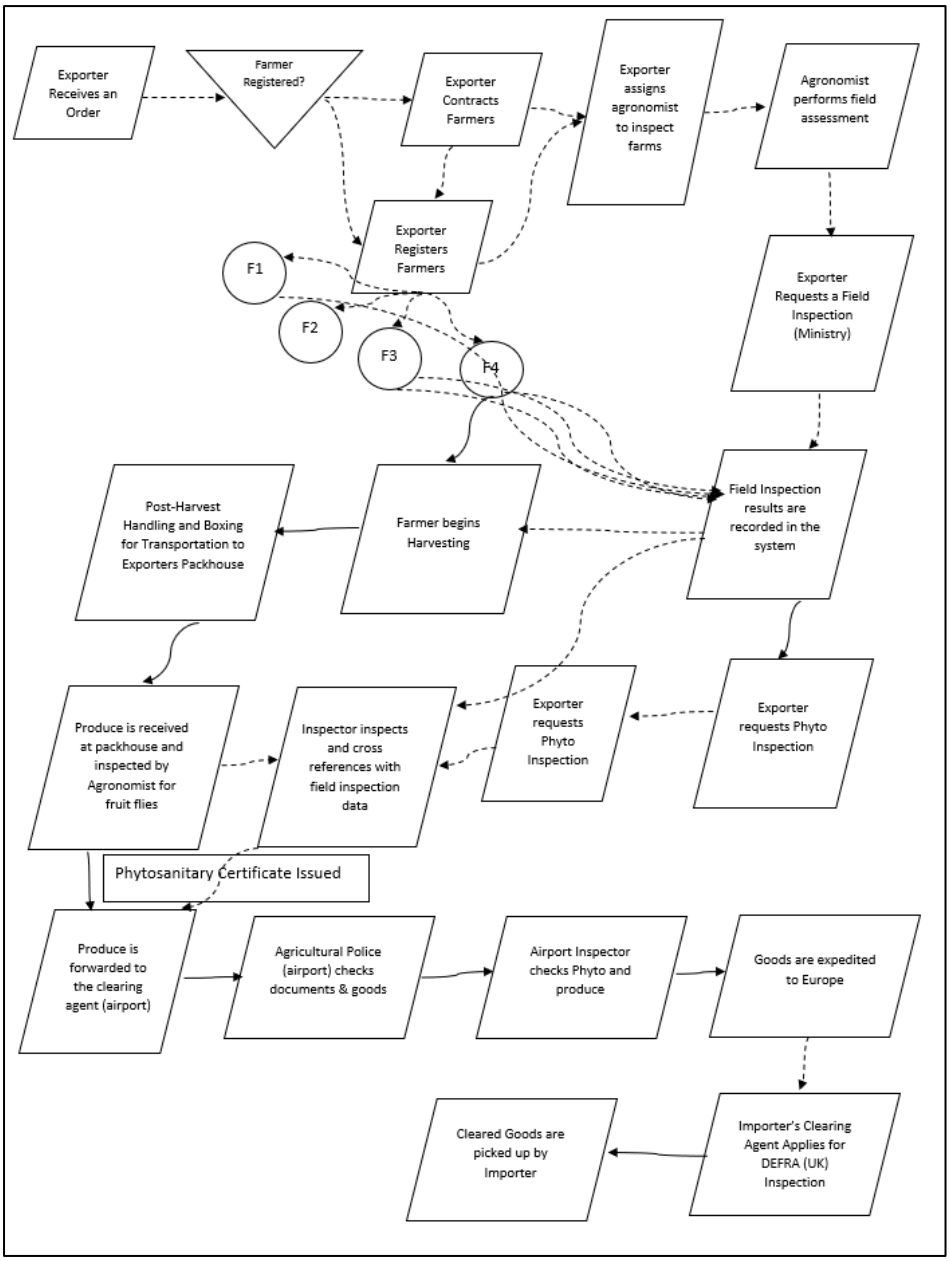

Figure 23: Export Process for Sensitive Products (e.g., hot peppers)

The process illustrated above is specific for sensitive exports which have increasingly come under the scrutiny of EU border control authorities. It requires the registration of outgrowers who must receive a permit to supply (following an official inspection of the production site) as well as of exporters who must similarly be licenced to export following an official inspection of their packhouses. To illustrate, Exporter (E3) noted that,

To illustrate, exporter E4 explained that:

"Because of the issue of FCM, many exporters have registered farmers and are able to follow up with the farmers to see if they are doing the right agricultural practices because you would not just buy from any farmer who

has not been supplying you, whom you don't know how the garden is and how they have been looking after it because you end up receiving someone's product which is infested especially hot pepper which is a very delicate product.

The false codling moth (FCM), Thaumatotibia leucotreta (Lepidoptera: Tortricidae) is an insect pest which represents an important threat to the production and marketing of a wide range of agricultural crops in the African-Caribbean-Pacific (ACP) countries. The FCM does not only affect the yield and quality of the crop but also as a quarantine insect pest, restricts the trade of susceptible agricultural produce on the international market (Adom et al., 2021).

The risk of an interception has imposed a need to know and verify that the production practices of farmers is in conformity with export market requirements. It is a situation that from a compliance perspective, imposes closer working relationships between farmers and exporters that enables exporters "to see" what is happening on the farm.

It is worth noting that from the perspective of the EU, there seems to be a mismatch between documentary evidence of a system of official controls and the practical reality of its effectiveness in preventing an exodus quarantine pests in consignments destined for the EU market. A quarantine pest is a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2019). Following a second audit of the Ugandan system of official controls for the export of plants and plant products to the EU in 2019, the audit team noted that

"Although the inspection systems of roses, fruits, and vegetables other than peppers are in line with requirements of the relevant international standards, the high number of EU interceptions with HOs raises concerns about the implementation and/or the achieved level of confidence. Therefore, imports from Uganda of these products pose a phytosanitary risk for the EU, in particular regarding fruit flies and FCM."

Because interceptions are an indicator of the effectiveness of the control system which has not successfully reversed the trend in interceptions, the EU is quite explicit about the phytosanitary risk presented by Ugandan imports. The system that seems to be theoretically compliant is practically falling short of its obligations. Hence, compliance with EU phytosanitary

controls constitutes a market access challenge for the Ugandan horticultural export supply chain.

Having established a background to the issue of interceptions and presented a general overview of the supply chain, I now proceed to examine factors contributing to interceptions and at the origin of some of the changes highlighted above notably with regards to sourcing practices.

5.2 Factors Contributing to interceptions

As mentioned previously, themes that were identified from an analysis of interviews and triangulated with official document reviews can be placed under four key categories in terms of Environmental (Pest & Product), People, Process & Technological factors. These are discussed in succession below.

5.2.1 Environmental Factors

Four key themes were developed under the category of environmental factors namely – the *regulatory, competitive, financial*, and more literally, the *natural* environment in which production operations are embedded (to which are related pest characteristics, and credence attributes of products). Because the regulatory and competitive environments are somewhat driven by climatic conditions favouring pest propagation, I begin with developing issues related to the natural environment contributing to interceptions.

5.2.1.1 The Natural Environment

Climate

In effect, even though Uganda is blessed with fertile soils and a lot of rainfall, the climate has proven to be an extremely favourable habitat for all sorts of pests and related pathogens. When asked what she thought about a restriction by the Ugandan government on hot pepper exports to the EU as a measure to curb rising interceptions, Exporter E6 explained that:

It is mostly our weather. It is the country that we live in. It is habitat for all kinds of pests. All kinds of pests. They will always live with us. Because our climate favours them. They would want to live here, and we cannot do without them. So even if you did what, they would always come back. Unless you spray. And when you over spray, they will still reject them for chemical residues. So, the problems that we have, have way more to do

with the climate that we have. The good climate that we have. It is a habitat for pests.

As a matter of fact, interceptions of Uganda's agricultural produce in the EU is first and foremost a consequence of the prevalence of quarantine pests in the country which is favoured by climatic conditions. Pest control as explained by E6, is a real challenge for exporters who feel trapped and frustrated. Too much spraying may result in excessive pesticide residues but again, failure to spray may lead to a similar outcome. This is in part due to the very characteristics of pests which are hard to detect.

Pest Characteristics & Credence

Further, climatic conditions exacerbate the prevalence of pests that are hard to overcome and hard to detect in the export control process. As noted by the EU during the first audit of the control system in 2016,

The false codling moth is widespread in the country. Its infestation in chillies generally does not cause clearly visible symptoms in the field because the larvae live hidden inside the fruit. Chillies are harvested continuously providing limited possibilities for chemical control. The presence of eggs and larvae is difficult to detect during the harvest and packing, even for personnel, who are well-trained in the biology of the pest and the symptoms of infestation

In effect, the false coddling moth in its early stages of development does not always present symptoms that are detectable and may only appear later in the process after export to the EU when it is sufficiently developed for detection. Hence, there is no guarantee of it being picked up during an incoming goods or official inspection process. In addition to pest characteristics which are hard to detect, continuous processing in terms of harvesting could mean one of two things: A) Insufficient resources which can either be dedicated to harvesting or spraying, but not to both and B) Issues with pesticide residues that shall be elaborated upon subsequently, in terms of Pre-Harvest Intervals (PHIs) and outgrower literacy levels. To further illustrate, Exporter E2 advised that:

"Before, we used to just check the product physically to see if there is no pest, there is no damage, then pack but now the issue is deep in the product itself; what have you sprayed, how did you spray and when did you spray?"

What E2 describes is an increasing degree of uncertainty and complexity in the control process owing to a tightening of EU phytosanitary

regulations. In effect, it is difficult to ascertain the quality of the produce even after purchase until later in the process. Hence, pest characteristics confer on produce, attributes (credence) that are hard to evaluate in a timely manner and impose on the outgrower a need to monitor and disclose information on treatment protocols. Consequently, the regulatory environment is expected to create conditions necessary for safe trade, with regards to the phytosanitary risk of exporting a quarantine pest, but this is not always the case as examined below.

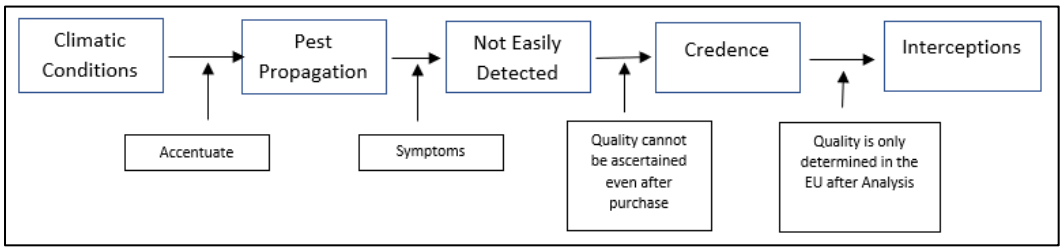

Figure 24: The Natural Environment contributing to Interceptions

5.2.1.2 The Regulatory (Institutional) environment

Inspection Procedures

The change observed above in the layout of the hot pepper supply chain is indicative of evolutions in the regulatory framework governing the horticultural production for the export market. As a matter of fact, in different ways, the regulatory framework has had to evolve in line with EU market entry requirements one of which is illustrated in a remark made by the EU auditing team back in 2016.

The NPPO requires growers and pack houses to operate a system of own phytosanitary inspections during cropping, harvest and packing and considers these private inspections to be part of the official control system. Although the NPPO to some extent audits, supervises and verifies these private activities, they cannot replace official inspections, in particular due to the potential conflict of interest.

The regulatory framework should be designed to detect and contain the presence of harmful pests in export consignments as they pose an environmental risk upon entry in the EU. However, as seen above, quality control with regards to the identification of the FCM can be problematic even for the most experienced. What is unique about the supply chain is the interaction of economic (i.e., outgrowers, exporters) and non-economic actors (i.e., the NPPO) in key quality control processes

Lack of Equivalence

Although the EU recognises that Uganda has an established plant health system with an appropriate legal framework in line with its obligations as a signatory member of the International Plant Protection Convention, conflicts of interest resulting from private sector inspections may prevent the achievement of the EU's plant protection objectives as an importing trading partner. In effect, Article 4 of the Agreement on the application of the sanitary and phytosanitary measures states that:

"Members shall accept the sanitary or phytosanitary measures of other Members as equivalent, even if these measures differ from their own or from those used by other Members trading in the same product, if the exporting Member objectively demonstrates to the importing Member that its measures achieve the importing Member's appropriate level of sanitary or phytosanitary protection. For this purpose, reasonable access shall be given, upon request, to the importing Member for inspection, testing and other relevant procedures.

It is also on the basis of this principle of equivalence (and its open-door requirements) that the EU is authorised to inspect the Ugandan export control system and influence the reorganisation of inspection activities. In this example, it can be argued that while the rate of EU interceptions triggered a lack of confidence in the export control system's ability to meet the EU's appropriate level of phytosanitary protection, an explanation resides in the organisation of export controls that was a shared responsibility of the NPPO and exporters. As outlined below by Inspector I3,

"The main difference between production over the last few years (i.e., up to 2017/2018) and currently (i.e., from 2019 onwards) is that initially, the MAAIF used to work with the exporting company (CEO) in a situation where the company agronomist was bridging the gap to what is currently in place where the MAAIF is engaging and talking directly with the farmer".

Up to the point where interceptions were an increasing concern for the EU, outgrowers and packhouses operated their own system of phytosanitary controls which were in turn audited and inspected by the National Plant Protection Organisation (NPPO). This shared responsibility raised doubts as to the efficacy inhouse inspections done by exporters who may be less stringent on themselves especially in times of product scarcity as subsequently discussed. The updated regulatory framework now requires a more important implication of the NPPO on the farm and in the packhouse

as well as contractual relationships between exporters and outgrowers. However, as shall be illustrated below, the competitive environment is not always conducive to contractual relationships as a means of enhanced monitoring of production activities.

5.2.1.3 The Competitive environment

Scarcity

The competitive environment has been observed to contribute to supply disruptions especially in times of scarcity when there is a rising trend of interceptions. This observation is elaborated upon in the passage below where E3 was asked to comment on interceptions as a challenge.

Q: Talk more about the winter and the festive seasons when demand is very high please talk more about that. Are there interceptions?

E3: That's when the level of interceptions increases because the prices of produce are high during winter. For example, I might be selling hot pepper at 9 pounds a box but someone is offering 18 or 20 pounds so it means people who are in business would not be thinking about tomorrow they would be wishing to make that money that week but exposing themselves to a risk. For me if my processes of operation are accommodating 2 tons of hot pepper it will be that even if you offer 30 pounds per box I will not because am putting myself at a risk of an interception which will make me lose all these profits I would have gotten. So, me I have fixed processes or procedures of operation and if the product fits those operations it goes to the market but if it doesn't fit them it stays.

The tendency is for exporters to be less stringent on quality control in times of scarcity (during the dry season) when demand (for hot peppers) exceeds supply during the winter months in the European market. Production yields are largely dependent on the generosity of rainfall resulting in intense competition amongst exporters for produce when production volumes are low. Even though contracts are a requirement for exporters to fulfil especially for sensitive products, the opportunism of outgrowers is a constant threat in supply relationships in general. In the exchange below during which E3 was asked to elaborate on difficulties encountered with outgrowers, he described them as "tricky and unreliable:"

Q: What makes them unreliable?

E3: You can give them an order and then they don't harvest or not even supply you but take the produce to another export company.

Q: If they have contracts what causes them to take produce to other exporters?

E3: You know when someone has a contract with you, there are things you agree but an exporter or a competitor can provide a truck to the farmer or there can be a slight difference even if it's 50 shillings.

To further illustrate, E5 advanced that:

the failure to meet targets usually happens during scarcity; because farmers know very many exporters, they act very funny and even ask for an advance payment; so, he doesn't pick the phone or its off and he tells you that he didn't get the produce, so they make up excuses not to supply but for us, since we are experienced in this business, we know why they are doing that. Maybe because they want to take it to another company because of a better price being offered.

The definition of a "target" in this case has a lot more to do with consistency in supply than with actual volumes agreed upon as delivery targets contractually. Farmers take advantage of competition between exporters and scarcity in the market during the winter months when demand outweighs supply in the EU and there is less production in Uganda due to the dry season.

Lack of Trust & fragmented relationships

Increased competition for the produce provides farmers with an opportunity to forfeit contractual agreements in favour of better prices or incentives (e.g., transportation) provided by competing exporters. It is to say that in times of scarcity, contracts no longer hold and therefore there is little incentive for outgrowers to dedicate resources to quality control and/or capability development. Transactions tend to be more spot market oriented in favour of the highest bidder. The effect of such opportunism it can be argued, is a tendency for exporters to see investments (time and financial resources) in outgrower capability development as risky, as illustrated below in the interview with E2 where he was asked to discuss challenges in the relationship with outgrowers

Q: What is the difficulty with engaging in supplier development?

E2: Trust, after developing that farmer he eventually runs away when the product is ready you won't see him, he will supply you 10% and gives another the remaining 90%! now you can't continue with that farmer, he is making you break the chain and makes you go to another; now, this is usually because someone is giving him a better price maybe double or a very slight difference.

Fragmented relationships are a dominant feature of the competitive environment owing to the opportunism of outgrowers in times of scarcity. It is evident from the passage above that there is uncertainty in the outcome of a capability development investment which usually involves the provision of inputs. Owing to a lack of trust, this relationship discontinuity means there are reduced opportunities for continuous improvement and even less for operational transparency. This may explain supply disruptions in the EU owing to uncontrolled non-conformities (e.g., excessive pesticide residues). Figure 25 below is a summary of how the competitive environment contributes to interceptions factors in the competitive environment contributing to interceptions.

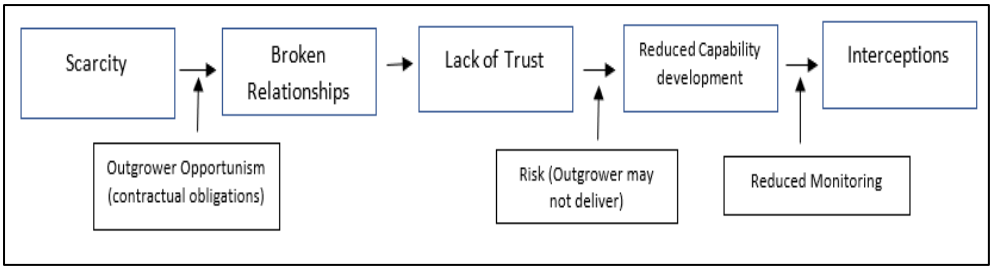

Figure 25: The Competitive environment contributing to interceptions

5.2.1.4 Financial environment

Delayed & Missed Payments

Related to the competitive environment is the financial environment in which access to capital is restricted for both outgrowers and exporters. Financial resources are critical in terms of access to quality inputs (notably FCM traps and pesticides) and personnel (e.g. the services of an agronomist) which ultimately determines the quality (conformity) of yields. However, due to the risk (of an interception) involved in the export process, exporters do not (if at all) get paid until after the consignment has been cleared in the EU. A situation that some importers have taken advantage of to delay or forfeit payments altogether, thereby complicating an already complicated financial situation. In the extract below, E5 discusses challenges faced with importers with regards to payments.

Q: What are some of the challenges you have with importers?

E5:They can control your payment because you can send 1 tone and they tell you this amount get spoiled due to this and that, yet you have no measures to use to prove them wrong; they send you photos which you

won't go there to verify so they will pay for what they feel like paying for. We are just price takers.

Generally, payments are only made after customs clearance and incoming goods inspection at the premises of the importer. The common experience is for importers to deduct payments for poor quality that cannot be verified by the exporter. As "price takers", they are subject to the goodwill of importers who may choose to pay "for what they feel like paying for" or not at all. In the passage below, E2 sees importers as conmen who play tricks to withhold payments. He is of the opinion that produce is often sold for free in such circumstances

Q: Tell me more about sending the produce for free.

E2: They advantage of you and make you lose money by playing tricks on you. With just a call, things are bad from 12 pounds to 8 pounds but me I can't manage I want to maintain my volume and margin because otherwise maybe I will need more money.

Deducted payments due to claims of poor quality eat into the margins of exporters who may have to make up for lost income in order to continue operating. Such losses have an impact on their ability to sustain quality in the production process as illustrated by E2 below.

Q: Do you employ a quality controller or an agronomist in your company?

E2: Can you afford? but somehow, I have friends I studied with who studied agriculture like myself, so I buy from them the chemicals or go to them when I have production challenges, or I go to them with the product and ask them what do you think?

While it is an officially recommended good practice to employ an agronomist, limited finances make it difficult to do so. Some exporters like E2 therefore rely on their private network for counsel on agricultural practices.

Lack of Market Presence & Secrecy

As mentioned above, the issue of delayed payments is mainly caused by the inability to verify the truth of claims made by importers (i.e. there is a lack of transparency) due to a lack of presence in the EU market. It is a situation the Ugandan Export Promotion Board is aware of as reported by PB1 below, an officer at the board when questioned on the subject:

Q: What criteria do you use to select possible markets because most exporters are complaining that they have got fraudsters?

PB1: That's a real challenge even yesterday we got again in a similar situation. We have seen most of this in Europe and not so much in the Middle East maybe it's the level of business. Unfortunately, this is happening in markets or countries were we have been for some time. The issue we received yesterday has prompted us to start studying what is really happening because initially it was there, but we see the frequency is going up. The key issue we have is that we are not present in the market which makes it difficult to address this.

Market presence would create the conditions (transparency) necessary for exporters to verify the claims of importers regarding the quality of produce received but will also enable a proper follow up of payments whose regularity and promptness would go a long way to sustain capability development through enhanced monitoring of production operations. However, it not only a question of delayed or reduced payments owing to quality issues. It is also a question of con men importers who are able to replicate their feats due to intense competition and secrecy among exporters. As confirmed by PB1 in the passage below when asked to expanciate on the issue:

Q: Maybe the problem is that exporters are so secretive they don't want to share their buyers they think maybe someone is going to sell the contacts.

A: You're right on that because on one of the interactions we had with a fruit and vegetable exporter, he relayed the same thing. The challenge is that when this guy receives a buyer, he doesn't even take time to ask a fellow exporter are you familiar with this guy? Have you dealt with this guy? So that's why we are seeing these repeat cases because you find guys who are giving us trouble are just like a dozen; they just keep showing up now and then, he cons you closes business with Uganda cons then goes to another country cons them and somehow comes back to Uganda. So, it's important to establish a mechanism that will help exporters especially when they are starting on so that we don't have to struggle at the end when money has been already lost. So, we hope that we can come up with that mechanism and we hope that exporters will take advantage of it.

Irregularities with payments can also be attributed to the competitive environment discussed above, restricting possibilities for due diligence amongst exporters dealing for the first time with some importers. Such secrecy can also be attributed to suspicion between exporters who fear losing a client to the competition. A situation that has played into the hands of con men and to the disadvantage of exporters. Withholding information on a bad sales experience, exposes other exporters to the same fate, with financial repercussions that restrict the ability of the supply chain to

sustain production qualitatively (through the access to quality farm inputs).

High Cost of Capital

The cost of capital in terms of interest rates on loans for which an exporter like E3 thinks are too high further impacts the ability of exporters to sustain quality in production. When asked to suggest how government policy might support exporters, he was quick to mention that:

"The interest rates on loans should be reduced because my friends and I are working on loan. To see that we benefit from these investments the government should support us"

It is obvious to imagine the loss is double when an exporter's payment is delayed, reduced, or altogether missing seeing as a majority resort to loans for their operations. Banks tend to charge high interest rates due to the risks involved (e.g., risk of interception) which further complicates a sustained development of the horticultural export industry.

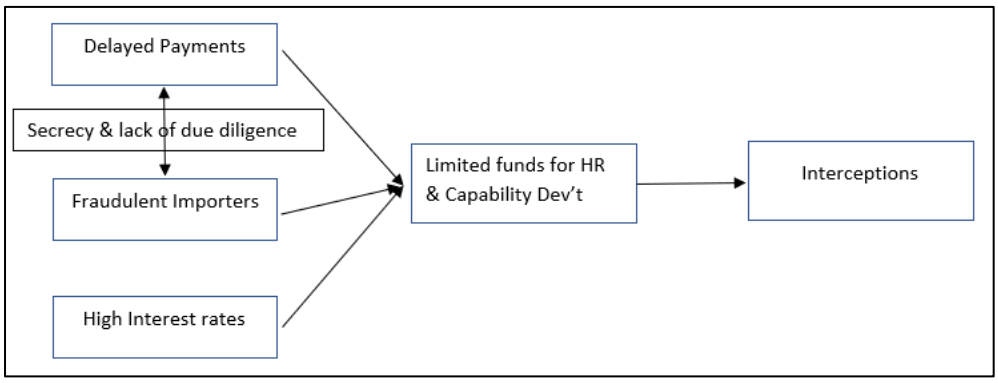

Figure 26: The financial environment contributing to interceptions

5.2.2 People Factors

By "people", reference is made to the capabilities and resources in the supply chain, and how limitations and/or shortages in some areas contribute to interceptions in the supply chain. This is to build on some of the environmental challenges discussed above. As above, the data presented was obtained from interviews of four exporters (E1, E3, E5 and E6), two inspectors (I1 & I3) and triangulated with inputs from EU audit reports of the export control system. Four main themes were identified namely: *literacy levels*, *knowledge/experience of (EU) phytosanitary regulations*, and *understaffing* at the NPPO.

Literacy Levels

Highly accountable for the observed rate of interceptions in the EU is the literacy level of outgrowers who tend to struggle with following pest control recommendations for the export market. It is important for outgrowers to keep and share records of the pest control protocols followed but often, these are either unavailable for review or unreliable resulting in a high degree of uncertainty in the export operation. To illustrate, when asked to discuss challenges faced with outgrowers, Exporter E1 stated that,

"*the [other] challenge is that our farmers are not educated on modern farming methods. Even when they are spraying, the farmer can't understand that I have this percentage of spraying and when you send it to the UK it has chemical residues, and they destroy all the shipment.*

It is one thing for a farmer to be educated and another for them to be aware of EU phytosanitary regulations. Farmers are furthest in the supply chain from the export markets in which their produce is consumed and probably even further from the institutions regulating their activity. They do not perceive the risk of non-compliance in the same way an exporter does because they do not always have or understand information required to engage in good agricultural practices. In addition, training farmers on export requirements does not always seem to work in the experience of an exporter like E5 who in response to whether or not training was provided to farmers on record keeping, explained that:

"We train them only that most of them are peasants (illiterate) who see it as a waste of time and resources. In other words, most of them don't take it seriously.

I: Does this affect your quality because they are going to bring products with no records?

E5: Of course, it affects the quality because we don't have any production details about the product.

In a context where an outgrower has the option to sell their produce locally or even regionally without the added pressure of having to upskill for the export market, training on production requirements for the export market may be perceived as an additional burden. Also, it takes a minimum level of literacy on the part of the farmer to understand what to record, when to record, and how to record which in the experience of E5 is lacking. A farmer who cannot read, can certainly not keep any records leaving the

exporter with no means to assess the quality of the product. Hence, the lack of information (opacity) on production conditions augments the degree of uncertainty in supply and negatively impacts the perceived quality of the produce. To further illustrate, E6 added that,

"because most of our farmers are illiterate, maybe they have read the label badly, then they've used the wrong quantities, the measurements are not right, and then they've sprayed and of course it says the residue levels will be out within 7 days and because of the concentration, it would have expanded and by the time you get there you think you are safe, and yet you are not.

As far as chemical residues are concerned, outgrowers need to consider pre-harvest intervals or PHIs, which is defined as the minimum amount of time between the last application of a pesticide and when the crop can be harvested (Islam & Haque, 2018). The label on the pesticide, should indicate the PHI, compliance with which, is a legal requirement. Compliance with the PHI means residues in the treated produce remain within specifications, considered safe for human consumption. An outgrower who cannot read, also cannot follow PHI requirements let alone document them. Respecting the PHI is rendered even more difficult by the need to apply the correct dosage (measurements). Hence, treatment involves spraying the recommended quantity of the recommended pesticide, at the recommended time and making note of it. These requirements are too often difficult to follow for farmers the result being rejections at the packhouse or interceptions in the EU

Awareness of Phytosanitary Regulations

Related to literacy levels, is the operators knowledge of EU regulations. Certainly, if outgrowers cannot read then their knowledge of EU regulations is equally going to be limited but the issue is even bigger. The knowledge and experience NPPO inspectors have with EU regulations is questionable. To illustrate, during the last EU audit of the export control system in October 2019 it was noted that

The national legislation, SOPs, work instructions and other DCIC documents provide a good basis for EU export related plant health inspections. However, there is a staff shortage, the guidance documents are not entirely appropriate, and the inspectors' knowledge is not always comprehensive. Due to these reasons, it is not ensured that all the inspections are carried out in line with EU requirements.

And with regards to guidance documentation,

Some provisions in the documents do not reflect the EU legislation correctly. Either some recent changes in the EU legislation were not taken into consideration or some of the EU provisions were interpreted incorrectly; Although some EU provisions are presented correctly, their form or context may mislead the inspectors

Although there is a legislative framework and official guidance for the execution of inspections gaps subsist in the knowledge base of inspectors. For instance, commenting on measures suggested by the NPPO to improve the compliance of Ugandan horticultural exports in Dec 2019, the system of official controls was found by the European Commission to be unaware of changes to EU Plant Health regulations (2019/2072 replacing 2000/29/EC). This is to say that Uganda was neither aware of notifications to changes that were issued eight months before coming into effect (April 2019) and therefore had no time to comment on changes that were going to affect its horticultural industry. Hence, the control system was found to be ill equipped for a high level of compliance with EU requirements. To further illustrate, another exporter (E3) when asked to comment on his relationship with the MAAIF advised that

some of the government inspectors are not well qualified in the identification of diseases and pests in produce and though being academically qualified, there is that practical bit of the crop with which the experience is zero; this is something serious. For instance, you have to do hot pepper like for more than four seasons before you might even understand it. When you see that the implementing arm (of the MAAIF) can't implement the regulations of the EU that means there is a problem, but these guys come with their bachelors, masters or PhD's.

Q: Do these inspectors educate you about the requirements of the different markets?

Respondent: They don't have that information; it is up to you to get it.

This passage illustrates the tension in existence between exporters and inspectors in the supply chain. These do not always see inspectors or regulatory officials as helpful or competent in providing support for export market compliance. Although they may be educated, note that hot pepper while being a blockbuster export commodity, is mainly produced in Uganda for the export market with both producers and inspectors having to upgrade their skill set on production requirements. However, as noted by the EU in the previous passage, staff shortages for inspections at the NPPO are a major challenge in the supply chain.

HR Shortages

If the growth in exports of fruits and vegetables notably hot peppers has been unprecedented as illustrated in figure 27 below, staff shortages at the NPPO have been counterproductive to the development of the sector. Notice the exchange below where an I1, an export control inspector was asked to comment on staffing for export controls. The interview was held in August 2019, three years after the first EU audit and three months before the second audit.

Q: How many inspectors are there in Kampala for fruits and vegetables?

I1: As I speak now, I used to work alone but we are now 3 inspectors and that's the team handling fruits and vegetables exports in and around Kampala.

Interviewer: How do you handle when you have about 20 consignments a day?

Respondent: These exporters have their shipping days but what we did is we divided the companies. Each inspector has about 10 to 12 companies so the exporters are supposed to communicate to us the inspectors about the days they are going to ship so that we program ourselves, you know on a given date and time you will be inspecting company X from there you go to another company Y so it depends on the communication from the exporters but it hasn't been an easy thing at times we have found ourselves reducing the inspection time because you have to leave and go somewhere for an inspection but also what we have been emphasizing on is internal inspections by export companies having agronomists so they are also supposed to check internally then for us we come and do the final check-up that is how we divide ourselves. We give time ranges depending on the communication from the exporters about the shipping dates and time.

This passage highlights three things: A) efforts made by the authorities augment resources available for inspections; B) collaborative planning in the scheduling of inspections involving exporters who provide advanced notifications of the shipping schedules and C), it signals an explanation for interceptions which may not be properly done due to time constraints. It is to say that the demand for inspections (on the basis of the said scheduling regime) clearly exceeds supply (i.e., the department is under resourced). This is also the opinion of I2, who as opposed to I1 is concerned with import controls. When asked to comment on challenges faced in her job as an inspector explained that,

People work long hours because borders don't close that's one of the major challenges as inspectors. There is a need to increase the capacity of the

entry points though URA (Uganda Revenue Authority) is working on improving entry points by putting their laboratories this has also been a big challenge too because sometimes you check someone's consignment and you're not sure your just guessing but it's important to prove to the person that you are stopping or destroying this, because of this reason. And the understaffing is also a problem.

While acknowledging the issue with staffing, I2 introduces another factor of concern, a process and technological issue with import controls (testing equipment) which are lacking. It is to say that the control system is short of human and material resources to guarantee a high degree of confidence in the inspection process. It can be argued that this, in combination with a prevalent pest situation, seemingly out of control by outgrowers whose literacy levels may prevent an adequate application of phytosanitary recommendations is to account for supply chain interceptions. Related to these as discussed below, is the quality of farm inputs, forgery in the phytosanitary certification process, and difficulties with the enforcement of packhouse rejects during inspections working together to account for interceptions.

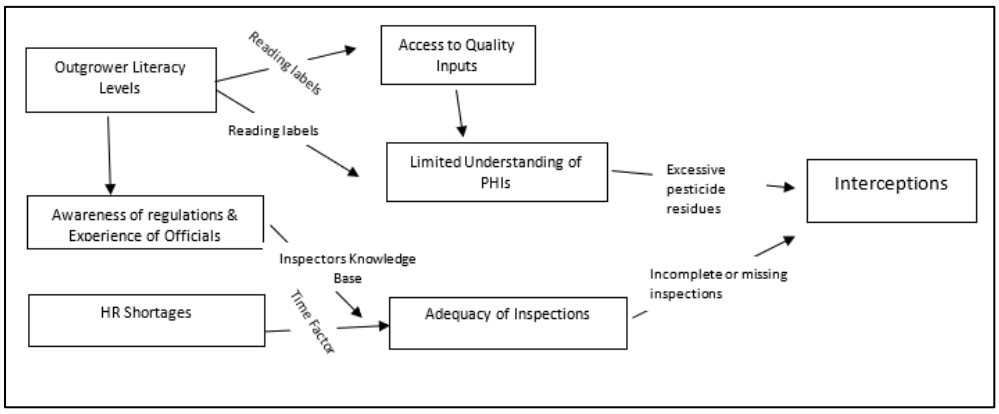

Figure 27: People Factors contributing to interceptions

5.2.3 Process Factors

Four overarching themes were developed as process factors contributing to interceptions. These include the *quality of farm inputs* (e.g., use of fake pesticides) used in the production process, *distance* separating outgrowers from exporters and inspectors, and the *lack of an ethical framework* (impacting the *management of rejects* and *document integrity* (e.g., forgery) in the phytosanitary certification process. The themes were developed based on their roles as inputs, facilitators, or outputs of

monitoring and control processes in the supply chain. Failures in these areas were seen to contribute to interceptions.

Quality of farm inputs

The quality of farm inputs notably crop protection inputs has been called to blame for the wave of interceptions registered in the EU. To this effect, some have blamed the government for laxity in preventing the sale of unregulated pesticides in Uganda, considering the literacy levels of farmers who for some cannot discern regulated from unregulated pesticides. It is also the role of the regulatory framework to create a regulated environment that support the export industry. When asked to discuss challenges faced with the ministry of Agriculture, E3 explained that

the challenges are too much with the ministry of agriculture; now like in the crop protection area, they are not coming up to impose bans on chemicals which have high PHI, high chemical residues and those are the reasons for interceptions, so they are not protecting exporters for compliance. We cannot even talk about corruption because even a blind person can see it, they should stop being corrupt because even these chemicals when you're bringing them in you have to get a license from the ministry of agriculture. These are chemicals we have complained about as exporters, but they are still on the market

Note the feeling of frustration at the inability of the government to regulate the use of certain pesticides that should not be sold on the market. These pesticides while being cheap and effective, result in excessive pesticide residues due to their extended pre-harvest intervals (PHIs). A PHI is the minimum amount of time between the last application of a pesticide and when the crop can be harvested. It is important for the outgrower to allow sufficient time to elapse between spraying and harvesting operations which as discussed above, due to literacy levels, is a difficult recommendation for some outgrowers to follow. In his opinion, export market compliance (and therefore access) is not sufficiently facilitated by the government due to corruption in the pesticide import licencing process. In a like manner, E4 suggested that

The government should put in more effort on chemicals because we have people here who are selling fake chemicals that are not fit for the purpose or which are harmful and farmers are innocent, they are ignorant, so they keep spraying but it's not working so we lose out because if you can't have your products sprayed properly, they won't be accepted. The government

should say we are bringing these chemicals from the source (i.e. they are authentic) and also punish those that are faking!

The role of public authorities in facilitating horticultural exports is not limited to official inspections but also to the regulation of imported farm inputs. The suggestion is for guarantees on the quality of pest control inputs and punitive action for the insubordinate. However, the definition of "fake" vs "authentic" is not an easy one as not all export destinations (e.g. the Middle East and the Maldives) have the same regulations concerning pesticide usage and agricultural production is not exclusively done for the export (EU) market. Recall how E5 mentioned above that some farmers see training in export market requirements "as a waste of time". This should not be surprising as the local and regional markets are an alternative with less stringent production requirements than the EU market. Hence, there is a need for behavioural change with regards to production for export market requirements which is not facilitated by the presence of "fake" chemicals in the local market. Fake should therefore in the context of alternative markets be understood in relation to stringent EU market requirements.

Further, monitoring the use of unregulated chemicals is not facilitated by the geographical distance separating outgrowers from export market stakeholders (exporters and inspectors).

Distance separating operators

It is the opinion of the Ugandan Export Promotion Board (UEPB) that the inability of farmers to follow recommendations (for the export market) is due to a certain disconnect between farmers and exporters which prevents critical information on good agricultural practices from being assimilated by farmers. As explained by PB1, an officer at the UEPB in response to being asked about difficulties encountered in the capacity development of farmers,

In the initial term we were looking at exporters only and then we had to go down further to farmers; now the key challenge we had was that there seemed to be a disconnect between farmers/real producers and exporters. Even the interactions that you had here (in Kampala) with exporters that you expected would trickle down to the farmers were not.

The UEPB is responsible for onboarding exporters and providing them with information regarding export market requirements. As with the NPPO who at one point in time considered private inspections of production sites to be part of the official control system (to the disapproval of the EU – see below), so too did the UEPB expect onboarding information on export market requirements to trickle down to outgrowers. To illustrate, the European Commission in its 2016 audit report noted that

"The NPPO requires growers and pack houses to operate a system of own phytosanitary inspections during cropping, harvest and packing and considers these private inspections to be part of the official control system. Although the NPPO to some extent audits, supervises and verifies these private activities, they cannot replace official inspections, in particular due to the potential conflict of interest"

What both institutions (non-economic actors) did not consider was the distance separating economic actors (exporters & outgrowers) from each other. The distinction between economic and non-economic actors is an important one. In effect, non-economic actors are expected (by economic actors) to facilitate monitoring and compliance in the supply chain. For instance, it is a nine to twelve-hour drive (355km) from Kampala to Bukwo (the furthest hot pepper producing region in Uganda to the East) and a 6 to 8-hour drive from Kampala to Ntungamo (the western most hot pepper producing region in Uganda to Kampala – see figure 28 below). Covering this distance for monitoring and capability building requires additional capabilities and resources (e.g., agronomists) that exporters cannot always afford. Hence, informative interactions between officials of the UEPB and exporters do not always benefit remotely located farmers. Considering the dispersion of production sites relative to Kampala where all export activity is based, one can expect problems relative to monitoring and eventually with the quality of produce. One exporter (E2) in the exchange below, points a finger at colleagues who rely on their phones for relationship building with outgrowers when asked to comment on his sourcing practices.

other exporters are still shopping produce on telephone but it's a big risk if you're not involved that means you're not controlling the product and you will face pests and minimum chemical residue (MCR); you won't be sure of the scouting because quality control starts on the field. Now if you're doing the scouting (i.e., visiting the fields) why would you bring FCM in the capsicum? you should have seen them in the field!

This is to say increased involvement in the process with farmers prevents problems from being detected much later in the supply chain either during packaging, operations or further down in the EU during an interception.

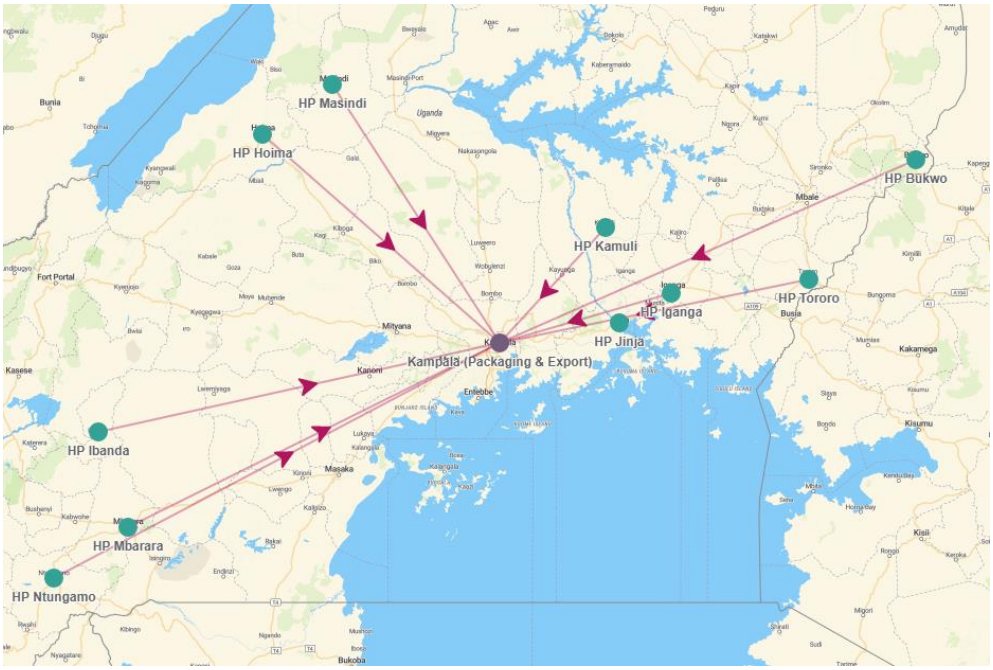

Figure 28: Geographical Dispersion of Hot Pepper Production Sites (prepared on Sourcemap.com)

Late Deliveries

Further, distance is also accountable for late deliveries, night operations, and the poor quality of inspections usually done under poor lighting conditions. In the exchange below, I1 expands on logistical challenges faced during inspections:

Q: What are some of the challenges you face as inspectors?

A: At times exporters work in the night during the day they are organizing produce from the gardens so we have a challenge of moving from one pack house to the other especially in the night they are security challenges but even when you inspect the pack house should have good lighting conditions so there are visibility challenges, you have to have good light in order to check for harmful organisms.

Late deliveries by farmers, at times you go to the pack house and you don't find all the produce that you have to inspect, and you can't stay there for the entire time, you have to go to another pack house which inconveniences the inspector.

Ideally, to preserve the freshness of produce, these have to be harvested and transported on the same day due to a lack of post-harvest refrigeration facilities. Hence, considering the distance travelled, consignments tend to

arrive late at night under conditions that are not too conducive for inspections. Coupled with staff shortages at for official inspections, there is a high probability for missed or improper inspections ultimately leading to interceptions in the EU.

Figure 29: A Late-Night Packing Operation

Post-Harvest Transportation

Fruits and vegetables once harvested are filled in rubble bags and transported by public transport (local buses), on motorbikes (boda boda) or in trucks where an exporter can provide one. Because farms tend to be remotely located and are not easily accessible by vehicle, there is a fair chance that the produce comes in on a motorbike. Proper handling especially with regards to post harvest packaging and transportation is vital to the quality of the produce. Consider the passage below in which E4 was prompted about training farmers on post-harvest transportation practices.

"we used to guide them (farmers) on how to do the packing and how they should be transported but due to the fact that you can't rule out the boda-boda, because there are people in places where a vehicle can't reach but

a boda-boda can reach so we wouldn't discourage them not to use a boda-boda but would tell them how to pack because they use sacks and when you put these perishables in sacks, they get spoiled especially the hot pepper and garden eggs. They get bruises and for hot pepper it easily breaks and by the time the person gets to the pack house the sack has a lot of damages; we would encourage them to buy second-hand class paper boxes (imported apple boxes). We tell them get these boxes pack your produce and tie them properly with a rope and maybe put on a boda-boda, if it's packed that way it will reach the pack house in good shape.

Post-harvest handling especially with regards to transportation is a challenge owing mostly to the remoteness of farm locations and the limited possibilities some exporters have to make inhouse arrangements for transportation. Access to proper post-harvest handling material is difficult and expensive so outgrowers rely on that which is available (rubble bags) and can be easily fastened with ropes to the back of a motorbike. However, because these are cramped into the bags, they suffer from bruises thereby increasing the volume of packhouse rejects and reducing volumes available for the export market.

Further, post-harvest quality can equally be compromised by poor weather conditions (e.g., rain and dust) but also, there a risk of contamination in transit by pests if transportation is not properly taken care of. As a post-harvest quality management strategy, some exporters like E5 in the exchange below have invested in trucks to handle transportation. In effect, when prompted to describe how hot peppers were transported to the packhouse for export, E5 explained that:

As a company, we have trucks which are well covered to avoid pests which can destroy the crop during transit, to avoid external factors like dust, rain, sunshine, or people touching who might contaminate the crop.

Cross contamination in transit is a challenge that requires substantial resources for proper management. However, as discussed above, limited access to capital.

Figure 30: Post Harvest Transportation

Lack of an ethical framework

Managing Rejects.

The enforcement of rejects during official inspections is a factor contributing to interceptions. Assuredly, an inspection will generally result in a pass or fail and the issuance of phytosanitary certificate in the first case, or a rejection notice in the latter. In both instances, an inspection report detailing the procedure and outcome of the inspection is issued. I1 when asked to detail what goes into the inspection report specified that,

The report will indicate the date of inspection, the name of the inspector, the produce inspected (you quantify in the report) for example if they are 100 boxes of capsicum (habanero), I will indicate that I have inspected 20 percent (25% is the requirement). I must record that, and, in this report, I also give my observations or findings and I also give recommendations, if I recommend that you destroy the consignment I will show it in the report and if it passes my inspection I will also show it in my report that the consignment is cleared for export and I have to sign on that report and also put in the report the quantities inspected and what I looked out for.

The obligation to specify inspected quantities is in line with findings and recommendations made by the EU in 2016 after the first audit of the official control system. To illustrate, the audit team noted that:

"in the case of consignments inspected at the pack house, it is not possible for the airport inspector to verify the integrity of the consignment before certifying it because the inspection report does not specify the inspected quantity"

While this might appear trivial at first sight, note that under pressure to meet export volumes as yields and quality tends to be uncertain, there is always the possibility of an exporter including rejected produce in a shipment or passing these on to another exporter. I1 further explained that

exporters find it difficult to reject produce because for them they're after money making so enforcement of the rejection is a challenge. We remain worried at times you might reject something when you leave you never know what happens they might add in some of the boxes. Because these exporters facilitate the inspection, they believe you must follow their suggestions because they have funded the activity which is wrong, and we always emphasize that the inspectors word is final but they always have that attitude such that because they part of the facilitation you must work according to their requirements.

There seems to be a conflict of interest owing to the need to make a profit, and the need to comply with export regulations on the part of exporters. Moreover, the attitude of some exporters with regards to rejects can either be explained by their lack of confidence in the abilities of inspectors (e.g., E3 who considers them inexperienced) and therefore in the legitimacy of the decision or again, by the fact that exporters are required to pay for the inspection. The term used locally is "facilitation" which may also suggest in practical and unlawful terms that the inspector has to in turn facilitate the inspection process with a pass. Recall from above that there is an expectation from non-economic actors for non-economic actors to ease the export process with policies and resources as opposed to fund these themselves. The management of such expectations is to account for forgery in the phytosanitary certification process.

Figure 31: Rejected Produce

Document Integrity (Forgery)

Forgery is mostly to account for EU interceptions labelled by the Commission as "Interceptions for reasons other than the presence of harmful organisms. Recall from fig 9 indicating EU interceptions of Ugandan horticultural produce. The bottom curve indicated interceptions for reasons other than the presence of harmful organisms which have been on the rise since 2015.

Table 11 below summarises these in some more detail.

• Phyto-sanitary Certificate: Additional declaration missing
• Phyto-sanitary Certificate/Plant passport: Modification of document
• Phyto-sanitary Certificate: Absent
• Phyto-sanitary Certificate/Plant passport: Expired date
• Phyto-sanitary Certificate/Plant passport: False information
• Phyto-sanitary Certificate: Additional declaration inadequate or invalid

Table 11: Interceptions for reasons other than the presence of harmful organisms (Source: Europhyt, 2020)

Interceptions for reasons other than the presence of harmful organisms are all related to irregularities on phytosanitary certificates. Hence, the phytosanitary certification process is the cornerstone of the horticultural export supply chain. Phytosanitary certificates issued for consignments

which have not been subject to any official phytosanitary control must be fake and therefore forged. This is due to a few reasons, notably the strict requirements that have to be met to qualify as an exporter judged to be unfair as outlined by E1 in the passage below during which he was asked to elaborate on challenges in the relationship with the MAAIF (i.e., the NPPO).

The NPPO just makes policies without any consideration for the background of the exporter. For example, before giving you a phytosanitary certificate there is a standard packhouse they are looking for, yet they don't know the exporter, or how he started this job, how found contacts for importers. They say we need this packing house and if you have it call us we supervise and give you the phytosanitary certificate and trust me only 10% of the exporters can meet those requirements and this results into people forging those certificates because they are supposed to be gotten from the NPPO

In the opinion of the exporter, authorities should consider the start-up costs involved in the export business. It is worth mentioning that the boom that was observed in horticultural exports from 2012 onwards (see fig 9) also witnessed the influx of what has been referred to elsewhere as "brief case exporters". To illustrate, Dijk Hoorn et al (2019) in a study of the Ugandan fresh fruit & vegetable sector laid down two basic models for understanding the role of hot pepper traders in Uganda.

- Large exporters with own land that often work without growers
- Small-scale exporters with no land who rely on smallholders' produce gathered through informal trading relationships. This group of exporters is often referred to as 'briefcase exporters' and has an opportunist business mentality.

Even as this group constituted the majority of exporters, it can be argued based on the opportunistic mentality referred to by Dijk Hoorn et al. that such would compromise efforts on quality control (e.g., shopping on the phone). In some instances, briefcase exporters have side lined the exporter registration process in shipping to the EU. To elucidate, in the passage below from the 2019 audit report, the NPPO informed the audit team that:

recent investigations (by the NPPO) could identify fraudulent use of PCs for chilli consignments, which did not originate from registered exporters and were not subject to any plant health controls. The UK Plant Health Service provided useful assistance in this issue. If any fraud or forgery is

identified the exporter is obliged to re-ship the consignment to Uganda at their costs or meet the costs of destruction at the port of destination

Most certainly, there has been a house cleaning effort that has involved the active collaboration of UK authorities to identify contravening individuals. However, the issue goes much deeper. In the passage below, E4 was asked to expand on the issue on the issue of interceptions for documentary reasons. She reported that UK Plant Health authorities:

"noticed that these people are using the same phytosanitary certificate that cleared goods yesterday with same serial number also appearing again on many shipments; they said there is a problem here! and they informed the ministry of agriculture and immediately started intercepting them. [as a corrective measure], they would give these people [EU authorities] serial numbers of the phytosanitary certificates [such that] if they find [that] the serial number of the certificate isn't on the list provided by the ministry, the cargo will be intercepted; because some exporters went ahead and made their own phytosanitary certificate books and also make their own serial numbers.

This passage illustrates both the opportunistic creativity of some Ugandan exporters in circumventing bureaucratic processes and the vigilance of UK authorities with regards to Ugandan imports. It also portrays cooperative efforts between UK and Ugandan authorities in the enforcement of compliance requirements through the advance notification of serial numbers to prevent use of fraudulent phytosanitary certificates and enable their detection.

Bureaucracy

Even so, to some exporters, the process of obtaining a phytosanitary certificate is a daunting one that may create an incentive for fraud. As further explained by E4.

For those that were intercepted because of documentation they were duplicating; for example, you know you need a phytosanitary certificate but because you go through hustles (i.e., huddles) to get it you so you get a blank one and make several photocopies and keep them this is want they were doing.

The explanation in this case does not suggest a lack of awareness of the requirement to obtain a phytosanitary certificate but rather, a disposition to do so owing to a complicated process. This could equally be explained by resource shortages as previously mentioned and illustrated below in the

experience of E1 discussing information sharing challenges faced with the MAAIF. He recounted that:

some of them (inspectors) are so arrogant when you go to their office, she doesn't care about you but all they care about is what they are taking. Me I lost about 1 tone and half of avocado and pineapples because I didn't know I had to get a phytosanitary certificate from the ministry. They changed the system, and we didn't know so I packed as usual but when I reached at the airport, they said we are waiting for the officer to come, I reached the office but for about 3 hours she wasn't in office. By the way she was a lady. She told us to offload all the boxes from the truck and we had already packed and wrapped the produce, but she wanted to inspect all the boxes and it was about 1pm and it reached 2:30pm and she had not yet finalized while we were telling her that we have paid for the flight and she said, "no I have to finish this"! and you find other people are not treated like that, they are given a whole booklet of phytosanitary certificates, maybe they pay some money ?.

The passage again highlights tensions between exporters and inspectors in the supply chain. The accusations range from arrogance to unavailability, amidst suspicions of fraud and self-centeredness in the phytosanitary certification process. It is to say that resource limitations can be interpreted as arrogance on the part of inspector even though there is a problem of awareness of export requirements and transparency in the certification process. Also, note the official inspection was not carried out in the packhouse, but rather, within the premises of the Ministry under extreme time pressure. It is a combination of factors that may explain forgery in the certification process (as a result of "hustles") as well as interceptions.

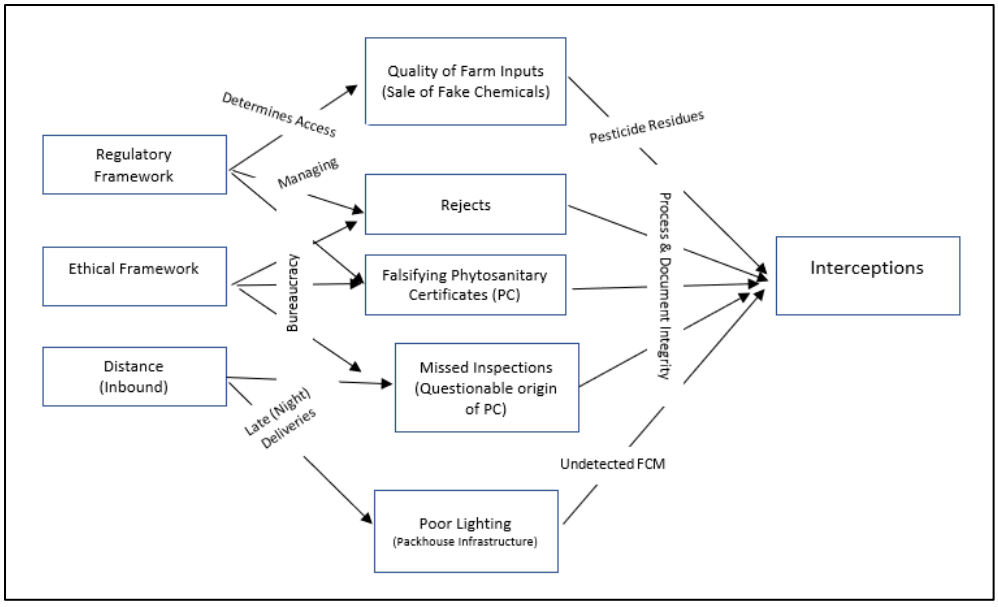

Figure 32: Export Process Challenges contributing to interceptions

5.2.4 Technological Factors

In exploring technological factors contributing to interceptions, three main themes were developed including *Pest Cross Contamination Monitoring & Surveillance*, lack of *Local Testing Facilities*, and *Shortages in IT infrastructure*

Pest Contamination

Sustained production for the export market requires the establishment of pest free places of production (PFPP) with scientific justification to stakeholders of interest (e.g., the EU) in the case of Uganda. Hence, techniques and procedures for pest monitoring and surveillance are of paramount importance for sustained market access. This has proven to be difficult in the horticultural export supply chain as outlined below the by the European Commission in its 2019 Audit of the UHESC. In the passage below, DCIC stands for the Department of Crop Inspection & Certification of the MAAIF. As a matter of fact, the key conclusion to the 2019 EU audit of the export control system was that the establishment and maintenance of FCM free production sites was not in line with international standards (notably ISPM 10). For instance, it was advised that:

during the establishment of the PFPPs the risk of the in-flying FCM was not assessed. The DCIC has no comprehensive information about the crops in the neighbouring plots. The FCM presence is not monitored around the PFPPs. There are no records about the seasonal patterns of FCM populations either which could be used for fine-tuning of the control strategies.

The key pest of concern in the supply chain is the FCM which as highlighted above, is a major challenge for all Afro-Caribbean horticultural export supply chains. Adom et al. (2021) report that the FCM is highly polyphagous (i.e., feeds on a variety of fruits and therefore guest to a wide range of plants). The passage above highlights a few key issues: A) There is a lack of comprehensive information on the presence of FCM in neighbouring crops which signals a possible source of cross contamination for production sites. Recall that production at the base is mostly done for subsistence farming. Whereas the FCM is polyphagous, there is always a chance that neighbouring plots (targeting local or regional markets i.e. growing produce other than hot peppers) are infested. B), one has to

consider the fact that inspections only target production for the export market and there is the likelihood that resources are scarce for a more extensive survey of neighbouring production sites. Hence, even though FCM may be present in neighbouring plots, there is no record of their pest status. This is not to say that neighbouring plots are contaminated. As a matter of fact, a study of FCM infestation patterns in citrus fruits by Stotter (2009), concluded that FCM were mostly confined to citrus orchards with limited host plants in the vicinity. Yet, he also argues the fact that knowledge of the behavioural patterns of the FCM is important in planning an effective control strategy. Table 12 is a summary of different pest monitoring and control options available for the FCM.

Control Technique	**Procedure**	**Comments**
Cultural Control	Orchard Sanitation (e.g., removal of fallen/immature fruit)	Difficult to implement due to labour intensity
Biological Control	Release of natural enemies into infested areas	Expensive, partially successful, with unpredictable results.
Chemical Control	Using pesticides to target eggs and emerged larvae before the bore into fruit	Pesticide resistance, can be expensive and ineffective
Mating Disruption (Pheromone Traps)	A synthetic female pheromone acting as a mating disruptant is distributed over a large area to prevent mating	Can be an expensive solution for small holder farmers
Attract and Kill (Pheromone Traps)	A synthetic pheromone consisting of the active ingredient pyrethroid is used to attract and kill male FCM	Use is recommended for light infestations
Sterile Insect Release	Uses irradiation to treat large numbers of male and female insects. After mating with a treated male, a wile female lays infertile eggs. Offspring if any is sterile.	A sophisticated solution that can be inaccessible for small scale commercial farming
Post-Harvest Control (Cottier, 1952)	Post-Harvest Cold Treatment of -0.55 degrees c.	Recommendation made by the EU to Uganda
Systems Approach Control (Moore et al., 2016; Hattingh et al., 2020)	-Preharvest controls & measurements & Post Picking sampling, inspection, and packhouse procedures -Post packing sampling & inspection -shipping conditions	This is the approach in operation in Uganda

Table 12: FCM Pest Control Techniques. (Adapted from Stotter, 2009)

Both Stotter (2009) and Adom (2021) suggest a combination of different control techniques for effective (early) detection and control of the FCM.

With regards to Uganda, a few key remarks were made regarding the efficacy of pest monitoring and control. These include:

1) *The chemical controls applied may eliminate FCM from the crop but cannot provide sufficient control for the maintenance of the pest free status for which the in-flying FCM adults must be targeted*
2) *The DCIC obliges packing houses to use commercially available FCM (pheromone) traps. However, the efficiency of the different brands under Ugandan conditions was not officially assessed and compared*
3) *Only two weeks after the chemical treatment are trap catches taken into consideration for the re-establishment of the PFPP status, while in-flying adults could arrive and settle before that; There is no supporting evidence to recommend to the growers any kind of physical protection against in-flying FCM.*

Chemical controls and pheromone traps are the two main techniques (or measures) used to survey, monitor, and contain FCM in the horticultural supply chain within the framework of a systems approach (Moore et al., 2016). According to the International Plant Protection Convention or the IPPC, systems approaches, which integrate measures for pest risk management in a defined manner, could provide an alternative to single measures aimed at meeting the appropriate level of phytosanitary protection of an importing country (e.g., the EU as a common market). Hence, a systems approach requires the integration of different measures, at least two of which act independently, with a cumulative effect (FAO 2017). It is this cumulative effect that seems to be lacking in the UHESC according to observations made by the EU auditing team above.

Cross Contamination

In effect, the risk of cross contamination from neighbouring plots is the key concern with regards to the integrity of export production sites. Related to this is the quality of pheromone traps and the timing between chemical controls and the collection of data on the pest status of the farm. Recall the problem with pre-harvest intervals (PHIs). As a matter of fact, outgrowers are recommended to spray at least two weeks before harvest, leaving enough time for residues to dissipate. In line with the systems approach, preharvest controls are only effected two weeks after spraying and just before harvesting by company agronomists who are only able to collect data on the pest status of the farm at that point in time. As earlier mentioned, outgrowers cannot be relied on to keep such records consistently and with accuracy (literacy levels). In addition, outgrowers

are geographically dispersed (distance) limiting possibilities for a more consistent follow up cross contamination issues (in-flying FCM from neighbouring plots).

Lack of local testing facilities

As previously mentioned, the MAAIF uses a systems approach to manage the production and export of horticultural produce. The IPPC advises that measures used in a systems approach may be applied pre- and/or post-harvest wherever national plant protection organisations (NPPOs) have the ability to oversee and ensure compliance with phytosanitary procedures (FAO, 2017). These measures (see table 11) include cultural practices, crop treatment, post-harvest disinfestation (e.g., cold treatment), and inspections (amongst others).

The quality of inspections both as a pre- and post-harvest measure in the SC is negatively impacted by the limited and expensive access to testing facilities for chemical residues. In the passage below, E6 was asked to discuss measures being implemented to manage interceptions in the organisation. Her response is without any ambiguity.

Q: What measures have you put in place to avoid those interceptions?

A: Training, training, trainings, and scoutings. We are always there; we are always trying but if I'm to tell you the truth it can never stop.

Q What of things that you can't see? Like chemical residues, how do you avoid them?

R: It is a risk; we lose a lot of money. We are always there; we are always losing money because we are always getting intercepted because the government is not helping us. They are not testing sites. I know there is Chemfarm that does tests; but they are quite expensive, and you cannot test all the time.

Q: You can't test every shipment....

A: You cannot.

Q: What is the cost of doing a chemical test?

A: It is high because it is not available. It is high. You need to find out from chemfarm. Because they are not testing for one chemical. They group them, and each one of them is different. You have to test for fertilizer, you have to test for pesticides...etc. They test for all that. So, if you are doing it, you'd need like 3 tests which is about USD 1000, or you send it to Nairobi.

Q: And you can't wait....

A: You can't wait because these are perishables. You must harvest them and send immediately

It can be argued that export controls are ineffective due to the unavailability of facilities for testing chemical residues. The IPPC states that "an advantage of the systems approach is the ability to address variability and uncertainty by modifying the number and strength of measures to meet phytosanitary import requirements" (FAO, 2019b). Not only have limitations been identified with regards to chemical controls and pheromone traps, but inspections are also unable to detect problems with residual levels prior to entry in the EU. This results in a lot of supply chain waste both in material and financial terms. Hence, technologically speaking, Uganda seems to be under equipped for a proper management of the FCM. This handicap is also related to data collection and data processing capabilities as outlined below.

Lack of IT Infrastructure

The integration of information systems for the collection, analysis, and dissemination of information in the supply chain is also to account for the rate of interceptions registered in the EU. For instance, handwritten phytosanitary certificates do not only increase opportunity for human error, but it also facilitates the duplication or falsification of phytosanitary certificates. Three key points were highlighted in the last EU Audit report of the UHESC:

1) *The outcome of the inspections is not recorded in an electronic database. Therefore, there is only limited possibility for using data of individual inspections for traceability, risk assessment, quality control or coordination purposes.*
2) *PCs are completed with a typewriter or at some packing houses by hand. Copies of the PCs are archived and certain information about them is uploaded into a simple database, which is accessible to the plant health inspectors.*
3) *Hence, the documentation system of the inspection reports does not facilitate the tracing back of non-compliances and the application of a risk-based approach. Measures are applied to ensure the integrity of the consignment and to combat fraud.*

The Pest Risk Analysis (PRA) framework developed by the IPPC is core to the management of quarantine pests in agricultural supply chains. It provides the rationale for phytosanitary measures and is comprised of

three main stages which involve the identification of an organism or pathway that may be considered for a risk assessment, its categorisation, and identification of containment measures (FAO, 2019b). The IPPC considers a key advantage of the systems approach to be its the ability to address variability and uncertainty by modifying the number and strength of measures to meet phytosanitary import requirements. However, in the absence of reliable or traceable information, owing to a lack of IT infrastructure, the EU as an importing party does not have the information required to address the uncertainty surrounding imports from Uganda. In a study of the role of information systems in implementing quality in processes, Sahin et al. (2002) concluded that the highest level of IT support was used in information and analysis, output quality assurance and innovation. It is important to record and disseminate inspection outcomes in order to facilitate investigations in the event of an EU interception. However, the use of tools such as emails and spreadsheets for the recording and dissemination of information remains a challenge.

5.3 Relationship Between Factors Contributing to Interceptions

Prior to discussing the creation of transparency in the supply chain as a solution to interceptions in the next chapter, it is important to analyse at this point, the relationship between these factors contributing to interceptions. Table 13 is a summary of issues explored above.

Factors	Categories
Environmental	Natural o Climatic Conditions o Pest Characteristics Regulatory o Equivalence with International Standards o Inspection Procedures Competitive o Scarcity o Fragmented Relationships Financial o Delayed Payments o High Cost of Capital o Lack of Market Presence o Secrecy
People	Literacy Levels Awareness of Phytosanitary Regulations Human Resource Shortages (NPPO)
Process	Quality of Farm Inputs (Pesticides, traps) Post-Harvest Transportation Distance (Outgrower Dispersion) Late Deliveries

	Bureaucracy Lack of an ethical framework ○ Forgery (Phytosanitary Certificates) ○ Managing Rejects
Technological	Pest Contamination & Cross Contamination Management, Lack of Local Testing Facilities Lack of IT infrastructure

Table 13: Summary of Factors Contributing to Interceptions

Based on a study of transparency inhibitors in agri-food supply chains done by Faisal (2015), in which the author developed a prioritisation matrix segregating transparency inhibitors based on their *Control Power* and *Reliance* on other factors, these can be placed on a similar scale comprising of two main dimensions: Impact (which is substituted for *Control Power*) & Dependence (which is substituted for Reliance).

Impact translates the influence a factor has on other factors but also on interceptions. Dependence translates the reliance of a factor on other factors. It can be argued that the greater the influence of a factor on other factors, the more strategic it becomes in the management or prevention of interceptions, which is the object of the next chapter. Also, highly dependent factors seem to be operational in nature and highly influenced by the strategic orientation of the supply chain. These are summarised in figure 33 below.

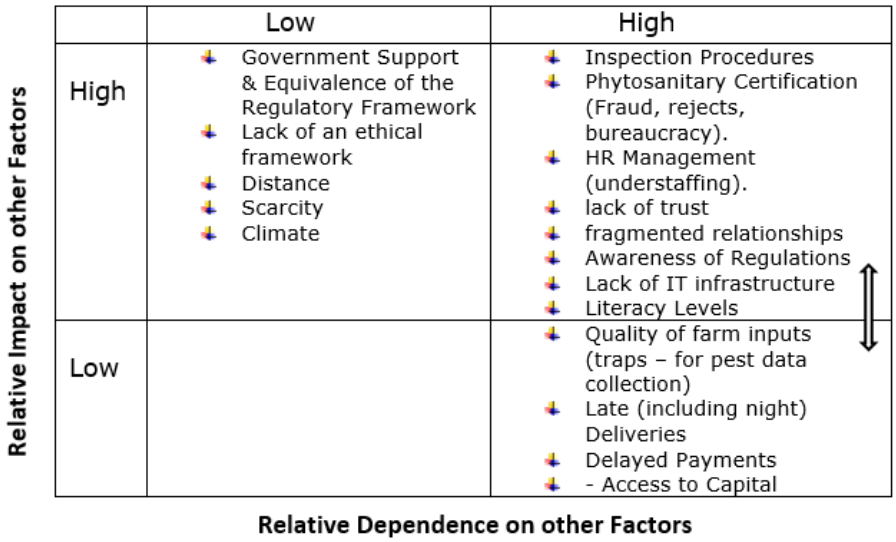

Figure 33: Impact/Dependence Matrix of Factors Contributing to Interceptions

Factors with a high relationship impact and low relationship dependence are "givens" to which the supply chain and notably the export control system must adapt. They have a high impact on interceptions and on other factors. For instance, the national regulatory framework is a "given" that must be equivalent under conditions described above to the phytosanitary requirements of the importing party. Hence, equivalence, while being externally determined, is not in itself determined by any other factors contributing to interceptions. However, the lack of equivalence leads to interceptions through a combination of factors (inappropriate inspection procedures, awareness of export market requirements fraud in the certification process) that can be strategically managed for enhanced compliance. This matrix is discussed in more detail in chapter 6 and 7 in the context of the literature (Faisal, 2015) on which it is based.

5.4 Summary

Table 13 above is a summary of factors contributing to interceptions in the UHESC presented above. As a matter of fact, in response to increased demand for specialty (exotic) vegetables from the EU marked by a significant increase in horticultural exports from Uganda, the fresh fruit & vegetable supply chain has been challenged by numerous interceptions due to plant health and documentary non-compliances. An investigation based on twelve semi-structured interviews and official document reviews (audit reports) reveals a combination of environmental (e.g., the equivalence of regulatory regime), people (e.g., awareness of regulations), process (e.g., a bureaucracy) and technological factors (e.g., restricted access to testing facilities) seemingly working together as inhibitors of transparency in the supply chain, ultimately leading up to interceptions. Chapter 6 involves a discussion of how this is the case while chapter 7 shall discuss these findings in the light of a broader literature and make recommendations for improving transparency in the UHESC.

Chapter 6

The Role of Transparency in Interceptions & Outcomes in the Horticultural Export Supply Chain

Introduction

Building on the previous chapter that examined factors contributing to EU interceptions of Ugandan horticultural produce, this chapter discusses steps taken by authorities to improve transparency in the supply chain. It begins by discussing the relationship between transparency and interceptions in the supply chain organisation and then moves on to discuss the roll out of transparency in the fresh fruit & vegetable supply chain for enhanced compliance and EU market access. With regards to the roll out of transparency, four overarching themes were developed in line with the process of change that intervened in the supply chain organisation. These include the updating of the legal framework regulating plant health, streamlining the export process, resource allocation, and capacity development. As a brief reminder, three research questions were formulated to guide the study

1) What are the factors contributing to interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) ?
2) How do these contribute to a lack of transparency in the Export Supply Chain (SC) ?
3) How did the supply chain respond to regulatory requirements for transparency and what are the outcomes ?

In the first section, I build on data presented in the previous chapter to answer the second question, thereby discussing the relationship between interceptions and transparency in the horticultural export supply chain. In the second section, I examine the response of the supply chain to regulatory requirements for transparency and the immediate outcomes of initiatives taken in that regard; thereby providing an answer to the final (third) question.

6.1 On the relationship between interceptions and transparency

The issue of transparency in the supply chain is first of all related to the concept of integrity as outlined by Manning (2006). In effect, In effect, Manning argues that misrepresentations or deceit in the agricultural supply chain can be related to the intrinsic integrity of the item (Product Integrity), the processes involved in its production (Process Integrity), the people employed in the value chain (People Integrity) and/or the data accompanying the item (Paperwork Integrity). Pest characteristics and pest control requirements for instance in combination with a lack of facilities for residue testing complicate an effective assessment of product integrity. Further, a falsified phytosanitary certificate is a document integrity issue that equally indicates issues with the people (issuing authority) involved in the process and may equally cast doubt on the integrity of the product. Manning advises that process verification measures (e.g., inspection and audit procedures) need to be in place to preserve supply chain integrity in such instances. This must be the case seeing as interceptions are the result of EU inspection procedures

At the core of Uganda's pest control challenges are difficulties related to the collection and dissemination of information for export market compliance. As a matter of fact, critical to the phytosanitary certification process, is the quality of information available for a proper assessment of the plant health status of consignments.

Essentially, quality control in the supply chain begins on the fields in a system where production is in the hands of mostly illiterate small holder farmers who are either unable or lack incentives to keep accurate and reliable production records. To illustrate, outgrowers operate a cost-benefit analysis which may impact their decision to record information on production practices. For instance, if the volume of their production destined for the export market (highly regulated) is less than that which is meant for the local market they may choose to not make the effort to comply with export market data entry requirements. Hence, data collection for purposes of traceability cannot be made mandatory resulting in scanty production data for proper inferencing during phytosanitary inspections.

With regards to traceability, while it is possible to trace back the origin of consignments to packhouses, and the origin of produce is generally identifiable during the sorting and packing process, such is not always the case at the end of the packaging operation. Inspectors face the challenge of enforcing rejects owing to a conflict of interest on the part of exporters who may re-consign rejects in a bid to meet export volumes.

In addition, as already mentioned, inspections are designed to verify the effectiveness phytosanitary measures taken at a previous stages in the supply chain. If there is little or no information to verify the effectiveness of crop treatment protocols or these are found to be unreliable (due to low literacy levels), then inspections lose their essence and export consignment become more exposed to interceptions.

Moreover, export inspections are used to ensure that consignments meet the phytosanitary import requirements of the importing country at the time of inspection. However, as mentioned above, owing to a lack of testing facilities for pesticide residues, there is no means to detect non-conformities until it is too late when consignments are analysed upon arrival in the EU/UK/EEA. Hence, consignments are often expedited under uncertainty (in spite of inspections and the issuance of a phytosanitary certificate) and with a high risk of an interception during EU border control inspections.

Furthermore, human resource limitations in the NPPO and a lack of clarity in the compensation of inspectors has created favourable conditions for fraud in the issuance of phytosanitary certificates. There is a feeling among some exporters that inspectors are more interested in compensation than they are in quality inspections. Similarly, insufficient time for inspections resulting from late deliveries and human resource constraints means consignments are expedited under falsified claims of conformity. Moreover, lack of digital data processing capabilities mean phytosanitary certificates are sometimes filled by hand with an increased opportunity for human error.

In addition, lack of comprehensive information on the distribution of certain pests of EU concern in Uganda impacts the reliability of declarations made on Ugandan phytosanitary certificates concerning the pest status of

consignments. The EU argues that because Uganda has no means of reporting with confidence on the presence or absence of certain harmful organisms, there is a high degree of uncertainty in the integrity of Ugandan horticultural exports which often result in interceptions.

Based on these factors contributing to a lack of transparency in the export process, and therefore contributing to interceptions, Ugandan authorities have been engaged in an ongoing process of organisational and structural changes in the horticultural export supply chain aimed at enhancing export market compliance.

6.2 Preventing Interceptions

6.2.1 Updating the Ugandan (Plant Health) Legal Framework

The very first step taken to manage EU interceptions of Uganda's horticultural produce was to update the plant health legislative framework by incorporating provisions for export market compliance. The process has been engaged twice, first in 2016 following the risk of an EU ban on Ugandan horticultural imports and later in 2019 under similar circumstances. In 2019, Ugandan authorities informed EU auditors that legislation in preparation to impact export related controls included:

1) A policy paper about the implementation of sanitary and phytosanitary rules of the World Trade Organisation was prepared and was presented to the cabinet of ministers for approval.
2) An implementing regulation (draft) of the Plant Protection and Health Act (Act No 6 of 2016) incorporating recent changes in the EU plant health import rules. The draft which was awaiting the approval of the Attorney General was expected to be published before the entering into force of the new EU plant health legislation (2019/2072/EC replacing 2000/29/EC) which entered into force on 14 December 2019

The regulatory update that intervened in the EU in December 2019 was a move by the European Commission to update protective measures against the introduction of pests of plants existing across different EU regulations notably 2016/2031 and 2000/29. It involved a reassessment of pests listed as harmful (e.g., fruit flies and the FCM) to the EU environment by the

European Food Safety Authority (EFSA). For instance, it was noted in the commission implementing regulation (EU) 2019/2072 that

As a result of the reassessment, some of the pests listed in Annexes I and II to Directive 2000/29/EC as pests not known to occur in the Union territory, should be included in the list of Union quarantine pests as pests known to occur in the Union territory, due to their established presence in certain parts of it

Because the EU quarantine pest list is subject to changes both in terms of additions and withdrawals, it is important for country NPPOs to update their legislative frameworks as these form the basis of information required for the proper execution of export phytosanitary controls

Recall from the previous chapter the observation on the part of EU auditors that plant health inspectors' knowledge of EU import requirement was lacking in some areas. In effect, in response to corrective measures suggested in 2016 and reviewed in 2019, the auditors noted that:

the DCIC produced a series of documents and organised a series of training events for the inspectors. However, the information in the relevant documents is sometimes improper or misleading. Additional efforts are needed to provide comprehensive information to the inspectors.

From an organigram perspective, the Department of Crop Inspection and Certification (DCIC) of MAAIF has shared responsibility with the Department of Crop Protection in drafting legislation, enforcement of phytosanitary standards and promotion of awareness of regulations, laws and policies governing official controls. The literature defines transparency as the degree of shared understanding of and access to product related information as requested by a supply chains' stakeholders without loss, noise, delay, or distortion (Hofstede, 2003; Wognum et al., 2011). The remark made by EU auditors suggest a degree of distortion in the interpretation of or access to EU market related information. Further, for there to be a shared understanding, there must be clarity. Clarity is a focus on the seamless transfer of meaning from sender to sender as opposed to the volume or relevance of the information shared (Schnackenberg & Tomlinson, 2016). Updating the legal framework in incorporation of changes to EU regulations as a basis for work instructions was therefore

of paramount and a first step towards enhancing export market compliance.

6.2.2 Streamlining the Export Process

As mentioned in the preceding chapter, since 2018 (two years after the first EU audit of the Ugandan System of official controls for the export of plant and plant products), organisational changes aimed at streamlining and creating more visibility in the export process have been effected notably with regards to the production and sourcing of hot peppers. Recall Figures 21 and 22 from the last chapter below which are an illustration of the "before" and "after" situation with regards to sensitive products (hot peppers).

Before Organisational Changes

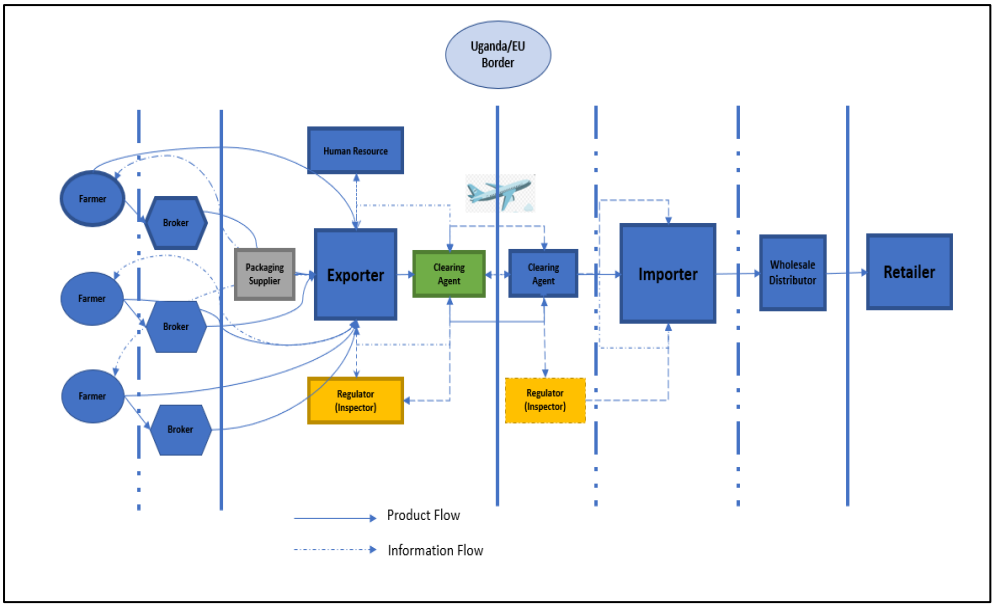

Fig 21: Layout of the Horticultural Export Supply Chain (Hot Peppers), up to 2018

It can be argued that the Ugandan horticultural industry was unprepared for the boom in exports of fresh fruits and vegetables notably hot peppers that has been on a steady increase since 2012. The consequence was an influx of briefcase exporters many of whom relied on brokers (agents) to close the both the knowledge and geographical distance separating them from outgrowers. Essentially, the level of implication in the production and sourcing process is what separates a briefcase exporter from an established and more organised exporter.

After Organisational Changes

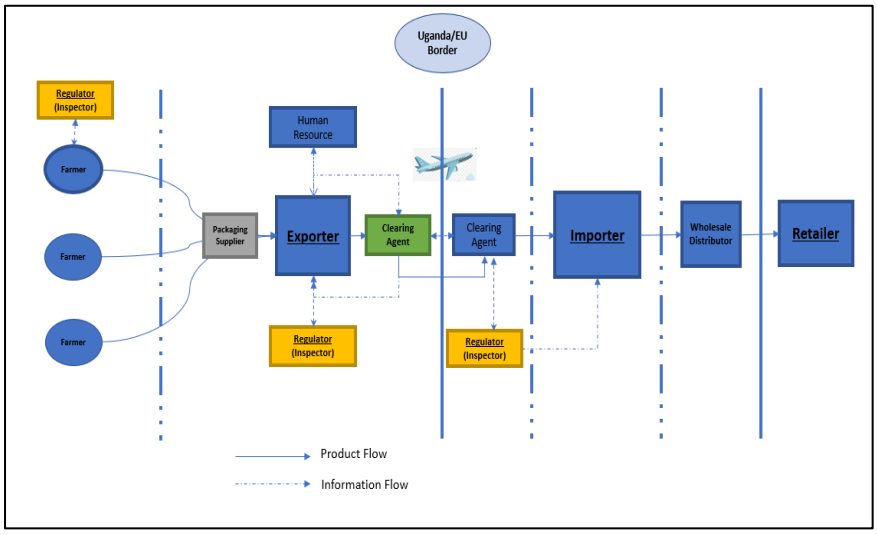

Fig 22: Layout of the Horticultural Export Supply Chain (Capsicums – Hot Pepper), post 2018

Also, these tend to be more opportunistic in their approach to the export market and invest little in the capability development of outgrowers.

Reliance on agents to source produce came with one major challenge - the inability to trace back produce to their source of origin in the event of an interception. In effect, agents tend to move around and consolidate volumes (for exporters with a limited sourcing network) and cannot be expected to divulge their sources in order to preserve their role and margins in the supply chain. It is not to say that knowledge of provenance reduces the risk of an interception but rather, that it enables tracing back of non-conformities to implement corrective and preventive actions. Hence, in order to improve knowledge on the provenance of hot peppers in the supply chain, the MAAIF reorganised sourcing activities around a more direct relationships between exporters and outgrowers.

Furthermore, whereas the NPPO relied on exporters to perform plant health inspections and audits of production sites (outgrowers) as part of the official export control system, such an organisation remained vulnerable to conflicts of interest (e.g., an exporter cannot fail their own inspection in order to meet export volumes). The new organisation of export controls requires official inspectors to have a bigger presence on the fields (as depicted in figure 23 above) in order to enhance the effectiveness of monitoring and surveillance practices for improved export market compliance.

Mandatory Registration Processes

The first step was to deal with the issue of brokers, and this was managed through a mandate for exporters to register outgrowers (up to four) after an official inspection of production sites which must be certified as free from quarantine pests of EU concern. During the 2019 EU audit inspection, the NPPO advised that

The MAAIF Department Agricultural Offices are responsible for the registration of farms. Each district office maintains a register which contains information about the geographical location of the plots, the crops, name, and contact details of the farmer. The registration of all the farms in Uganda has not been completed and the records are not yet stored in a country-wide electronic database which could support the certification of places of production free from FCM.

Hence, even though IT infrastructural problems persist, there is an effort to identify outgrowers and therefore create additional visibility in supply chain operations with regards to provenance. Moreover, the outgrower registration process succeeded that of exporters whose identities and capabilities were targeted early on following recurrent interceptions. This was achieved through the introduction of a check list designed to assess the readiness of trader applicants seeking access to the EU market. Recall from the last chapter that E… considered requirements imposed on exporters by authorities as unrealistic with regards to the start-up costs for the export business. In the passage below, an officer (FA1) working with the Ugandan Fruit & Vegetable Exporters Association explains why exporters find the process problematic.

Q: What is problematic for the exporters as far as the checklist is concerned?

A: The essence of that checklist was to verify a number of things first of all it looks at the legalities of these companies as we had a scenario were someone else would ship in my name; that was allowed many years ago but business has been legalized that you should be a registered entity so that you can be traceable, but you also have legal obligations; you can't just wake up and do deals and run away. It also looks at the technical setting of the business: do you have the personnel who understand this sector and are about to provide an extra service.
Then it looks at the production where do you produce from, who supplies you and it also looks at what governs this trade, are you able to articulate the export market requirements? then it also looks at your entire system the general understanding of your business. Do you have like a quality control system, quality controller, do you know quality specifications of the things you are exporting? It's a general list but it's also evidence based.

Then it also goes on to look at your infrastructure, where you are handling your produce, do you have a pack house, or a pack shed? Do you have specific requirements for this pack shed? So, it looks at all those and it has been a working document for ministry of agriculture and us as an association for new entrants into the sector. If you do not pass this checklist it's purely no.

The registration process introduced therefore made it difficult for opportunistic exporters to operate as it requires a certain investment of time and money to tick all boxes on the checklist. It requires for an exporter to have full control over their value chain from the farm (suppliers) through the packhouse (adequate facilities and quality control staff), as well as a certain mastery of export market requirements. The process generally requires identity and operational disclosure on the part of exporters with traceability being a key objective. These new requirements for exporters were equally reported to the MAAIF by the NPPO as reported below in the 2019 audit report.

Growers and exporters of plants for planting and flowers and pack houses and exporters of fruit and vegetables are registered. The registration is valid for one year.
The companies are obliged to introduce and operate a phytosanitary control system and provide certain information to the authorities. Each packing house with EU exports is registered by the DCIC. The establishments must meet specific conditions including appropriate space and lighting for sorting and packing, training courses for workers about pests and symptoms, quality controls upon reception, during processing and on the packed goods. Packing houses are obliged to record their own HO checks and provide them to the inspectors.

It can be argued from the above passages on the recently introduced process for outgrowers and exporters that a fair attempt has been made to professionalise the horticultural sector limiting the degree of informality involved in export operations (e.g., shipping through another company) by setting infrastructural and operational standards that must be adhered to by exporters.

Coding for Traceability

Further, concurrent to the registration process is the attribution of traceability codes to outgrowers and a recommendation to have these mentioned on phytosanitary certificates such that non compliances can be traced back to their points of origin. However, the coding system is in its infancy and requires fine tuning. Notice the exchange below where one of

the inspectors (I2) interviewed provides a background to the traceability system. He explained that:

"our systems are still young but in countries like South Africa, a single farmer can supply a supermarket chain in Uganda, although us Uganda the farmers are mostly small scale and an exporter has to source from so many farmers so that they fill the volumes; because exporters consignments were being destroyed, we set up a system so that different farmers have codes just in case of anything, an exporter can tell its farmer so and so who caused me trouble so what can I do? Should I ban him from supplying me or should I train them? That was the reason of the coding system because of our production system.

The coding system was therefore introduced to cope with the smallholder production system that involves multiple farmers supplying a single exporter with no means of telling what came from where in the event of a noncompliance. Whereas the South African model involves large scale farms that are sophisticated enough to supply a single customer with required volumes, the Ugandan model requires sourcing from multiple sources to meet volumes. Recall from above that the Ugandan model is primarily a subsistence farming model leveraged for the export market. The coding system enables the exporter to trace back non-compliances and possibly follow up with training requirements. However, the coding system in its early days was not without problems due to a lack of standardisation in its usage across different export organisations. Any given farmer could have as many codes as exporters they were dealing with which again made tracing back non-compliances a problem. E3 explained about the codes that

Every farmer and every farmer group have different codes which goes differently to their boxes. If a specific farmer has 5 different plots, those plots will have different codes, for example 225; but understand that I might have different plots on the same acre depending on the size; let us say you planted a quarter to make an acre; because different pests are bound to attack the plot and different responses are undertaken, so we can have like 2251 the "1" can stand for the first plot and it should be demarcated in the garden. In case of any problems, you can trace the produce because when you get an interception these are processes you have to go through.

This passage is an illustration of complexity in the Ugandan fresh fruit & vegetable export supply chain owing to the farming model. Acres are broken down into plots that are probably sowed at different points in time and are therefore subject to different treatment protocols based on the pest status of those different plots. The feedback from E3 requires on his

part working knowledge of the farmers' fields and production processes. The farmer registration process (whose outcome is a "permit to supply") that was updated in 2019 meant farmers now have unique identifiers attached to relevant demographic data on boxes that have been packaged for export. Irrespective of whom they supply produce to, authorities have a means of tracing back non compliances to the acre and plot within the acre. In the passage below, E4 describes measures taken to limit the risk of an interception during the sorting process,

Firstly, we came up with codes of every farmer; the other measure was to ensure that every farmer that brings produce goes through a system. The system was we handle the farmers in the order of their coming in. We would have sorting tables and make sure our farmers come from A to B and C, we receive the produce keep in the shelter to remove the field heat, once the field heat is removed, we bring it to the first table for inspection to check if the product has no pest like the moth and this is done by a quality controller. He first checks and if he says this is okay then we push it to the first table for sorting now the first group does the first sorting as they check out, the second repeats as they check for the FCM since it's a very complicated pest; so we had people who had been trained to sort, the process was done like 3 times then we confirm this is ready for export; The second measure on the codes was to ensure that all farmer codes are recorded on the phytosanitary certificate to help do the follow up which farmer brought pepper that had infection. Because for us, we wouldn't see the moth because it was in the egg or maggot stage, but those people would see what we have missed seeing.

Upon arrival at the packhouse, quality control is done by an agronomist who carries out visual checks prior to sorting, during sorting and after packing. These are aimed at detecting the presence of fruit flies and involves cutting and/or breaking a given percentage of fruits in search of symptoms. Staff in charge of sorting and packing produce are trained in the identification of symptoms of HOs that are of concern to the EU.

Mandatory Process Documentation

There are three key stages in the supply chain (illustrated in figure 34 below), each with specific information requirements that have been made mandatory in order to facilitate export compliance.

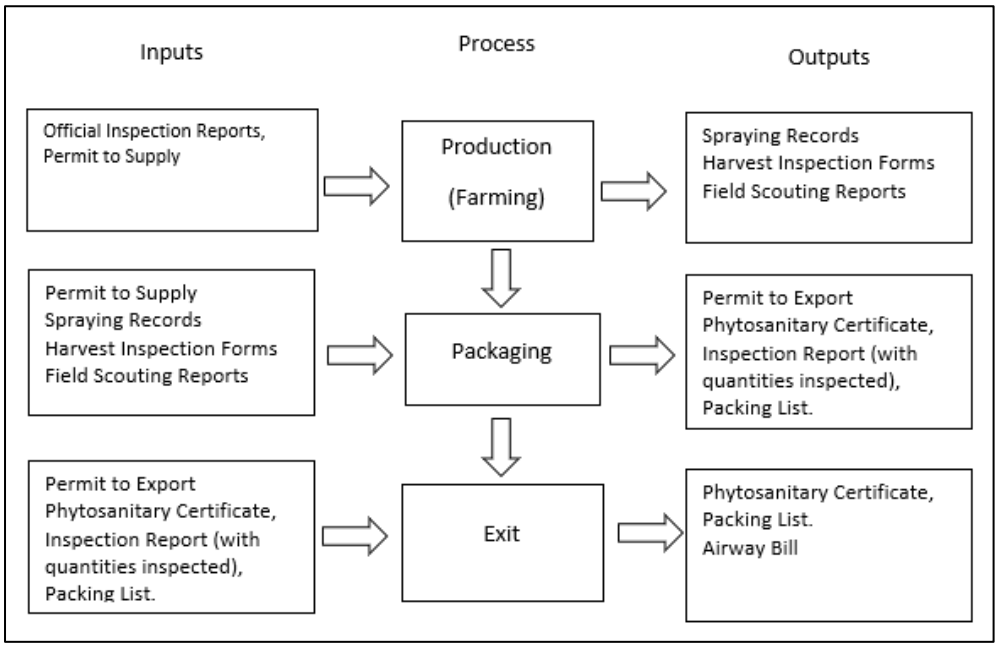

Figure 34: Mandatory Disclosure Process in the UHESC

Process inputs are the information requirements for the process to run. Outputs are information requirements for the next stage in the process (or supply chain) to operate with confidence that compliance requirements in the previous stage have been meet. Supply uncertainty is accentuated in the absence of information. For instance, as depicted in figure 30 below, upon arrival at the packhouse, harvest inspection forms (indicating yields that must add up to expected yields from the fields over time in order to validate provenance) and spraying records (indicating protocols) must be presented by the outgrower in addition to the permit to supply that was granted following an official inspection of their fields. These documents accompanied by field scouting reports are forwarded to the NPPO to initiate the phytosanitary certification process. At the point of exit (airport), the consignment must be accompanied by a phytosanitary certificate issued by an official (NPPO) inspector and presented alongside the exporters permit to export. The inspection report is a very important document that was updated to include inspected and certified volumes. This is in response to the challenge of managing inspection rejects that exporters may be tempted to include in the consignment in order to meet volumes. The Agricultural Police is responsible for physical and document checks upon arrival at the airport alongside NPPO inspectors before final clearance for export. It is also a measure against the fraudulent of phytosanitary

certificates and the unregulated participation of "briefcase" exporters in the value chain. To illustrate, it was reported by Ugandan authorities to the EU audit team in 2019 that:

On behalf of the DCIC the agricultural police of Uganda carry out documentary and identity checks on each consignment of fruits and vegetables at the entrance of the international cargo area at the Entebbe International Airport. The consignment must be accompanied with the PC and with DCIC packing house inspection report, packing list and freight documents. These requirements enable the competent authorities to combat possible fraud.

Figure 35 below summarises the phytosanitary certification process alongside disclosure requirements for outgrowers and exporters

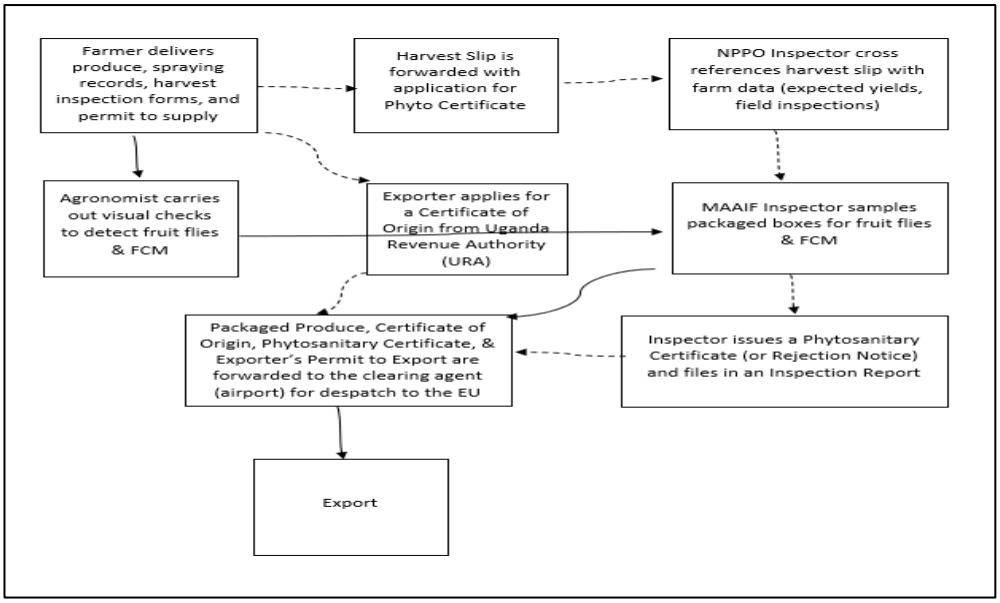

Figure 35: Incoming goods inspection process

Collaborative Planning of Outbound Shipments

Seeing as a combination of resource constraints and a high volume of shipments meant some consignments were being expedited without prior inspections, the NPPO requires for exporters to provide advanced notifications of shipments to enable proper planning and scheduling of resources for inspections. For instance, it was reported to the EU audit team in 2019 that:

DCIC together with Uganda Flower Exporters' Association, the Fruits and Vegetables Exporters' Apex Body secretariat continue to enforce sharing of shipment schedules weekly, to enable DCIC allocate adequate numbers of inspector

Further, in discussing his daily routine, Inspector I1 advised of the following in a context where he discussed resource limitations at the Ministry.

These exporters have their shipping days but what we did is we divided the companies. Each inspector has about 10 to 12 companies so the exporters are supposed to communicate to us the inspectors about the days they are going to ship so that we program ourselves, you know on a given date and time you will be inspecting company X from there you go to another company Y so it depends on the communication from the exporters.

Such advanced notifications, intervening as part of the export process streamlining initiative has reduced pressure on inspectors. The EU had noted a number of interceptions that intervened as a result of falsified phytosanitary certificates issued without any prior inspection of consignments. This was explained by staff shortages in the DCIC coupled with a high volume of shipments during peak periods. In view of these resource shortages which as highlighted by the EU below, the next step in the process of creating transparency in the export supply chain was to allocate additional resources for export controls on the part of the MAAIF. The EU audit team noted that:

The workload on the inspectors does not allow a meticulous inspection of the samples in peak periods. Therefore, imports from Uganda of these products pose a phytosanitary risk for the EU, in particular regarding fruit flies and FCM

Recall the experience of E1 in the previous chapter who had his consignment inspected off the truck after hours looking and waiting for an inspector as well as the "hassle" described by E4 experienced by some exporters to obtain phytosanitary certificates. Conscious of the risk posed by Ugandan exports risking interceptions either due to product and/or documentary non-compliances, the number of inspectors available for inspections has been increased.

6.2.3 Resource Allocation & Capability Development

Allocating Resources

Resource allocations have been at the core of organisational changes in the horticultural supply chain. It was first of all imposed on exporters to employ the services of an agronomist in charge of monitoring production

practices and reporting findings from pest scouting tours in the field. Further, additional inspectors were allocated to outgrowers and exporters in a move to integrate data from field and packhouse inspections during the phytosanitary certification process. It was noted in the 2019 EU audit report that:

At the time of the audit (October 2019), 17 inspectors worked full-time with EU export inspections. Six inspectors were responsible for the packing houses while 11 worked at the Entebbe International Airport. DCIC inspectors working with seed certification and pesticide controls may provide temporary assistance for plant health.

The figures reported above in 2019 especially for packhouse inspections are significantly higher than they were in 2018 as reported by the inspector (I1) in the passage below who was interviewed one year earlier.

Q: How many inspectors are there in Kampala for fruits and vegetables?

A: As I speak now, I used to work alone but we are now 3 inspectors and that's the team handling fruits and vegetables exports in and around Kampala.

Q: How do you handle when you have about 20 consignments a day?

A: These exporters have their shipping days but what we did is we divided the companies. Each inspector has about 10 to 12 companies so the exporters are supposed to communicate to us the inspectors about the days they are going to ship so that we program ourselves, you know on a given date and time you will be inspecting company X from there you go to another company Y so it depends on the communication from the exporters

The passage highlights the importance of collaborative planning in the scheduling of shipments, an element in the export process that has been highlighted as important by the MAAIF with regards to guaranteeing the frequency and adequacy of inspections. It also signals a 100% increase in resources available for packhouse inspections which is expected to curb the volume of EU interceptions.

Capability Development

Awareness of EU regulations and directives was identified as a challenge across the supply chain at the level of outgrowers, exporters, and inspectors. To bridge the knowledge gap, the provision of training is a responsibility shared between the MAAIF, and Exporter Associations working in collaboration with the Ugandan Export Promotion Board.

Provider / Group	UEPB	Exporters	MAAIF
Inspectors			X
Exporters	X		X
Outgrowers	X	X	X

Table 14: Capability development/training matrix for the UHESC

As can be inferred from table 14 above, outgrowers receive the bulk of training offerings which mostly cover good agricultural practices notably with regards to pest management techniques. In the passage below, I1 discusses activities carried out by the Ministry in terms of capability development.

Q: How do inspectors help in supplier development (farmers)?

I1: We work hand in hand with local governments (at district level) and we offer trainings to the farmers but at exporter level it's demand driven; they have to request us then we respond but we offer trainings to different categories farmers, sorters, transporter and even the clearing agents.

Q: When do you offer these trainings?

I1: For the farmers it depends on budget releases for the ministry because every quarter there is some money that can be put aside for training farmers, so we prioritize those that show a need or where we hear presence of a harmful organism we go and train them but also exporters invite us to train their farmers when they observe that they is a challenge in their activities so it's more of a response to a request by exporters.

Q: In case you have identified there is a harmful organism in their consignment and the ministry has released money to go and train farmers, what are some of the aspects that you would train farmers on?

I1: We train farmers on the determination of harmful organisms because it's an important point, as a subset of determination we train them on identification of harmful organisms and on the chemical control were it can take away the issue and we can also train them on IPM (Integrated Pest Management). We also train them on clear sorting and degrading to avoid the harmful organisms being passed on to the produce to exporters, but we also train them on general aspects like agronomy (Good Agricultural Practices) things like early planting to escape the pest attacks, the use of protective gear is also part of the training, also soil and water conservation. We go to the extent of Phytosanitary and quarantine operations were necessary to stop the disease.

There is a considerable responsibility on government officials for the provision of training or more generally, for the upgrading of outgrower skill sets. Exporters like farmers, are subject to similar training packages with the added responsibility of having to pass these down to farmers. In the passage below, the PB1 who works for the Ugandan Export Promotion Board (UEPB) was prompted to report on the agency´s role in capability development.

Q: When do you choose to engage into supplier development with the exporters?

PB1: The need of exporters range right from how they handle the product all the way up to the way they deliver them to the buyer. I think from what you have just said from your experience you have seen some mistakes. Our trainings are needs based, so if you're looking at what kind of programs, we do then what you have to do is probably look at what we have been doing over the years. Because with the limited resources we have we try to address the areas which we think are critical at that given point in time for example if you looked at what we were doing last year because of the issues we have had in the EU market surrounding oil seeds, fruits, vegetables and flowers you find that most of our trainings and capacity building programmes focused on the horticulture sector and oil seed sector and particularly food safety and Phytosanitary requirements because from our assessment we found those are the key issues we needed to address at the key point in time. Why? Because we were staring in the face of a possible ban. So, if you look at what we have been doing over the years it's mostly in response to issues that we see.

The UEPB is usually the first port of call for exporters with capability requirements. Focus has been on the development of capabilities that will minimise the event of interceptions and involve creating awareness around EU phytosanitary requirements. With regards to inspectors, training is designed to update and fill knowledge gaps regarding EU regulations and standards (ISPMs) issued by the IPPC. mainly gathered from EU Audit reports and triangulated in interviews as illustrated above in this and the previous chapter.

6.2.4 Inhouse Production & Forward Integration

The problem with brokers in a regulated context is the difficulty involved in tracing back non-compliances. While being a convenience factor in a sourcing strategy, the involvement of brokers in the value chain for sensitive products evolved into a risk factor with regards to sensitive

products (quarantine pests) and interceptions. When asked what he would do differently in terms of sourcing sensitive products, E2 advised that

"actually, we were the first people to get intercepted, I would do it differently I trying buying here and there you find like 5 shipments go through and on the 6th shipment I get intercepted. So, I decided I have to have control of at least more than 50% or 80% of the produce that goes. I decided to grow the product myself because I know what is required, I know the chemicals; I know the PHI of the chemical I am to use and when I talk to the farmers, I know what am telling them which wasn't there before.

Buying from here and there is indicative of loose and fragmented relationships that breed uncertainty in the final outcome of a transaction when the consignment is inspected in the EU. E2's experience with interceptions is quite unique in that as stated, he was the first to have been intercepted. The decision to produce at least 50% of his exports in-house does not only provide him with the necessary compliance information, it also provides him with the skills necessary for training out-growers on the remaining 50% he buys from them. Note that out-growers are more likely to comply with the requirements of an exporter who produces in-house than they are with one who doesn't. This can of course be expected as they tend to also provide outgrowers with farm inputs (seeds and chemicals) to assure uniformity in output. Others like E5 have set up demonstration farms to not only supplement sourcing from farmers but to also provide them with an example to follow. For instance, E5 explained that:

"As a company we have a farm which serves as a demonstration farm, but we also have out - growers and other farmers. We usually select farmers neighbouring our farm because they can copy the agronomic practices we do on our farms and it's also easy to collect the produce.

The location of the demonstration farm is strategic and provides access to information in both ways (for the farmer who can copy good practices, and for the exporter who simply knows "what is going on" in the farmer's garden including a first option on the farmer's yields. Others have simply rejected the idea of engaging farmers with contracts and chose to focus on the demonstrated commitment of the farmer. When asked how he selected farmers, E3 responded,

"For us whoever is willing to do the business so long as he has the capacity, we do it.

I: How do you determine capacity?

R: Capacity is the willingness, like I want to be employed in the hot pepper industry, but we all do those advisory services to the farmers but basically if someone is willing to do the business, he has time (full time employment) because if you're stepping in and out of your gardens you might "burn your fingers" with anchor foods because we have a strict policy in terms of interceptions

The implication is that because some farmers are opportunists, they lack the commitment necessary to supply the quality required to access the export market. Hence, contract or no, trust and commitment from farmers are pre-requisites in the sourcing strategy.

Forward Integration

However, farmers also expect a minimum level of commitment from exporters, and this comes with market consistency i.e., taking produce from them on a regular basis, but such is not always the case. To illustrate, an exporter is equally dependent on the consistency of orders from their customers (importers). When asked why he doesn't sign contracts with farmers, E1 advised that,

Because our market especially, me the market I have is not constant. For example, in the middle east they have 3 or 4 season, so they take much fruits in summer and in winter they take vegetables like avocado because they drink a lot of juice like avocado. Since I don't have a permanent buyer, I cannot commit myself to sign a contract with the farmer.

Nevertheless, others have found a way to sustain commitment and trust from both farmers by importers by offering an all-year-round market for the farmer on the one hand, as well as all year-round supply for the importer on the other. This requires forward integration with distributors in the EU market. It is a question providing farmers with an outlet for their produce when it is in season, such that they in turn prioritise the exporter when the produce is scarce. This is the situation with E6 who observed that,

"What we used to do is a contract that favours both of us because there are situations or there are seasons were you find the produce is flooding the market meaning the demand has reduced the other side in the market so when the demand goes down they will be an overflow and people will have nowhere to sell and others will just keep dumping; but for us we would tell them we will take the produce even during the time when the produce is in plenty so because of that my boss had an understanding with importers such that in the season when the produce is plenty they cut

down the prices to see that they can carry more volume to keep the farmers from missing out and this was also helping us to maintain the gardens".

Forward integration is a mechanism that in this case that enables the exporter to provide the out-grower with some demand consistency during the high season, in return for supply consistency in the low season. It was discussed in the previous chapter how scarcity breeds opportunism on the part of out-growers who forfeit contractual obligations in the low season, thereby compromising the ability of exporters to carry out sustained capability development initiatives. The model presented here worked so well so that the level of commitment in the relationship on the part of both parties proved to be detrimental to outgrowers as they were punished for their loyalty by other exporters when the business closed its doors, and no one would buy from them.

Backwards Integration

Even though presented above by E6 as a strategic move aimed at securing product in the low season, backwards integration is now a mandatory requirement in the horticultural export supply chain that is locked in with the outgrower registration and exporter certification process as outlined below by E7.

Q: Do you get challenges of interceptions?

E7: Yes, in the EU market we do, first, they want "organic stuff", they want natural fertilizers. They test the produce if you have been using phosphates on the farm they do not accept, and you can only comply if you're a farmer and exporter at the same time.

Q: Does that mean that yourself you don't have farmers?

E7: I do have farmers we out-source from though my aunt also has a farm.

Q: Are these farmers you source from contracted?

E7: Yes, we have to sign a document that's a requirement from the UEPB.
Q: What does the farmer contract entail?

E7: It entails the price at which we shall buy the product within that specific period. because they are so many of us who look for the produce so if you don't book produce you don't get it, you know the season fluctuates, we have had a wonderful one this year. We sign a contract of service, a contract that you will deliver that produce when we book it, we also sign a responsibility of rejects because they can be so many rejects so they know

we can't pay for them and when they're harvesting, they are careful to avoid them from cracking.

Q: What are the benefits of signing these contracts with farmers for you as an exporter?

E7: When we sign a contract, they (farmers) feel a sense of value rather than just coming to do business, it also gives them assurance of a ready market for their produce, it also protects us as buyers so that in case of anything they do not say "we never agreed on this"

Clearly, integrating backwards enables the exporter to guarantee produce when it is scarce but also, it creates a sense of worthiness on the part of the outgrower who sees in the commitment of the exporter, operational continuity. The contract includes a service level agreement which targets the low season but also engages the Outgrowers responsibility in the event of non-compliances. As such, the outgrower is more inclined to do what is right.

Further, backwards integration is a capability development activity that engages the outgrower but requires an investment on the part of the exporter. Such is the case of E4 in the discussion below where she expands on supplier development practices.

Q: What kind of supplier development would you give to the farmers?
E4: Actually, what we used to do is give them small loans which we deduct when they start supplying because they would end up with us and would not sell elsewhere. So, we had an arrangement where we would give these people small loans in form of cash other, we would get together with them and see what do they want, some wanted sprayers, others wanted money to stock chemicals, others would want to enlarge their gardens, others would want to construct an irrigation system on their garden because there are those that would be close to water and would tell us they want to construct an irrigation so that they would supply in season and out of season. We would ask them to make a budget of how much they need and them my boss would go ahead and buy for them the things they need or give them money and they do whatever they want to do.
Q: Would you give them agrochemical inputs?
E4: For pesticides we used to get money and give them, or we would buy for them but in most cases, we would give them money and they purchase for themselves.
Q: Would you offer trainings on how to use the agrochemicals?
E4: We would hold trainings at our office and write to ministry of agriculture to give us inspectors to come and train the farmers.

It is worthy to note that this is one of the few cases where investing in supplier capability development is not perceived as a risk by the exporter who like E7, is in a well-established and committed relationship with the

outgrower. Investing in equipment and other farm inputs (pesticides) is a good way to obtain information on the Outgrowers farm operations both in terms of quality (i.e., what has been sprayed) and quantity (i.e., product availability in low season). However, when things go wrong (and the produce is taken elsewhere), there is less incentive to develop outgrower capabilities and more reason to develop in-house production capabilities. Nevertheless, as shall be discussed in the subsequent chapter, the introduction of a mandatory registration process for Outgrowers by Exporters while aimed at improving operational traceability, can be leveraged to minimise the opportunism of Outgrowers through the legitimisation of contracts from a regulatory point of view.

Figure 36 is a summary of the different actions taken in the supply chain to improve transparency discussed above.

The chain of events seems to indicate a hierarchy or dependence of factors as discussed in the previous chapter. For instance, it is obvious that updating the regulatory framework created a premise for streamlining the export process and facilitating the backward integration of supply chain operations. It has also resulted in an added level of transparency in the phytosanitary certification process, for instance, the mandatory registration of Outgrowers and Exporters makes it possible for authorities to track back non-compliances and sustain quality improvements through the integration of field extension services in the phytosanitary certification process. Also, relationship building, and behavioural change are key features of the improvement strategy through different capability development activities (review of SOPs, training, awareness, and sensitization programs) involving direct support from public authorities.

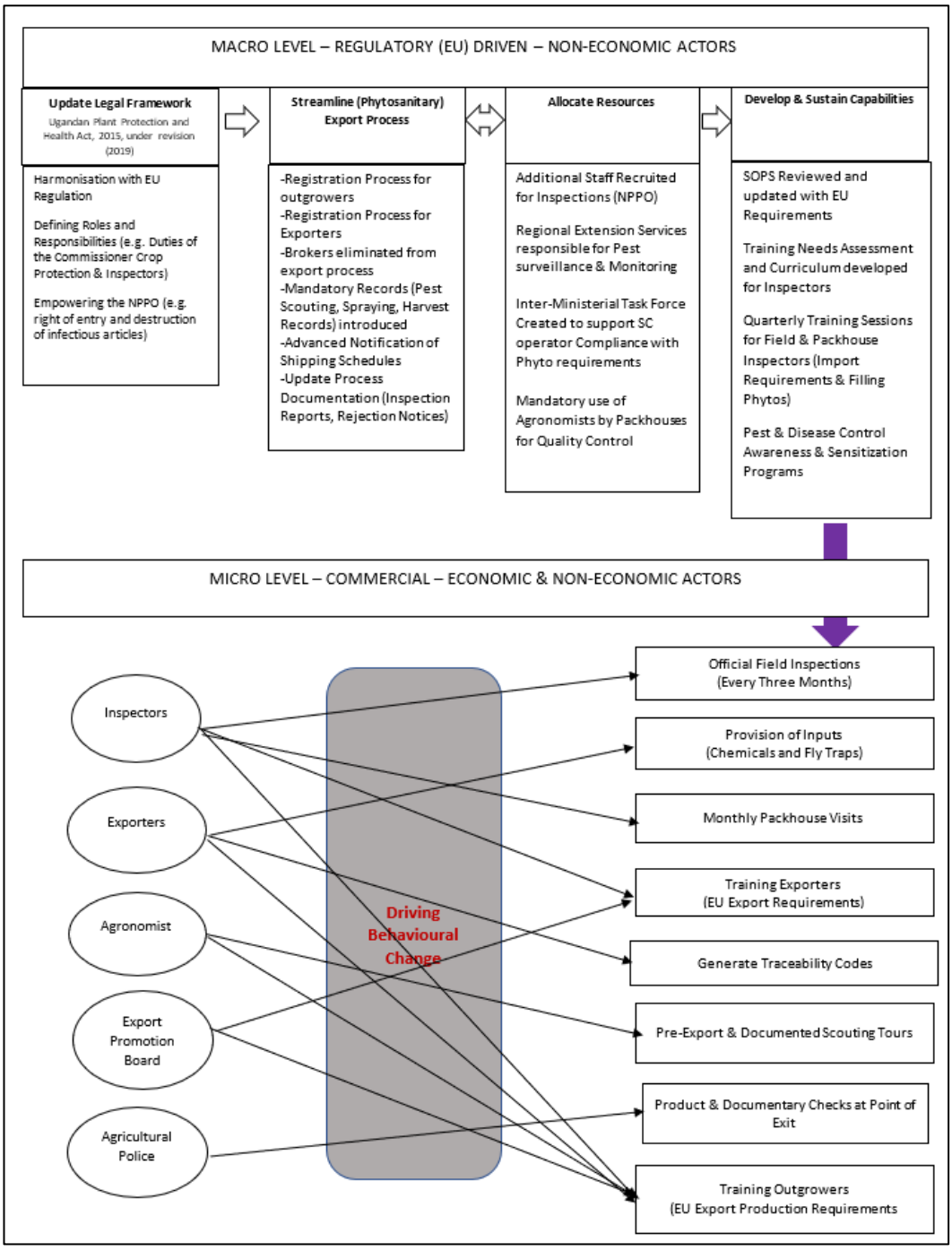

Figure 36: Creating Transparency in the Ugandan Horticultural Export Supply Chain

In summary, it can be argued in that transparency is critical to the effective prevention and management of interceptions in the UHESC. It can be inferred from figure 31 that the regulatory framework is the pacesetter for improvements in the supply chain as it lays the foundation for a streamlined export process, resource allocation, and capability development activities. The dispersion of production sites and the distance involved that complicated monitoring on the part of exporters has been

tackled by a reallocation of public resources (inspectors and regional extension services) to assist with data collection and monitoring activities that have been a challenge for under resourced exporters. The regulatory framework has also facilitated the backwards integration of exporters through the mandatory requirement for them to register Outgrowers (engaged on a contractual basis) and the use of the services of an agronomist for documented scouting tours. In a recent development, Uganda has adopted the WTO electronic phytosanitary certification system which aims to provide developing countries with a simple generic system for the electronic production and issuing of phytosanitary certificates. This has gone a long way to reduce cases of fraud and forgery in the certification process although challenges subsist in the collection and dissemination (or availability) of data backing up claims on the certificates.

Chapter 7

Discussion & Conclusions

Introduction

This chapter discusses findings presented in the previous chapters within the context of a broader literature, recommendations for improving transparency in the UHESC, research contributions, limitations, and recommendations for future research.

Recall that three research questions were developed with the objective of investigating factors contributing to interceptions (or supply disruptions), and steps taken to remedy the situation in terms of enhanced transparency and market access.

1) What are the factors contributing to interceptions in the Ugandan Horticultural Export Supply Chain (UHESC) ?
2) How do these contribute to a lack of transparency in the Export Supply Chain (SC) ?
3) How did the supply chain respond to regulatory requirements for transparency and what are the outcomes ?

An embedded single case study design consisting of semi-structured interviews, participant observations, and official document reviews was the preferred approach to tackling the research questions. Research objectives included the following:

1. To identify factors and processes through which interceptions are caused in the Ugandan horticultural export supply chain
2. To examine their role as inhibitors of transparency in the supply chain
3. To evaluate the response of the supply chain to demands for greater transparency and compliance from of the EU
4. To make recommendations for improving transparency in the supply chain.

The case study approach was useful in accounting for the complexity of supply chain relationships, and in providing an in depth understanding of a contemporary phenomenon occurring in a dynamic regulatory environment.

As a matter of fact, not only are interceptions a contemporary issue experienced by SSA horticultural supply chains, but there is also limited coverage of the phenomenon in the Agri-Food supply chain literature. Hence, a case study seemed appropriate for the tracing of operational processes leading up to interceptions as well as for examining the response of the organisation to the issue. Uganda was instrumental in the illustration of two things:

1) An operational relationship between transparency and interceptions (or it can be argued, between transparency and market access) that has to this point been mostly institutional in the literature.
2) Vertical integration and upskilling in a SSA horticultural export supply chain as a result of public standards, as opposed to the same outcome in other countries (e.g.) brought about by the implementation of private standards.

Based on the findings presented in the previous chapters, the following conclusions or propositions can be made and discussed in the context of a broader literature. The first two propositions are aimed at the first research question while the third and fourth, are aimed at outcomes in the supply chain.

1) Although institutional or trade transparency (e.g., notification & participation in decision making processes) is an important factor contributing to the sustained access of horticultural exports from SSA, supply and/or value chain transparency has a greater bearing on the immediate and effective market access of Ugandan horticultural exports.
2) Factors contributing to interceptions in the UHESC can be categorised as inhibitors of transparency based on their relative *impact* and *dependence* on other inhibitors:
    a. High *impact* and low *dependence* factors (e.g., equivalence of the regulatory framework) acting as independent inhibitors capable of influencing the structure and organisation of the supply chain.
    b. High impact and high dependence factors (e.g., fragmented relationships, lack of trust, lack of IT Infrastructure) acting as

strategic inhibitors capable of influencing the competitive advantage of the supply chain

c. Low impact and high dependence factors (e.g., quality of farm inputs,) acting as dependent inhibitors highly influenced by the structure and organisation of the supply chain.

3) Compliance with phytosanitary regulations requires an update of regulatory and ethical frameworks (high impact & low dependence factors) resulting in a concentration of supply chain relationships through vertical integration, and a progressive shift towards inhouse production capabilities on the part of exporters.
4) Upgrading involves the active participation of non-economic actors (i.e., state authorities and agencies) through the allocation of resources and the development of capabilities for monitoring and inspections, as well as for the implementation of Good Agricultural Practices (GAP).

These propositions are now discussed below with regards to the literature.

7.2 Summary of Research Findings

7.2.1 On the Level of Transparency in the UHESC

Prior to discussing factors contributing to interceptions and their role as inhibitors of transparency in the UHESC, it is important to make an informed judgement on the level of transparency observed in the supply chain.

As a matter of fact, transparency is required with regards to three key elements in the supply chain (Figure 34 & 35 – Chapter 6):

A) The pest status of production sites
B) The crop treatment status of production sites
C) Information contained in phytosanitary certificates.

These three information requirements are critical to both outbound (Uganda) and Inbound (UK) phytosanitary certification processes. Failures or asymmetries in any one area automatically lead to a non-compliance. Regulatory requirements are such that there can be no middle ground between Opacity and Clarity (i.e., translucency) in the quality of information shared between supply chain stakeholders.

With regards to the first two elements, the dispersion of production sites (figure 28) coupled with low outgrower literacy levels (figure 27) impact the availability, accessibility, and reliability of information on the pest and treatment status of production sites. Awaysheh & Klassen (2010) define transparency as the extent to which information is readily available to both counterparties in an exchange and also to outside observers. In a supply chain context, transparency refers to information available to companies involved in a supply network (Francisco and Swanson, 2010) which in this case, is limited by access to remote production sites. It was also seen how access to quality farm inputs was negatively impacted by literacy levels and compounded by a weak regulatory framework governing the import and distribution of pesticides. It is this lack of information that ultimately leads to interceptions as operations are conducted in opacity with regards to critical quality control information.

In effect, in discussing the importance of information to personal and national development, Aguolo (1997) concluded that access to most of the world's wealth of information (e.g., export market requirements) will remain a myth for developing countries until they overcome prevailing obstacles including high rates of illiteracy, unawareness of the relevance of information, and lack of infrastructural facilities (Aguolu, 1997).

With regards to Information contained in phytosanitary certificates, the EU was very clear about its lack of confidence in phytosanitary declarations owing to a lack of comprehensive information on the status and prevalence of certain harmful organisms in Uganda (pages 168, 170, 175, & table 11). For information to be transparent, it must be verifiable. That is to say it has to be unbiased and founded (Schnackenberg & Tomlinson, 2016). The authors argue that verifiable (and therefore transparent information) is the perception that information is correct and therefore true to the highest extent possible, given the relationship between sender and receiver. Information that cannot be verified is therefore opaque which is characteristic of Ugandan phytosanitary certificates. The situation is made even worse by bureaucracy and incidents of fraud and/or forgery in the phytosanitary certification process such that consignments are expedited and certified without any official inspections. Based on these challenges and with regards to the three critical supply chain information

requirements listed above, it is fair to say the Ugandan horticultural supply chain has been characterised by a high level of opacity which accounts for the rate of interceptions observed and illustrated in this study. Consequently, as opposed to requirements for institutional transparency on the part of the EU (e.g., timely notification of changes to regulations), supply chain transparency (in terms of the quality of information shared) as indicated by the (low) level of availability, accessibility, and reliability of information, has a greater impact on EU market entry outcomes for Ugandan fresh fruits and vegetables.

7.2.2 Factors Contributing to interceptions as Inhibitors of Transparency.

As factors contributing to interceptions or supply disruptions, *climatic conditions* favouring the prevalence of quarantine pests notably the false coddling moth, which is difficult to detect even for experienced operators, are a quality control challenge leading up to interceptions. Moreover, *fragmented relationships* accentuated by the distance commonly separating outgrowers from exporters and inspectors complicates the effective monitoring and control of pests in production sites. Further, the *literacy levels* of outgrowers complicates access to *quality farm inputs* and a proper mastery of pre-harvest intervals often leading to excessive pesticide residues and interceptions in the EU. Moreover, limited *access to testing facilities* for pesticide residues means non-compliances cannot be detected until it is too late in the EU. In addition, human *resource limitations* at the NPPO means some consignments are expedited without phytosanitary inspections although documented and certified as such. This points to *ethical issues* with regards to the falsification of phytosanitary certificates which is rendered even more difficult by limitations in IT infrastructure.

In order illustrate the role of this factors as inhibitors of transparency and to facilitate an eventual prioritisation of recommendations for improvement, they can be categorised based on their relative *impact* and *dependence* on other inhibitors. This is building on a similar framework developed by Faisal (2015) in which supply chain transparency inhibitors were classified based on their control power, and reliance on other inhibitors.

In this research, *Impact* is understood both in terms of contribution to interceptions and influence on other factors. These are reviewed in succession below.

High impact and low dependence factors

Factors with a high relationship impact and low relationship dependence are "givens" to which the supply chain and notably the export control system must adapt. They have a high impact on interceptions and on other factors. For instance, the national regulatory framework is a "given" that must be equivalent under conditions described above to the phytosanitary requirements of the importing party. Hence, equivalence, while being externally determined, is not in itself determined by any other factors contributing to interceptions. Similarly, climate, distance, and scarcity are all givens that contribute to interceptions in terms of: A) pest prevalence and the related impact on the credence attributes of fresh produce; B) distance also means dispersion and difficulties with coordinating quality improvements; C) In times of scarcity the opportunism of outgrowers is a barrier to capability development and hence less there is less visibility on the activities of outgrowers. In effect, With regards to credence, a "given" in the supply chain, Deimel et al. (2008) argue that food products are often characterised by credence attributes that are not easily controlled by customers unless at high cost. This is the case for hot pepper exports from Uganda that are often subject to interceptions in the EU due to a lack of affordable local testing facilities for pesticide residues

Further, in the development of his *control power* vs *reliance* matrix of supply chain transparency inhibitors, Faisal (2015) concluded that the most important inhibitors contributing to a lack of transparency in meat supply chains were lack of a regulatory environment, lack of an ethical framework, lack of consumer concern, and a fragmented supplier base.

In this regard, the findings of this study are consistent with those of Faisal (2015) in the sense that an inappropriate regulatory environment for instance, facilitated the existence of opportunistic briefcase operators, less concerned by the phytosanitary requirements of the export market. Further, the lack of an ethical framework is evident in cases of fraud targeting the delivery of phytosanitary certificates that often resulted in EU interceptions due to documentary irregularities. Moreover, the distance

separating outgrowers from exporters resulted in a fragmented supplier base rendering difficult the effective monitoring of production practices as well as access to comprehensive data on the pest status of production sites. Hence, in addition to product characteristics, these factors acting independently of each other have a high impact on interceptions and other inhibitors as further discussed below.

High Impact, High Dependence Factors

Another category of variables includes factors with both a high impact on interceptions, and a high dependence on other inhibitors. This is the case of fragmented relationships owing to the dispersion of production sites and scarcity in times of which outgrowers tend to be opportunistic and forfeit contractual obligations. It is also the case of literacy levels that while affecting the ability of outgrowers to read and follow crop treatment specifications, is dependent on the will of public authorities to train and/or educate farmers on GAP. The same is true of staffing levels at the NPPO impacting the availability and quality of export controls. Again, the regulatory framework should account for staffing requirements of the NPPO as it should for the quality of the phytosanitary certification process that has been witnessed incidents of fraud leading to interceptions. In discussing determinants of transparency in agricultural supply chains, Deimel et al. (2008) argue that the information characteristics as well as the cultural embeddedness of the supply chain have an incidence on the level of transparency. Even though Nonaka & Takeuchi in a discussion of knowledge creation in Japanese organisations explain that tacit knowledge (based on experience) is more difficult to communicate than explicit knowledge (e.g., product specifications), the literacy levels of outgrowers makes it difficult to communicate both tacit knowledge (what was done) and restricts the comprehension of explicit knowledge. Literacy levels are therefore a high impact factor contributing to interceptions and dependent on the will of public authorities to educate and train outgrowers. In effect, Granovetter (1985, 2006) defines social embeddedness the extent to which economic action is linked to or depends on action or institutions that are non-economic in content, goals, or processes. He argues that when economic and non-economic activity are intermixed, non-economic activity

affects the costs and techniques available for economic activity. This is the case of Uganda where economic activity (the occupation of exporters) is largely dependent on non-economic activity (the role of government and inspectors) for the development of the export industry. This is equally evident in the lack of IT infrastructure supporting the phytosanitary certification process (which has been subject to fraud) and local testing facilities for pesticides.

Further Deimel et at. (2008) argue that trust and commitment in relationships positively impacts information transparency which is not the case in the UHESC owing to a fragmented supplier base.

It is worth noting that while factors such as the lack of an IT framework and a fragmented supplier base were classified by Faisal (2015) in the category of low impact and high dependence variable, this study considers these to have a high impact in terms of interceptions owing to their direct contribution in terms of outcomes such as fraud and limited possibilities for coordination respectively. Hence, this study makes a slight divergence from the findings of Faisal (2015).

Low Impact, High Dependence Factors

On the opposite end of the spectrum, are factors with a relatively low or manageable impact on interceptions, but with a high dependence on other inhibitors. For instance, late night deliveries which tend to be non-conducive to inspections due to poor lighting conditions are a direct consequence of the long distances goods have to travel. Also, delayed payments and access to capital both of which restrict the ability of exporters to invest in capability development and monitoring activities are dependent on ethical and regulatory frameworks respectively.

7.3 Outcomes of regulation in the UHESC

7.3.1 UK Interceptions of Ugandan Hot Peppers

Interceptions are a notable outcome of regulatory developments in the EU/EEA with regards to horticultural exports from SSA. Jaffee & Masakura (2005) argued that the deepest reforms and the most elaborated efforts to bring greater transparency to food safety management have taken place in the United Kingdom, stimulated by a series of food safety crises and scandals (e.g., the BSE) which provoked disruptions to the food system.

Ugandan exporters view the UK market as most inaccessible in terms of controls for pesticide residues even though these can be said to be on par with interceptions due to the presence of harmful organisms. It can be argued that the 1990 Food Safety act has resulted in strict requirements for documentation and quality control that unlike (Kenya), the Ugandan horticultural export supply chain has struggled to keep up with. Fig 37 below illustrates the position of the UK as a fasted declining destination for Ugandan horticultural exports.

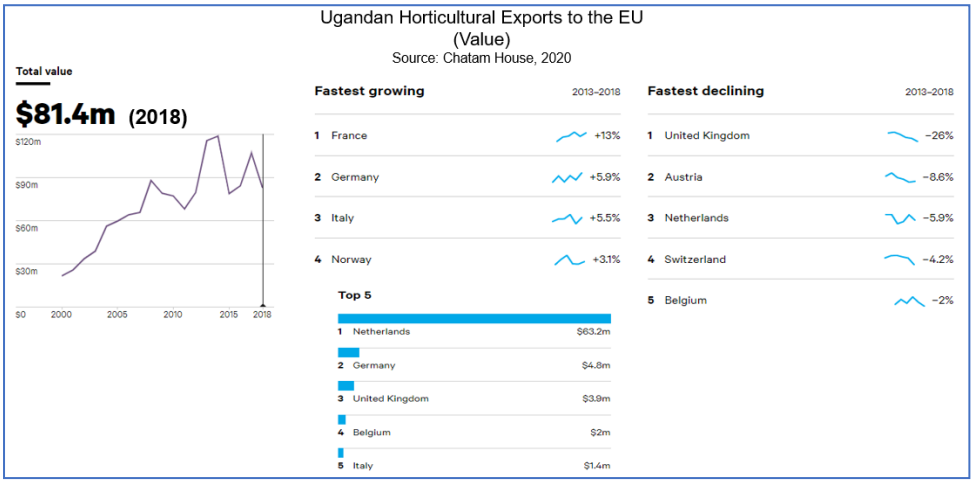

Figure 37: Ugandan Horticultural Exports to the EU

As can be inferred from Figure 37 above, the UK while featuring amongst the top three destinations for Ugandan horticultural produce, is also amongst the fastest destinations for Ugandan horticulture. Jaffe (1995, 2003) as well as Jaffe & Masakure (2005) noticed a segmentation in the EU market for SSA horticultural produce which was found to be even more pronounced in this study, and a possible explanation for interceptions. To illustrate, existing parallel to the traditional supermarket fresh fruit and vegetable supply chain, is a large and growing market for specialty vegetables consumed by first- or second-generation immigrants from Africa, Asia, and the Caribbean. The authors argue that purchasing arrangements for this segment of the market tend to be less stringent on matters of traceability, GAP, and to a large extent, the monitoring of pesticide residues. Demand for Ugandan vegetables notably capsicums (bird eye chilli, hot peppers) is fuelled by demand from the Asian and Afro-Caribbean diaspora who are themselves importers and distributors. It was observed that this segment of the market is indeed less stringent on

quality control with regards to plant health requirements and have therefore invested and/or required considerably less of Ugandan producers in comparison to the Supermarket approach to Kenyan producers and exporters.

7.3.2 Concentration & Vertical Integration

Compliance with phytosanitary regulations requires an update of regulatory and ethical frameworks (high impact & low dependence factors) resulting in a concentration of supply chain relationships through vertical integration, and a progressive shift towards inhouse production capabilities on the part of exporters.

It was noted in chapter 2 how the need for compliance with international standards (private and public) was changing the landscape of international trade in FFVs across SSA. This change was expected to be manifested in terms of:

A) A shift from spot market operations to supply chain management structures requiring improved coordination between value chain actors (Jaffee & Masakure, 2005; Asfaw et al., 2010; Hensen & Reardon, 2005; Hensen et al., 2011)
B) Increased vertical integration threatening the existence of the small-holder contract farming model (Jaffe, 1995; Jaffe & Masakure, 2005; Dolan et al. 1999; Dolan & Masakure, 2005).

While the findings of this study are in accordance with point A, the conclusion is uncertain for point B. To point out, key to managing interceptions and transparency in the supply chain was the disappearance of brokers from the sourcing process and the introduction of a mandatory registration process for outgrowers (smallholders) by exporters in order to facilitate the traceability of consignments (figure 21, 22, & 23). Hence, there has been a noticeable shift from typically spot market-oriented operations to supply chain management structures in terms of coordination (and supply chain governance). It would seem that the move has rather worked in the favour of smallholder farmers (Outgrowers) who now have closer relationships with exporters and progressively, a guaranteed market for their produce.

Further, Minot & Ngigi (2004) observed a trend toward consolidation in the Kenyan horticultural sector, in which small farmers were progressively being pushed out of the lucrative export market as a result of increasing concentration in European retail markets and rising concern over the environmental and labour conditions at the farm-level forcing exporters to work with larger farmers, who can more easily document their production.

While it is true that Ugandan exporters are progressively developing in-house production capabilities in order to better manage the transaction and supervision costs of sourcing from a large number of dispersed outgrowers (Dolan & Humphrey, 2000), the push factors in operation are not entirely the same.

To illustrate, whereas consolidation in Kenya and other horticultural exporting countries like the Ivory Coast and Zimbabwe was driven by concentration in European retail markets (Jaffe, 1995; Dolan et al. 1999; Minot & Ngigi, 2004; Jaffe & Masakure, 2005; Dolan & Masakure, 2005), the situation in Uganda is driven by pressure from the implementation of public standards (i.e., International Standards for Phytosanitary Measures - ISPMs) and compliance with EU phytosanitary regulations. As opposed to Kenya where retail supermarkets visit and audit production facilities (Jaffe & Masakure, 2005), production facilities and export control processes in Uganda have been less subject to EU Supermarket pressures and more exposed to mechanisms of public governance in the EU involving two official audits of its export control system by the EU Directorate General for Health and Safety (DG Sante) in 2016 & 2019. Consequently, even though consolidation in the specialty vegetable segment of the EU FF&V market (served by Uganda) has been limited in comparison to the conventional market dominated by large supermarket chains, the enforcement of public standards is progressively having the same effect in Uganda with outgrowers facing the risk of been phased out of the international value chain. However, what was observed in Uganda is a mandatory concentration of outgrowers through the registration process around exporters (see figure 23 & pages 186 – 188) which it can be argued, is a sign of their continued and maybe sustained presence in an evolving supply chain organisation.

7.3.3 Upgrading

Gereffi & Fernandez-Stark (2018) define upgrading as an economic process whereby firms, countries, or regions move to higher value activities in Global Value Chains (GVCs) in order to increase the benefits from participating in global production. The upgrading process can either be product, process, functional, or sectorial (Gereffi & Fernandez-Stark, 2018).

Upgrading in the UHESC has been more process oriented, involving a reorganisation of the production system.

Gereffi defines *process upgrading* as the process which transforms inputs into outputs more efficiently by reorganising the production system or introducing superior technology. This process in Uganda has also involved the active participation of non-economic actors (i.e., state authorities and agencies) through the allocation of resources, the development of capabilities for monitoring and inspections, as well as for the implementation of Good Agricultural Practices (GAP). This has been a noticeable shift from policy engaged in the 1990s as reported by Rios et al. (2009), during the introduction of Non-Traditional Agricultural Exports that saw government restrict its role to rule setting and regulatory control leaving production and commercial activities in the hands of the private sector. For instance, the creation of task force (highlighted in chapter 6) which was in effect a private-public partnership comprised of the NPPO and the private sector was designed to support supply chain compliance with export market requirements (e.g., through the elaboration of a packhouse standard). However, in spite of attempts to improve export market compliance through a supply chain wide capability program involving outgrowers, exporters, and inspectors, the social embeddedness (or dependence of the private sector on support from the public sector) of the supply chain as defined by Granovetter (1985, 2006) means the pace of change is slower. In effect, judging Jaffe (1995) as well as Jaffe & Masakure (2005) the situation in Uganda today can be likened to the situation in Kenya in the 1990s where exporters maintained relatively simple pack house structures consisting of a warehouse with concrete and aluminium roofing as well as facilities to unload and reload packed produce onto trucks. Also, the authors state that quality control essentially involved re-grading and re-packing sub-par produce supplied by farmers.

Thus, whereas some authors as discussed above have attributed upgrading in the SSA horticultural industry to the repositioning of the fresh vegetables chain by EU supermarkets and a continuous emphasis on healthy eating (Dolan & Humphrey, 2006), a situation which pushed Kenyan exporters for instance to keep pace with best practice in the industry, upgrading in the UHESC is a slower process. To illustrate, Rios et al. (2009) explain that whereas SSA countries like Kenya were taking advantage of the roll out and enforcement of private standards in the EU throughout the 1990s to upgrade the horticultural production and export system, these requirements have only very slowly filtered into distribution channels for more exotic and ethnic fruits and vegetables. Consequently, while African suppliers of temperate vegetables (e.g., Kenya) were being put under pressure to upgrade food safety and other standards, these were largely missing through the early 2000s in the ethnic food trade. A situation that today explains the infrastructural and capability gap between Uganda and neighbouring Kenya in terms of horticultural exports and a rising wave of interceptions to which the country has to respond if continued access to the EU market remains a priority.

7.4 Suggestions for Improving Transparency in the UHESC

This research has built on a supply chain inhibitors prioritisation matrix to understand how Interceptions are caused and eventually managed in the Ugandan Horticultural Export Supply Chain. The case study has illustrated the fact that institutional transparency is a necessary but insufficient condition for the sustained access of SSA's horticultural produce to high value markets in the west. These export destinations (notably the UK) are increasingly stringent on the need for SSA supply chains to substantiate compliance with phytosanitary standards owing to the risk of introduction and spread of harmful organisms. It is therefore important for supply chain operators to identify and prioritise actions for improving supply chain transparency. Based on the impact/dependence matrix discussed above, the following suggestions for improvement can be made:

7.4.1 High Impact, Low Dependence Variables

Identified as high impact, low dependence factors with regards to interceptions and influence over other factors were:

- Climatic conditions
- The Equivalence of the Regulatory Framework
- The Lack of an ethical framework
- Distance
- Scarcity

While it is true that little can be done to influence climatic conditions as a given, an update of the regulatory framework has been done to improve equivalence with EU regulations including provisions for additional resources (e.g., extension services & additional inspectors as well as the mandatory use of an agronomist by exporters for field scouting and monitoring purposes.

Also, it is expected that supply chain integration evidenced in the mandatory registration process discussed in chapter 6 (pages 186 – 188) is capable of resolving sourcing issues in times of scarcity as exporters are officially bound to outgrowers who will be less likely to forfeit official, if not contractual obligations.

However, recommendations can be made with regards to the development of an ethical framework, managing the distance between outgrowers and exporters, and IT infrastructure. These recommendations are indeed process upgrades that in GVC terms, complement the reorganisation of the production system and involve the introduction of new technology.

Supply Chain Code of Conduct

It was noted how the social embeddedness of the supply chain in terms of interactions between economic and non-economic actors i.e., exporters and inspectors often resulted in non-compliances (e.g., the falsification of phytosanitary certificates presented in chapter 5, pages 166 - 168) and therefore interceptions. The opportunity of an interministerial task force comprising of members from both the public and private sector aimed at reinforcing compliance with export market requirements can be leveraged for the design and introduction of a supply chain code of conduct. In effect, the UHESC can be conceptualised as an organisation comprised of private and public interests that can only be aligned with a code of conduct that specifies norms for behaviour on the part of both parties. This code of conduct should breed and sustain a culture of cooperation and knowledge

sharing, that considers the external competitive environment with a unified and coherent approach to compliance and market access on the part of both economic and non-economic supply chain actors. It can be argued that whereas at least two thirds of all fresh produce shipped to the EU from Uganda are packaged in boxes labelled "Produce of Uganda", the supply chain has been fragmented in its approach to the EU market with intense competition between exporters resulting in costly information asymmetries. Meanwhile, the EU treats Uganda as a unit, a supply chain, in terms of non-compliances with consequences (e.g., restrictions) that tend to be systemic and not particular. Hence a code of conduct should foster a unified approach to the export market as well as a culture of cooperation between supply chain actors.

Distance & Dispersion

The dispersion of outgrowers is a challenge compounded by the distance between them and exporters that has led a to a reorganisation and a reallocation of resources by the NPPO to production sites in the regions. As of today, regional extension services have been commissioned to assist with the capability building of outgrowers as well as with data collection and reporting for pest monitoring purposes. This reallocation of resources that came with an update of the regulatory framework justifies the positioning of *distance* as a high impact factor that is staked to the regulatory framework not only contributing to interceptions, but also impacting the quality of (data in) the phytosanitary certification process. The use of drones for pest monitoring activities could enable extension services and company agronomists to cover more territory with more precision in data collection for pest monitoring (Puri, 2017; Ren et al., 2020). Veroustraete (2015) reports that from the ability to image, recreate and analyze individual leaves on a corn plant from 120 meters height, to getting information on the water-holding capacity of soils to variable-rate water applications, agricultural practices are changing due to drones delivering agricultural intelligence for both farmers and agricultural consultants. These have also become increasingly cheaper and accessible (kulbacki et al., 2018). Further, drones can assist with automated data collection if used for spraying which is not only economical but precise in

the provision of critical compliance data which to this point has been complicated by the remote dispersion of outgrowers in the supply chain. Whereas regulation on the use of drones in Agriculture in SSA has been noted to be a threat (Ayamga et al., 2021), Uganda's regulatory framework is an evolving one requiring the issuance of a licence for commercial use by the Ugandan Civil Aviation Authority.

7.4.2 High Dependence/High Impact Factors

IT infrastructure – Blockchain Technology

IT infrastructure is a highly dependent contributor to interceptions as well as to the level of transparency observed in the supply chain. As in all organisations it is highly dependent on the commitment and resources of top management which in the case of Uganda, is an under resourced public authority rendering a public service. However, Rios et al. (2009) noted the role of international donors in the development of Uganda´s non-traditional agricultural exports (NTAEs) and hence there is a possibility for these to invest in technology adoption in terms of digitalisation for enhanced market compliance. The lack of IT infrastructure has facilitated the fraudulent use of phytosanitary certificates (see pages 166 – 168), also impacting the perceived quality of information (see page 175) and therefore the perceived transparency of the supply chain. The solution to this has been to share in advance with UK authorities, the serial numbers of issued phytosanitary certificates such that these can be traced back to the issuing authority (see page 168). While this is indeed a very simple and effective mechanism for authenticating phytosanitary certificates, it is a recommendation to explore digital ledger technologies (e.g., blockchain technology) for enhancing transparency in the phytosanitary certification process. Blockchain is an emerging digital technology allowing ubiquitous financial transactions among distributed untrusted parties without need for intermediation (Kamilaris et al., 2019). Often linked to Bitcoin the virtual currency that made the technology popular, its applications in agriculture for traceability purposes has been on the rise in recent years providing unprecedented levels of transparency to stakeholders (Tian et al., 2016; Caro et al., 2018; Lin et al., 2018). Xiong et al. (2020) describe it as a ledger of accounts and transactions that are written and stored by all

participants. They also see it as a trusted way of storing data or a reliable source of truth about the state of farms, inventories, and contracts in agriculture where the collection of such information is often costly. Francisco & Swanson (2018) describe blockchain technology as an open-source decentralised database for storing transaction information using duplicate ledgers called blockchains. The authors argue that besides providing increased supply chain transparency, blockchain technologies create an immutable and distributed aspect of the custody of record by nature of the protocol which lends itself well to traceability applications.

With regards to Uganda, UK authorities have already demonstrated a willingness to work with Ugandan authorities in the prevention of fraud in the certification process through the advanced communication of serial numbers of phytosanitary certificates. This willingness to cooperate which is already evident in a simplified (email) process, can be enhanced with the blockchain concept of non-fungible tokens (NFTs).

An NFT is a unique digital certificate of authenticity that is publicly verifiable, and into which any type of data can be programmed including audio-visual and photographic material for enhanced traceability. While representing a future for art, supply chain applications notably with regards to certification programs are equally interesting. The fact that NFTs cannot be exchanged, substituted, or tampered with due to their unique properties presents a solution to issues of fraud and forgery in the phytosanitary certification process. Furthermore, in integration with drones (see above), blockchain technology can be used to create an immutable and highly transparent ecosystem in the horticultural supply chain for reliable knowledge and information sharing between economic and non-economic supply chain actors.

7.5 Research Contributions

This study contributes to literature exploring changes in the structure of internationally dispersed but functionally integrated supply chains. These have been analysed under the Global Value Chain (GVC) framework that explores the different ways through which countries or regions reorganise themselves in order sustain or increase benefits from participation in these international production systems (Gereffi & Fernandez-Stark, 2011; 2016;

2019). However, the predominant approach to analysing GVCs notably in the SSA region has mainly focused on the role of private sector actors (Lead Firms) in the governance and transformation (upgrading) of GVCs. To illustrate, most studies in the agricultural sector, have either focused on value distribution (Dolan et al., 1999; Fitter & Kaplinsky, 2001) or on a firm level input/output analysis (Jaffe, 1995, Gereffi & Fernandez-Stark, 2016;2019) to explain structural orientations in GVCs. It is to say that the GVC approach is concerned identifying value chain drivers through an analysis of the division of economic surplus.

Nonetheless, as mentioned by Keane (2008) in a working paper with the Overseas Development Institute, although understanding the division of economic surplus across nodes in the GVC approach is fundamental to determining chain drivers, this cannot be a unique point of interest to researchers. Assuredly, governance and structure is determined by actors and factors other than lead firms and value distribution in the chain. Whereas governance structures in the GVC framework are perceived as those internal to the value chain, external governance structures (e.g., international standards) and most notably the state have a bigger role to play in structural outcomes than captured in the literature. For instance, although Jaffe (2003) acknowledges the role of the regulatory environment in the determination of structural outcomes, the role of the state (national and supranational) is often restricted to rule setting and enforcement (i.e., penalties).

Moreover, even though the role of transparency (e.g., through mandatory traceability systems) in preserving consumer confidence (by establishing accountabilities and responsibilities for breakdowns in international food chains) has been extensively discussed in the literature (Opara & Mazaud, 2001; Trienekens et al., 2001; Hofstede, 2003; Manning, 2006;2018; Knowles & Moody, 2007; Wognum et al., 2010; Whitworth et al., 2017), there is a persistent bias towards sanitary (as opposed to phytosanitary) concerns. Yet, phytosanitary concerns have been observed to impact governance outcomes in international food chains as illustrated in this research. In addition, the role of transparency as a determinant of both governance and upgrading outcomes in GVCs warranted further investigation. This was evident in the study by Faisal (2015) where

inhibitors of transparency notably at a regulatory level were to blame for food safety concerns but there again, focus was on the sanitary aspects of the agro-food supply chain.

Based on this assessment, this research conceptualised transparency within the framework of a GVC bottom-up analysis to illustrate outcomes of external governance structures in the form of phytosanitary interceptions. It also examined and illustrated the role of the state in the determination, coordination, and success of upgrading in a domestic horticultural value chain. Building on a supply chain transparency inhibitor matrix (Faisal, 2015), it discussed the impact of phytosanitary concerns in the Ugandan horticultural export organisation and makes the argument that governance/structure does not only reflect the economic distribution of value but also, the information requirements (or the need to evidence the compliance) of the supply chain. Thus, in addition to GVC research, it contributes to the literature on SC transparency in illustrating its role in facilitating and/or impeding the market access of high value horticultural products from SSA.

7.6 Research Limitations & Future Research Orientations

First, with respect to the research design, Uganda's horticultural export supply chain is composed of two main sectors namely flowers (plants, and plants for planting) on the one hand, and fresh fruits and vegetables (FFVs) on the other. Moreover, the fresh fruit and vegetable sector has evolved during the course of the study into separate supply chains that remain interconnected namely the supply chain for sensitive products (hot peppers), and that for non-sensitive products. Meanwhile, even though the supply chain for flowers is also considered sensitive with regards to EU plant health requirements it is a much more mature supply chain in terms of managing the transparency requirements for export market compliance. Owing to this complexity, a multiple case study design aimed at a comparative analysis of similarities and differences between the FFV, and flower supply chains (in terms of market access) would be more appropriate. This would be a natural candidate for future research whose outcomes can be invaluable in the provision of strategic recommendations for improving the performance of the FF&V sector.

Furthermore, the case study could have adopted a mixed methods approach to quantitatively validate the positioning of transparency inhibitors on the Impact/Dependence Matrix as a basis for sound recommendations on improving transparency in the supply chain. The scope of this study can be broadened to include inhibitors in the institutional aspects of transparency which equally have a major role to play in the participation of the SSA region in international horticultural value chains. For instance, it would have been interesting to understand the extent to which Uganda participates or has participated in the enactment of international phytosanitary regulations impacting Ugandan horticulture. Even though it could be inferred from EU audit reports than participation was limited, the extent of Uganda's nonparticipation wasn't fully apprehended has not been fully apprehended in this study.

Hence, it is a recommendation to carry out a quantitative study in order to validate the positioning of a broader set of transparency inhibitors on the impact/dependence matrix. Such a study could result in a framework that can be used to guide current and future initiatives aimed at increasing transparency in the UHESC.

Also, the study included a very limited participation of outgrowers as a result of language barriers. In effect, these could not be interviewed extensively or without use of an interpreter hence interaction with outgrowers during the data collection process was limited to observations. Thus, even though much was learned about outgrowers from exporters, there is a risk of bias in the findings presented which is therefore a research limitation. The recommendations for future research discussed above should therefore incorporate more inputs from the outgrower community for a more complete picture of export market challenges and possible challenges.

Moreover, as discussed above, the development of IT an infrastructure integrating all necessary information requirements for a reliable phytosanitary certification system should be considered a priority for future research. Investigating blockchain integration possibilities in the export value chain notably with regards to NFTs in the certification process, holds promise for the competitive advantage of Ugandan Horticulture. Hence, a study aimed at experimenting and concluding on the use of NFTs

and blockchain technology in the UHESC for enhanced compliance with phytosanitary standards is recommended for future research.

7.7 Conclusions

This research has built on a supply chain inhibitors prioritisation matrix to understand how quarantine interceptions are caused and eventually managed in the Ugandan Horticultural Export Supply Chain. It has also built on the GVC literature to explain upgrading patterns and outcomes in the UHESC. It has illustrated the point that institutional transparency is a necessary but insufficient condition for the sustained access of SSA's horticultural produce to high value Western markets. These export destinations (notably the UK) are increasingly stringent on the need for SSA supply chains to substantiate compliance with phytosanitary standards owing to the risk of introduction and spread of harmful organisms. It is therefore important for supply chain operators to identify and prioritise actions for improving supply chain transparency.

Further, process upgrading in Uganda as predicted by the Global Value Chain framework has involved a realignment of supply chain relationships albeit from a regulatory perspective with the emergence of vertically integrated structures aimed at enhanced coordination and operational transparency in compliance with international phytosanitary standards. However, as opposed to Lead Firms, the state has been observed to play a much bigger role in the determination, coordination, and success of the chosen pathway in terms of upgrading. Hence, the study has illustrated the impact of EU/UK plant health interceptions on the transformation of the UHESC as evidencing compliance with phytosanitary regulations has evolved into a strategic priority with regards to sustained EU market access.

Hence, the study has also validated findings from previous research on the impact of public and private standards on restructuring in the SSA Horticultural export industry, albeit from a different perspective. As a matter of fact, whereas previous studies highlighted the role of consolidation and the development of private standards in the conventional EU fresh fruit and vegetable retail sector, public standards (ISPMs) and the direct implication of the UK/European Commission have had a bigger

impact on outcomes in Uganda. Previously, this influence has been manifested indirectly through public legislation (e.g., the 1990 Food Safety Act in the UK) that introduced strict requirements on Supermarkets for due diligence and traceability in the agri-food supply chain as a result of incidents such as the BSE outbreak.

These outcomes include the development of supply chain management structures (backward and forward integration), as well as in-house production capabilities, that constitute a shift from spot market operations, all of which have been known to negatively impact the participation of small holders (or outgrowers) in the export value chain. However, the Ugandan response to EU concerns of the phytosanitary threat posed by Ugandan horticultural exports may have a promising future for small holder farmers. In effect, it can be argued that the mandatory registration of outgrowers by publicly licenced exporters has resulted in a regulated consolidation of the supply chain, aimed at improving the quality of information in the supply chain, and more specifically, in the phytosanitary certification process.

Hence, in spite of an increasing recourse to in-house production capabilities on the part of some exporters, there seems to be a bigger move towards a (state) regulated integration of small holders in the export value chain. This future is even more promising considering the lack of consolidation and private standards in the EU specialty FF&V market supplied by Uganda, as opposed to the conventional FF&V market supplied by Kenya, whose industry has witnessed more drastic structural and infrastructural changes over the last three decades. Conclusively, the state in Uganda has had bigger role to play in the coordination, performance, and sustained access of Ugandan horticultural exports to the EU than has been observed elsewhere (e.g., Kenya).

This must be the case because using the Impact/Dependence Matrix of supply chain transparency inhibitors to reflect on steps taken to improve transparency in the UHESC, the prioritisation of actions in factors with a high impact on interceptions (such as the equivalence of the regulatory framework was seen to have a positive impact on other high impact/high

dependence factors (e.g., resources for phytosanitary inspections) acting as inhibitors of transparency and contributing to interceptions.

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Appendices

Appendix 1: Exporter Interview (E2)

E2 AGENCY – 10 years in the business

Question: What are the names of the company?

Answer: E2 agency [Name is Edited]

Question: What is your position in this company Sir?

Answer: Am the director

Question: What are the major export products of the company?

Answer: Matooke, garden eggs, capsicum, sweet potatoes and avocado that's basically it. There is a spectrum of things that come in and go because of the weather here and the quality issues for example ground nuts, yams but those ones have issues for example the freshness of ground nuts is a big problem with a lot of sunshine but people have been taking them by first putting them in water (for them to appear fresh) but it's risky because you have to dry them again because if you don't dry them they get that mold so each product has a challenge.

Question: What are the major destinations of your products?

Answer: It's UK but sometimes I used to take to Netherlands but it's basically Europe because Europe is earlier for us since we have that arrangement, they give us a euro form and our products don't pay taxes on entry.

Question: Apart from tax exemption why do you chose Europe as your major destination?

Answer: It's because we have an attachment because it's very hard to choose a market that you don't have an attachment because these things are eaten by Ugandans, Ghanaians, Nigerians we would all like to take to Russia but I mean the financial issues because they're basically no contracts so you have to be a bit comfortable with the Ugandan UK relationship but other who have verged on the Web have contacts in Scandinavian and Asia but even the volumes can be so low that you can even breakeven in those other countries. These markets of the UK and Netherlands they are already aware we have the products that they want so it's easier and if not Europe we cannot compete with the market requirements of USA and South America because South America they are all like us product provider.

Question: How do you source your products?

Answer: From out-growers, the volumes might not permit us to grow so we basically use out-growers and most of these products you can source them and it's maybe cheaper because if you have only 1 ton of matooke a week it's not easy to plant that small volume and you become profitable because where we source these products like matooke they are already established so for you to say you will do it on your own people have tried and they haven't been successful.

Question: How many out-growers do you have?

Answer: No what you do like for each product let me start with matooke like those ends of Mbarara and Kyotera side exporters have built up a system you get a person (broker) who has particular farmers were he gets the produce so when you go in he has a list already so and so has this much then you move the truck, for others who have small orders maybe you have to you have to send us who have big trucks, sweet potatoes and sweet bananas the same thing. Now the trick comes with these other vegetables, the aubergine and the capsicum these ones.

Question: For capsicum how do you source it?

Answer: For capsicum it's a very big challenge maybe these days they have stopped getting interceptions maybe the chemical residue levels have gone down now they are being so strict on the pests. With capsicum it's very tricky you can lose a lot of money if intercepted so you have to find a way to have the growers in control and they know what they are doing.

Question: What have you done to ensure that you have the out-growers under control?

Answer: Now you need to also a small farm of those products at least to start with so that you minimize what you get from out (sourced produce). Secondly you need to train those farmers to the extent of supplying them with the chemicals so that they can conform to the intervals and use those specific products you have given them to spray at those specific intervals plus training.

Question: Which type of training do you give the farmers?

Answer: We do training though it's informal whenever they're delivering produce at the pack house, we are always talking do this do that, spray that spray this. Before we used to just check the product physically there is no pest, there is no damage then pack but now the issue in deep the product itself, what have you sprayed, how did you spray and when did you spray.

Question: Do these out-growers give you documentation of how they have been taking care of the products?

Answer: Maybe not but somehow, they have got to know that this is a business and if I lose and am not paid they will equally lose money. Now like for example my farmer who was giving me capsicum and aubergines what he was doing he had 2 farms and he was doing "shift harvesting" like when he would spray this side he would harvest

the other side but that is a crude way but you're supposed to give each farm 2 weeks after spraying chemicals of course the maximum they stay in the produce is 2 weeks but for the Rockets (market name for a very strong pesticide) those ones we send away. That's a crude way because you lose a lot that week you take produce to the market the other week you don't, the other way is to buy these weaker chemicals which have a small harvesting gap.

You know you have to find a balance when you give that farm big space you find a challenge because the produce will get those pests we have come up with a cocktail of pesticides which has a small harvesting gap but still effective.

Question: Do you train farmers on how to use this cocktail?

Answer: Yes we do because most exporters do 4 days but you make sure you have few days like 1 or 2 but if you use a stronger chemical increase your harvesting gap too those are the things we keep trainings them.

Question: What are the criteria if selecting out-growers of capsicum?

Answer: Capsicum has challenges because prices keep on fluctuating and the prices they give us in Europe they almost never change so someone has to be understanding that is a business and you're going to be together and his going to conform to whatever you're telling him and if you don't have trust you're going to have a problem because if he keeps on spraying what he thinks is, his going to start using Rocket because it's very effective cheap but the waiting period can be a month so that mentally has to get out of a farmer when they are doing capsicum and aubergines.

Question: Do you sign contracts with these farmers?

Answer: No that's a challenge because we also don't sign contracts with the buyers that how tricky it is, it's a mutual trust basically but if you want to sign a contract you can no one will stop you but these farmers are not so learnt to the extent but still a contract doesn't have to be written we have that contract that is verbal. You deliver a good product and you're paid.

Question: The terms are what in this case?

Answer: A good product and it conforms to what they want in Europe whether in advance, whether after or whether cash it's that kind of contract.

Question: Does it talk about the rejects at the pack house?

Answer: Not really but we have rules that the quality control begins with you (farmer) and we have scouts before harvesting but if you bring a sack with 50% bad produce we don't sort that means the farmer has a problem the percentage has to be 10%. For instance if you bring something which you claim it has already been sorted and it's 40% that means you have not done sorting but it doesn't stop there it also means you don't know what you're doing. Because the things we would have agreed upon are

very clear now the physically appearance of the produce you have failed now how are we sure of the inside of the product which we can't see.

Question: What are the benefits of supplier development or training these farmers?

Answer: You will be so relieved but sometimes you can't control like delays, but you will be so relieved when you have a farmer who is trained and doing what you want. Even when you get an order you will be sure of getting what you want in terms of volumes and quality.

Question: What is the difficult of engaging in supplier development?

Answer: Trust, after developing that farmer he eventually runs away when the product is ready you won't see him, he will supply you 10% and supplies other the remaining 90% now you can't continue with that farmer so his making you break the chain and makes you go to another now, this is usually because someone is giving him a better price maybe double or a very slight difference.

Question: If you were given an opportunity what would you do differently to develop your out-growers in terms of capacity in capsicum?

Answer: Actually we were the first people to get intercepted, I would do it differently I trying buying here and there you find like 5 shipments go through and on the 6th shipment am intercepted until I decided I have to have control of at least more than 50% or 80% of the produce that goes. So I decided to grow the product myself because I know what is required, I know the chemicals; I know the PH of the chemical if am to use it when am telling also the farmers I know what am telling them which wasn't there before.
But other exporters are still shopping produce on telephone but it's a big risk if you're not involved that means you're not controlling the product you will face pests and minimum chemical residue (MCR) you won't be sure of the scouting because quality control starts on the field. Now if you're doing the scouting why would you bring FCM in the capsicum you should have seen them in the field.

Question: What are the risks associated with the export business?

Answer: Now the biggest risk for instance like aubergine I tried to do that and I was successful and now eventually there is temperature and we can control them because we don't have a cold chain even in the UK or at the airport they put the things outside on a ramp and when it comes to the laboratory it's very hot and remove our things. Last time I took aubergines in the UK they spent 4 days outside and got ripe after checking them they was no chemical but I lost all the money approximately 2000 pounds it's not my own making because the products are in the laboratory and delivered to the customer while they are ripe who will pay, so the weather issue is so risky and we depend on trust and you find your putting in like 10,000 pounds but it's mutual trust you don't have someone at the end up to monitor your produce and tell you like how many boxes got spoilt so someone can lie to you if those boxes were not bought and he doesn't lose because he send you a picture of a box so he can send you

a picture of another box because he never even sends you codes he just send you pictures of the produce

Question: What are some of the risks associated with farmers you deal with?

Answer: These days we don't have a problem with aubergines and capsicum maybe with avocado the problem is with temperature and the timing. For the former the farmers can nurse it very but cures it using Rocket and you might not know because this stays in the product for 4 weeks and he will have a very good product. We used to get very good pepper from Mubuku irrigation scheme because they were using Rocket the day they stop using it the product was a disaster. People believe that the only way of getting rid of the FCM is by using a very strong chemical but it's by having a spraying partner and you're using good agricultural practices.

Question: What kind of information do you share with farmers and what of information do they share with you?

Answer: For each product we share different information because we have charts in pack houses, we want to show each product has its own pests, diseases and spraying pattern. For the matooke when it's very hot rap them when they are still young, so we are patterns with farmers in the business.

Question: So, what do they (farmers) share with you?

Answer: Basically those ones are always asking about prices which is close to impossible in Europe because the biggest cost is the flight charge the flight guy has the biggest control over us that's what these big companies like Ice mark and KK foods before they used to enjoy because they went to the companies and got the cheapest flights and used to have a very big competitive advantage over ours and now those airlines are no more.
So we compete for the best flight charges so if you want to get problems go to Ethiopian airways and the losses you will get them. So you have to go for the expensive flights because they offer good services and wouldn't bend low for us.

Question: Have you ever missed a flight?

Answer: The experience we have in this business the company am going to use is very important I wouldn't even go for 10 cents less by using Ethiopia I know I would be saving money because you have some much to control and then you get a headache on the flight which is the biggest cost then you're not serious you would rather use Emirates airline because it will leave here and drop in the UK on the same day it's very expensive but very efficient.
So you minimize the risk of produce getting spoilt because these are perishables. Ethiopia would be fine but they don't have many flights from Addis Ababa or maybe they have their own cargo same thing with Turkish airlines so you would rather sort out the flight issue first and you're at level with fellow exporters or better and then you go in other things.

Question: How do you deal with these fellow exporters, how do you deal with them?

Answer: We have an association and are supposed to be friends and partners sharing information but this business there is a problem because each one has his own thing in his own way because people are always saying they will take my buyer we even reached a point of not putting addresses on boxes and IO bills but some of these things I said to hell and if am dealing with you and the address is everywhere but where you work together for a long time you have to know everyone has to make money, know how to play the game and rules of the game but my fellow exporters have this problem maybe they have an ambition of supplying the whole Europe I don't know, the market is so big you can't supply it all. We would be better off if we share information.

Question: What of MAAIF?

Answer: You know they are supposed to give us phyto-sanitary certificates they are supposed to be the biggest players since they certify the product but apart from that you ought to the risk or else you lose the money. They come at the pack house and are to give you the phyto and tell you that you know the rules of exporting capsicum and I am doing my sampling but for your case you know what it means not to pay you for the produce so they do their job.

Question: Who organizes the trainings the trainings, is it MAAIF or UEPB?

Answer: MAAIF organizes, they're obliged to organize trainings because the risk is on us so that's why for perishable products, we have charts of pests and diseases, but this is public information MAAIF has all the information.

Question: Do you employ a quality controller or an agronomist in your company?

Answer: Can you afford? but somehow I have friends I studied with who studied agriculture like myself so I buy from them the chemicals or go to them I have production challenges I go to them with the product and ask them what do you think. So when am buying the chemicals I also make sure I get my service also, he sells me chemicals and I get training indirectly because he has too so I avoid going down town to agro-chemical inputs dealers I go to my friends and sometimes they ask me to take them to my farm to see what is happening there but otherwise we are supposed to have an agronomist. For example, ground nuts look like a very simple product because they need them fresh from the garden you wash them but if you're not trained, they get molds which can cause cancer.
Sometimes in my shipment I have a lot of avocado, matooke, sweet potatoes but aubergines and capsicum a big question mark so whenever I sense trouble, I skip exporting them.

Question: So that is a method of minimizing the risk of interceptions?

Answer: Yes exactly, that's why interceptions have gone down people have been dodging and am one of them.

Question: How many interceptions have you had in the last two years?

Answer: Around six it's a lot of money my friend in the UK used to tell you lose money time and again because you want to work and it has become a routine for you so I decided why should I lose this money now I have my own gardens of aubergines but it's this rain (lack of) that is giving me issues so I decided why don't I irrigate because you can make about 4 pounds on a box because the aubergines and capsicums the weather affects them badly and volumes go down and the prices hike.
But still they won't say the capsicum is expensive in Uganda let us not check for the moth they will still check for the moth and MCR's but if the product is yours you have control but most of our fellow exporters don't know routine they just say I will buy from farmers and they lose even those big companies don't want to put in because routine is easy the product is brought in by farmers and taken out for export.

Question: What information do you receive from importers?

Answer: We basically talk about what is in the market, like the weather is bad stop this product that would be his interest not to reduce his margin.

Question: How do you receive your orders from importers?

Answer: In what way, WhatsApp or Email my situation is a bit unique because I have been with my buyer for 10 to 15 years the money wouldn't be an issue it's the quality and consistence and make sure that each of gets money so I don't have many buyers so for people who have many buyers it's a challenge controlling you finance and produce at the same time if you're not so careful you might be sending your produce for free.

Question: Tell me more about sending the produce for free.

Answer: They advantage of you and make you lose money by playing tricks on you with just a call of things are bad from 12 pounds to 8 pounds but me I can't manage I want to maintain my volume and margin because otherwise maybe I will need more money or staff.

Question: Take me through the process of getting a phyto-sanitary certificate?

Answer: Your registered they know where you work and before you ship you notify him but you need to in a good relationship with him because each one needs the other now he has to inspect the product before you take it through sampling. He supposed to come at the pack house

Question: Is there laxity with the inspector because they have been working with an exporter for a very long time?

Answer: There is always laxity with human beings, but the principle remains the laboratory are put there for people who want to dodgy the phyto-sanitary certificate you can't keep bribing.

Question: What I know you pay these inspectors to come and do your work, how to do set the facilitation given to the inspector?

Answer: The official set fee is about 20,000 to 25,000/= but eventually the association agreed we need to give them transport allowance to come to the pack house but if he decides that he won't come you have to look for a "win-win" situation and if your stack on the official fee he might not punish you but he will be inconvenienced. He will say have the cargo here at the ministry from 8am to 6pm because those our working hours and if your packing at night where will you get a phyto.

Question: How do you deal with the challenge of packing at night?

Answer: At first we used to have issues like for matooke but I have my own truck and they leave this place very early in the morning like at 3am and all other products we need to see them in broad daylight but sweet potatoes come from wetlands and arrive late and we take about 2.5 tons and they (farmers) wash from there because washing 2.5 tons of sweet potatoes you can't manage you will get issues with your neighbor the water will be too much.
So, the risk was too much and I was losing money so I decided you have to bring the produce during day time or else I go another supplier then the people sobers up.
I got another buyer but I got issues you know this business operates on individualism now when I go someone who was giving me the same order moreover in the same market I can't hold it the volumes because you can employ people but still it's all about quality which is affected when you're taking so many tons for basically capsicum and aubergines

Question: How do you ensure traceability issues?

Answer: Those are the codes first of all the codes are supposed to help you, you're supposed to give each farmer a code because if you don't do that how will you improve (quality) you have to have traceability in case you face a challenge.
Traceability is basically related to quality but it mostly applies to vegetables and you should have consistent farmers with capsicum so that you train them they know what to do and they know what you want and they have codes but what I saw in the UK they don't report back using codes when they get the consignment it's destroyed all of it and for us we even code on the phyto-sanitary certificate but there is an improvement because that's why you see the number of interceptions have decreased also the European union has relax a bit on capsicum and aubergines. They are telling us to pre-cool the vegetables for 12 hours to a tune of 4°C so that we don't export live pests. It's another expense to the exporter but what is funny when you have a cold facility at the pack house it has to be a cold chain, it needs to be a cold chain from the farmer now the issue of pests would be solved maybe it would die but these produce get issues when they get out of a cold truck and change temperatures.

Question: In general, what are some of the challenges you're facing as a company and exporter?

Answer: The challenge is basically about losing money because the quality control is hard sometimes because of the weather in Uganda and at the airport after weighing the produce they put them on the ramp last time we had a lizard in the consignment in one of the boxes it was from Entebbe airport what could I do and you know they can they can survive up to Heathrow and those lizards we have at the airport came in consignments they are not Ugandan lizards.
There is no person at the end point to confirm your produce and there is no contract which binds you and the importer because with a contract you would be sure of what you're earning.

Question: From what you have seen in over ten years of experience in this business what would be your recommendations to improve the export sector of fruits and vegetables?

Answer: I think the agriculture and food people the other side should be partners with us we are doing for them a big job feeding their nation. Not just being policemen these are people who are knowledgeable about agriculture you take aubergines on Monday and your release them on Thursday night you would know that these things are going to ripe if it was sweet potatoes maybe and then there is no email to the customer those are double standards.
For the flight that's government if they come in to improve the flight issue is increasing our exports to the EU because we are the ones supposed to earn the foreign exchange for the country.
They also to give us more training in GAP issues and to know that we dealing sensitive produce and the other problem is that the farmers just plant their products you buy or don't buy that would maybe work on the local market but they should know that we are dealing with an export market which is sensitive on chemicals and quality issues.

Question: Don't you think before selecting farmers to work with you have to deal with that?

Answer: We do verbal agreement but it's funny because someone is growing these things on his land so that's were agricultural police should come in because if you have given this guy a loan how do you quantify the produce into money or you force them to give you the produce.

END OF THE INTERVIEW

Appendix 2: Exporter Interview (E4)

Question: What is your name madam?

Answer: My names are MM [E4]

Question: Which export company are you working with?

Answer: North roads enterprise it's a new company and currently we are not shipping because our buyer isn't in the country he travelled, so he said when he comes back, we shall resume.

Question: For how long has the company been in existence?

Answer: The company was registered last year; it's not an old company.

Question: Have you had any shipments before?

Answer: Yes

Question: What have you been shipping?

Answer: We have been shipping bird eye chill, then we also ship garden eggs the white one, export raver (this has types the long and the round one which we call rose raver and the rose raver has two types there is one that is pink and the other is black but they are round in shape), we also export matooke, hot pepper, avocado.

Question: What are your major destinations of export?

Answer: UK only now

Question: How do you source the products?

Answer: We have farmers since I was in the system because the previous company I was working with when the owner passed away the director of London fruits and vegetables

Question: So, you took on the farmers when he passed away?

Answer: Yes because I had worked for so many years with London fruits and when the director passed away these farmers were left in the space and had nowhere to supply their produce so they kept on coming to me and calling me asking me "do you have any plans, what can we do we have nowhere to go, we have no one to buy our products". We had so many farmers so I was really forced to come in and rescue although the quantity they had I wouldn't really take all by myself, I would try to divide the orders amongst them so that their gardens don't die out.

Question: Is London fruits still in operation?

Answer: No, when the director died what happened was that the relatives came into the business and failed to agree on certain things because everyone was looking at how do I benefit, they were so expectant they thought that they was a lot of money their so everyone was looking at the money issue instead of looking how do they maintain the company because the company was operating really well and even when he passed

away we had shipments even when he was still laying in the hospital bed we continued working but unfortunately the family members failed the company and it was torn apart that's how it ended.

Question: I contacted someone on the list of London fruits and he kept tossing me around?

Answer: Of course because the company isn't there, it remained on paper but it's no longer in existence

Question: When you took on the farmers did you sign a contract with the farmers?

Answer: Well the fact that I knew them before because we had signed contracts with London fruits but me I hadn't done that part of signing a contracts and putting things in a formal way though it's a requirement by the ministry of trade but still the fact that you are not sure of the market because like right now we are not doing anything until my buyer comes back then we shall resume so if you sign a contract that means if you're not operating these farmers will ask you were are we going to sell our produce. If you have a contract you have to always be there to help them see that their goods are sold but we have a mutual understanding if am able I find them good exporters who can buy your products until I get back into business, when we resume we start from where we left of they understand though they were issues some of them were not comfortable stealing to other exporters so they were like we don't want to sell to those ones we shall wait for us we shall continue removing and replanting.

Question: Why wouldn't they want to sell to other exporters?

Answer: It's because of terms of payment since some exporters have kind of segregation. For example if I have farmers supplying me and you're not happy with me in the same business you don't want my suppliers to supply you. You know they is competition in business and rivalry. So we had rivals with London fruits and other companies so those other companies thought since London fruits is no more let those farmers that were supplying London fruits also suffer because they also never used to supply to them the time they needed the produce. Issue was London fruits had led a strategy and planned very well we had many farmers it never reached a time and we missed produce because they is a season when the rain is little and you find some of the products are scarce but find for us we always had farmers whom we had organized even during the dry season we would still get all the products. So it became an issue how does London fruits get products while for us we are suffering while for us we can't get even one so it became a big issue that some of the exporters started getting jealousy but you need to find out how is someone doing his business, get to this person ask them how are you doing this?, how are you able to get this produce even in the dry season how do you do it but they never bothered to do that, they instead rose up and started saying all sorts of things yet we planned and laid a strategy. So when he passed away some of the exporters didn't want to buy produce from these farmers that were supplying London fruits and the mey fact that they ask and found out you were supplying London fruits they wouldn't buy from you so that's how they started

suffering because they had nowhere to supply their produce wherever they would go and say I was supplying London fruits they would say so you were the people so they were never been treated well like they would delay their payments, some of them would take their produce and tell them we didn't ship your stuff it remained here at the office and someone who has put in transport carrying the produce to the office and then you tell them that the produce remained here of course the farmers will get demoralized and some of them destroyed the gardens in the process because they felt they had nowhere to sell their stuff.
And then the other issue was the FCM so this made many exporters have registered farmers and able to follow up with the farmers to see if they are doing the right agricultural practices because you would not just buy from any farmer who has not been supplying you, whom you don't know how the garden is and how they have looking after it because you end receiving someone's product which is infected especially hot pepper is a very delicate product so you have to really first investigate and maybe if you can visit this person before even taking up his product. To be lenient you would look for people who know how to look for the moth they check the pepper and sort it like 3 to 4 times to be sure the garden isn't infected. That's another reason why exporters don't just buy any farmer.

Question: What were so of the details in the contracts London fruits used to sign with farmers?

Answer: What we used to do is a contract that favors both of us because they are situations or they are seasons were you find the produce is flooding the market meaning the demand has reduced the other side in the market so when the demand goes down they will be an overflow and people will have nowhere to sell and other will just keep dumping but for us we would tell them we will take the produce even during the time when the produce is in plenty so because of that my boss had an understanding with that importers they had away they would agree such that in the season when the produce is plenty they cut down the prices to see that they can carry more volume of making the farmers lose out and this was also helping us to maintain the gardens because when you have started harvesting and you don't harvest the gardens die very fast so this continuous harvesting plants the plant to keep producing more and you look after them then spray. So farmers would run to us because we are the only one who would take a lot of produce during plenty whereas many of the exporters wouldn't do that and also became jealousy. "For us we are not taking and this man is carrying lots and lots of stuff where is he taking it" but everyone has his own market so it's also the way you discuss it with your buyers and how about are your buyers some importers can go an extra mile to look for market elsewhere. So they importers would give him assurance that we shall buy so much.

Question: Did the contracts have terms of payments?

Answer: Yes we would put terms of payments, we used to ship 3 times a week and we used to make payments twice a week so Wednesday and Saturday so we agree like if you were supplying at the beginning of the week we make payment on Saturday

reason being you want this produce reach the market be received because we they is a possibility of an interception so when we send the produce and it reaches the market and it's accepted we also make payments to our farmers if the produce is intercepted we sit down and found out where is the problem coming from who gave us infected hot pepper.

Question: How would you find out who has given you infected produce?

Answer: We used to give codes to our farmers and ensure that all these codes appear on the phyto-sanitary certificate so when they intercept they look on the codes like code number so and so has been intercepted so they give us a feedback and record what they have intercepted so that helps us to follow from our records and know these people brought us hot pepper which had a moth we call them and tell them your pepper is infected and in most cases they used to admit and they would say "we were just trying to see that it will pass but we know we have the FCM" others would tell you "we have been spraying so now tell me what chemical should I use". We used to get them like that and would help them get rid of the moth. That's how we would agree terms of payment, we pay after the produce has been received in the market and they also accepted it.

Question: Is it possible to get a copy of that contract

Answer: I don't know if you can get it because me when I left London fruits we left everything on the laptop.

Question: Haven't you developed any contract for North Road?

Answer: No I haven't yet

Question: What kind of supplier development would you give to the farmers?

Answer: Actually what we used to do is give them small loans which would deduct when they start supplying because they would end up with us and wouldn't sell elsewhere. So we had an arrangement where we would give these people small loans in form of cash other we would get with them and see what do they want, others wanted sprayers, other wanted money to stock chemicals, others would want to enlarge their gardens, others would want to construct an irrigation system on their garden because they are those that would be close to water and would tell us they want to construct an irrigation so that they would supply in season and out of season. We would ask them to make a budget of how much they need and them my boss would go head and buy for them the things they need or give them money and they do whatever they want to do.

Question: Would you give them agro-chemical inputs?

Answer: The pesticides we used to get money and give them or we would buy for them but in most cases we would give them money and they purchase for themselves.

Question: Would you offer trainings on how to use the agro-chemicals?

Answer: We would hold trainings at our office and write to ministry of agriculture to give us inspectors to come and train the farmers.

Question: How often would you hold these trainings?

Answer: We used to do that like 3 times a year.

Question: What were the benefits of you training the farmers and giving them loans?

Answer: Actually the benefits were that our buyer would always get whatever quantities they are asking for because we had assurance from the farmers to bring all the produce to us and not selling to other exporters so that's the advantage we had that all the farmers we used to support would bring the produce so however big the order would be we would still sustain it.
It helped us improve the quality of the produce and helped our farmers learn how to look after the gardens especially hot pepper, the vegetables were having a lot of issues they were easily attacked by the pests so these trainings were helping the farmers learn how to look after the gardens and how often to do the spraying.

Question: Would you train the farmers on how to transport the produce?

Answer: Oh yes we used to guide them on how to do the packing and how they should be transported the fact that you can't rule out the bodaboda [motor cycles], they are people in places where a vehicle can't reach but a bodaboda (motorcycle) can reach so we wouldn't discourage them not to use a bodaboda but would tell them on how to package because they used to use sacks and when you put these perishables in sacks they get spoiled especially the hot pepper and garden eggs. They get bruises and for hot pepper it easily breaks and by the time the person gets to the pack house the sack has alot of damages, we would encourage them to buy the second hand class paper boxes (imported apple boxes). We tell them get these boxes pack your produce and tie properly with a rope and maybe put on a bodaboda, if it's packed that way it will reach the pack house in good shape.

Question: Would you teach them how to sort the produce?

Answer: We would teach them to do the first sorting though they would bring the produce and we resort it.

Question: What would be the essence of the first sorting?

Answer: To reduce on the work load at the pack house because we used to have many farmers because them not sorting was causing us to have more damages and look for where to dump them so this was helping us to reduce on the garbage

Question: What are some of the difficulties you would encounter while training those farmers?

Answer: One of the difficult is that we would give people money to go and prepare their gardens and you find they are in place that is dry and the soil isn't good so

someone would think if I would grow the hot pepper it would yield he grows it and it fails, so those people would take time to pay back the money and actually by the time my boss died many had a lot of money with them but the fact that the company was torn apart we had no base to stand and ask for this money because if the company was still in operation we would say you're the farmers who owe as so much and would follow up on such things.

Question: Wouldn't you find difficulties in training farmers?

Answer: The challenges would be maybe they are those that never went to school like you really need to get a trainer who knows a local language and others would take long to understand the content of the training. The fact that most of these chemicals instructions are written in English and farmers don't really understand them so they keep doing the opposite of the instructions. We had an incident with a farmer who messed up the chemical and it splashed in the eyes so am sure this person has lost this eye because he went up to Kenya and they told him that they are going to operate him but the eye had stopped seeing and he was under a lot of pain and it was due to poor handling of the chemicals.
The other problem was you know these chemicals are very dangerous and others would get challenges in handling, they were handling it with bare hands and remember these don't go from the hands easily without using a detergent an people were getting problems after touching the chemical and come eat food but until we had several trains telling them that mey washing with water can't remove them until you use liquid soap even this bar soap can't remove them, so later we advised them to buy gloves and wearing protective gear during mixing and spraying.

Question: If given an opportunity to do supplier development in North Road and given the mistakes you learnt from London fruits. What would you do differently?

Answer: The fact that I have that experience I wouldn't want myself to repeat those mistakes which were affecting the farmers. We would make sure we help those farmers because most of them as much as we told them buy protective gear some of them would prefer to be given because they didn't know where to purchase them. I would stock these protective gears and ensure that they purchase them from me and ensure every farmer has protective gear because we Africans take things for granted we don't know how to protect our lives yet these chemicals are very dangerous, I saw it from that farmer who mishandled the chemicals.
I would also want to work closely with the farmers because I want to have good quality for my farmers it's want will keep me in the market. By closely working with the farmers I mean like visiting the farmers on their gardens during the time of production because then we used to have field workers and I was based in the office though I would administer most of these people that were going in the field and some of them wouldn't go and reach the farm but he would come and tell you he reached their because from his experience he knows what to tell you and he would tell you oh I saw this and that and you have no way of proving that his telling the truth, luckily enough technology has improved things now me I would want to visit the farmers and ensure

that they are doing the right or proper agronomic practices. The questions would be is the farmer having protective gear, a pit where to dispose off the used chemical contains which can also be used for disposing water used for cleaning the sprayers and mixing containers.
Also ensure that this farmer has a proper shade whereby when they are harvesting they come to the shelter to do the first sorting not directly in the sun. I would love to do close supervision because my boss never used to do that but if you want good quality you have to reach out to farmers see what problems they are facing, we used to ask them from office but if you visited a farmer these people will know your with them and you love what you're doing because some of them get discouraged when they see the person they are dealing with is not encouraging them they give up and so many people are out there who want to grow these products but they don't know what to do but if you visit and remind them your supposed to do this, this person will take precautions and in the end we will also be protecting the farmers because very many people have developed illness that are different to treat out of ignorance. This will enable me to sure that the products they're harvesting are free from chemical residues. And also ensure that the time they take after spraying to harvesting is well followed before the produce is brought to the market. The farmers need constant training to understand that not to think that you're taking to the market you won't be affected because it might end up in your house or the restaurant in town where you will be eating the following day.

Question: What are some of the measures you put with North road or London fruits to avoid interceptions?

Answer: Firstly we came up with codes of every farmer; the other measure was to ensure that every farmer that brings produce goes through a system. The system was we handle the farmers in the order of their coming in. We would have sorting tables and make sure our farmers come from A to B and C, we receive the produce keep in the shelter to remove the field heat, once the field heat is removed we bring it to the first table for inspection to check if the product has no pest like the moth and this is done by a quality controller. He first checks if he say this is okay then we push it to the first table for sorting now the first group does the first sorting as they check out, the second repeats as they check for the FCM since it's a very complicated pest so we had people who had been trained to sort, the process was done like 3 times then we confirm this is ready for export that was the second measure on the codes.
Ensure that all farmer codes are recorded on the phyto-sanitary certificate to help do the follow up which farmer brought pepper that had infection. Because for use we wouldn't see the moth because it was in the egg or maggot stage but those people would see what we have missed seeing.

Question: What of avoiding interception because of documentation?

Answer: We never had such because our documents were okay. For those that got interceptions because of documentation they were duplicating for example you know you need a phyto-sanitary certificate because you go through hustles to get it you get

a blank one and make several photocopies and keep them this is want they were doing. After get these copies the exporters would be help that they have jumped the queues and hustle of getting it, before it used to work for them but when they noted that these people are using the same phyto-sanitary certificate that cleared goods yesterday with same serial number is also appearing again on many shipments they said there is a problem here and they informed the ministry of agriculture and immediately started intercepting them and they would give these people serial numbers of the phyto-sanitary certificates if they find your serial number of the certificate isn't in the serial numbers the ministry sent the other side the cargo with be intercepted because some exporters went ahead made their own phyto-sanitary certificate books and also make their own serial numbers.

Question: What of cases where exporters buy a whole phyto-sanitary certificate receipt book from inspectors?

Answer: Some of those cases were/are there were some would buy like a whole carton of phyto-sanitary certificates from the ministry and keep but the ministry people would record that we have sold like 20 or 30 books to London fruits and they have these serial numbers which would be used in a specific period of time.

Question: What type of information do you share with or receive from the farmers?

Answer: The first information I would share with them is quality when my buyer says I want this like this and that. Like if it's hot pepper I tell them make sure that all the stocks are attached don't remove them because when you remove the stock you reduce its shelf life and rots very fast but when the stock is there it might take even a week when it's still okay so the buyer gives you instructions and you pass them to the farmers.
And also information about the prices because the farmers are always complaining why are the prices always constant for this period so you tell them the demand has not increased so the prices are still the same but when they increase I will also increase for you and it automatic when the prices increase the demand increases and products become scare because I want to get my volume I will say I will give you this much.

Question: What kind of information do farmers share with you?

Answer: For them the information they share is mostly problems encountered with the product. He will come and tell you that I have a problem with a fungus or virus and he doesn't know what to do and would want some assistance from us and describe the infection, then what kind of chemical can help him.
They would also come to inquire if the type of soil is appropriate but that had started recently the issue of checking the quality of the soil whether it's okay for a specific product to yield

Question: What of fellow exporters what kind of information do you share with each other?

Answer: With fellow exporters it has been tricky since everyone has his own market people don't want to share information. They has been a big gap among exporters because each one is doing his own and doesn't want to know what the neighbor is doing and keeps hiding his information however, if they was unity and these exporters came together they would be able maybe to set prices for the products because they is a problem where you find they're those "buyers" (We thought that conmen were only in Africa but those white men also con people here) you can think you have gotten a buyer you supply for some time he pays you but runs away with some of the money and orders from another person so if the exporters were really united these problems would not be there because if you know buyer/importer was being supplied by maybe North road if he runs away from me and you know, you first inquire what happened what have you stopped supplying this importer but here someone just claps hands he has got a buyer without even finding out what happened not knowing this guy ran away with someone's money. We had a buyer who used to do that and coned many of the people here but he kept rotating from one exporter to the other but this was because people were not sharing information and worst of all you can't board a plane and go to the UK to look for him it's not a cheap thing to do.
The few people just share information on market prices these are mostly friends taking in the same market like the UK and sometimes we share information on the flight charges. You can have because I have a big volume they have given me a discount so I can even help to ship for you because I have a discount but that is done by a very few exporters but most of them everyone is doing his or her own thing that is the fruits and vegetables export industry in Uganda people don't want to share information they have tried bring exporters together but it's still a hustle.

Question: What of UEPB what kind of information do they share with you and the reverse?

Answer: The UEPB does all, they share information with all the exporters and they have tried to bring the exporters together and the information they share is about the markets and it's done by sending mails to exporters.
Before we used to get the certificates origin so they is an online system they want to introduce where exporters apply online but the systems are not friendly because you can sit on the URA system to apply for that certificate and you fail to go through and you end up doing it for 3 to 4 days.

Question: Is it because the system is complicated?

Answer: Yes the system is complicated sometimes it's on and off, when you go to the URA staff they will tell you this isn't my work we trained you people on how to use the system. The UEPB should have trained the exporters on how to use it and also endeavor to put a separate office to help those who are finding difficult because not all people have the same brains but you find you want that certificate and your shipment is a few days and you can't get it but before we would get walk into UEPB get it and walk away.

Question: What is the expiry period of the certificate of origin?

Answer: I don't know the expiry period but the problem is with the system of URA. This should be done in the office but you fail somehow you try to submit and it fails but when you go to URA they do it on their computers in just a few minutes but by the time you walk to them you have to give "something" it's not a free service and yet this certificates are supposed to be free. We are paying a lot of income tax when would I have to buy the certificate of origin. yet the profit margins on these products very small but the more volumes the more profits just like any other business but if you're doing 1, 2 or 3 tones it's very little money.

Question: What of the ministry of agriculture what kind of information do you share with each other?

Answer: The kind of information they share with us is like when they get information on interceptions from UK, Belgium or whatever destination and they share with all the exporters, even they send this message there is no secrecy everyone reads it for instance North road was intercepted and they sent this product to this nation with FCM
The ministry also gets information from the European union concerning the Euro GAP and they invite us to meetings and tell us what to do with regards to the standards like when they were coming for the audit we were communicating with MAAIF so it them that organized the exporters.
In addition, they always want to ensure that all the exporters have the required facilities in place.
When the EU was threatening to put a burn on Uganda so they were like look this is what these guys are planning so they would call us to see how we can solve the problem because this was affecting our exports and some affecting the economy during the time when we had many interceptions

Question: What are some of the risks/challenges you face as exporters?

Answer: The major challenge is with flight charges, the flight charges in Uganda they're crazy because they end up taking approximately 70% of what you would earn then remaining 30% is divided between packaging (which is expensive now days because the factories say they are importing the material and the dollar is up)
The other challenge is if you landed on a buyer who isn't stable or serious and for example you ship 2 to 3 tones to this person he doesn't pay you that might require you to sell your land to get back on track because you would have put in a lot of money and this is the major risk or challenge because after such an experience you can raise up again or completely fail. It's not easy to know that this in is going to con me or not you just try out when you find his good you do business, sometimes you find he wants the business but his just struggling and he takes long to pay so if he doesn't pay you in time you won't be able to do the next shipment until he pays.
The other challenge like in the UK they want to pay after they have sold the produce that means as an exporter you need to have money that can cover up 3 shipments if

you ship twice a week all the costs inclusive (mostly the problem is with the flight charges because the farmers can be talked to and they understand)
The risk with the farmers is that they spray today and want to harvest tomorrow instead of following the instructions so that can lead you into interceptions because the other side they check for chemical residues (MCR) that's why we need to keep a close relationship with the farmers because they take these things for granted but they need to know

Question: How do you receive your orders from importers?

Answer: Through mails or phone calls

Question: What are usually the specifications in the orders?

Answer: The packing is mostly determined by the shipper. He will say I want hot pepper so many kilos if it's 4kg you don't put 4.5kgs because he won't pay for the extra produce, then the color for the case of pepper

Question: Do you use ICT in your business?

Answer: Yes but most of them are busy and they tell you I don't have time to sit on a computer but sometimes they send the orders in advance to enable changes or adjustments which can be communicated in time

Question: Have you ever missed any flights?

Answer: No

Question: What have you done to mitigate this challenge?

Answer: You can miss a flight if you don't prepare in term for example if your shipping Wednesday you must have your order on Monday or earlier than that you can have it on Sunday. Monday you send people in the field to start bringing stuff, Tuesday they're bringing, on Wednesday if the plane leaves at 11am by 7am latest the truck must be leaving for the airport but ideally you have to dispatch the trucks at night if you don't want stress.
The late deliveries happen during the dry seasons in scarcity when you're trying to meet the volumes so this will be catered for with in those days. The problem is if you move late you will be handled late or you will be left because the flight doesn't wait for you it’s you who waits for the plane so you have to put time for the process at the airport starting with the traffic gam on Entebbe

Question: Is there a possibility of the produce losing weight?

Answer: Yes it's possible, the fact that we deal in fresh produce it's a tricky thing but the way we have tired handling that is by getting the produce when it's fresh because every time they stay they lose water like today is Monday if am shipping on Wednesday I need most of the cargo to be with at most by the end of the end Tuesday were as some of the produce might arrive at night because of the long distances (for

matooke when the demand is too high sometimes they go inside Tanzania to get them). Issues would arise with mechanical breakdowns but we used to make sure that if they is any breakdown with a vehicle the office is informed immediately so that it can be dealt with very fast (All this was done in time so that we avoid late deliveries)

Question: What is the role of clearing agents in the export business?

Answer: What make the clearing agent effective is you the shipper because you provide the information in time. If you have got the volume of your cargo inform him immediately I have this tonnage, this is the breakdown so when you give him the breakdown it helps him process the documents very fast if you delay to give him the information things will also delay. Like the certificate of origin you have to fill it in and they take it to URA and they upload it on their system to get authorization of dispatching the cargo by stamping by URA so those things you have to make you give information to the clearing agent so that everything can be done in term.

Question: What recommendations would you give the government, fellow players or the EU that would help in improving the business of F&V?

Answer: I would begin with our government here as much as the government says they don't tax fruits and vegetables exporters but me I know they do because at the end your business your supposed to pay income tax I would suggest if government would help and negotiate with these airlines and they give a reasonable rate because the flight rates really crazy it's too much, I heard Rwanda negotiates for exporters and if the president says that charge is too much it cannot work for my people but the airline refuses then he will not bring in his plane in the country but he there is no voice for exporters the airlines charge the way they want and will tell you that you have 1 tone so they charge you more in most cases they consider those with big volumes but we are all on business and if you're over charging more the small exporters when will they ever grow.

The government should put in more effort on chemicals because we have people hear who are faking chemicals and giving them that are not fit for the purpose or which are harmful and farmers are innocent they are ignorant so they keep spraying but it's not working so we lose out because if you can't have your products sprayed properly they won't be accepted. If the government would say we are bringing these chemicals from the source no faking and punishing those are faking
Maybe what I can talk about interceptions because they really put out some many people out of business, these people don't tell you want was wrong with the interception but they just tell you we have intercepted your 40 boxes we found a moth. Take a photo and show me what you have found and so know. The only way part of your produce can be intercepted is when they have different codes and what used to happen before is when you have 400 boxes of hot pepper and they are 10 with the moth the entire consignment would be intercepted so that's how we came up with this method of splitting the codes on the phyto-sanitary certificate.

END OF THE INTERVIEW

Appendix 3: Inspector Interview (I1)

Question: What is your name sir?

Answer: Am called EM [I1]

Question: What do you work as in the ministry of agriculture?

Answer: I work as an agricultural inspector currently in charge of fruits and vegetables export

Question: What is your operational area?

Answer: My operational area is Kampala and the neighboring areas depending on where the pack houses are located

Question: Do you have any designated number of exporters you work with?

Answer: I have up to 36 exporters whom I visit on different days

Question: How is your schedule with them?

Answer: I depend on phone calls when they have a shipment

Question: What is your role and responsibility as an inspector of fruits and vegetables?

Answer: My role is simply to inspect and certify, if your complaint I certify

Question: Explain more about the inspection bit what do you look for?

Answer: Depending on the product we inspect a wide range of products for example hot pepper or chill I look for the FCM it's one of the regulated pest and the foul army worm, then when I go to egg plants I look for the eggplant fruit borer. So I check the produce for compliance to EU requirements that means I check for pests and diseases but I also check for the general hygiene if it measures the sanitary conditions like if the place is clean enough and you can handle the produce from their without any infection or contamination and depending on the product I look for different things for example if they are pineapples I will look for the mill bugs, if it's pepper I look for the FCM, if it's chilly I look for the fruits flies danger symptoms sugarcane I can look for the sugarcane stock borers so inspection is product specific, for sweet potatoes I look for the potato weevils so those are some of the things I look out for.

Question: What would be some of the things that would cause you rejecting signing a phyto-sanitary certificate

Answer: For example if I find a harmful organism I don't sign for that one and the inspection depends on sampling if I find a harmful organism in a sample of a given product I don't certify for that product.

Question: Isn’t there acceptable qualities of harmful organisms?

Answer: For harmful organisms to the EU its zero tolerance, if I find them the entire load of that product in the consignment is rejected

Question: Do you also enforce things to do with traceability of consignments?

Answer: According to the new EU requirements traceability is a big issue. I have to make sure that exporters have traceability codes that can show you right from the names of the farmer, the locations and also the farm, the codes must simplify so I have to make so that the codes are in place and they are put on boxes before shipping.

Question: Do you know that some of these source produce from brokers. How do they present that on the boxes?

Answer: The issue of brokers issue have not come across that issue because the exporters I go to the show me the lists of the farmers and where necessary the ministry organizes and we visit the farmers what I can't talk about is sourcing from brokers because I have not been following that

Question: How do inspectors help in supplier development (farmers)?

Answer: We work hand in hand with local governments (at district level) and we offer trainings to the farmers but at exporter level it's demand driven; they have to request us then we respond but we offer trainings to different categories farmers, sorters, transporter and even the clearing agents.

Question: When do you offer these trainings?

Answer: For the farmers it depends on budget releases for the ministry because every quarter there is some money that can be put aside for training farmers so we prioritize those that show a need or where we hear presence of a harmful organism we go and train them but also exporters invite us to train their farmers when they observe that they is a challenge in their activities so it's more of a response to a request by exporters.

Question: In case you have identified there is a harmful organism in their consignment and the ministry has released money to go and train farmers, what are some of the aspects that you would train farmers on?

Answer: We train farmers on the determination of harmful organisms because it's an important point, as a subset of determination we train them on identification of harmful organisms and on the chemical control were it can take away the issue and we can also train them on IPM. We also train them on clear sorting and degrading to avoid the harmful organisms being past on the produce to exporters but we also train them on general aspects like agronomy (the general agricultural practices) things like early

planting to escape the pest attacks, the use of protective gear is also part of the training, also soil and water conservation. We go to the extent of phyto-sanitary and quarantine operations were necessary to stop the disease.

Question: How do you monitor the quarantines?

Answer: Of course we work hand in hand with local governments and district production coordinators these are very important because for us (inspectors) have a very limited team but we also have now agricultural police which can be involved in were necessary to block movement of infested produce from one region to another.

Question: Do also clear the infected farms/gardens?

Answer: Where need be we can do that but it has been happening in major diseases like banana bacterial wilt but for the fruits and vegetables we have really depended on the farmers. We give the advice, demonstrate in the field but the entire operation is left at the farmers level to handle in collaboration with the agricultural officers of a Sub-county where possible.

Question: When you do training, what feedbacks have you heard concerning farmer performance?

Answer: For instance we have listened to testimonies from farmers I can give an example of chilies and peppers farmers have told us in several sessions that how they are able to identify the pest, on how to avoid it, implementation of IPM practices we have heard such stories but also we have seen a reduction in interceptions of the exported consignments with can be traced back and show the farmers have really taken in what we have trained in pest control and disease management. So at pack house level we have seen a reduction in the cases of infestation of the produce.

Question: Paint a real picture of when you receive a phone call from an exporter to when you issue out a phyto-sanitary certificate.

Answer: When I go to a company responding to a phone call the first thing I would look out for is the presence of the consignment and also the documents describing the consignment, I first carry out documentation checks and these include the packing list where possible I also look at the invoice because the packing list will show me the quality of the produce and will also describe the produce in the consignment then after that I go in the real physical examination of the produce after looking at the documents. If it is capsicum I will check how many boxes are there and I will determine my sample size, i first look at the list and look at the produce if it's available as declared on the list before physically examining the produce.

Question: What do you write in the inspection report?

Answer: The report will indicate the date of inspection, the name of the inspector, the produce inspected (you quantify in the report) for example if they are 100 boxes of capsicum I will indicate that I have inspected 20 percentage I must record that and in

this report I also give my observations or findings and I also give recommendations, if I recommend that you destroy the consignment I will show it in the report and if it passes my inspection I will also show it in my report that the consignment is cleared for export and I have to sign on that report and also bet it but in the report the quantities inspected must be part of it and what I look out for.

Question: Who remains with the report?

Answer: That's part of my work I know when I inspect I write an inspection report before proceeding on whether to give a phyto-sanitary certificate or not and where it (the consignment) does not pass I give a rejection notice. So the report remains with the exporter.

Question: Talk more about the rejection notice?

Answer: It's also given to the exporter, but all these ones copies go to the ministry. The rejection notice shows the consignment inspected and which harmful organisms you have been able to identify and the steps taken plus the signatures of the inspector and exporter as a sign of agreement that you have rejected the produce

Question: What is the standard procedure of sampling of capsicum?

Answer: What we have been doing when the boxes are less than 50 we do 100% inspection as the number of boxes increase we also reduce the number of boxes being inspected for instance if they are 150 boxes I might decide to inspect 45 or 60 boxes but normally we consider a sample that is not less than 10% of the total produce if they are 200 boxes at least you don't go below 20 boxes inspected, we have a standard operating procedure for export certification which I don't have here now but it shows how the sampling is done depending on the volume of the consignment.

Question: What do you write down on the phyto-sanitary certificate?

Answer: The phyto-sanitary certificate is supposed to show the full contact address of the exporting company, it must show the consignee that's the importer, date of inspection, the location of the pack house, the number and descriptions of the packages (how many are they, what do they weigh because somewhere you have to show the net total weight), date when the phyto-sanitary certificate was issue, a section of additional declarations these are special statements that are put on the certificate that the product is free from a such pest and these statements are captured according to EU requirements or directives and also there is a section of treatment, in case you do any treatment before it goes your supposed to indicate which treatment and which chemical have you used, the duration and time, you sign somewhere give your names plus the date.

Question: How many inspectors are there in Kampala for fruits and vegetables?

Answer: As I speak now I used to work alone but we are now 3 inspectors and that's the team handling fruits and vegetables exports in and around Kampala.

Question: How do you handle when you have about 20 consignments a day?

Answer: These exporters have their shipping days but what we did is we divided the companies. Each inspector has about 10 to 12 companies so the exporters are supposed to communicate to we the inspectors about the days they are going to ship so that we program ourselves, you know on a given date and time you will be inspecting company X from there you go to another company Y so it depends on the communication from the exporters but it hasn't been an easy thing at times we have found ourselves reducing the inspection time because you have to leave and go somewhere for an inspection but also what we have been emphasizing on is internal inspections by export companies having agronomists so they are also supposed to check internally then for us we come and do the final checkup that is how we divide ourselves. We give time ranges depending on the communication from the exporters about the shipping dates and time.

Question: Do you give trainings to internal inspectors?

Answer: Yes, we occasionally give them trainings

Question: How often do you give these trainings?

Answer: You know government business also the money is released in quarters and for a quarter they might release like a single training so what we have been emphasizing we talk to these exporters and somehow facilitate that trainings in that case we can have trainings on every after 2 months

Question: Who facilities the inspection? Is it the exporter or ministry?

Answer: At the moment the ministry does not facilitate inspectors it's exporters who do so because they are no ready funds to fuel the vehicles and give allowances to inspectors we depend on our salaries but it's exporters to facilitate we don't give them a standard amount but according to what they can hold.

Question: What are some of the challenges you face as inspectors?

Answer: At times exporters work in the night during the day they are organizing produce from the gardens so we have a challenge of moving from one pack house to the other especially in the night they are security challenges but even when you inspect the pack house should have good lighting conditions so they are challenges like visible you have to have good light in order to check for harmful organisms.
But also logistical challenges what they give isn't much and you're supposed to move to direct locations they are transport challenges I think the government needs to look at this issue seriously.
Late deliveries by farmers, at times you go to the pack house and you don't find all the produce that you have to inspect and you can't keep their for the entire time you have to go to another pack house which inconveniences the inspector.
The exporters find it difficult to reject produce because for them they're after money making so enforcement of the rejection is a challenge. We remain worried at times

you might reject something when you leave you never know what happens they might add in some of the boxes. (Limited cooperation especially were rejection has to be enforced)
Also the volumes to be inspected have a lot of diversity, pineapples, mangoes, avocado etc and each one requires a different inspection regime because of variations in the produce.
Because these exporters because they facilitate the inspection they believe you must follow their suggestions because they have funded the activity which is wrong and we always emphasize that the inspectors word is final but they always have that attitude such they are part of the facilitation you must work according to their requirements.

Question: What are some of the requirements from the exporters that compromise compliance?

Answer: The exporters target is to have bigger volumes of the export and the inspector target is safe trade to see that the consignment is not infected so somehow the requirement of the exporter is a bigger volume of the produce passes your inspection. For example the exporter might be interested in fulfilling 600 boxes of capsicum according to the order from Europe and you inspect and find only 200 boxes can pass so that can lead to a compromise because you're not in agreement with the exporter and they want to harass to clear all the consignment.
But also issues of hygiene, you might find the produce isn't clean enough and you tell them you have to clean this produce. I can give an example of maybe sweet potato you have to remove the soil if you find it dirty and because their target is always to catch up with the flight and the cleaning might not be done well which leads to lack of compliance because sanitary conditions are also catered for.

Question: I have some understanding that you also inspect rejects

Answer: For rejects we have to ensure that they are taken away for instance most of the exporters send the rejects to the local market. Part of our responsibility is that the rejects are taken away to avoid adding on the number of boxes to the produce.

Question: What if you come and find an exporter without rejects what do you do in that case?

Answer: Of course, I have never found a case without rejects and you emphasize that it's removed as fast as possible. I never found a case where the consignment is 100% fit for export that's why in the inspection report we write I have inspected such and such export and these numbers of boxes I have found that they are compliant so rejects are always part of the system.

Question: What recommendations would you give as an inspector to improve the fruits and vegetables exports?

Answer: The first thing I would recommend is that they is need for inspection right from the places of inspection, there is need for inspectors to work closely with the farmers right from planting or field preparation in order to overcome these infestations

targeting inspections at these pack houses will not solve the problem of interceptions. Inspectors should work with the farmers following the produce chain up to the pack house.
I would also recommend that local governments register these farmers and work closely with them because they are known then the ministry inspectors. I would also recommend that the team of inspectors be boosted because currently we are under staffed we need to have a bigger team of others going to the field and others targeting pack houses and exit points inspections like at the airport (for fruits and vegetables they is no exit point inspection it only happens at the pack houses)
I would also recommend that each exporter such recruit an agronomist or quality controller who is qualified in agriculture at least at diploma level because we really need these internal inspections be conducted very well because we can't be everywhere so these agronomist can do part of the job.
Exporters need to work hand in hand with the farmers to avoid late deliveries, timing is an issue let the deliveries be made in the first part of the day then it can be sorted and we inspect.

Question: Have you reached case where you have intercepted a produce and then it gets intercepted?

Answer: Yes that happens because some of the harmful organisms have difficult stages which can't be easily detected for example the eggs of some of these pests like the foul army worm or FCM at pack house you might inspect and they escape as the shipment goes to the EU the eggs hatch into the larvae which can be detected by EU inspectors so this happens with some of the products we have inspected. That is why I suggest that inspection should be done at garden level to avoid infestation in the field because if the harmful organism attacks the produce it might escape in terms of eggs. Even as part of your sampling space some of the produce might escape with harm organisms.

Question: What are the negative aspects that come with some of the consignment you have inspected gets intercepted?

Answer: Of course, you as an inspector you become demoralized it's like you haven't done a good job. In cases of destruction it's a pitch to the he exporter to see what you have inspected is destroyed and might have cost implications although it doesn't apply to us but the relationship between the exporter and inspector is negatively affected.
In the ministry it might be seen as if you're not doing a good job in inspection that's the negative side of it.
The government needs to increase the frequency of trainings of farmers, exporters and all those involved in the export chain.
Government also needs to facilitate inspectors because somehow their stand is compromised when you’re getting facilitation to the exporter whom you're try to ensure that his complaint.
They must be a standardization of pack houses to ensure proper hygiene and avoid contamination of the produce.

END OF THE INTERVIEW

Appendix 4: Extract (Findings 2016 Audit Report)

Executive Summary

This report describes the outcome of an audit carried out by the Directorate General for Health and Food Safety of the European Commission in Uganda from 6 to 15 September 2016. The objective of the audit was to evaluate the system of official plant health controls for the export of plants, plant products and plants intended for planting to the European Union (EU).

The production system for plants for planting, vegetables, herbs and cut flowers to be exported to the EU is aimed at minimising pest presence. With considerable efforts, the growers of plants for planting and roses are able to keep the risk of presence of harmful organisms in the export consignments very low.

Uganda has an established plant health system with an appropriate legal framework. In recent years, the National Plant Protection Organisation (NPPO) introduced several additional measures, which improved the system of official phytosanitary controls. Although the inspectors are experienced and well-trained, severe staff shortages prevent the NPPO from running an official export control and certification system fully in line with EU requirements.

Official controls are carried out in greenhouses, at pack houses and at the airport, however their scope and frequency are not in line with EU requirements. Phytosanitary certificates are issued for consignments after inadequate or in many cases without official inspections.

The NPPO requires growers and pack houses to operate a system of own phytosanitary inspections during cropping, harvest and packing and considers these private inspections to be part of the official control system. Although the NPPO to some extent audits, supervises and verifies these private activities, they cannot replace official inspections, in particular due to the potential conflict of interest.

As comprehensive information is not available about the absence/distribution of certain harmful organisms of EU concern in Uganda, certain statements included on Ugandan phytosanitary certificates cannot be considered as reliable.

Although the current inspection system is not compliant with EU requirements, the recent efforts for its improvement have resulted in a low number of EU interceptions of plants for planting and cut roses. A similar system, which is being developed and implemented for fruits and vegetables, has not yet provided similar results.

The report contains recommendations to the NPPO of Uganda to address the shortcomings identified.

2 OBJECTIVES AND SCOPE

The objective of the audit was to evaluate the system of official plant health controls for the export of plants, plant products and plants intended for planting (plants for planting) to the EU. To meet the objective the following meetings and visits were carried out:

Meetings, visits		**No.**	**Comments**
Competent Authorities	Central	2	MAAIF NPPO
Plant health control sites	At producers, pack houses	7	Producers of plants for planting, roses, vegetables and herbs, export pack houses for vegetables
	At the border	2	Entebbe International Airport - two cargo handling centres
Plant health laboratory		1	Plant Health Laboratory Namelare

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Although the current inspection system is not compliant with EU requirements, the recent efforts for its improvement have resulted in a low number of EU interceptions of plants for planting and cut roses. A similar system, which is being developed and implemented for fruits and vegetables, has not yet provided similar results.

6 OVERALL CONCLUSIONS

The production system for plants for planting, vegetables, herbs and cut flowers to be exported to the EU is aimed at minimising pest presence. With considerable efforts, the growers of plants for planting and roses are able to keep the risk of presence of harmful organisms in the export consignments very low.

Uganda has an established plant health system with an appropriate legal framework. In recent years the NPPO introduced several additional measures, which improved the system of official phytosanitary controls. Although the inspectors are experienced and well-trained, severe staff shortages prevent the NPPO from running an official export control and certification system in line with EU requirements.

Official controls are carried out in greenhouses, at pack houses and at the airport, however their scope and frequency are not in line with EU requirements. Phytosanitary certificates are issued for consignments after inadequate or in many cases without official inspections.

Appendix 5: Extract (Findings 2019 Audit Report)

Executive Summary

This report describes the outcome of an audit carried out by the Directorate-General for Health and Food Safety of the European Commission in Uganda from 10 to 18 October 2019. The objective of the audit was to evaluate the system of official plant health controls for the export of plants and plant products to the European Union (EU).

The National Plant Protection Organisation of Uganda (NPPO) requires growers and packing houses to operate pest controls in the crops and pest related quality checks on the exported goods which contributed to the improvement of the EU conformity of consignments of plants for planting but do not maintain a sufficiently low level of harmful organism (HO) presence in other crops or consignments.

The NPPO has improved the conditions necessary for export inspections, in particular by staff increases and implementation of standardised procedures. Efforts were also made to enhance cooperation with the associations of growers and traders.

The system of official inspections of plants for planting has been improved and currently it is in line with EU requirements. This is reflected in the low number of EU interceptions with HOs.

For peppers Uganda certifies that the fruits were produced at places free from false codling moth. However, the system of official inspections cannot guarantee that the place of production is free from that pest which is indicated by the high number of EU interceptions. Therefore importing peppers from Uganda poses a considerable phytosanitary risk for the EU. The proper application of any of the two relevant options provided by the EU legislation - pest free places of production or effective treatment of the fruits – would require significant additional efforts.

Although the inspection systems of roses, fruits and vegetables other than peppers are in line with requirements of the relevant international standards, the high number of EU interceptions with HOs raises concerns about the implementation and/or the achieved level of confidence. Therefore, imports from Uganda of these products pose a phytosanitary risk for the EU, in particular regarding fruit flies and False codling moth.

The Ugandan phytosanitary certificates do not always reflect correctly the plant health status of the consignment and that the goods were produced in line with EU requirements. The measures applied in response to EU notifications did not result in the reduction of interceptions due to the presence of HOs.

The report contains recommendations to the NPPO of Uganda to address the shortcomings identified.

6 OVERALL CONCLUSIONS

The NPPO requires growers and packing houses to operate pest controls in the crops and pest related quality checks on the exported goods which contributed to the improvement of the EU conformity of consignments of plants for planting but do not maintain a sufficiently low level of HO presence in other crops or consignments.

The NPPO has improved the conditions necessary for export inspections, in particular by staff increases and implementation of standardised procedures. Efforts were also made to enhance cooperation with the associations of growers and traders.

The system of official inspections of plants for planting has been improved and currently it is in line with EU requirements. This is reflected in the low number of EU interceptions with HOs.

For peppers the NPPO certifies that the fruits were produced at places free from FCM. However, the system of official inspections cannot guarantee that the place of production is free from that pest which is indicated by the high number of EU interceptions. Therefore importing peppers from Uganda poses a considerable phytosanitary risk for the EU. The proper application of any of the two relevant options provided by the EU legislation - pest free places of production or effective treatment of the fruits – would require significant additional efforts.

Although the inspection systems of roses, fruits and vegetables other than peppers are in line with requirements of the relevant international standards, the high number of EU interceptions with HOs raises concerns about the implementation and/or the achieved level of confidence. Therefore imports from Uganda of these products pose a phytosanitary risk for the EU, in particular regarding fruit flies and FCM.

The Ugandan PCs do not always reflect correctly the plant health status of the consignment and that the goods were produced in line with EU requirements. The measures applied in response to EU notifications did not result in the reduction of interceptions due to the presence of HOs.