UCT GRADUATE SCHOOL OF BUSINESS
UNIVERSITY OF CAPE TOWN

Innovation and value creation in the fish and cut-flower export sectors in Uganda

By

Timothy Esemu

MBA; BComm (Hons); Grad ICSA.

Thesis Presented for the Degree of
DOCTOR OF PHILOSOPHY
in the Graduate School of Business
UNIVERSITY OF CAPE TOWN

Supervisor: Professor Eric Wood

July, 2012

Abstract

Innovation and value creation in the fish and cut-flower export sectors in Uganda: Timothy Esemu - July, 2012

This empirical study investigates the extent to which Ugandan fish and flower exporters are creating value and increasing their profitability through innovation activity and whether or not they are improving their ability to manage innovation projects effectively. It applied a mixed-methodological approach using a survey questionnaire and semi-structured in-depth interviews administered on production, quality control, marketing and financial managers. It used primary and secondary data to develop financial models to estimate operating profits from different combinations of product, process and marketing innovations at industry and company levels. Empirical evidence shows that the lines of business that are associated with the highest profitability in one period change over time, thus confirming the need for and potential benefits to be gained from innovation. It also shows that while most innovations were on average associated with improved profitability, the profitability of certain innovations was lower than for existing business lines, an indication of value destruction from such innovations. The study further demonstrated that limited progress has been made in penetrating premium export market segments (in particular retail channels) where there appears to be potential for higher financial returns. Additional results show that there is significant disparity in the ability of exporters from both sectors to create value from innovation activity, and that this appears to be linked to differences across firms in the speed with which critical capabilities are developed. A regression analysis shows that there are different sets of factors which are associated with profitability differences across firms in the two sectors. These results suggest that if managers are to obtain the best possible financial returns from innovation activity, they need to develop specific innovation management capabilities which are tailored to their specific context. The study also has implications for public policy in that it highlights areas in which public research bodies can help exporters to reduce risks and enhance returns to innovation activity by helping them to recognize and manage the associated risks and thereby improve their potential to create value from innovation.

Declaration

I, TIMOTHY ESEMU do hereby declare that this thesis is an outcome of a study that is my original work and has never been published anywhere or submitted before for an award of a degree at the UNIVERSITY OF CAPE TOWN or any other University.

Candidate: Timothy Esemu

Signed:……..

Date:……..

Dedication

This thesis is dedicated to my parents who brought me into this world and worked so tirelessly to get me to this level. Thank you for all that you have done to make me who Iam.

Acknowledgement

Thanks and acknowledgements are due to the following:

My supervisor, Professor Eric Wood of the Graduate School of Business, University of Cape Town. Thank you for the dedicated professional guidance and support throughout the difficult and trying moments of my research. My thanks also go to the helpful advisors in the Graduate School of Business University of Cape Town and at Makerere University Business School. Friends and colleagues (past and present) at Makerere University Business School, especially the Principal, Professor Wasswa Balunywa for the encouragement and professional support and to all others in the Department of Marketing and International Business. The people in the flower and fish export sectors in Uganda who shared with me their valuable time and insights. The staff of Uganda Flower Exporters Association (UFEA) and Uganda Fish Processors and Exporters Association (UFPEA). The German Academic Exchange Program (DAAD) for the scholarship that gave me the financial support to study at the Graduate School of Business University of Cape Town.

My family who have supported me through EVERYTHING. Your patience and endurance will always ring in my mind.

Table of Contents

List of diagrams and tables

Chapter 1: Introduction and Overview

1.1 Introduction

This chapter provides an introduction to the thesis, gives an overview of the empirical approach taken, and sets out its structure. It describes the general research area and the specific research objective and questions addressed in the thesis. The chapter also points out the scope of the study, its significance and why it is relevant to management practice and public policy. The main objectives of this chapter are:

- To introduce the thesis and state the key motivation for the study;
- To state the research objective and questions pursued in the empirical study;
- To give an overview of its theoretical and empirical approaches;
- To justify the topic.

The empirical study reported in this thesis aims at analyzing the role of innovation management in firm value creation and financial sustainability in the Ugandan fish and flower export sectors. Although innovation is widely considered to be a significant driver of firm performance (McWilliams & Siegel, 2000) and essential for survival (Brown & Eisenhardt, 1995; Christensen & Bower, 1996; Covin & Miles, 1999; O'Reilly & Tushman, 2004), it is difficult to demonstrate a strong empirical relationship between innovation and financial performance (Tidd, 2001). Most empirical studies on innovation performance have concentrated on analyzing the relationship between innovation and firm revenue growth (e.g. Cooper, 1994; Cooper & Kleinschmidt, 1995; Tidd, 2000). In contrast, relatively limited attempts have been made towards analyzing whether innovation creates value and improves financial sustainability, most particularly among agro-commodity exporters in poor sub-Saharan African (SSA) countries. An analysis of innovation and financial performance is important because it provides insights into how innovation creates financial value and sustainability for the company since it has a high risk of failure and could instead result in value destruction (Leonard-Barton, 1992; Cooper, Kleinschmidt & Edgett, 2001).

The theoretical base for this empirical study is adopted from mainstream innovation theory (Schumpeter, 1942; Drucker, 1985; Porter, 1985). According to this theory innovation is the source of value creation. Accordingly, the study integrates marketing theory (Hunt, 1983; Kotler & Amstrong, 2001) and the "resource-based theory" of the firm (Barney, 1991) to provide a theoretical framework for empirical analysis of value creation and value appropriation. Value creation is a process through which companies produce goods or services and deliver them to the consumers in markets in order to satisfy their needs (Barney, 1991; Grant, 1996). A company has to capture and retain part of the value created in order to provide sufficient returns to investments in innovation activities and hence contribute positively to its financial position (Porter, 1985; Grant, 1996). Both value creation and appropriation are therefore important for the future financial sustainability of the company (Barney, 1991).

The main theoretical proposition in this study is that innovation can lead to improvement in profitability and competitiveness only when net revenue gains from innovation exceed the full costs of that innovation. This is a pre-requisite for evaluating whether innovation is associated with a net improvement in financial performance for the company (Porter, 1985) because the financial outcome of any innovation project is uncertain. There is always the risk that the project could destroy value rather than create it, thereby worsening their competitiveness (Cooper & Kleinschmidt, 1995). Under these circumstances, companies need to select and manage innovation projects very carefully in order to give them a reasonable chance of a positive outcome.

Although there are a number of conceptual approaches to the study of innovation namely: input-output approach (Pavitt & Walker, 1976), activity approach (Hansen, 1999), and the innovation systems approach (Lundvall, 1992; Malerba & Orsenigo, 1995), none of these approaches addresses the practical aspects of innovation management namely, idea generation, innovation development and project selection, risk management and financial performance evaluation. This study adopts the management (project) level approach to innovation (Cooper, et al., 2001) with a focus on the analysis of innovation project prioritization and selection, the innovation project mix, innovation risk management,

project exploitation, and the determination of firm-level capabilities that are critical to innovation success. This approach focuses on the most important goal of company innovation that is, creating economic and social value (Drucker, 1985) and also emphasizes innovation project selection because it is directly linked to optimal resource utilization and financial sustainability for the company.

The research approach adopted in this study involves a mixture of both quantitative and qualitative methods, what is commonly referred to as mixed methods (Tashakkori & Teddlie, 2003). This involves firstly a qualitative exploration of the innovations adopted by the companies within the particular industry and underscoring the dynamics and interaction between the different innovation activities. Secondly, a quantitative approach is used to model profitability margins associated with the different combinations of innovations in two agro-commodity sectors. Thirdly, the financial impact of different innovation choices across the companies in the sectors is analyzed. Fourthly, the main drivers of profitability differences across the companies in each sector are analyzed through regression analysis.

The rest of this chapter is set out as follows. Section 1.2 provides the background to the study. Section 1.3 presents the motivation for the study. Section 1.4 presents the research objective and questions pursued in the study. Section 1.5 provides the scope of the study. Section 1.6 highlights the significance of the study. Section 1.7 gives a summary of the main findings and contributions of the study. Section 1.8 presents an overview of the thesis structure. Section 1.9 presents the limitations of the study, summary and main conclusions.

1.2 Background to the study

Although innovation performance in agro-commodity export sectors in sub-Saharan Africa has attracted increasing attention in recent years (e.g. Dolan & Humphrey, 2000; Kjollerstrom & Dallto, 2007; Trienekens & Willems, 2007), these studies have concentrated on the analysis of general benefits to the exporters and improvement in export sales volume, revenue or pricing (Kiggundu, 2004a; Ponte, 2005; Wood &

Kaplan, 2005). They have not adequately explored the relationship between firm-level capabilities and innovation project selection, and how this contributes to value creation and financial sustainability.

Studies on innovation performance in agro-commodity export sectors in SSA have adopted either the cluster or value chain perspective. The cluster perspective is based on the pioneering work by Marshall (1920) and has been further developed by Porter (1985, 1990). It focuses on analyzing the role that external actors operating in a local geographical context play in innovation by improving company access to skilled labor, scarce inputs and local knowledge. The cluster perspective to innovation relates to the notion of the "industrial districts" (Brusco, 1982; Piore & Sabel, 1984; Pyke & Sengenber, 1992; You & Wilkinson, 1994). Industrial districts are made up of firms that are similar and geographically close and hence provide the potential for firms to interact and learn from one another, which in turn spur innovation. Within the context of innovation studies in SSA, cluster perspective has been adopted by a number of studies (e.g. Kiggundu, 2004a; Wood & Kaplan, 2005). The main output of cluster based innovation studies is the documentation of the environment for and determinants of innovation and their presumed contribution to increased firm revenue.

The global value chain (GVC) perspective (Gereffi, 1994) focuses mainly on analyzing the different stages involved in the production and marketing of both industrial and agro-commodity products and the role that leading international companies play in setting standards and determining the nature and patterns of innovation or upgrading mainly among producers in developing countries (e.g. Dolan & Humphrey, 2000; Kaplinsky, Morris & Readman, 2002; Trienekens & Willems, 2007). The main output of value chain studies is the assessment and profiling of different innovations undertaken at different stages of the chain and the analysis of distribution of relative gains to different players along the chain. It has been argued that lead companies in developed countries capture a disproportionately larger share of value chain profitability at the expense of developing country producers (Kaplinsky & Morris, 2002).

In relation to global value chains, there are global production networks (GPN) (Markusen, 1996; Hendersen et al., 2002; Coe, Dicken & Hess, 2008). These are global value chains that have developed into tiered structures with the key role being played by a lead firm. Global production networks are associated with developments in technology, sophistication of products and changes in the patterns of competitiveness whereby producers concentrate in areas in which they have core competences and outsource others to other firms which increasingly include small and medium-sized enterprises from developing countries.

Irrespective of whether innovation is analyzed using the cluster or the value chain perspective, the main focus of innovation performance studies in agro-commodity export sectors in SSA has been on analyzing export performance in terms of growth in volume, revenue or price. In this regard, innovation is considered to hold the key for access to international product markets where there is potential for economic benefits (Gibbon, 2005). These benefits include growth in export revenue and improved foreign exchange earnings for the exporters, growth in government tax revenue and employment for the poor (Kaplinsky, 2006; Biggs, 2007; Subramanian & Matthijs, 2007). In particular, the use of scientific knowledge and modern technology in form of improved farm inputs, animal and crop husbandry practices, post-harvest handling and cold chain management has been associated with improvement in firm productivity and access to export markets (Kjollerstrom & Dallto, 2007). This has been reported in sectors producing fresh and partially processed high unit value agro-commodity products or foods. For example beef in Botswana and Namibia (Stevens & Kennan, 2005), horticulture in Kenya (Dolan & Humphrey, 2000), pineapples in Ghana and grapes in South Africa (Trienekens & Willems, 2007), and fish in Uganda (Kiggundu, 2004a, 2006; Ponte, 2005).

However, the empirical approach adopted in these studies and the evidence presented only address revenue or product pricing and ignore the profit impact of innovation activities undertaken and yet it is the latter that directly relates to future sustainability considering the uncertainties and risks associated with innovations. While the use of export revenue growth and price as measures of innovation performance is useful in

providing an indication of the extent to which exporters have been able to penetrate and generate sales from export markets, they do not provide a complete picture of the financial impact of innovations adopted by the exporters. These studies therefore provide limited insights into the effectiveness and competence with which innovations are selected and implemented, and whether that is improving or declining overtime. In addition, these studies do not sufficiently answer some important questions such as whether these successes are internally sustainable, that is whether or not they are able to be self-financing, are gaining speed, are dynamic, or likely to enable the exporters to gain entry into premium market segments using cost effective means. In this respect, limited lessons can be drawn from these studies to inform managers and policy makers on actions that need to be taken to enhance growth and sustainability of the companies.

This study therefore attempts to contribute to the debate on whether or not agro-commodity exporters in SSA are creating or destroying economic value from innovation activity by focusing on the Ugandan fish and flower export sectors. These sectors were chosen in order to provide a basis for comparing and contrasting the effectiveness of innovation management in emerging and dynamic agro-commodity export sectors in the context of an SSA country. Whereas the fish sector has existed in different forms for more than a century and has transformed itself in order to meet the requirements of foreign markets, the flower sector is still in relative infancy (for an overview and background to the fish sector refer to *appendix 1* and for the flower sector *appendix 4*). In addition, these sectors have potential for contributing to economic growth and development in Uganda as demonstrated by their rapid growth in export volume and revenue over the period 1995-2000 amidst many challenges (Dijkstra, 2001; Kiggundu, 2004a). For example, the fish export sector experienced a ban on fish imports by the EU and a drastic decline in export prices which prompted the exporters to engage in large-scale innovation in order to regain the necessary approvals to be able to supply that market again (Kiggundu, 2004a; Ponte, 2005). Similarly, the flower sector went through a disastrous period in the 1990s with certain flower varieties that turned out to be loss making (Asea & Kaija, 2000; Dijkstra, 2001). The episodes of difficulties in these sectors

resulted in some companies in the flower sector going out of business after making financial losses (ADC/IDEA, 1998b; Asea & Kaija, 2000).

Thus, a combination of rapid growth in the Ugandan fish and flower export sectors, the turbulence that resulted in financial losses as well as some failures and the high intensity of innovation activity adopted by the exporters in order to survive makes them suitable for undertaking the analysis of the value creation potential and financial sustainability impact of innovation activity. Accordingly, a project-level analysis of innovation management in the two sectors was undertaken in an attempt to determine whether or not those innovations have created or destroyed value and by how much. The study also sought to determine whether or not the exporters are getting better at managing the risks associated with their innovation activities.

This thesis is a product of a research journey that started when the researcher first interacted with private sector participants and facilitators in a seminar organized by the International Trade Center (ITC) in collaboration with Uganda Export Promotions Board (UEPB) in Kampala Uganda in July 2002. The seminar was aimed at facilitating the private sector in developing sector export competitiveness strategies. The author subsequently held additional discussions with the Chief of Party of the Competitive Private Enterprise and Trade Expansion (COMPETE) project funded by the United States Agency for International Development (USAID) on the different issues that the project was addressing to help improve competitiveness in the cotton, coffee and flower export sectors in Uganda. It became apparent from these discussions that Ugandan export sectors lacked well developed strategies of how to approach and compete in export markets. One of the areas that seemed to be less understood and yet vital for competitiveness and survival was innovation. These sectors appeared to lack a good understanding of how different combinations of new products, production techniques and access to premium export market channels could potentially improve financial performance. This prompted the author to embark on the development of a research study on innovation in export oriented sectors with a focus on the Ugandan fish and flower industries. The next section states the main motivation for this study.

1.3 Motivation for the study

The main motivation for this study is to get a deeper understanding of how innovation leads to value creation or destruction and the factors that drive these financial outcomes. A focus on financial aspects of innovation activity is preferable to the analysis of revenue, volume or market share growth because it gives better insights to the future financial sustainability of a company. But this is not easy to achieve owing to the difficulties associated with obtaining reliable profit data from companies (Ramachandran & Shah, 1998) hence the need to develop a novel methodological approach to estimate operating profit margins attributable to different innovation activities. In addition, there is need to assess innovation from the managers' or practitioners' perspective because outcomes of previous innovation studies such as Cooper and Kleinschmidt (2007) and advice by innovation experts often calls for continuous innovation with a broad focus on the adoption of practices benchmarked on innovation in the context of high technology industries in developed countries. However, this may not be relevant given the unique innovation challenges faced by managers in agro-commodity export sectors in poor SSA countries (Biggs, Shah & Srivastava, 1995b; Mytelka, Goedhuys, Arundel, & Gachino, 2004; Diyamett & Wangwe, 2006). Accordingly, there is need for empirical analysis to provide new insights on innovation management and financial performance that is grounded in the context of companies operating in a poor SSA country.

1.4 Research objective and questions

The main objective of this study is to investigate the extent to which Ugandan fish and flower exporters are creating value and increasing their profitability through innovation activity and whether or not they are improving their competitiveness and sustainability overtime. The study seeks to answer the following four inter-linked research questions:

1. To what extent are the Ugandan fish and flower exporters able to increase their profitability through value creating innovation activity?
2. How important are the interactions between the different innovation activities in order to create value?
3. To what extent are the financial benefits of innovation activity in the two sectors increasing overtime?

4. What are the main firm-level capabilities that determine the profitability of innovation activity in the two sectors and how effectively are they being managed?

1.5 Scope

The study was empirically undertaken in Uganda with a focus on innovation activities implemented by Ugandan fish exporters in the period 2002-2004 and flower exporters in the period 2001-2004. The study focused on companies at the processing and export stages of the respective value chains most of which are concentrated near the shores of Lake Victoria especially around the main urban and commercial centers of Kampala, Jinja, Entebbe and Masaka in Uganda. The analysis concentrated on product, production, marketing and supply chain innovation activities implemented by these companies and their exports to the European Union markets where the bulk of their products are sold. Exports to other markets are negligible and hence were not included in this empirical study. Innovation was analyzed at the management and project level because this is where aspects of financial value and sustainability can be best analyzed (Cooper, et al., 2001).

1.6 Significance and justification of the study

This study seeks to make contributions to knowledge in a number of areas including method and data (Phillips, 1987), management practice and public policy. With regard to method, this study devises a novel means to estimate the financial impact of innovation at the project level in an agro-commodity sector and to test whether or not those estimates have any validity. The resulting empirical insights challenge previous notions about the extent of benefits arising from innovation in agro-commodity export sectors in SSA. This contributes to knowledge on innovation activity and financial sustainability of agro-commodity export sectors in poor SSA countries and what can be done to improve it.

Regarding management practice, the contributions of the study are in terms of a deeper understanding into the importance of an appropriate mix of innovation activities and how

they can be effectively managed in order to increase the chances of creating value and realizing higher financial returns and sustainability. It also provides insights regarding analysis that managers can conduct in order to guard against innovation uncertainties and risks that may instead destroy rather than create value for the company. In the latter stages of the research, the empirical results were discussed with industry players and it became clear that the use of financial models to estimate the impact of individual innovation initiatives was uncommon in both of these industries. Several industry players believed that such models hold promise for improving decision making around innovation projects and increasing the potential for value creation from innovation activity. This is discussed further in chapters 6 and 7. It is therefore hoped that if the above objectives are realized, the study could be of benefit to practitioners, researchers and policy makers alike. The next section presents a summary of main findings and contributions of the study.

1.7 Summary of main findings and contributions of the study

Among the most important results is that both the Ugandan fish and flower exporters, on average, experienced improvement in their overall profitability for the period understudy. These periods saw fairly intensive innovation activity in products, production systems, marketing approaches and supply chain management systems in both sectors. The findings suggest that in aggregate, innovation activities in both sectors resulted in improved profitability and that there was a moderate level of satisfaction with innovation performance in both sectors. It further suggests that while these exporters were subject to considerable pricing pressure from competitors and influence from powerful, well-resourced customers overseas, that these pressures were not so great as to preclude Ugandan exporters in these sectors from improving their financial performance. At the project level, there was wide variation in the extent of financial gains achieved across different innovation projects. Although these financial gains may also be partly attributed to donor assistance that was provided in a variety of different forms which nevertheless were not possible to quantify, further empirical evidence suggests that there is not a high level of dependence by companies on donor agencies in both the Ugandan fish and flower sectors. Thus, the improvements in financial performance of the companies arising from

innovation activity can be largely attributed to their effective use of internal resources and capabilities.

It was also found that the profitability associated with a particular product innovation can be highly dependent on an appropriate combination of production technique and market channel which offer the best possible alignment. In this regard, the combination of different innovations in the areas of product, process and market selection can have a significant impact on the potential to create value. Further to that, empirical evidence shows that there were larger disparities in profitability at company-level in the flower than in the fish export sector. This may be attributed to differences in the rate of learning among these exporters but also raises the question of why flower exporters were probably learning faster than fish exporters.

Further empirical evidence shows that in both the fish and flower sectors, it appears that Ugandan producers have made limited progress expanding the volume and value of sales in the most profitable activities. This is because the most profitable activities involve selling to the most demanding type of customer, namely large retailers. But there is considerable scope for improvement before they can deliver to retailer requirements on a large scale. It was further observed that there is significant change in the relative profitability of different lines of business overtime in both the fish and flower sectors. This is an indication that producers face uncertainty as to the most optimal use of their existing resources. Whereas this may be overcome through diversification of company activities across different products, production processes and customer type, and varying the quantities in each business line overtime according to prevailing market prices, the scope for that diversification of activities appears to differ between the industries depending on the level of risks faced. This implies that the extent to which companies can diversify their innovation risks will depend on the circumstances faced in the individual industries.

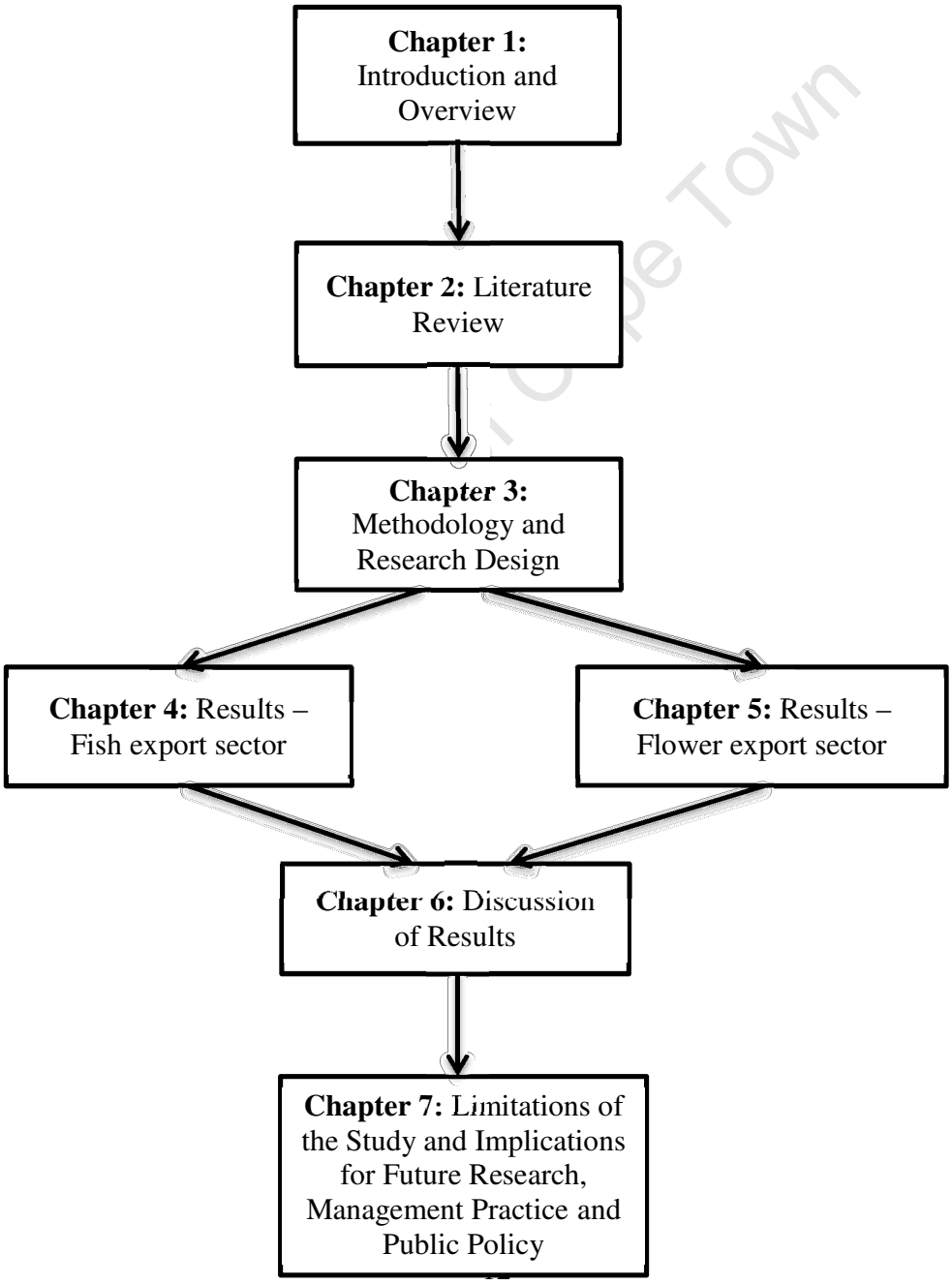
It was further established that there are entirely different areas of management practice which were associated with profitability differences between companies. This highlights

the unique context for innovation activity in each sector and the requirement for specific management capabilities in order to obtain the best financial outcomes from innovation activity.

1.8 Structure of the thesis

The thesis is structured into seven chapters as outlined in Diagram 1.1 below.

Figure 1 Outline of the entire thesis



Chapter One: Sets the basic outline and context of the empirical study reported in the thesis. This has been presented in this chapter.

Chapter Two: Presents a review of the literature on innovation management and financial performance.

Chapter Three: Provides an explanation of the overall methodology and research design adopted for the study.

Chapter Four: Presents results of data analysis and interpretation for the Ugandan fish export sector.

Chapter Five: Presents results of data analysis and interpretation for the Ugandan flower export sector.

Chapter Six: Presents the overall research findings, discussion of results, contributions and conclusions of the study.

Chapter Seven: Highlights the limitations of the study and its implications for future research, management practice and public policy.

1.9 Limitations of the study

The key limitations of this study relate to the specific industry context, which necessarily limits generalizability of the findings. Whereas the industry context is important in bringing out the unique and practically relevant aspects of innovation, it limits the study in its generalizability to other industries. It makes no claim about the ability to generalize its findings to other industries or geographical contexts. However, there is considerable scope to test for external generalizability in further studies. Furthermore, it is hoped that the method pioneered here will provide a useful basis for exploring the financial impact of innovation activity in other sectors.

While the empirical approach is likely to be applicable in a wide range of settings, the results themselves may be of limited use outside the specific industries studied here. Furthermore, while great care was taken to obtain reliable data, in certain cases it was necessary to rely on secondary data as adequate primary data was not available. This meant that some of the data in the financial models was not as fine-grained as would be ideal. For this reason, the precision in financial models is limited to some extent by the

quality of the available data. Nevertheless, it is believed that they provide a rich and useful picture of the profitability impact resulting from the adoption of innovations. This view is corroborated by expert industry respondents.

1.10 Chapter conclusion

This chapter has highlighted the lack of empirical evidence and understanding on whether innovation creates or destroys value especially in the context of agro-commodity export sectors in SSA. It identified and put into context the theoretical and empirical approach followed in the study and stated the main research objective and questions. It also stated the significance and contributions of the study to methodology, management practice and public policy. Finally, it presented the structure of the thesis and the limitations of the study. The next chapter presents a detailed review of the literature on innovation management aimed at developing a conceptual framework for this study.

Chapter 2: Literature Review - a Theoretical and Conceptual Synthesis

2.1 Introduction

As pointed out in chapter 1, the main goal of this empirical study is to determine whether innovation in the Ugandan fish and flower export sectors is creating value and contributing to financial sustainability, and whether these exporters are improving their capabilities to manage innovation effectively. Pursuant to that research objective, this chapter presents an extensive review of literature on innovation management in general and with specific reference to agro-commodity export sectors in SSA. This is aimed at developing a theoretical and conceptual framework to guide the study. The chapter is structured thus. Section 2.2 provides the definition of innovation and an explanation of the context in which it is used in this thesis. Section 2.3 presents a critical review of firm innovation theory. Section 2.4 explores the relationship between innovation and firm performance, and offers an explanation of how uncertainty and risk associated with innovation can result in innovation failure. Section 2.5 presents a discussion of the most important firm-level capabilities needed to manage innovation effectively. Section 2.6 presents an analysis of past literature on innovation in agro-commodity export sectors in SSA, and its relationship with value creation and financial sustainability. Lastly, section 2.7 presents the conclusion of the chapter.

2.2 Definition of innovation

There are wide variations in the definition of innovation (Goffin & Mitchell, 2005), and in the views that managers hold regarding its nature (Majaro, 1988). Innovation has a long history dating back to the seminal work of Schumpeter first published in 1934. In his comprehensive definition, Schumpeter considered five different aspects of innovation. He argued that economic development is driven by innovation through a dynamic process in which new technologies replace the old through a process of "creative destruction" (Schumpeter, 1942). He suggested that the innovation process is characterized by:

1. The introduction of a good (product), which is new to consumers, or one of higher quality than was available in the past;

2. Methods of production, which are new to a particular branch of industry. These are not necessarily based on new scientific discoveries and may have, for example, already been used in other industrial sectors;
3. The opening of new markets;
4. The use of new sources of supply;
5. New forms of competition that lead to the restructuring of an industry.

According to Porter (1990) innovation includes both improvements in technology and better methods or ways of doing things that can be manifested in product changes, process changes, new approaches to marketing, new forms of distribution, and new concepts of scope which involve learning and/or research and development (R&D). Although, the definition of innovation offered by Porter is similar to Schumpeter's, it goes further to indicate that innovation can stem from an organization's learning and not just the R&D activities alone. An important similarity between the two definitions is that they both use the word 'new' to explain what innovation is, but in reality many commercial innovations are not original. A number of innovations spread through markets from some organizations to others (Rogers, 1985). Thus, according to Rogers innovation is an idea, practice, or object that is perceived as new by the individual or other unit of adoption and it is the perception of newness that is important rather than the originality.

Innovation can also be assessed in terms of scope. In this respect, innovation may have a narrow focus on a limited set of changes in a few aspects of the organization or it may have a broad focus with a wide range of innovative outputs affecting many parts of the organization. The narrow view of innovation involves the implementation of one or more types of innovation, for instance product and process innovations (Utterback, 1994) that may require radical changes within a specific sector (Mensch, 1975; Dosi, 1988) or technological change (Rosenberg, 1976).

Accordingly, product innovation refers to the development and introduction of new or significantly improved products and/or services with respect to their characteristics or intended uses, or is perceived by someone as new and has been successful in the market

(Porter, 1990; Kotler, 1991; Grunert & Ottowitz, 1997). It includes different types of new products which may involve modifications of existing products, and are perceived as "new to the firm" or "new to the market". Process innovation can be referred to as the development, adoption and implementation of new or significantly improved methods of manufacture, distribution or delivery of services (Porter, 1990; OECD & Eurostat, 2005). This narrow approach to innovation emphasizes "radicalness", a notion that involves technological novelty, and is often an outcome of investments in scientific research and technological development (Dosi, 1988; Utterback, 1994; OECD, 1997). However, relatively few companies, in particular industrial sectors, account for most radical innovations. Most companies in the majority of industrial and other sectors do not introduce any radical innovations (Freeman, 1994).

The broad view of innovation takes into consideration a wider range of activities than what is spelt out under the radical and technology-based product and process innovations (Lundvall, 1992; Mytelka, 2000; North & Smallbone, 2000). Under this view, innovation involves all changes including those that are incremental and new to an individual firm, even though other firms have already adopted such changes (Sternberg, 2000). Such changes may include new or improved products, processes, and in addition management methods and marketing techniques.

New management methods involve the introduction and implementation of a new management practice, process, structure, or technique in relation to work method, business practices or external relations (Birkinshaw, Hamel & Mol, 2008). This may be intended to improve efficiency and effectiveness in the organization (Clarysse et al., 1998). New marketing methods are comprised of the implementation of new marketing approaches that involve significant changes in product design, packaging, product placement, product promotion and/or pricing, and the penetration of new markets or new market channels and segments (Kotler, 1991; OECD & Eurostat, 2005). The broad approach perceives innovation as consisting of continuous and incremental improvements that become part of the organization's strategic focus in contrast to the narrow view that focuses on only major and radical changes. The above review indicates that innovation

activities can vary greatly in their nature and scope from one firm to another depending on the perspective adopted.

The diversity in innovation activities discussed above demonstrate that while some companies engage in narrowly-defined innovation projects, such as the development and introduction of a new product, others focus on continuous improvements to their products, processes and operations with or without external support (Sternberg, 2000). All the different aspects of innovation are potentially important and any of them may be pursued by a company depending on its size, resource availability, technical and market competence (Tidd, 2000). Innovation may therefore consist of the implementation of a single significant change, or of a series of smaller incremental and continuous changes that together can constitute a significant change. In addition to the above perspectives, innovation may also be classified broadly into the "economics level" or "managerial level" perspectives.

The economics level perspective to innovation focuses on higher level impacts such as its role in enhancing social change and economic development (Freeman, 1982; Porter 1990; Lundvall, 1992). This perspective highlights what is changed that is, the combination of product, process and market changes, by how much they are changed, and how they relate to social and economic progress, at the level of region, country, industry and individual company. The managerial level perspective, by way of contrast, tends to focus at the level of individual innovation projects, their prioritization, selection, resourcing, implementation, ongoing monitoring, alignment to organizational strategy, and their individual and collective impact on financial performance. The managerial perspective acknowledges and prioritizes the uncertainties, risks and organizational complexities associated with innovation, the likelihood of significant financial losses resulting from project failure, the challenge of creating economic and financial value from innovation, and the management capabilities required to do so (Leornard-Barton, 1992; Cooper et al., 2001).

Notably, most definitions of innovation have tended not to emphasize its primary purpose namely, to create value. Most definitions of innovation associated with the economics perspective tend to emphasize what activities are involved rather than why they are pursued, tend to assume that value will automatically flow, and in this way they fail to realize the uncertainty and risks inherent in it (Porter, 1990; OECD & Eurostat, 2005). In this sense they could be said to be "technicist". By contrast, Drucker (1985) emphasized the primary purpose of innovation, namely, "the effort to create purposeful, focused change in an enterprise's economic or social potential" (Drucker, 1985: p. 96), thus reinforcing the Schumpeterian emphasis. Drucker's definition is one of the few recent ones to recognize that the only worthwhile reason to pursue innovation, with all its attendant uncertainties and risks, is to enhance economic and social value and that doing so requires extraordinary managerial attention and effort.

This study adopts the inclusive approach to innovation consistent with the views of Lundvall (1992), Mytelka (2000), North and Smallbone (2000), and Sternberg (2000). But it also recognizes that innovation is complex in that it has many dimensions involving different processes, uncertainties and risks with diverse outcomes and many challenges (Leonard-Barton, 1992; Tidd, 2005). Under these circumstances there is need for balance and alignment in the implementation of the different innovation portfolios in order to improve the chances of innovation success (Cooper et al., 2001). This in turn requires dedicated management attention at project, portfolio and organizational-levels because these are the areas where financial sustainability of innovation is determined (Leonard-Barton, 1992; Cooper et al., 2001). The managerial perspective of innovation therefore forms the basic framework for this empirical study. In this respect the study focuses on the analysis of "innovation management". Innovation management is defined for the purposes of this study as an integrated process through which managers gather ideas and set priorities on how to develop new products, processes, management practices and marketing techniques and carefully take into account the uncertainty and risks involved in their commercialization so as to create and appropriate more value for the company (Goffin & Mitchell, 2005). The next section presents a critical review of innovation theories.

2.3 Critical review of innovation theory

Research on innovation management has adopted different theoretical perspectives derived from a range of disciplines namely, management science, economics, geography, sociology and psychology (Tidd, 2001). This review particularly focuses on the industrial organization, marketing, and resource-based theories of innovation. This is aimed at developing an integrated theoretical framework for the study.

2.3.1 Industrial organization theory

Industrial organization (IO) theory of innovation emphasizes the significance of competitive positioning in markets (Tirole, 1995; Freeman & Soete, 1997). It seeks to determine how industry structure that is, the concentration of firms in an industry influences how companies compete and how this in-turn determines the innovation strategy adopted (Damanpour, 1991; Daft, 1992; Wolfe, 1994). It argues that companies innovate to defend their existing competitive position or to seek new competitive advantages with the aim of maximizing profits. A company may therefore take a reactive approach and innovate to avoid losing market share to a competitor. Alternatively, it may take a proactive approach aimed at gaining a strategic market position relative to its competitors. The latter may be achieved through the development and commercialization of higher quality products that can enable the company to differentiate its offering in the markets. This theory therefore attempts to explain the influence of competitive market forces on innovation by providing answers to the question of why firms innovate and how it influences their performance (Tirole, 1985). It also seeks to explain the relevance of firm innovation as a way of continuously renewing its competitive position in the market through the development of new products and processes needed to create and deliver value to the consumers relative to market competitors (Freeman & Soete, 1997).

IO theory further states that in a competitive market, companies are subject to selection by competitive forces and this compels them to adapt through organizational learning and technological development (Nooteboom, 1999). Learning is important because it helps companies to develop capabilities and strategies to deal with uncertainty and to exploit opportunities offered by the market. Learning is therefore the main driver of new

technological development (Teece, 1996) needed to achieve scale and scope. Scale helps companies in the achievement of cost efficiencies, while scope helps them to improve the efficiency with which they offer new products in the market. In order to attain scale and scope economies, companies try to develop informal and formal networks of external linkages in order to source advantages from the market with the aim of improving their innovation potential.

Although industrial organization theory highlights the role of industry structure and how this impacts on the choice of innovation activities undertaken, it has a number of shortfalls. Firstly, the industrial organization theory portrays a static view of an industry. In this regard, it fails to take account of how innovation strategy is formulated in an increasingly dynamic environment (Bettis & Hitt, 1995). Secondly, the traditional industrial organization theory is based on the assumption of a stable industry structure with set boundaries, a view that has also influenced the development of many analytical tools such as competitor analysis, strategic groups and diversification typologies. However, the reality is that traditional industry boundaries are increasingly getting blurred because many industries converge or overlap, more especially in technology-related sectors (Hamel & Prahalad, 1994; Bettis & Hitt, 1995). This therefore puts into question the relevance of the industrial organization theory in the analysis of competition and innovation in modern science based industries.

Thirdly, due to the increasing rate of change in most industries, companies are under pressure to react quickly because competitiveness is now based on the time duration taken to introduce and commercialize innovations (Stalk & Hout, 1990) particularly in technology-based industries. But in its traditional form, industrial organization theory cannot adequately explain the speed and flexibility required for firm innovation to be successful in dynamic industries. The static nature of the industrial organization theory further indicates that it does not sufficiently explain issues relating to the internal challenges, complexity or sustainability of the innovating firm. This study therefore draws on the component of industrial organization theory that views competitive pressure and the resultant need for effective strategic responses as primary motivations for

innovation, and which recognizes that improved performance is not guaranteed by the decision to innovate. This conceptual approach is to some extent used in the quantitative analysis. In particular, the relative competitiveness of Ugandan companies in different lines of business (as indicated by their net profitability in each line using actual export market prices) is examined overtime to see whether it is increasing or decreasing.

In addition, the changes in relative volumes of each line of business are also examined. Combining the two allows one to examine the extent to which Ugandan companies are switching out of lines in which their competitiveness is declining and managing to identify alternative lines in which they can achieve satisfactory profit margins and then expand their volumes in such business lines. However, there was limited application of IO theory in the study on innovation and value creation in the Ugandan fish and flower export. This is because the analysis undertaken in the study could not take account of the complex and diffuse structure of the global supply chains of fish and flowers. This is also because the analysis of the Ugandan fish and flower export industries does not bring in any element of industry structure and hence there is a limited fit with IO.

2.3.2 Marketing based theory of innovation

The marketing based theory of innovation focuses on the users of innovation outputs by highlighting the importance of buyers of new products who can either support the innovation if they are willing to buy the new products, or reject it. To this end it emphasizes the need for knowledge of buyer behavior and market exchanges between buyers and sellers, and the understanding of why firms innovate and the strategies they adopt to do so (Hunt, 1983). It identifies the main challenge that companies face as that of trying to match their products with the demand of the buyers largely because buyers are heterogeneous. Since buyers are heterogeneous, product differentiation and effective targeting becomes an important and necessary tool for capturing demand for the new products. This will also depend on an effective understanding of the objective and social characteristics as well as the image of the product (Kotler & Amstrong, 2001).

The marketing based theory of innovation integrates the three strategic orientations of the company namely, customers, competitors and technology in explaining when and why companies engage in new product development (Gatignon & Xuereb, 1997). It acknowledges that a company's strategic orientation as a market driven company (Day, 1990), is a significant driver of its performance. In particular, the customer and competitor orientations are important in helping the company to improve its ability to successfully bring new products to market (Day, 1990, 1994). Meanwhile, the technological orientation of the company also contributes immensely to the development of new products and their commercial performance (Cooper, 1984a).

The theory seeks to explain the linkage between the customer, competitor and technological orientations of the company and their contribution to market success or failure of new products. Customer orientation is where a company undertakes deliberate measures to gather information and understand target buyers in order to be able to create superior value for them on a continuous basis (Narver & Slater, 1990). In terms of a company's innovation behavior, a customer oriented company is one with the ability and the will to identify, analyze, understand, and answer user needs. Customer orientation also helps the company to learn a large part of the market's technical, social, cultural, legal and political issues that can provide useful information needed for market segmentation. It also helps the company in determining the growth rate of the market and along with other market characteristics, they serve as guides to managers on how to respond to market trends, in order to identify suitable opportunities for the company to adopt effectively, differentiated market positions that offer meaningful potential for value creation.

Competitor orientation measures the ability and will to identify, analyze and respond to competitor's actions (Narver & Slater, 1990). This is important in that knowledge of competitor's competences enables the company to select the right types of new products in order to match and/or exceed the competitors' product strengths (Cooper, 1984a). Competitor orientation is therefore necessary for the commercial performance of innovations. The technological orientation of a company is its ability to have strong R&D

competencies, in particular being proactive in acquiring new technologies and using them for the development of new products and production processes (Cooper, 1984b, Kanter, 1988). A technology oriented company exhibits the ability and will to acquire substantial technological capabilities which are used in the development of new products and production processes. Thus, customer, competitor and technological orientations enable the company to effectively assess market needs, identify and develop suitable products and production processes and to respond effectively to those market needs with an attractive and differentiated offering.

The marketing based theory of innovation is important and relevant for this study in that it emphasizes the importance of marketing and branding capabilities in a company. In particular, the analysis of strategies needed by a company to attract product buyers (Atuahene-Gima, 1996) and improve the chances of success in premium export market channels is emphasized in this study. In addition, the emphasis that marketing approaches place on price and cost competitiveness is important and core to this empirical study. It is noted that the development and implementation of cost effective strategies is important in that it improves a company's chances of success in innovation and enables it to remain financially sustainable (Sheth, Sisodia & Sharma, 2000). Whereas market and technological orientations are good in that they enable a company to gather the necessary information about customers which is then used to design improved products, produce them and determine the most effective way of marketing the new product to the buyers, these activities need to be undertaken cost effectively in order to ensure profitability and sustainability in competitive markets. Thus, the development of innovations with lower costs can be critical for market success (Gatignon & Xuereb, 1997). The importance of marketing capability is further emphasized in the resource-based theory of innovation (Barney, 1991) which is presented in the next section.

2.3.3 Resource-based theory of innovation

The resource-based theory of the firm (RBV) underscores the importance of internal factors that determine the extent and nature of innovation activities, processes involved and the competence with which companies undertake them (Penrose, 1959; Wernerfelt,

1984; Barney, 1991). The theory highlights the role of organizational resources and capabilities in influencing the outcome of the innovation process (Leonard-Barton, 1992; Henderson & Cockburn, 1994; Brown & Eisenhardt, 1995). Within this perspective organizational resources (tangible and intangible) are combined and transformed to produce innovative forms of competitive advantage. The resources considered to be critical for innovation can be categorized as financial, technical and intangible (Barney, 1991).

The availability of financial resources contributes immensely to a company's capacity to undertake innovative activities (Delcanto & Gonzalez, 1999; Lee, Lee & Pennings, 2001), while lack of funds may limit a company's ability to fund critical innovation projects (Teece & Pisano, 1994; Helfat, 1997). Technical resources (e.g. engineering and production equipment, and information systems and processes) have also been found to positively affect the level and success of innovation efforts of a company (Gatignon & Xuereb, 1997; Song & Parry, 1997). This demonstrates that carrying out innovation activities requires a minimum prior investment, which may or may not raise the possibility of producing innovative output of increased value for the company and for its customers in form of increased quality, depending on the extent and quality of resources available.

Intangible assets are also considered as important company resources that facilitate innovation activity. From the strategic point of view, intangible assets bring together requirements necessary for producing sustainable competitive advantage that is, being valuable, rare and difficult to imitate and replace by competitors (Barney, 1991; Hitt et al., 2001b). Examples of intangible assets are: qualified human capital with technical skills in R&D project management, proprietary technology and market knowledge (Barney, 1991). In particular, technical skills are important in that they increase a company's ability to carry out innovation activities (Song & Parry, 1997; Delcanto & Gonzalez, 1999).

An important intangible asset that is critical for innovation development and market success of a company is knowledge. Accordingly, a company's stock of knowledge (tacit and explicit) can be considered to be an important strategic resource that determines innovation capability and commercial success (Kogut & Zander, 1992; Nonaka, 1994). The RBV further states that companies should not only be able to create knowledge within their boundaries, but must also actively engage themselves in the acquisition of new ideas from the external environment (Lane & Lubatkin, 1998). This will help them to prevent rigidity and be able to benchmark their technological and marketing capabilities with those of leading competitors in the market.

The focus of learning should be on product and brand development, marketing changes and on improving the ability to align the different aspects of innovations such as complementary products, production processes, appropriate and complementary market channels and the promotion of product brands in those markets (Galbrath, 2005). Thus, having knowledge resources in form of (a) the ability to align innovation activities to the strategy of the organization; (b) selection and implementation of the most suitable organizational structure, values and culture; (c) suitable management systems to limit innovation risk and fully exploit innovation potential, and (d) selecting an appropriate mix of innovation projects (referred to as the innovation project portfolio) is central to the commercial success of innovation (Leonard-Barton, 1992). This is because the most important resource of all is the management skill in understanding the challenges and risks which innovation imposes and the ability to respond effectively to them (Cooper et al., 2001).

The RBV also recognizes the importance of organizational capabilities in that they determine a company's capacity to coordinate resources, put them into productive use and generate innovative outputs (Collis, 1994). The literature on RBV acknowledges that R&D, learning, innovation project management and marketing are among the most important capabilities which are used to increase a company's capacity to innovate and to successfully commercialize the innovations. Accordingly, capabilities to manage R&D effectively have been considered to be crucial for new product development (Cooper,

1984a, 1991). Learning capabilities also indicate positive effects on innovation capacity and help the company to continuously adopt new practices and improve (Lynn, Skov & Abel, 1999). Innovation project management capabilities have been considered to be essential in the execution of new product development and process improvement projects (Cooper & Kleinschmidt, 1995). Marketing capabilities in particular, market and consumer analysis, channel selection, branding and promotion are important for the commercialization, implementation and exploitation of innovation (Song et al., 1997). An important capability for accelerating company innovation and its success is the alignment of the marketing, finance, production and R&D functions through purposeful team building and information sharing within and between departments (Souder & Jenssen, 1999). The RBV therefore posits that an innovative company can improve its performance once it has the internal resources that can be exploited to develop capabilities that in turn can create sustainable competitive advantages (Grant, 1996, Porter, 1998), and that can be used to create barriers to competition (Porter, 1985; Prahalad & Hamel, 1990).

This empirical study recognizes the importance of "resource-based theory" in understanding and explaining differences across companies in their approach to managing innovation. In this respect, it applies the resource-based theory to analyze and explain how companies create and appropriate financial value from innovation activity with a specific focus on fish and flower export sectors in Uganda. Accordingly, the analysis will consider project portfolio selection, capacity to copy best innovation practices, brand ownership, the ability to align the different innovations (products with complementary products and appropriate market channels), the ability to source sufficient quantities of raw materials in order to achieve economy of scale in certain value added products and the availability of sufficient financial resources for innovation investment. The RBV is used in this empirical study to distinguish between companies in terms of their approach to innovation. It therefore, provides insights on the uniqueness of firm resources and how this determines the nature and patterns of innovation implemented, the challenges faced, the uncertainties and risks involved and the level of progress made

towards realizing more financial value from firm innovation activities in the two sectors under study.

This empirical study therefore adopts an analytical approach that draws on a mix of marketing and 'resource-based' theories of innovation. These theories are integrated to provide a framework for analyzing the extent to which Ugandan fish and flower exporters are able to increase their profitability through engagement in value creating innovation activities. The theoretical framework is further used to analyze the extent to which interactions between the different innovation activities contribute to value creation, growth in financial benefits of innovation activity overtime, and the main firm-level capabilities that determine the profitability of innovation activity in the two sectors. The next section presents a review of innovation and firm performance.

2.4 Innovation and firm performance

Innovation can improve firm performance in a number of ways. Most notable among them is increasing the buyer's willingness to pay more because of the improved product quality hence the opportunity for the firm to charge higher prices (Priem, 2007). It also improves the ability of the firm to increase volumes at the same price (Porter, 1998), shift products from low price segments to high priced market segments (Porter, 1998; Kaplinsky & Fitter, 2004), and reduce costs (Hoopes, Madsen & Walker, 2003). Although these are potential ways through which a firm can create economic value, it cannot be assumed that the firm will necessarily be able to appropriate all of this value in form of Schumpeterian profits (Porter, 1985; Sirmon, Hitt, & Ireland, 2007).

Schumpeterian profits are defined as the profits that arise when a company is able to appropriate all or at least part of the returns from innovative activity (Nordhaus, 2004). This is important for the company because it will influence future performance and sustainability (Alexander, 1962; Fisher, 1969) in that it provides resources to finance future investments in innovation projects thereby enabling the firm to renew its key organizational resources and capabilities on a sustainable basis. It will also put the firm in a stronger position to negotiate for bank loans with favorable interest rates (Maksimovic,

1990; Machauer & Weber, 1999), and in addition provide bargaining power necessary for negotiations in partnerships for future business expansion, growth and development (Dollinger, Golden, & Saxton, 1997). Although the literature discussed above highlights the potential contributions of innovation towards improvement in financial performance and future sustainability of a company, there is still limited empirical evidence on the impact of innovation on financial performance. The next section reviews literature on the role of innovation in value creation.

2.4.1 Innovation and value creation

Value creation from innovation can be categorized into use value and exchange value (Bowman & Ambrosini, 2000). Use value refers to the specific quality of a new product or service as perceived by the users in relation to their needs. It is based on subjective judgments that vary from one individual to another. Exchange value is the monetary amount realized at a certain point in time when the exchange of a new product or service takes place, or the amount paid by the user to the seller for the use value of the new product. The amount of value realized for the seller in the sale is likely to be dependent on the relative amount of value that is subjectively realized by the target user (or buyer) or at least the amount of value which the user (or buyer) expects at the time of the sale to realize subsequently. Although the subjective value realized or expected by the user (or buyer) is supposed to translate into the user's willingness to exchange a monetary premium for the perceived additional value, many users are disappointed in that they do not realize the expected value.

In order for value to be created on a sustainable basis, two important conditions must be fulfilled. First, the monetary amount exchanged must exceed the producer's costs of creating and delivering the value in question in order to provide incentives for the producer to continue in production (Barney, 1991). Second, the monetary amount that a user will exchange should be adequately justified by the perceived performance difference between the new value that is realized by the use (from the new product or service) and that which would be realized by that user's closest alternative product or service (Kotler & Amstrong, 2001). Without these respective surpluses, neither the user

nor the creator of value would be willing to repeatedly engage in these activities over time. However, the subjectivity regarding the judgments of the buyer or consumer constitutes an element of environmental uncertainty to the producer (Brown & Eisenhardt, 1997). Similarly, because an organization is not certain of what new features will satisfy a consumer or how they will affect the consumer's willingness to pay, an innovative supplier is faced with significant market, technical, and organizational ambiguity and uncertainty (Damanpour, 1995; Van de Ven et al., 1999). These may have a negative influence on its profitability and consequently on the sustainability of an innovation.

When a company is faced with competitive market conditions, there is need for it to create new advantages as existing ones are worn away by competitors. Thus, companies in competitive markets are under continuous pressure to improve their offering and increase the level of appropriate benefits provided to customers in such a way that the latter are willing to pay a sufficient price to justify the improvement (Lepark et al., 2007; Priem, 2007). To achieve this, the company will require internal capabilities to identify suitable opportunities for improving its product offering and to persuade its customers to pay sufficient prices for the improvements as stipulated in the RBV theory. The improvement in products and processes should therefore be based on a consistent analysis of the perceptions and desires of product users, and product alternatives available to them, as well as the socio-economic context in which they live and the evaluations they make about the new value that has been created (Kohli & Jaworski, 1990). This helps the company in planning, executing and delivering the desired value to the consumers through new or improved products. Where a firm does not have sufficient internal capabilities, it may engage in continuous capability building through external networking (Nahapiet & Ghoshal, 1998).

In order for the firm to remain financially sustainable after dispensing resources on projects to improve its products, services, processes, and marketing, it should have the ability to capture sufficient value. This depends on more than just the consumer willingness to pay because other competitors may be able to copy the improvements and

attract those same customers by offering a slightly lower price, particularly if those competitors avoided some part of the cost of developing the improvements. The extent to which this can occur depends on the existing "*regime of appropriability"* (Porter, 1998; Smith, Stirling, & Berkhout, 2005). In a strong regime of appropriability, the innovator is able to capture a substantial share of the value created. On the contrary, in a weak regime of appropriability, other parties derive most of the value created by the firm through "value slippage" and this arises when use value is high and exchange value is low. Where there is significant slippage in value, there is likely to be reduced incentives for the innovating firm to continue innovating in the long-run. Thus, it is important to understand the nature of the appropriability environment in which the company operates so as to determine the extent to which it can capture value from innovation.

2.4.2 Innovation and value appropriation

There are two key conditions that are often in operation in an open market situation and they together determine which parties capture the additional value that is created through a particular innovation. These are competition and isolating mechanisms (Lepark et al., 2007). Competition forces companies to produce and sell new or improved products or services that deliver value to the buyers. The monetary exchange value of a new product is a measure of its appropriateness in meeting the needs of the buyers or consumers. The appropriateness of a new product or service as perceived by the user increases its use value and monetary exchange value. In relative terms the development of new products or services can yield a situation where there is limited supply and high demand, thus favoring a higher exchange value.

In a competitive market situation, the condition of limited supply and high demand provides incentives for other suppliers of the product or service to replicate the new value that was created from the new product and by so doing, take part of the profits in the market (Barney, 1991). As a consequence of the competition, supply increases and the exchange value (price) declines to a point where supply equals demand. This reduces the value that would accrue to the original innovator because it is shared with other competitors in the industry. It will also lead to a situation of high use value for the

consumers and low monetary exchange value for the original innovator. Thus, a competitive market situation often leads to the slippage of value away from the creator to be shared with competitors and users in the market (Lepark et al., 2007).

In contrast, where there is limited competition in the industry, there is plenty of power or good potential for greater value capture by the original innovator or value creator. This can be explained using what is referred to as "isolating mechanism." An isolating mechanism is any idea, knowledge, physical, or legal barrier that may prevent replication of the value creating product or service by a competitor (Porter, 1985). Isolating mechanisms help to limit value slippage, thus enabling the source of innovation to capture most of the value created. There are potentially different forms of isolating mechanisms that competing firms can employ to protect their innovations from competition. Although these isolating mechanisms can vary from one industry to another depending on its structure and nature of products, they can be largely determined by the configuration of a firm's value chain Porter (1985), a collection of organizational resources Barney (1991), and effective resource management (Sirmon et al., 2007).

The main challenge of innovation management is the strategic task of balancing the use of organizational resources for the two processes of innovation project execution with the expectation of creating new value and the actual appropriation of that value (Hansen & Birkinshaw, 2007). The commitment of resources by managers to the competing goals of value creation and value appropriation is determined by the strategy chosen by the company to compete in the market (Day, 1994). Managers in a company can decide on which capabilities they will emphasize relative to the others (Rumelt, 1987; Ghemawat, 1991). Innovation project execution for value creation influences the potential magnitude of the advantage whereas value appropriation influences the amount of the value the firm is able to capture, and the time over which the firm is able to sustain its advantage and appropriate the resulting value (Grant, 1996). Given that firm value depends on both the magnitude and the persistence of the advantage and its value potential, both influence financial performance, and hence a careful trade-off must be maintained between the two (Hansen & Birkinshaw, 2007; Stadler, 2007).

In reality no single organizational factor or capability uniquely defines or determines a company's ability to appropriate value from innovation (Leonard-Barton, 1992). Different capabilities give rise to isolating mechanisms and also influence the length of time the company is able to realize value depending on industry and other environmental factors. A number of other factors determine the extent to which innovators are able to appropriate value from their innovations, for example, property rights, the tacitness and complexity of the technology, lead-time and, complementary resources (Barney, 1991). Similarly, the extent to which a firm is able to appropriate value from its innovations will depend on the degree with which its managers are able to correctly determine or forecast the needs of the market through research (Kohli & Jaworski, 1990). It will also depend on the amount and type of resources needed and hence the costs to be incurred in order to create and deliver unique additional value to consumers. These conditions may or may not exist in a company thereby presenting a condition of uncertainty and risk for any company pursuing a new innovation project. The next section presents a discussion of the uncertainties and risks that managers are likely to face in their pursuit of economic benefits from innovation activity.

2.4.3 Uncertainty, risk and innovation failure

Innovation activities are often faced with many uncertainties and risks, and hence can potentially lead to a positive or negative performance outcome (Mansfield, 1981; Leonard-Barton, 1992). Whereas innovation can lead to improvement in company performance (Porter, 1985), on the contrary it may lead to losses due to higher capital investment costs, higher input costs such as labor and raw materials, increased wastage and higher overhead costs (Mansfield, 1981; Leonard-Barton, 1992; Tushman & O'Reilly, 1997). Given that innovation can either improve or worsen the competitiveness and financial performance of a company (Christensen, 1997), it cannot therefore be assumed that it will necessarily result in improved overall financial performance.

The likely impact of any innovation on financial performance depends on a large variety of unpredictable factors (Mansfield, 1981; Leonard-Barton, 1992). These factors may

relate to technological uncertainty (Datar et al., 1997) or the structure of industry and its impact on competition (Rosseger, 1996). For example, products sometimes fail in the market place because managers over-value their benefits relative to the existing products and yet consumers may under-value them in favor of familiar products (Gatignon & Robertson, 1985; Gourville, 2005). Under these circumstances therefore, managers cannot know or predict with certainty the financial outcomes of innovation activity.

Accordingly, innovation projects can fail and destroy value rather than create it for the firm (Mansfield, 1981; Leonard-Barton, 1992; Tushman & O'Reilly, 1997). This can arise for a variety of different reasons such as when a project is accepted or rejected for the wrong reasons (Christensen, 1997; Tushman & O'Reilly, 1997) or fails for reasons that could not have been foreseen and are often not well understood (Moore, 2004). Innovation may also destroy value because an organization tries to do too much of it, does not have an appropriate system for selecting innovation projects, selects the wrong ones, does not know how to manage them effectively (Cooper et al., 2001). The main challenge faced by managers in respect of innovation strategy is therefore to assemble an appropriate combination of management practices that will assist the company to make effective choices around how to utilize its resources for value creation and value appropriation while at the same time seeking to limit and mitigate the potential risks and uncertainties in the industry (Leonard-Barton, 1992; Cooper et al., 2001).

In view of the above discussion, the analysis of innovation and its relationship with value creation and value appropriation should recognize the potential impact of uncertainty and risk on innovation outcomes. An innovation perspective grounded in uncertainty, risk and financial sustainability is therefore necessary in enhancing existing theory such as marketing and the resource-based view. Together these provide a sound framework for analyzing innovation and its performance outcomes. The next section presents a review of literature on firm-level capabilities that determine financial performance of innovation activity.

2.5 Capabilities to manage innovation effectively

As pointed out above innovation is complex and involves uncertainty and risk. In order to improve the chances of commercial success and financial sustainability, there is need for certain resources and capabilities for the company to identify a suitable portfolio of innovation projects, execute them effectively, realize as much value as possible from the successful projects and limit the losses from failed projects (Hansen & Birkinshaw, 2007). Capabilities for effective innovation management reside in different areas of management practice. They can be linked to management of internal resources and capabilities, making effective use of external resources and capabilities, management of risk, management of tensions between different functions each with its own innovation priorities, and the effective coordination of the overall innovation in the company. These capabilities are discussed below.

2.5.1 Management of internal resources and capabilities

Internal firm resources and capabilities are critical drivers of innovation performance. This is consistent with the resource based view of the firm (Barney, 1991). Much of the research on innovation management that attempted to identify internal capabilities and 'best practices' is based on the experience of specific sectors in which the resource based theoretical framework has been applied. For example, models of technology management are derived from the experience of US high-technology firms (Pisano, 1996; Christensen, 1997).

New product development (NPD) capabilities have particularly been identified as important for successful innovation (Borch & Forsman, 2000). This is well documented in the case of large industrial firms in developed countries such as the US chemical industries both at the business and project levels (Cooper & Kleinschmidt, 1995) and the Japanese consumer electronics and automobiles industries (Clark & Fujimoto, 1991). The literature on NPD emphasizes the importance of establishing formal processes for developing new products, for example the stage gate approach for monitoring progress on individual projects, and making resource allocations dependent on the achievement of specific milestones as a way of reducing the risks of project failure (Cooper, 1991). This

involves a set of management processes for moving new product projects from the idea generation stage to launch of the final product. It also involves 'the use of portfolio management processes to assist in effective resource allocations between different projects' (Cooper & Kleinschmidt, 1995: p. 1993). According to Cooper and Kleinschmidt (2007), the strongest driver of profitability is the existence of a high quality, rigorous new product development process, one that emphasizes upfront homework, tough Go/Kill decision points, sharp early product definition, and flexibility.

There is need for management processes to ensure effective integration of technical activities (e.g. R&D, manufacturing operations and marketing) through the formation of effective cross-functional teams. The ability to combine different types of skills is associated with successful new product development (Leonard-Barton, 1992; Griffin & Hauser, 1996; Bessant & Francis, 1997). Similarly, effective communication between technical activities and marketing is said to enhance NPD success (Cooper, 1984b, Cooper & de Brantani, 1991).

Besides NPD processes, trust among employees in a company is considered to be critical for effective innovation management (Ruppel & Harrington, 2000). Having a sense of trust among company employees has been found to facilitate the development of technological innovation (Handy, 1993). Trust among company employees enables them to feel emotionally safe which in turn provides incentives for them to willingly put forward ideas and opinions (Ekvall, 1996). Thus, initiatives can be taken without fear that there will be reprisal in case of failure. Under these circumstances, communication is open and straight forward hence facilitating the flow of information in the company. In companies where there is trust and good communication, people are willing to experiment with new ways of doing things thereby promoting innovation (Dyer & Nobeoka, 2000).

Trust also enhances social capital in that it helps an individual to identify another individual within the company with knowledge that can promote innovation. In this respect, trust increases opportunity for accessibility to knowledge within the different

company units (Jaworski & Kohli, 1993). It also permits the individual to share knowledge openly and develop a deep understanding of the need for innovation which enhances efforts towards improving existing products, processes and markets (Rowley et al., 2000). Trust can therefore be considered to be an intangible asset (Barney, 1991) that can help members to share experiences on how to implement certain innovations or improvements (Dyer & Nobeoka, 2000) with potential for improving company performance. Alternatively where trust is missing, people may be suspicious of each other and are wary of making expensive mistakes which may lead to low levels of innovation (Ekvall, 1996).

Imitation capabilities or the copying of "best practices" from other companies is also a common approach to developing innovation capacity within a company. This involves copying what competitors are doing and striving to improve it. It is a common practice in sectors where product and process innovations are incremental and in this case companies learn from the successes and failures of others and use this knowledge to improve their own innovation projects (Antonelli & Calderini, 1999; Maskell, 2001). Imitation involves the development of mechanisms for copying 'best practices' from local competitors and benchmarking against their innovation practices and performance by gathering information about competitors' innovation activities, to gauge how well the activities are performed (Cebon & Newton, 1999). This requires skill in the acquisition of external explicit and tacit knowledge using both formal and informal social networks (Lane & Lubatkin, 1998) and the effective integration of the newly acquired knowledge with existing internal knowledge to create new knowledge that can support the implementation of the innovations. Copying best practices can help companies to improve their innovation capacity which may then contribute towards improvement in product quality, cost reduction, and consistency and flexibility in operations (Hart, 1995; Csaszar & Siggelkow, 2010). However, the ability to copy and implement best practices effectively also depends on existing firm resources and capabilities (Barney, 1991).

The ability to select appropriate innovation projects and manage the portfolio effectively has also been linked to successful product innovation and financial performance (Cooper

et al., 2001). It is particularly important because of the speed at which resources are consumed in the innovation process and the need for these to be managed carefully (Cebon & Newton, 1999). The focus of portfolio management is on making strategic, technological and resource choices that govern project selection and the future shape of the organization (Cooper et al., 1999). The process of innovation project selection involves evaluation and resource allocation under uncertain conditions and hence requires careful assessment of the organization's priorities, the degree of alignment of different projects to those priorities and which projects are likely to generate the best returns for the organization. Early models used return on investment to evaluate the economic feasibility of innovation projects (Bard et al., 1988) but this approach fails to take into account organizational strategic priorities, resource limitations, and different uncertainty and risk profiles of different innovation projects. According to Cooper et al. (1999), the best performers use explicit tools, such as weighted scoring methods, that involve both quantitative and qualitative assessment and consistently apply them to all projects considered to belong to the portfolio. This to a large extent enables the evaluators to take account of the different factors that might be of potential risk to the future sustainability of the innovation projects.

Although the focus of most innovation literature is on technical capabilities and their role in innovation development, marketing capabilities (market analysis, customer needs analysis, market testing, monitoring and promotion) are equally important (Calantone & Di Benedetto, 1988; Verhaeghe & Kfir, 2002). However, the commercialization stage in the innovation process which depends highly on the application of marketing capabilities is typically the most neglected component of innovation management (Adams, Bessant & Phelp, 2006). And yet without this commercialization stage, the early technical stages of innovation that involve research, concept development and prototyping and overall project management, will not be commercially successful for the company (Hansen & Birkinshaw, 2007). Thus, managers should pay attention to the commercialization of innovation projects in order to get a whole picture of the potential for value creation and the likely uncertainties and risks involved. This will help them in identifying the relevant capabilities for effective management of innovation risk.

Possessing the necessary capabilities for identifying and managing innovation risk and applying them effectively to innovation projects reduces the potential for innovation failure and in the case of unavoidable failure can reduce the extent of the loses involved (Cooper et al., 1999). This depends on the ability of managers to match 'technical' expertise in areas of technology and project management, with 'soft' skills in people management which is necessary in promoting creativity and limiting fear of failure while also limiting innovation risks. However it is rare that managers will have the necessary capabilities to blend technical and soft human relations skills which are necessary for successful implementation of innovation projects. Besides, successful innovation management requires significant investment and interplay of financial and technical considerations. Effective innovation management therefore depends on the development and application of an integrated methodology with a clear strategy that is made up of distinct mix of technical, people and project management skills (Goffin & Pfeiffer, 1999). This approach is necessary for the identification of innovation risks and the subsequent development and implementation of risk mitigation strategies.

In order to effectively manage the risks associated with innovation projects and to improve the chances of commercial success, there is need for an appropriate strategy (Kim & Mauborgne, 1997; Tidd, Bessant & Pavitt, 2001). The strategy should integrate technical, marketing, human resource and risk management capabilities. This will require capabilities in analysis of market trends and determining how these drive the need for innovation (Kohli & Jaworskii, 1990). It will also need capabilities in the assessment of the role of technology, the opportunities it offers, and the acquisition of expertise in the relevant technologies (Clark, 1987; Burgelman & Rosenbloom, 1989). In addition, there is need for managers to develop capabilities for effective communication of the roles played by the different facets of innovation, namely; product, process and marketing innovations (Bughin & Jacques, 1994; Dyerson & Mueller, 1999; Cooper et al., 2001; Drake, Sekkab & Jonash, 2006). This is necessary to enhance the synergy between the different functional parts of the company and to match the available resources to the innovation strategy. Equally important is the need for managers to develop appropriate methodologies and techniques for evaluation of innovation performance which is based

on the use of effective measures (Boag & Rinholm, 1989; Cooper & Kleinschmidt, 1995; Adler, Everett & Waldron, 2000). The management of external resources and capability is also important for the success of innovation and is discussed in the next section.

2.5.2 Management of external resources and capabilities

The management of external resources and capabilities particularly external sources of information and knowledge contributes to effective innovation management. External resources are particularly relevant for firms from poor countries because they lack their own resources and capabilities to engage in innovation activity (Mytelka et al., 2004). In addition, when firms operate under conditions of complexity and uncertainty as is often the case with the international business environment, there is need for links with other organizations (Craig & Douglas, 1996). The linkages are both formal and informal and are developed with suppliers, customers, training institutions, financial intermediaries, professional industry associations, research institutions, donor/ government support agencies, regulatory institutions/ bodies of law and government (Glazer, 1991; Sinkula, Baker & Noordewier, 1997; Souitaris, 2001; Dayasindhu, 2002). Studies in this area have focused on the nature, content, role and how these relationships present additional opportunities and or impose additional constraints to the firm's innovation efforts.

Vertical relationships along value chains (Gereffi, 1994) have been sighted as important sources of information and knowledge for innovation (Powell, Koput, & Smth-Doerr, 1996; Dyer & Sing, 1998). In particular, suppliers have been considered to be an important source of knowledge for innovation (von Hippel, 1988). Customers have also been regarded to be an important source of innovation knowledge (Atuahene-Gima, 1995; Bessant, 2003) in that they provide market information about their preferences which can guide the innovation efforts of the companies (Afuah, 1998). These interactions yield valuable business knowledge (Eriksson et al.,1997) and information regarding scientific developments in the production methods, market changes and developments, competitor strategies and any relevant information on changes in legislation and its impact on competitiveness in the international markets (Caloghirou, Kaskelli & Tsakanikas, 2004).

Horizontal relationships in form of clusters or geographical agglomeration of companies (Marshall, 1920; Porter, 1990) or in form of industrial districts (Brusco, 1982; Piore & Sabel, 1984; Pyke & Sengenberger, 1992; You & Wilkinson, 1994) have also been considered to be instrumental for innovation development. In particular, these relationships offer convenient social and institutional structures to shape knowledge transfer and learning. This has also been recognized by Kogut (1988) who considers collaboration a vehicle by which knowledge is transferred and by which companies learn from one another through the interactions of their individuals. These relationships may go beyond borders and take the form of global production networks (Markussen, 1996; Henderson et al., 2002; Coe et al., 2008).

Horizontal collaborations constitute a way of transferring firm-specific tacit and explicit knowledge (Ciborra, 1991). In this respect it facilitates knowledge acquisition and creation (Nonaka, 1994; Nonaka & Takeuschi, 1995). However, successful knowledge transfer and learning depends on the capacity and commitment of the focal company to absorb, analyze, synthesize and utilize the acquired knowledge in order to develop innovation projects (Cohen & Levinthal, 1990). According to Lane and Lubatkin (1998), a company's capacity to recognize, assimilate, and exploit external knowledge depends in part on the similarity between the exchange partners' knowledge bases, organization systems and dominant logics. Thus learning in horizontal networks or clusters is not automatic.

Resources and capabilities are therefore crucial in the planning, execution and evaluation of innovation projects. The successful development and commercialization of innovation requires the use of different sets of resources and capabilities. According to the RBV, companies with unique sets of resources and capabilities are more likely to execute successful innovation projects than others. Managers are therefore encouraged to seek ways of acquiring the resources and developing capabilities both internally and externally in order to improve the capacity of their companies to carefully evaluate prospective innovation projects, undertake sufficient risk assessment and to carefully implement them

in order to improve chances of commercial success. This is further explored in the case of agro-commodity exporters in SSA. Thus, the next section explores the literature on innovation resources and capabilities in agro-commodity export sectors in general and with a special focus on SSA and the fish and flower export sectors in Uganda.

2.6 Innovation in agro-commodity export sectors

Research on innovation in agri-business export sectors suggests that successful exporters are more likely to be engaged in product adaptation or modification to suit the unique specifications of the foreign markets (Ibeh, Ibrahim & Panyides, 2006). This to a large extent depends on having internal resources and capabilities for research and development (R&D), quality control and brand development (Aksoy & Kaynak, 1994). For example, capabilities for product modification and adaptation are considered to be important in the food sector where consumer tastes may be rooted in national preferences (McGee & Segal-Horn, 1992). In particular, capabilities in the adaptation of food products to suit international market preferences has been found to be critical in explaining the significant success of meat exporters studied in the Japanese, Mexican and Korean markets (Leake, 2000). Other researchers such as Morgan and Sarris (1991), and Charlet and Henneberry (1992) have also reported a positive association between a firm's product-related innovation capabilities and international market success.

Other studies in agro-food processing have demonstrated the growing significance of capabilities in meeting International Standards Organization (ISO) standards in food processing. ISO standards usually prescribe rules that require agro-food processors to ensure that processes are transparent, documented, reproducible and controlled largely because of health and safety concerns (Jaffe & Henson, 2004). The prevalence of ISO standards can also be attributed to the increased competition and growing power of retailers that enable them to force food suppliers along the entire chain to re-organize quality systems and implement international standards in order to meet their supply and delivery requirements (Boudouropoulos & Arvanitoyannis, 2000; Jaffe & Henson, 2004).

Market knowledge and capabilities have also been associated with new product advantage among agro-commodity exporters (Li & Calantone, 1998). These capabilities arguably give the exporters opportunity to undertake market analysis to determine the shifts in competition and customer demand (Dougherty, 1992). Coupled with existing internal knowledge and past experience, the new knowledge can be successfully incorporated into new product development. Knowledge of new developments in the export markets facilitates the exporters in improving the appeal of their products to the buyers and in positioning the products in export markets.

The importance of marketing capabilities in the form of product branding, adoption of new distribution channels and improved customer relationship management is also associated with innovation success in international agri-business (Charlet & Henneberry, 1992; Aksoy & Kaynak, 1994; Crick et al., 2000). In particular, product branding capabilities have been highlighted in a number of studies undertaken among internationally active agri-business firms and are considered to be instrumental in facilitating differentiation in dynamic markets. As an illustration, differentiation based on branding was observed by (Mauget & Declerck, 1996) as a contributing factor to improvement in export revenue growth among successful Danish and French agro-food export companies. The importance of continuous product differentiation and brand building for international market success was also highlighted in Chryssoichoidis (1996) and Leake's (2000) respective studies of Greek dairy companies and a US meat exporting firms.

In addition to the above capabilities, the application of niche marketing capabilities has been reported among successful international agro-business firms. For example, Charlet and Henneberry (1992) concluded in their US study that small companies offering unique and specialized agro-food products used their knowledge of foreign market niches to develop distinct export advantages. This category of niche markets may be based on ethnicity (Aksoy & Kaynak, 1994; Shaw & Young, 2000). In that regard, the exporter takes advantage of knowledge about culture and traditional preferences of ethnic groups to modify food product offered and develop more suitable promotional programs.

However, the commercial success of innovation in agro-commodity export sectors depends to a large extent on how internal capabilities are aligned with external capabilities such as knowledge of customer tastes and preferences (Kohli & Jaworski, 1990) in order to improve the chances of commercial success of their innovations. The next section specifically explores the literature on capabilities for effective innovation management among agro-commodity exporters in sub-Saharan Africa.

2.6.1 Innovation in agro-commodity export sectors in sub-Saharan Africa

Studies on innovation activity in agro-commodity export sectors in SSA are relatively new (Oyelaran-Oyeyinka, 2006; World Bank, 2006). They have mainly adapted the methodologies used in developed countries in order to capture the special characteristics of the innovation processes that are largely informal with few formal R&D projects (Oyelaran-Oyeyinka, 2002) and are incremental in nature (Oyelaran-Oyeyinka, 2005; Hall, 2005). The extant literature shows that these exporters are faced with market failures arising from high investment and production costs caused by externalities such as high cost of imported inputs. These externalities present high barriers to innovation (Mytelka et al., 2004). These factors prevail at the macroeconomic and at firm levels by increasing the costs associated with the development of new products, production processes and marketing practices.

Innovation barriers operating at the macroeconomic level include for example economic uncertainty, poor physical infrastructure, fragility and weakness of government support institutions for business, lack of social awareness about innovation and lack of public policy instruments for business support (Mani & Romijn, 2004a; Oyelaran-Oyeyinka, 2005). The instability at the macro level limits any long-term innovation investment as managers view the environment to be riddled with uncertainty (Diyamett & Wangwe, 2006; World Bank, 2006). At firm level, innovation among these exporters is hampered by lack of financial and human resources, technology and research infrastructure, entrepreneurial and management skills; and the risk-averse attitudes of managers (World Bank, 2006). In addition, barriers to the accumulation of technical and managerial capabilities by the exporters are high and difficult to tackle, particularly in the case of

highly qualified human capital, local and international linkages, and tacit knowledge incorporated in organizational routines (Biggs, Shah & Srivastava, 1995b).

Most of the product innovations are introduced through imitation (Kaplinsky & Fitter, 2001a) and process innovations through the purchase of machinery and equipment and through the licensing-in of technology (Oyelaran-Oyeyinka, 2005; World Bank, 2006). Most innovations involve minor incremental changes based on adaptations of existing products and processes, but in some instances they may involve major changes in existing systems, for example the introduction of hydroponics flower production technology in the Ugandan flower export sector. Organizational change that involves alteration of structures, work relationships and employee attitudes is an extremely significant aspect of the innovation process in these sectors because of its direct impact on organizational performance. Organizational change contributes to the firm's ability to absorb new technologies incorporated in machinery and other equipment (Dolan, Humphrey & Harris-Pascal, 1999; Lall & Pietrobelli, 2002). Exporters in these sectors tend to be reactive in their innovation activity. For example, innovation in the export oriented agricultural firms are mainly dictated by the competitive pressure in the export markets and by the conditions and standards set by the regulatory authorities and lead firms in the downstream stages of the agricultural export value chains (Jeffe, 1998; Jeffe & Henson, 2004; Gibbon, Lazaro & Ponte, 2010).

The measurement of innovation in these sectors is a challenge because of the difficulty of applying existing definitions of innovation adopted from industrial sectors in developed countries (Mytelka et al., 2004). For example, there is the problem of measuring incremental changes, which may not result in "new or significantly improved" products or processes as stipulated in the established definitions from developed countries. In spite of the low level of innovation adoption among agro-commodity exporters in SSA, there are a few exceptional cases for example the Kenyan flower and horticulture industry (Dolan et al., 1999) that are worth exploring in order to provide practical insights on the analysis of innovation and value creation.

There is limited empirical evidence which suggests that agro-commodity exporters that have engaged in technological capability development and innovation have witnessed improvements in export performance (Jaffe, 1998; Kaplinsky & Fitter 2004; World Bank, 2004). The only exceptional cases is where specialized skills and technological capabilities have been used in enhancing product development, process improvements, and market development and the results show a positive relationship with export performance (Lall, Weiss & Zhang, 2006). An example in this respect is the application of technology to introduce innovative products in the non-traditional agricultural sectors which has been reported in the case of fresh agricultural produce sector such as vegetables, fruits, and flowers in Kenya (Dolan & Humphrey, 2000; Whitaker & Kolavali, 2006) and the wine industry in South Africa (Wood & Kaplan, 2005).

Accordingly, capabilities in product upgrading with respect to design and quality is associated with superior unit price performance in that either unit prices grow more rapidly or fall less rapidly than those of competitors (Kaplinsky & Readman, 2005). An example here is the case of Namibia where the market share of its beef exports to the EU and the corresponding unit values are reported to have grown faster than in the case of Botswana (Stevens & Kennan, 2005). Further empirical evidence shows that success of new food products depends to a large extent on the exploitation of new premium market segments (Kaplinky, 2004). However, none of these studies have demonstrated whether or not the increase in price exceeds the increase in costs of production associated with the new products. In other words, none of the studies of SSA agro-commodity innovation have demonstrated that financial performance has improved as a result of innovation activity.

Empirical studies have also acknowledged the complementary role that capabilities in process upgrading play in enhancing the success rate of product innovations in agro-commodity exports. Evidence on the study of successful agro-food exporters in SSA indicates that they are more likely to have adopted modern process technologies to help improve productivity (Kjollerstrom & Dallto, 2007). For example, the adoption of modern technology and innovation in inputs, crop agronomy, animal husbandry, post-

harvest handling and cold chain logistics management has been reported to be associated with growth in export volumes among fresh produce exporters in Kenya, Ghana and South Africa (Kaplinsky, 2004). Similarly, improved methods of meat processing and quality control have been associated with improved export volumes among Botswana meat exporters (Stevens & Kennan, 2005). However, measures based on export volume growth used in the above studies do not demonstrate whether or not there was any improvement in the profitability of the exporters.

Capabilities for improved and integrated cold chain management to international standards have also been associated with the international success of the Kenyan horticulture industry (Dollan & Humphrey, 2000; Bonaglia & Fukasaku, 2004). This is particularly reported among the pineapple exporters in Ghana (Trienekens & Willems, 2007), and the fresh fruits exporters in South Africa (Kjollerstrom & Dallto, 2007). This is important because buyers of perishable products require consistency in timing, quality, form and volumes delivered (Dolan & Humphrey, 2000).

In spite of the important role that technological capabilities have played in innovation success in these sectors, it involves considerable cost to the exporters. Costs include the procurement of expensive equipment, higher cost services, laboratory tests, certification fees, procurement of genetically improved planting materials or animals and the training of employees (e.g. Jaffe & Henson, 2004; Ponte, 2005; Humphrey & Memedovic, 2006). However, most of the previous studies on technological capability development have not extensively analyzed the costs associated with it. One study which estimated the costs associated with process innovations in the Ugandan fish export industry (Ponte, 2005), made no attempt to compare the costs of introducing process innovation with the increased prices or revenue obtained in the export markets to determine whether or not the exporters were earning profits. An analysis of costs and revenue is important in providing insights on whether or not these innovations resulted in a net improvement in financial performance or organizational sustainability.

The development of marketing capabilities in form of branding and the use of new export market channels has also been associated with improvement in export volumes among exporters in African agro-food sectors. Branding has reportedly been used to bring new or modified products to market and in the case of the food industry, packaging and branding has been used to differentiate products in an attempt to improve competitiveness among exporters in Kenya and South Africa (Brooks & Lucatelli, 2004). However, the actual profitability impact of branding was not adequately analyzed. Further evidence shows that product differentiation can be achieved through the promotion of country brands, or brands based on credence claims (Humphrey & Mamedovic, 2006). An example is the case of a successful citrus fruit supplier in South Africa (Outspan International) that was given the right to market a variety of cultivars sourced in distinct ecological areas as a "national product" to consumers in Europe (Mather, 1999). Similarly, some exporters in Kenya introduced specific brands of fresh produce in an attempt to reposition themselves in the premium segment of the EU export market (Jaffee & Masakure, 2005). Thus, branding can be applied as an important component of successful penetration of premium niche markets (Kaplinsky & Morris, 2006).

In spite of the profit potential arising from the use of consumer brands, relatively few agro-food exporters in SSA own any consumer brands, leaving the majority of exporters with no option but to sell to brand owners in the export markets possibly under seemingly unfavorable terms (Ewert & Henderson, 2004). The potential advantage of brand ownership is that it is an important source of bargaining power in the international supply chain and hence is a key aspect of marketing strategy (Humphrey & Memodovic, 2006). However, promoting a consumer brand for an agricultural or food product in Europe is an immensely costly and risky undertaking and there is no guarantee that it will succeed (Wood & Kaplan, 2005).

Although the available literature gives examples of successful emerging brands in agro-export industry in SSA such as the Namibian beef brand (Stevens & Kennans, 2005), there is so far no empirical evidence on their financial sustainability. The available evidence is based merely on export sales volumes, rather than net profitability. Further to

the uncertainty on brand ownership highlighted above, there have been plenty of examples of brand failure in the South African wine industry (Wood & Kaplan, 2005). For example Wood and Kaplan report that the biggest South African wine brand was launched by a UK company (later acquired by a US company) and plenty of home grown South African brands have had limited success by comparison. Thus, the launch of international consumer brands by African agro-food exporters is associated with uncertainty and a lack of empirical evidence showing its financial benefits or contributions to organizational sustainability.

The development of capabilities in the management of new distribution channels has also been associated with improved market performance. Dolan and Humphrey (2000) and Wijnalds (2005) in their separate studies on the horticulture industry in Kenya have observed that direct supply to the retail chains in the EU in contrast to the use of the traditional wholesale markets is associated with earning of higher revenue by comparison with competitors. However, these studies do not examine the additional costs and risks associated with supplying retailers directly. Similarly, the development of external network capabilities in international market channels has been associated with improvement in export revenue growth (Rutashobya & Jaenssen, 2004). For example the large horticulture exporters in Kenya have reportedly gone into joint venture with clearing and forwarding firms in Kenya and Europe in order to have control over the transport process so as to guarantee the maintenance of product quality (Dolan & Humphrey, 2000; Whitaker & Kolavalli, 2006). Once again, these empirical studies do not identify or report any additional costs and risks associated with these efforts. There has therefore been no attempt at estimating the financial sustainability of these new approaches to marketing strategy among the exporters.

2.6.2 Overall assessment of innovation research in agro-food export sectors in SSA

The foregoing review of innovation activities and the evidence of their impact on the performance in agro-food export sectors in SSA has highlighted the constraints on innovation activity by African agro-food exporters and the lack of empirical work on the financial benefits or sustainability of these innovation activities. The remaining part of

this section will summarize the discussion on innovation activity in these sectors. The above review highlights the positive contribution of several different types of innovation activity to growth in export sales and revenue. This is an indication that innovation may be helping in the improvement of product quality and consistency of supply and hence their appeal and acceptability in export markets. However, as noted earlier, innovation is risky and may destroy rather than create value for the exporter. This reality seems not to have been adequately explored in the empirical studies reviewed above. These empirical studies have not given adequate attention to the question of whether or not innovation is actually creating or destroying value, that is, resulting in improved financial performance or not. In particular, they have not pointed out that innovation can destroy value and that just by going into "high value products" or any other form of innovation does not necessarily mean that it will result in improved financial performance or sustainability. In this regard, financial sustainability refers to the ability of the firm to sustain its resources, competitiveness and profitability overtime (Nugent, 2001).

The lack of attention to financial outcomes to innovation activity in SSA is perhaps not surprising in view of the difficulties associated with collecting reliable profit data in SSA (Ramachandran & Shah, 1998). This limitation drastically reduces the usefulness of these studies for improving the practice of innovation management in SSA agro-food sectors. By way of illustration, the lack of financial performance data in innovation studies means that it is not possible to isolate the contribution of different types of innovation to the overall improvement in performance, how well aligned or mutually reinforcing they are, what is the optimal mix of product, process and marketing innovations, or how best to implement them. All of the above aspects are essential for effective management of innovation activity in such a way that increases the probability of value creation and improved financial sustainability. A more in-depth analysis of the net impact of innovation activity would therefore be needed to investigate the contribution of different types of innovation activity to financial performance and sustainability in these sectors and how best to manage a portfolio of innovation activities so as to create value and improve sustainability.

In addition to the above observations, previous empirical studies have tended to focus their analysis on a specific dimension of innovation at a time for example product innovation (e.g. Dolan & Humphrey, 2000; Whitaker & Kolavali, 2006), process innovation (Kjollerstrom & Dallto, 2007) and marketing innovation (Brooks & Lucatelli, 2004). Limited attempts have been made to examine the full range of innovation activities and yet innovation is a multi-dimensional construct that should be examined as such to effectively assess its contribution to firm financial performance and sustainability. Thus, there appears to be a lack of common conceptual framework in analyzing firm innovation activity and its impact on performance hence it is difficult to make generalizations from such empirical results. The next two sections briefly examine the nature of innovations undertaken by fish and flower exporters in Uganda respectively.

2.6.3 Critical review of innovation research in the fish export sector in Uganda

A number of empirical studies have assessed innovation activity in the Ugandan fish processing and export sector. For example, separate studies by Josupeit (2006) and Ponte (2005) have reported that technological upgrading and innovation in this sector was stimulated by the need to meet the changing consumer tastes in the EU fish markets. Another study by Kiggundu (2004a) attributed the innovations in this sector to the need to meet market entry and compliance requirements instituted by the EU authorities. In particular, new market entry requirements followed the establishment of new regulations on food safety, Sanitary and PhytoSanitary (SPS) requirements, hygiene and quality standards as stipulated in the EC Council Directive 91/493/EEC (Avermaete et al., 2004; Jaffee & Henson, 2004; Ponte, 2005). These were aimed at controlling and preventing food contamination and risk to human life and the environment.

Innovations in this sector were also induced by the new opportunities associated with the preferential market access offers by the EU such as the zero tariff and non-quota restrictions to the least developed countries (LDCs) under the Cotonou Agreement and the Everything But Arms (EBA) (Dijkstra, 2001; Keizire, 2004). Competitive pressure in the EU and other export markets can also account for the innovations undertaken by the exporters in this sector. Most notably, the entry of similar but cheaper fish products into

the EU markets, such as tilapia from China and Pengasius (basa) catfish from Vietnam. Accordingly, this stimulated quality improvements and value addition using advanced fish processing technology in order for the Ugandan fish products to remain attractive to consumers in the EU markets (Josupeit, 2006). An example is the value added fish products that enabled Ugandan exporters to earn higher prices per kilogram than previously achieved in the EU markets (Ponte, 2005; Kiggundu, 2006). In all, exporters in this sector undertook different forms of product, process, marketing and supply chain innovations for example new fish products, processing techniques, quality control procedures, cold storage techniques and marketing approaches. These were all aimed at improving competitiveness and survival in the competitive international markets (Nyeko, 2005; Ponte, 2005; Kiggundu, 2006).

However, previous innovation studies in this sector have not sufficiently analyzed the net financial impact of these innovation activities and hence it is difficult to draw any firm conclusion about the degree of progress in their long-term sustainability. Limited attempts in this direction include the study by Ponte (2005) that partially estimated the cost of upgrading the fish processing plants to the standards required by the EU authorities, but did not analyze the costs of other innovations and the prices associated with the different fish products and hence did not estimate the likely net financial returns associated with the innovations. The study by Kiggundu (2006) identified the technological changes undertaken by the fish exporters and modeled the contribution of these changes to export volume growth, but did not estimate the costs associated with the different innovations and the prices derived from the different fish products, to this end it did not analyze the contribution of these changes to financial performance. The only exception is the study by Bambona (2002) that attempted to model the profit impact of adding value to the Nile perch fillets for export to the EU retail markets. Although the latter study concluded that it was profitable to add value to Nile perch, it did not take account of all the costs involved and other options in developing and marketing value added fish products. For example, the additional cost of marketing to retail channels was not included in the analysis. It also ignored the revenue and cost impact of other innovations undertaken by the fish exporters and hence could only provide partial

estimates of the net financial impact of certain specific innovation efforts of fish exporters in Uganda.

Previous studies of innovation in this sector do not therefore provide sufficient insights into the effectiveness with which the firms were undertaking the innovations and the extent to which the investments in the innovations have been able to bring in financial returns. There can be no guarantee therefore that past innovations in this sector have necessarily resulted in improved financial performance or sustainability. The next section reviews innovation research in the flower export sector in Uganda.

2.6.4 Critical review of innovation research in the flower export sector in Uganda

Innovation in the flower export sector in Uganda has been documented in a number of empirical studies (e.g. Asea & Kaija, 2000; Dijkstra, 2001; VEK-World Bank, 2004). Innovations adopted by Ugandan flower exporters were in the form of new plant varieties, new process technologies, new marketing and supply chain approaches, and new management systems that emphasize quality improvement.

A notable product innovation was the adoption of the sweet heart and intermediate flower varieties to replace the T-Hybrid flower varieties (Wijnands, 2005). Flower producers in Uganda had realized that the T-hybrid roses were not suitable for the growing conditions under which they operate and hence could not attain the required flower yield and stem length prompting the exporters to sell them at lower than the normal auction price in Holland. In a study by (ADC/IDEA, 1998), it was established that flower growers were making losses and between 1995 and 1998, up to four flower exporters had been bankrupted. This was attributed in part to poor flower yields as a result of failure by the growers to identify suitable flower varieties and also because of the many constraints that collectively increase the cost of operations to Ugandan firms relative to others in the industry (ADC/IDEA, 1998; Asea & Kaija, 2000). The main constraints plaguing the industry included poor physical infrastructure, lack of cold storage facilities at the airport, difficulties in getting flight cargo space to ship the flowers to the export markets and the high cost of borrowing long-term finance. However, previous studies did not estimate the

losses attributable to the growing of T-Hybrid roses, hence it remained unclear as to how large the losses were in the industry, how profitable firms in the industry are now, how this varies across firms in the industry, and what the relative combination of different innovations was to these improvements.

Process innovations reported among Ugandan flower exporters were mainly in the form of the introduction of technologies for multiplication of planting materials, improving flower growing techniques, modern crop agronomy and disease control, and improved post-harvest cold chain management (Wijnands, 2005). Other innovations introduced were mainly with respect to improvement in quality control (VEK-World Bank, 2004). This was achieved through reorganizing the supply chain, improvement in flower handling and re-organizing the work force to ensure effectiveness in plant care and flower handling. In addition, marketing innovations were mainly in form of exploring the possibility of selling flowers through direct wholesale markets in addition to the auctions (Wijnands, 2005).

The adoption of innovation and the performance improvements in this sector following the difficulties experienced at the inception stage have been attributed to factors such as government policy reforms and increasing donor support that enabled the flower exporters to build capability to implement innovation projects and also to overcome the constraints faced in the industry (Asea & Kaija, 2000; VEK-World Bank, 2004). However, the sustainability of these external advantages is not guaranteed. Whereas donor support is important for emerging industries, firms must achieve independent sustainability as the donors will eventually cease to provide the financial support. The net impact of these support initiatives to the individual firms remains unclear and it is not known as to whether or not the industry can survive without donor support (Wijnands, 2005).

The foregoing review of innovation studies in the Ugandan flower export sector has highlighted the difficulties faced by the sector in its inception stages and the subsequent recovery of the industry through active involvement in innovation activity by the flower exporters as well as assistance from government and donors. However, previous studies

do not quantify the losses made by the flower farmers, or indeed how profitable the new varieties are under different production techniques and which combination of product, production and market innovations are optimal in the Ugandan context. The only attempt to analyze profitability in the Ugandan flower industry is the VEK-World Bank (2004) study which reported marginal profits made by the sweet heart rose varieties. Although important in highlighting the economic viability of rose farming in Uganda, this study did not take account of the different product, production and market combinations. Instead, it only examined flowers that were grown on soil based production systems and exported to the auctions. Other production and marketing changes adopted in the industry such as the production of intermediate roses, the use of hydroponics and sale to direct wholesale export markets were not explored. Overall sustainability of innovation activities in the industry therefore remains unclear.

In sum, the review of literature on innovation capability and firm performance in SSA in general and in particular the fish and flower export sectors in Uganda has revealed that there is lack of a common approach to modeling the profit impact of innovation activity. This might be because data for undertaking a profit impact analysis is not readily available as agro-commodity exporters are not willing to provide the revenue and cost data for reasons of their confidentiality (Ramachandran & Shah, 1998). This empirical study therefore attempts to contribute to this knowledge gap by exploring the profitability associated with innovation activities in the fish and flower export sectors in Uganda and examining which management practices are associated with superior performance.

2.7 Chapter conclusion

This chapter has explored and reviewed varied literatures on firm innovation in general and innovation activity and financial performance in the agro-commodity export sectors in SSA. It has highlighted the lack of consistency in the application of methodologies in analyzing the impact of innovation on firm performance. It has also identified the lack of previous studies on the financial impact of innovation activities in agro-commodity export sectors in SSA. The chapter provides an integrated theoretical framework that combines mainly marketing and resource-based theories of innovation to analyze

innovation activity and value creation in agro-commodity export sectors in a poor country context. The next chapter presents the methodological framework adopted in the study reported in this thesis.

Chapter 3: Methodology and Research Design

3.1 Introduction

This chapter broadly explains the philosophical and methodological approach adopted in this thesis. It is structured as follows: Section 3.2 presents a brief review of methodological developments in innovation studies. Section 3.3 presents the different approaches used in the empirical analysis of innovation and the justification of the use of mixed methods in this study. Section 3.4 outlines the research design adopted in the study. Section 3.5 describes the approach adopted in the operationalization and measurement of the research variables. Section 3.6 outlines the main validity and reliability procedures adopted for the study. Section 3.7 indicates the techniques and tools of data processing and analysis used in the study. Section 3.8 briefly explains the limitations of the methodological approach used in the study. Section 3.9 gives a summary of how the research approach fits with research design parameters and conclusion.

3.2 Conceptualization and methodological developments in innovation studies

The conceptualization and methodological developments in past innovation studies can be categorized into four approaches namely: input-output approach (Pavitt & Walker, 1976), activity approach (Hansen, 1999), the innovation systems approach (Freeman, 1982; Lundvall, 1992), and management-project level approach (Cooper et al., 2001). A comparison of these approaches in terms of their main focus, measures of innovation adopted and the underlying assumptions is presented in Table 3.1.

Table 3.1 Approaches to the study of innovation

Approach to innovation	Key assumptions and focus	Measures of innovation adopted
Input-output approach	*Key assumption*: Innovation is a linear input-output process. *Focus*: Technological innovation indicators based on innovation inputs and outputs.	▪ R&D Expenditure. ▪ Existence of formalized R&D department in a company. ▪ Participation in joint R&D projects with other companies. ▪ Acceptance on publicly funded innovation support programs. ▪ Educational background of staff. ▪ Patents. ▪ Number of successful New Product Development (NPD) projects.
Activity approach	*Assumption*: Innovation is a multi-disciplinary process. *Focus:* Backward & forward linkages in the process.	▪ Research. ▪ Implementation (production). ▪ End-use (customers of the product & process outputs). ▪ Linkages (bringing together complementary knowledge). ▪ Education.
Systemic approach	*Assumption*: Innovation is a systemic process largely driven by linkages between firms and other external agencies. *Focus*: Inter-organizational flow of technological knowledge and learning.	▪ Systemic linkages (structure and strength of the network). ▪ Linkages with lead firms, knowledge institutions. ▪ Output from external linkages (cluster/value chains) in form of patents, new products, new processes and systems.
Management (project) level approach	*Assumption*: Innovation is a complex and integrated process of gathering ideas, setting priorities and developing new products, processes, management practices, marketing techniques including their successful commercialization. *Focus*: Actual management of innovation activities by identifying opportunities and taking care of uncertainties and risks.	▪ Uncertainties and risks in innovation. ▪ Actual revenue and costs associated with innovation. ▪ Financial value of innovation

Source: Literature review by author

3.2.1 Input-output approach

The input-output approach to innovation is based on the characterization of inputs such as R&D expenditure and outputs such as patents (Schmookler, 1953) to measure the level of innovation in companies. This approach attempts to identify, count and characterize

companies that commercialize technological innovations (Little, 1963). Its focus is on describing the characteristics of companies, sources of innovation, and costs incurred in R&D, and the results of innovation presented as patents, new products and new processes. It defines innovation as performance in being the first to file patents or commercialize new products and processes.

However, patents and R&D expenditure are of limited use as indicators of innovation because patents measure inventions rather than commercially applied innovations and R&D expenditure represents only a portion of total innovation costs. There are other significant innovation costs that go into investment in new machinery and equipment, tooling, product design, trial production, and market testing all of which were previously ignored and yet are important in bringing new discoveries to market (OECD & Eurostat, 2005). Besides, the focus on R&D expenditure exclusively as the main innovation activity ignores other important aspects of innovation for example informal and part-time innovation activities undertaken outside the formal R&D laboratories. Moreover companies differ significantly in the level of R&D productivity that they can achieve (Pavitt, 1976).

This approach also views innovation as a linear process that is assumed to move automatically from R&D to invention, development, market launch, and profitable sales growth. This is somewhat idealistic because the practice of innovation involves both backward and forward actions and interactions between different processes all aimed at improving the market potential of new discoveries (Kline & Rosenberg, 1986). In addition, this approach does not address the practical realities of innovation management, namely, identification of ideas, setting priorities based on opportunities identified and the translation of ideas into innovation activities, their commercialization, management of uncertainties and risks and the gathering of value that accrues to the firm. Thus, the approach only provides limited insights into what constitutes a successful innovation (Geroski, 1994; Iansiti & West, 1997). The activity approach to innovation discussed below attempts to overcome some of the limitations of the input-output approach.

3.2.2 Activity approach

The activity approach to innovation builds on the framework of the input-output approach and is multi-disciplinary. It incorporates planning, design, prototyping, testing and implementation of innovation activities with the aim of improving overall organizational performance (Kline & Rosenberg, 1986). Although this approach attempts to analyze the activities undertaken at different stages of the innovation process, it overlooks the most important components of innovation namely, marketing, selling, distribution and risk management. It measures innovation in terms of the proportion of a firm's total resource base devoted to it as well as outputs in form of the number of significant new products and processes produced by the firm (Pavitt, 1976; Sheth & Ram, 1987; Porter, 1990). However, the approach does not analyze innovation in terms of improved revenue growth, higher prices, lower costs or improved profitability. These are the most important performance outcomes of innovation addressed at the management and project level.

The activity approach also lacks clarity in the definition of the scope of innovation and what should be counted as an innovation activity as distinguished from other activities (Hansen, 1999; Sternberg, 2000). In addition, this approach does not look at the uncertainties and risks involved in innovation and the financial realities that determine future innovation project sustainability and firm growth. A further limitation of the approach is that, it focuses disproportionately on the internal processes and innovation activities of the firm and pays limited attention to external or institutional factors that might enhance or hinder innovation within the firm. Arguably, the two building blocks required to understand the innovation process are the firm (the creator and manager of knowledge), and the national, regional and international innovation systems as the providers of the environment and resources needed for the creation of this knowledge. This view to a large extent is well articulated under the innovation systems approach (Freeman, 1982; Porter, 1990; Lundvall, 1992; Mytelka, 2000) which is discussed in the next section.

3.2.3 Innovation systems approach

The innovation systems approach emphasizes the importance of linkages between companies and networks of actors engaged in different aspects of innovation activity in a given geographical space. It particularly emphasizes the role of Science and Technology (S&T) institutions, universities and other research institutions in the innovation development process in companies (Porter, 1990; Lundvall, 1992). It calls for the empirical analysis of innovation to include aspects of co-operation and collaboration so as to recognize and account for the role played by external actors as well as processes within companies (Lundvall, 1992). It further recognizes the central role of national governments in strengthening the S&T infrastructure, regulatory framework, policy and institutional conditions that influence company innovation (Freeman, 1987; Hall, 2005).

The innovation systems approach attaches a significant amount of value to processes of learning which are promoted by information and knowledge flows through linkages between the different actors in the system (Lundvall, 1992). It characterizes the nature of linkages between the company and external actors, and how these linkages facilitate technology transfers from outside, and learning and knowledge development within the company (Lall, 1992, 2001). External linkages may be developed through the framework of clusters and/or value chains. Clusters facilitate knowledge flow and learning by creating a socio-economic environment in which companies and institutions can interact within a given geographical space (Porter, 1985). Value chains can also facilitate knowledge flow and learning through linkages with input suppliers and product users both nationally and sometimes internationally (Gereffi, 1994; Giuliani, Pietrobelli & Rabellotti, 2005).

As was observed earlier with the input-output and activity approaches to innovation, the innovation systems approach also appears to give insufficient attention to the realities of innovation at the company level. These realities include the commercialization of innovation and the attendant challenges such as the selection of the most optimal innovation portfolios, their alignment, management of innovation project risks and costs, and the difficulties of creating value from innovation. Considering the weaknesses of the

input-output, activity and innovation systems approaches and failure to address the primary purpose of innovation, namely to create economic and social value for the company, this study will adopt the management approach to innovation. The management approach focuses on the analysis of different innovation activities at project level and emphasizes their collective contributions to value creation. The next section briefly reviews the management (project) level approach to innovation.

3.2.4 Management (project) level approach

The management or project-level approach to innovation addresses the concerns and realities relating to how to conceive ideas, develop them into innovation projects, implement and monitor the projects, and evaluate their commercial outcomes (Cooper et al., 2001). This approach considers innovation to be a complex and integrated process of gathering ideas, setting priorities and developing new products, processes, management practices, marketing techniques including their successful commercialization (Goffin & Mitchell, 2005). The focus of this approach is on the actual management of innovation activities by identifying opportunities and taking care of uncertainties and risks in order to increase the chances of commercial success and value creation.

The management approach conceptualizes innovation as an ongoing process involving interactions between markets as sources of opportunities and the company's knowledge base and capabilities through which innovation ideas are identified, priorities set, innovations projects developed and implemented with sufficient attention paid to the uncertainties and risks involved. This approach also emphasizes the importance of feedback between earlier stages of innovation (R&D and product development) and later stages of the innovation process (market testing and commercialization) and how these interactions serve to improve management capacity to effectively manage innovation risks and increase the chances of value creation. This empirical study adopts the management/project level approach to innovation. The next section presents a discussion of the different approaches to the empirical analysis of innovation.

3.3 Approaches to the empirical analysis of innovation

Different approaches have been used in the empirical analysis of innovation. These approaches fall into the traditional quantitative and qualitative domains. But increasingly an approach combining the quantitative and qualitative traditions (mixed methods) is used. These three approaches are discussed below to highlight their strengths and limitations in providing a more credible way of analyzing innovation and financial performance.

3.3.1 Quantitative approach

The quantitative approaches to the empirical analysis of innovation have been mainly undertaken through industry surveys using questionnaires and standardized measures. The questionnaires are used to measure expenditure on innovation, number of patents registered, internal sources of innovation and external knowledge flows (OECD & Eurostat, 2005). However, this approach has limitations that reduce its practical usefulness as a method of analyzing innovation or its role in value creation.

A major challenge with innovation surveys relates to the measurement of innovation itself. For example, researchers often experience difficulties with separating parts of innovation expenditure that are related to new and improved products or processes from parts related to other routine activities (Hansen, 2001). Innovation surveys have also been mainly inclined towards selecting companies considered to be highly innovative because they are perceived to be more willing to provide relevant data and therefore more likely to respond than the less innovative ones (OECD & Eurostat, 2005). Under these circumstances, the less innovative companies are under-represented thereby giving a high risk of bias. In reality, the analysis of non-innovative companies and even failed innovations is important because it provides the researchers with broad and useful insights regarding the nature and outcomes of innovation for example, the new products or processes (Nassimbeni, 2001; Salazar & Holbrook, 2003).

Another limiting feature of innovation surveys is that the definition of innovation adopted by researchers in developed countries has a strong bias towards technical aspects and

neglects customer needs analysis, willingness-to-pay analysis, marketing and branding aspects (Jaworski & Kohli, 1993; Mytelka et al., 2004). The emphasis of technical aspects of innovation at the expense of other equally important aspects such as commercialization may not be helpful for the analysis of innovation in poor SSA countries. This is because minor innovations, and adaptations and assimilations of existing technologies from the developed countries are often more common than major innovations among producers in SSA (Diyamett & Wangwe, 2006). This is an indication that the processes of technological development and innovation in SSA countries are essentially different from those in developed countries, and hence may require a different approach to their measurement and analysis.

An additional limitation with industry innovation surveys relates to the use of postal questionnaires in that sometimes respondents lack clarity on the meaning of the terminologies used in the questionnaire (Moser & Kalton, 1985). Under these circumstances inaccurate responses generated from the field study due to respondents' misunderstanding of what was meant in the questionnaire may be overlooked and even if they are not, there is unlikely to be opportunity for getting clarifications in face-to-face or telephone interviews (Mason, 2002). A further limitation is that findings of most innovation surveys are based on questionnaires sent out to the managers and not necessarily to the personnel in the organization who would be most knowledgeable about the innovation process (Eurostat & OECD, 2005). Although it may be presumed that the responsibility of filling out the questionnaires is delegated by the manager down the company hierarchy to the appropriate personnel, this may not be the case in actual practice and hence the outcome of the innovation survey may not be accurate.

Innovation surveys have also been historically biased towards manufacturing industries and neglected agricultural, resource-based and service sectors (Mytelka et al., 2004). This is because manufacturing firms have been an important and dominant source of innovation historically, and databases and registers are more readily available for manufacturing than in the case of other sectors at least in the developed countries (OECD & Eurostat, 2005). The results of innovation surveys have also only concentrated on

describing the characteristics of firms considered to be innovative as distinguished from the ones which are not innovative. Although some attempts have been made towards using surveys to assess the financial outcomes of innovation in developed countries (e.g. Cooper et al., 2001), no empirical study has so far reported an analysis that evaluates the financial implications of innovations particularly among agro-commodity exporters in SSA. The next section reviews the qualitative approach to innovation.

3.3.2 Qualitative approach

The analysis of innovation has also utilized qualitative approaches. Rich qualitative approaches have been used in a number of innovation studies (Leonard-Barton, 1992; Christensen, 1997; Tushman & O'Reilly, 1997). In particular, detailed case studies (Yin, 1994) have been used in the analysis of knowledge flows and innovation patterns in the different industries and companies in order to reveal the unique trajectories taken by individual innovations (Malerba, 2002). For example, the nature of innovation activities undertaken by companies, the outputs of such innovations, the sources of knowledge and the learning used to support the adoption of such innovations have been studied. This approach has been used in some SSA studies such as the analysis of innovation in the Ugandan fish export industry (Ponte, 2005), and innovation in the South African wine industry (Wood & Kaplan, 2005). Although the qualitative approach is useful in mapping out the structure and pattern of innovation activities in specific sectors and within firms, it lacks the analytical tools for evaluating the contributions of those innovations to financial performance and sustainability.

The qualitative approach therefore appears to be useful in the mapping of innovation patterns in an industry which reveals the rich history of innovations developed, the factors associated with their development, the challenges faced and what has been done to address those challenges. In order to complement the qualitative approach, more especially as regards the assessment of the financial implications of the innovations, quantification becomes necessary and the tools for doing it are found in an approach which incorporates detailed quantitative data e.g. on costs and revenue associated with different types of innovation. Hence, an empirical study focused on determining whether

companies are extracting value from their innovation activities would require both the quantitative and qualitative approaches. This is referred to as the mixed methods approach. The next section gives the rationale for using mixed methods in this study.

3.3.3 The mixed methods approach: linking qualitative and quantitative data

In order to achieve the objective of investigating the pattern of innovation activities in the fish and flower export sectors in Uganda, and the extent to which those innovations are creating or destroying value, this study adopted a combination of quantitative and qualitative data collection techniques or the mixed methods (Creswell & Plano Clark, 2009; Teddlie & Tashakkori, 2009). The mixed methods (MM) research has emerged as an alternative to the dichotomy of qualitative (QUAL) and quantitative (QUAN) traditions by emphasizing the mixing of methods and the disentanglement of methods and philosophy (Greene, Caracelli & Graham, 1989). According to Tashakkori and Teddlie (1998), mixed methods is defined as the combination of qualitative and quantitative approaches in the methodology of study. Mixed methods research has also been referred to as the third path (Gorard & Taylor, 2004), the third research paradigm (Johnson & Onwuegbuzie, 2004), the third methodological movement (Teddlie & Tashakkori, 2003), and "a new star in the social science sky" (Mayring, 2007, p.1).

The mixed methods approach reinforces the complementary roles of qualitative and quantitative methodologies. To this end, the qualitative approach allows the researcher to delve more deeply into the subject of study (Silverman, 2000; Mason, 2002) in order to identify the different types of innovation activity, interactions between these innovation activities, the difficulties experienced in implementing them and expected benefits. On the other hand, the quantitative approach would permit investigation of the extent of value creation associated with different innovations. Estimating the profitability associated with each innovation depends on a variety of quantitative data on cost and pricing structures. Accordingly, the researcher adopted a combination of the quantitative and qualitative approaches to study the different innovation activities and to estimate costs and revenue associated with them. This was necessary to evaluate the contribution

of the different innovations to value creation, a task that would not have been easy to accomplish by relying on a single method (Kirk & Miller, 1986).

The complementary nature of these methods, the purpose for using them, and the benefits to the overall research were explored for the different stages of this empirical study namely: design, data collection and data analysis (Greene et al., 1989). These complementarities are outlined in Table 3.2 and are considered important and relevant for the analysis of the financial impact of innovation in the two sectors under study. For example, at the design stage, the qualitative approach helps in locating the different cases within the sectors to be studied while the quantitative approach is used to develop the data collection instrument. At the data collection stage, the qualitative approach helps in providing background data that is useful in determining who is to take part in the study, while the quantitative approach helps in the gathering of data on perception regarding innovation performance, costs and revenue. Lastly, at the data analysis stage, the qualitative approach helps in showing patterns of innovation and the generalizability of specific observations, while the quantitative approach helps in quantifying variables in order to facilitate comparison and the determination of profitability and the extent to which respondents are satisfied with it.

Table 3.2 Complementary aspects of research methods

Stage of research	Qualitative approach	Quantitative approach
Design stage	By finding a representative sample and locating different cases.	By aiding with conceptual development and instrumentation.
Data collection stage	By supplying background data , identifying overlooked information, and helping avoid "elite bias" (talking only to high status respondents)	By making access and data collection easier.
Data analysis stage	By showing the generality of specific observations, correcting the holistic fallacy (monolithic judgments about a case), and verifying or casting new light on qualitative findings.	By validating, interpreting, clarifying, and illustrating quantitative findings, as well as through strengthening and revising theory.

Source: Adapted by author from Greene et al. (1989)

3.4 Research design

The research design adopted for this study can be characterized as cross-sectional (Sechrest & Sidana, 1995) and it involved using a combination of different steps in an attempt to integrate qualitative and quantitative methodologies (Miles & Huberman, 1994; Tashakkori & Teddlie, 1998; Creswell, 1999; Morse & Niehaus, 2009). According to Creswell and Plano Clark (2009 p.77), this approach is referred to as the "convergent parallel design and it occurs when the researcher collects and analyzes both qualitative and quantitative data during the same phase of the research process and then merges the two sets of results into an overall interpretation". The integration was undertaken at the literature review, pilot, field, and confirmatory field stages of the study as indicated in Table 3.3.

Table 3.3 Different phases of data collection

Study phase:	Phase 1 Pilot study in the fish and flower sectors	Phase 2 fish sector	Phase 2 flower sector	Phase 3 (Sector confirmatory field work)
Data collection period	1 week	8 weeks	8 weeks	2 weeks
No of observed firms	2	15	16	6
Research design and main focus	Preliminary survey and basic interviews	Semi-structured in-depth interviews (Fish Sector) and use of self-administered questionnaires	Semi-structured in-depth interviews (Flower Sector) and use of self-administered questionnaires	Confirmatory interviews in the 6 firms, three from each sector and with sector experts
Time perspective	4 years	3 Years (2002-2004)	4 Years (2001-2004)	4 Years (2001-2004)
Main purpose	Exploratory and descriptive	Explanatory and analytical	Explanatory and analytical	More analytical
Method for data collection	Exploratory interviews with the managers and sector experts.	Self-administered questionnaires, in-depth interviews with the managers and sector experts, analysis of documentary sources.	Self-administered questionnaires, in-depth interviews with the managers and sector experts, analysis of documentary sources.	More in-depth and analytical interviews with the managers in the firms and experts from sector organizations.
Form:	Semi- structured	Structured and semi-structured	Structured and semi-structured	Structured and more analytical

Source: Author.

Basic literature review: Basic literature review provided the framework for the design of this empirical study. Initial reviews of the literature focused on identifying the theoretical framework used and how it was applied in the empirical analysis of innovation in developed and poor SSA countries. The bulk of this was presented in chapter 2 and partly in the earlier sections of this chapter. After an extensive review of the literature, gaps were identified especially regarding the lack of previous studies investigating the financial returns to innovation. Literature on both the quantitative and qualitative analysis of innovation was explored and it became apparent that no previous studies had undertaken an in-depth analysis of the different forms of innovation activity and the ways in which they contributed to firm value creation in either the fish or flower sectors in Uganda. This was used to draft the data collection instruments for this study.

Pilot study: Based on the review of literature and through consultations with two experts, one each from the flower and fish export sectors, pilot studies were undertaken. The outcome of these pilot studies led to further refinement of a semi-structured interview guide and a questionnaire both of which covered different aspects of innovation management. Altogether four firms, two each from the fish and flower export sectors were used in the pilot study.

First field study: The first field study used both the self-administered questionnaire and in-depth interview in the fish processing and export sector in Uganda. In addition, a review of documents and other secondary sources was used to collect both qualitative and quantitative data. Out of the 22 companies identified in the register of fish exporters, only 15 that were fully operational responded to the self-administered questionnaires while 2 declined to take part in the study and 5 were non-operational. However, of the 15 that were operational and willing to take part in the study, only 13 companies accepted to provide adequate financial data (chiefly revenue data) and to take part in the interviews. There was no attempt to get hard profit data in view of the sensitivity regarding profit data in Uganda and the likelihood that if profit data were provided it would not be reliable (Ramachandran & Shah, 1998). The integration of the quantitative and qualitative

approaches was achieved at this stage by simultaneously collecting data using the questionnaire and through the in-depth interviews.

Second field study: The second field study adopted the same approach as in the first field study mentioned above, although minor adaptations were required in view of the different types of innovation activity in the two sectors. Out of the 20 companies identified in the register of flower exporters, only 16 were fully operational and willing to take part in the study using the questionnaire. However, of the 16 that were willing to take part in the study, only 15 companies were willing to provide financial data and to take part in the interviews. Details of the contents of questionnaire used are in *appendix 7,* while details of the interview guide used in the fish sector study are in *appendix 8.1* and for the flower sector in *appendix 8.2*.

Confirmatory field study: Confirmatory interviews were conducted in 6 firms, three from each sector and with 4 industry experts, 2 from each sector. These interviews were used to confirm the accuracy of estimates of profitability associated with different combinations of innovation at different points in time.

3.4.1 Study population

The population under study in this research is composed of export firms in the flower and industrial fish processing sectors in Uganda. These are companies directly involved in the production and export marketing of flowers and processed fish respectively. Registers of the flower exporters obtained from the Uganda Flower Exporter's Association (UFEA) and of the fish exporters obtained from the Uganda Fish Processors and Exporters Association (UFPEA) were used to identify eligible firms. The total number of firms in the sectors, and the ones that were contacted and accepted to take part in the study are indicated in Table 3.4.

Table 3.4 Population and samples of Ugandan flower and fish exporters

Sector	Total number of registered exporters found in the register	Number of exporters that were willing and provided questionnaire data	Number of exporters that provided revenue data and took part in interviews
Flower exporters*	20	16	15
Fish exporters**	22	15	13
Total	42	30	27

Source: Author using survey data

Notes.
* Obtained from the register of flower exporters kept at the Uganda Flower Exporters' Association (UFEA)
** Obtained from the register of industrial fish exporters kept at the Uganda Fish Processors and Exporters Association (UFPEA)

3.4.2 The sampling plan

Samples for this study were drawn from the population of exporters in the flower and fish sectors using databases of registered flower and industrial fish exporters in Uganda respectively. Additional verifications were made by consulting the data base of all exporters in Uganda kept by Uganda Exports Promotion Board (UEPB). Although the researcher targeted all the registered exporters in the fish and flower sectors for the study, not all of them eventually took part in the study. Out of a total of 20 registered flower exporters, only 16 were located and accepted to take part in the study representing an 80% response rate. Four flower exporters could not be located at all and were presumed to have discontinued trading. In addition, 2 firms were found not to be growing and exporting cut flowers but only exported cuttings and thus were excluded from this analysis altogether, as the decision was taken to focus solely on the export of cut flowers given that this is the major source of revenue in the sector. Out of a total of 22 registered fish exporters, only 15 accepted to take part in the study representing 68% response rate. The remaining seven firms declined to take part in the study citing confidentiality as the main reason for non-participation.

3.4.3 Respondent selection

Upon first contact with the firm, the researcher approached top management to seek permission for the study. After permission had been obtained and careful discussion of the subject matter of research and its objectives, appropriate people with the requisite information and knowledge of different aspects of innovation activities of the firm were identified as key informants with the assistance of senior management. These were mainly senior and technical staff with responsibility for and technical understanding of innovation activities and who had links with both local and foreign external partners in their respective value chains.

The above restrictions assured that the respondent had a broad view of the technical function of the firm and how it was integrated across functional boundaries and the organizational level, and could provide the detailed innovation and technical information required. Multiple informants were therefore selected among the production, quality control, export marketing and financial managers in each firm. Four sector experts were also contacted to take part in the study, two each from the fish and flower sectors. Thus, purposive sampling of respondents was used and data drawn from multiple sources in order to guard against the possible weaknesses arising from common methods bias (Doty & Glick, 1998). Common methods bias is the magnitude of the discrepancies between the observed and the true relationships between constructs that result from common methods variance and normally arises when the same person provides data on both the independent and dependent, or all the variables under study. To overcome this problem, production, quality control and marketing managers provided data on the different innovation activities, while financial managers provided data on the revenue and cost estimates associated with those innovations. The structure of the sample used in the study is presented in Table 3.5.

Table 3.5 Sample structure of the Ugandan flower and fish exporters

Designations of key informants	Flower Sector		Fish Sector	
	Number of informants interviewed	Number of returned questionnaires	Number of informants interviewed	Number of returned questionnaires
Production Managers	15	15	13	16
Quality Control Managers	8	8	10	10
Export Managers	14	9	13	10
Accountants	7	15	5	16
Sector Experts	2	N/A	2	N/A
Total	46	47	43	52

Source: Author using field data

Notes: N/A is used to denote not available

3.4.4 Sources of data

The study used both primary and secondary sources of data. Secondary data was gathered through documentary review and analysis of records in the companies (Johnson & Turner, 2003). Primary data was gathered through the use of self-administered questionnaire and using a detailed structured interview guide (Patton, 2002), supplemented with observations. The survey questionnaire was used to gather perceptual data on the different aspects of innovation and the respondent's level of satisfaction with the profitability of their firm. The interview guide was used to collect detailed data on the different types of innovation activities undertaken, the capabilities involved, the linkages created to facilitate learning, as well as the objective data on revenue and costs.

3.4.5 Data collection methods and instruments

The study employed two approaches to data gathering: the questionnaires and the structured face-to-face interview. A pre-tested questionnaire with items anchored on a five-point Likert scale was used (Likert, 1932). Initially questionnaires were targeted at each of four respondents in each of the selected firms implying that altogether 128 questionnaires were dispatched. However, only 107 usable questionnaires were received from the two sectors. After dispatching the questionnaires, constant reminders were made

through repeated telephone calls and visits to the firms in order to reduce the attrition rate and improve the external validity of the results (Ary et al., 2007).

The face-to-face interviews varied between 50-70 minutes. The interviews were conducted with the help of an interview guide and all the recommended interview protocols (Cresswell, 1999) were strictly followed. After each of the interviews, a summary of the proceedings was presented to the interviewee to confirm the accuracy of the data captured as suggested by (Miles & Huberman, 1994). In all the cases, the interviews were found to have captured the relevant issues and only a small number of clarifications were required to improve the quality of data captured. The proceedings of the interviews were captured on a tape recorder and transcribed.

Additional data was gathered through direct observation (Flick, 1998) of the various innovation activities undertaken in the defined context of flower farms and fish processing factories. Observations focused on the lay out of the facilities and how actual processing takes place and by doing so the researcher was able to identify differences in the work methods used. Observed data was recorded in form of field analytical notes. Through writing field notes, the observations were turned into data and as Rossman and Rallis (2003, p.195) stated "as an observer, you need to turn what you see and hear into data and this is done by writing the field notes".

The focus of the study was on the three year period (2002-2004) for the fish export sector largely because of the availability of data in view of the challenges faced in the industry after the fish ban, but also consistent with the 3-4 year period commonly used in innovation studies such as the Community Innovation Surveys (OECD & Eurostat, 2005). In the flower sector, the study focused on the four year period (2001-2004). This was the period soon after the flower sector adopted several changes in its product, production and marketing operations and thus was considered to be the most suitable period of study to offer a comparative analysis with the fish sector that was also undergoing many changes prior to the period 2002-2004. The next section provides the operationalization and measurement of the research variables.

3.5 Operationalization and measurement of research variables

This section shows the operationalization and measurement of the independent and dependent variables based on an analysis of literature on innovation management.

3.5.1 Measurement of independent variables

Innovation was conceptualized as a multi-dimensional construct consisting of product, process and marketing dimensions. Through face-to-face interviews, different innovation activities undertaken by the exporters were identified. This is based on the inclusive definition of innovation adopted from North & Smallbone (2000). It also sought to identify and explain the different organizational capabilities that were driving innovation performance and financial sustainability in the two sectors.

3.5.1.1 Product innovation

The starting point was to ask the interviewees whether they considered any of their products to be innovative in any way and whether any new or modified products had been introduced in the period 2002-2004 in the case of the fish exporters and the period 2001-2004 in the case of flower exporters. Following positive reply additional questions were asked to explain what was innovative about the product and how it differed from the previous products of the company and what other companies were offering. This was confirmed through a more systematic assessment of whether or not a particular company's products were innovative by using sectoral information sources including interviews with experts from the two sector organizations, the Uganda Flower Exporters Association (UFEA) and Uganda Fish Processing and Exporters Association (UFPEA).

3.5.1.2 Process innovation

Interviewees were asked if any new production processes or equipment had been introduced in the period under study, including new methods for workplace management. This should have involved more than a straight replacement for the existing process and/or equipment, but one that added value to the company's existing resources. This was

verified and confirmed through additional interviews with experts from UFPEA and UFEA.

3.5.1.3 Marketing innovation

Interviewees in the selected firms were asked whether the firm had entered any new market segments, introduced new marketing practices and or used new wholesale or consumer market channels. These included asking questions on whether any new methods for increasing sales (for example, information about new markets, branding, promotion, packaging, pricing, distribution/customer service capabilities and use of the internet) had been introduced in the period under study.

3.5.1.4 Organizational capabilities driving innovation performance

Interviewees in the selected firms were asked to identify and assess the extent to which internal company resources and capabilities as well as external resources and capabilities were contributing to innovation and financial performance. An interview guide was used to identify the different company resources and capabilities. A questionnaire containing Likert type questions based on a scale anchored from 1-5 was used to measure the extent to which specific organizational capabilities (all of which had been shown in previous research to be relevant to effective innovation management) were perceived to be contributing to innovation and financial sustainability.

3.5.2 Measurement of dependent variable

There are wide differences in empirical results on the performance outcomes of innovation most probably because researchers lack a common approach in terms of standardized measures and meanings, and scope of analysis (Greenley, 1994). In this empirical study, operating profit that is, earnings before interest and tax (EBIT) has been chosen as the dependent variable (Drury, 1990). This is because it is important for survival and also measures the ability of the firm to extract sufficient value from the market in order to more than offset the costs of innovation. As pointed out earlier, profitability is also important because it gives companies more financial resources to

continue funding their business operations and future growth through innovation (Drucker, 1998; Porter, 1998) and yet it has been largely neglected in studies of innovation in agro-commodity export sectors in SSA. A focus on profitability is consistent with the resource-based perspective (Barney, 1991) and addresses the issue of how efficient the firm is in utilizing its physical, human, financial and other resources to develop innovation projects and satisfy market demand in a financially sustainable way.

However, using profitability as a measure of innovation performance is not without challenges. Most notably obtaining reliable data on profitability in firms is often problematic especially in poor countries where such data is not publicly available and managers are reluctant to report profits because of its sensitivity and confidentiality (Ramachandran & Shah, 1998). Accordingly, the researcher used multiple measures so that the different indicators could be compared and thereby give an indication of their reliability. The first set of indicators of profitability used in the study was based on the Likert scale. While the Likert scale gives an indirect measure of profitability, it has the advantage of being less susceptible to respondent bias or misreporting. Thus, managers were asked to indicate their level of satisfactions with profits associated with the innovation activities and operations in general using a Likert type scale anchored from 1-5. This provided an important supplement to the quantitative measures of profitability and it was correlated with the estimates from the financial models to test whether those estimates had any validity. The result of the correlation for the fish sector is presented in chapter four, while for the flower sector is presented in chapter five.

The second indicator of profitability was based on estimates of operating profit (EBIT) at the industry and company levels in order to assess the financial sustainability impact of innovation. These were based on models of operating profit margins associated with specific combinations of product, process and market innovations which were widely adopted in each sector. These estimates were presented to industry experts for independent assessment of their accuracy. In addition, this data was used to estimate net operating profit in each of the companies, and the level of correlation between these estimates and the levels of satisfaction with profitability was tested. It was envisaged that

this would make an important contribution to what is so far known because estimates of profitability based on individual or combinations of innovations in agriculture in SSA are generally lacking. What is available are attempts at estimating profitability in agro-based industries in general, for example profitability of sorghum farming in Nigeria (Baiyegunhi & Fraser, 2009), a comparison of profitability in rose farming in Uganda and Kenya (VEK-World Bank, 2004) and the transaction cost analysis of fish operations in Uganda (Collinson et al., 2005). None of these studies explores the contributions of innovation to profitability in export agriculture. In this study therefore, the framework commonly used to measure operating profits in agriculture is modified and used to estimate the profitability levels associated with innovation activity.

The study notes that there are many different measures of profitability in a company depending on the purpose of the measure and the structure of the costs included in the analysis (Drury, 1990). It therefore uses the operating profit before interest and tax (EBIT). The main advantage of using EBIT is that it allows the model to take into account depreciation charges on capitalized assets, including new equipment associated with new production processes and thus will reflect the higher overhead costs of firms which have made significant capital investments as part of their innovation activity, but excludes the effect on profitability of different gearing ratios and different interest rates on different types of debt funding by excluding the interest charges. This means that the estimates should in theory be equally applicable to all firms which adopted a particular innovation in a sector, regardless of differences in how the necessary investments were financed. No empirical study has reported using this approach to analyze profitability of innovation in agriculture in SSA and hence the motivation for adopting it in this study. A detailed explanation of the financial model used is presented below.

3.5.3 Financial performance model

The estimate of operating profit margin used in this study is defined as the difference between gross firm revenue and the total non-interest costs in the firm (Glautier & Underdown, 1990). It evaluates the profitability of the firm in relation to the different combinations of product, process and marketing innovations. It is defined as:

$$\mathbf{PM = QP - [\Sigma X (PC + MC + OC + IC]}$$

Where,

PM = Operating Profit Margin

Q = Total quantity of product exported (kilograms or stems)

QP = Total revenue of the firm

P = Unit price of product in US $

PC = Variable production costs per unit,

MC = Freight & marketing per unit,

OC = Overhead costs per unit,

IC = Investment (depreciation) costs per unit,

X = Output produced and exported.

The financial model incorporates all the costs associated with the changes in production, post-harvest handling, supply chain management, and export marketing of flowers and fish products. Broadly these costs fall under production, marketing and freight, overheads and investments. This classification to a large extent captures all the relevant costs for the purpose of analyzing the financial impact of firm operating configurations in the two sectors. It is important to note in this case that there are a variety of ways in which costs can be classified and there is no single classification scheme that is considered to be best particularly in the treatment of fixed and variable costs (Drury, 1990). Cost classification largely depends on the purpose for which the information is being sought (Horngren, 1998), and the one adopted for this study is considered fit for the purpose of evaluating profitability in the fish and flower sectors given the secondary and primary data available for those sectors.

The financial models developed in this empirical study are dynamic in that they use actual average selling prices obtained by the Ugandan exporters at different points in time, as well as actual average purchase prices of the inputs. However, there are some important limitations with the models. They use average prices and average costs for the whole industry. The effect of this approach is probably to put upward bias on the cost estimates of the larger firms who are likely to be able to negotiate somewhat more

favorable prices on certain inputs and similarly downward bias on cost estimates of smaller firms. In other words, this approach is likely to understate the true extent of variation in profitability within the sector. This problem was unavoidable because it was not possible to obtain sufficiently detailed data on the input costs of the different firms. Thus, the models provide an estimate of the average level of EBIT associated with typical combinations of product, process and marketing innovations in the industry, but are somewhat less useful as a basis for estimating differences in performance between producers in Uganda. Nevertheless, this modeling approach can provide an indication of inter-firm differences in profitability, and how these are likely to have shifted overtime. This can be achieved by using the profit margin estimates associated with each of the different combinations of innovations together with data on the actual product, market, and production process mix of each firm at different points in time.

The other weakness is that the total profit estimates at the firm level will account for some but not all of the inter-firm differences and those results should therefore be interpreted with somewhat more caution. For example, it was not possible to take account of differences across companies in effectiveness of the implementation of each innovation, which are likely to exist in practice as a result of differences in the technical and marketing capabilities across the companies. It is also important to note that the study does not account for all the different possible combinations of product, process and marketing innovations. Nevertheless, the combinations of innovation included in the models represent over 90% of the revenues in each of the respective sectors and the results, therefore, were expected to provide some useful insights to the relationship between innovation activity and financial performance and sustainability of firms in the two sectors.

3.5.4 Approaches for analyzing the association between independent and dependent variables

In order to determine whether there is any relationship between the way in which innovation was managed in the sample companies and the financial performance across the sample companies, multiple regression models (MRM) were used. The regression

models used variables relating to organizational capabilities and innovation management practices as explanatory variables and "satisfaction with improvement in profitability" as the dependent variable. The next section explains the reliability and validity measures adopted in this study.

3.6 Data reliability and validity

The questions of validity and reliability in empirical studies which combine quantitative and qualitative methods are important and fairly complex. This section reports the different measures that were taken to ensure that the data used in the financial models and the data gathered through questionnaires are reasonably trustworthy (Denzin, 1994; Miles & Huberman, 1994). Since procedures and content are often theoretically and practically allied to one another, this section specifies the measures taken in order to ensure that procedures and content were as trustworthy as possible.

3.6.1 Data reliability

In quantitative research reliability implies that data can be generalized to a larger population (Field, 2009). In qualitative research, the generalization towards theory, analytical generalization according to Yin (1994) is the main interest. In order to ensure reliability of the instrument and address the possibilities of retrospective bias and common methods variance, the instrument was developed through a process which involved careful question wording and sequence. This was achieved after an extensive review of literature on innovation theory and empirical techniques previously used in its analysis. It was then pre-tested in a pilot study in order to ensure that questions in the interview guide and items in the questionnaire were addressed in a proper manner and understood in the way they were intended. After making relevant adjustments, the final instrument was used to gather data. In order to ensure that the data provided an accurate representation of reality, multiple sources of evidence were used from within each company (Miles & Huberman, 1994; Yin, 1994; Mason, 2002). In addition, industry experts were used to verify data gathered from the industry.

Secondary sources were also used to ensure reliability of the data. For example, published data from Globefish (2002, 2004) from the Food and Agricultural Organization (FAO) was used to verify data on the price of fish earned by the exporters in the EU markets. Data obtained from the Department of Fisheries in the Ministry of Agriculture Animal Industry and Fisheries was used to verify data on company export volumes. In the case of flowers, additional price data was obtained from Uganda Flower Exporters Association that regularly collects price data from the flower markets for the purpose of guiding the exporters. This data was used to verify the prices provided by the flower exporters. Cost data was based on estimates made by UFEA and further verified through an interview with the Executive Director of UFEA and accountants in the flower export firms. Cost data for the fish sector were based on earlier estimates made in the transaction cost study by NRI and IITA (2005) further discussed with the industry experts and accountants for their accuracy and in order to include other cost categories considered to be relevant in the case of innovations and firm operations in the sector.

3.6.2 Data validity

Validity refers to the extent to which a test measures whatever it is supposed to measure (Wiersma & Jurs, 2005). Validity was achieved in different ways, for example, by combining the quantitative and qualitative methods to address similar and related phenomena. Notes from interviews and quantitative data collected on revenue and costs were communicated to the respondents for verification regarding their accuracy. This implied systematically engaging in active data collection in all the three phases of field work. Thus, the study employed methodological triangulation to achieve data validity consistent with the observation by Denzin (1994) that trustworthiness of research data is founded on triangulated empirical materials. Validation was also done at the stage of data analysis by determining whether there was any item non-response bias in both the flower and the fish export sector data. The results of these tests are reported below.

3.6.2.1 Item non-response bias tests for the fish sector

Item-non-response (INR) is a condition in which the researcher fails to collect complete information due to respondent's unwillingness or inability to provide a requested piece of information (Frick & Grabka, 2005). This may arise because of the respondent's reservations to answer a question that appears to be too sensitive or that affects confidentiality such as is the case with questions on personal or company income (Riphahn & Serfling, 2005). This phenomenon can be a potential source of measurement error that may lead to bias in the results (Cameron & Trivedi, 2005). Accordingly, an attempt was made in this study to determine whether there is any possible source of bias in the situation where some firms that took part in this study declined to provide sales revenue and cost data.

Out of the 15 fish exporters which could be identified, located, contacted and that agreed to participate in this study, 2 exporters declined to provide any data regarding their revenues at either an aggregate level or by product type. For reasons explained previously, no firms were asked for information regarding their profitability. Revenue data was a requirement for the financial models to estimate profitability at firm level. Firms which did not provide revenue data had to be excluded from that modelling exercise and, hence also from most of the subsequent analysis. An analysis was therefore undertaken to test for the possibility of item-non-response (INR) bias. In particular, tests were conducted to check for whether there were any significant differences in the level of satisfaction regarding recent profit performance between firms that provided revenue data and those which were unwilling to do so in the fish export sector in Uganda. All the firms provided responses regarding their level of satisfaction with recent profit performance. The mean level (across respondents in the same firm) of satisfaction with improvement in profitability over the previous three years was computed. The level of satisfaction was measured using a five-point Likert scale ranging from, 1(*very dissatisfied*) to 5(*very satisfied*). The results of this analysis are presented in Table 3.6.

Table 3.6 Variation in profit satisfaction levels between the companies which provided revenue data and the one which did not in the Ugandan fish export sector

Data status	Statistic	Satisfaction with improvement in profitability over the previous three years 2002-2004 (*original responses from each respondent*)	Satisfaction with improvement in profitability over the previous three years 2002-2004 (*mean response for each firm*)
Respondents from the two companies that did not provide revenue data (revdata = .00)	Mean N Std. Deviation Std Error Mean	3.6000 5 .54772 .24495	3.6000 5 .36515 .16330
Respondents from the thirteen companies that provided revenue data (revdata = 1.00)	Mean N Std. Deviation Std Error Mean	3.7674 43 .68443 .10437	3.7674 43 .55651 .08487

Source: Field survey

The above analysis reveals that the respondents which did not provide revenue data were from fish firms which had marginally lower levels of satisfaction with improvement in overall profit levels over the previous three years (M = 3.6000 versus M = 3.7674). The t-test for equality of means was used on the scale item that read "satisfaction with improvement in profitability over the previous three years-using mean responses for each firm" to test for differences in profitability satisfaction levels between the two groups. The result of the test shows that this difference was not significant: t-test for equality of means, t (46) p=0.601 for original variable and p=0.517 for the derived variable with a mean response for each firm; it represents a small sized effect r = 0.1. The differences are therefore not significant suggesting that there is unlikely to be any bias resulting from these cases of item-non-response with regard to the revenue data and the resulting exclusion of these two firms from the profit modelling exercise.

It was noted that both of the fish exporters which declined to provide revenue data were locally owned. This implies that locally owned firms are somewhat more likely to be sensitive about providing performance data. For this reason, it was decided that further analysis should be conducted in order to test for differences in the level of profit

satisfaction by different ownership types. In this regard an analysis was undertaken to determine whether there was any bias in responses based on ownership. Three categories of ownership were defined as follows: local, joint local and foreign, and foreign. This ownership structure is based on concentration and identity of owner(s) (Steen & Pedersen, 2000; Gegajlovic & Shapiro, 2002; Gursoy & Aydogan, 2002). A local company is defined here as one in which a majority ownership of at least 70% was by local or domestic shareholders. A foreign company was considered to be one in which a majority ownership of at least 70% was by foreign shareholders. A joint company was one in which there were both local and foreign shareholders but with non-commanding a controlling share-holding of above 70%. For the full sample of fifteen firms, the majority (eleven) were locally owned, two were foreign owned and two were jointly foreign and locally owned.

The mean responses regarding the level of satisfaction with improvement in profitability for the three categories of ownership: local, joint local and foreign, and foreign for the level of satisfaction with improvement in profitability were computed. The results are presented in Table 3.7.

Table 3.7 Variations in satisfaction with performance according to ownership among Ugandan fish exporters

Ownership	Statistic	Satisfaction with improvement in profitability over the previous three years 2002-2004 (*original responses from each respondent*)	Satisfaction with improvement in profitability over the previous three years 2002-2004 (*mean response for each firm*)
Respondents from locally owned firms	Mean N Std. Deviation	3.6774 31 .59928	3.6774 31 .44811
Respondents from jointly local & foreign owned firms	Mean N Std. Deviation	3.8000 5 1.303384	3.8000 5 1.18673
Respondents from foreign owned firms	Mean N Std. Deviation	4.1429 7 .37796	4.1429 7 .13367
Total	Mean N Std. Deviation	3.77674 43 .68443	3.7674 43 .55651

Source: Field survey

In general the foreign companies reported the highest level of satisfaction with improvement in profitability (M = 4.1429), followed by the jointly owned companies (M = 3.8000), and lastly the locally owned companies (M = 3.6774). A one-way independent ANOVA was also carried out to test for the differences in the means. The results of the ANOVA test indicate that there was no significant impact of ownership on satisfaction with improvement in profitability. These differences were not significant for the original variable $F(2, 40) = 1.349$, p=0.271, and for the variable with mean responses for each firm $F(2, 40) = 2.113$, p=0.134. Although the average profitability of foreign firms appear to be substantially higher than locally owned firms, the difference is not large enough to result in a significant source of potential bias in the results.

3.6.2.2 Item non-response bias tests for the flower sector

Out of the firms which could be identified from databases for the flower sector, located and contacted, 16 agreed to participate in the study. One flower exporter did not provide revenue data and therefore had to be excluded from all subsequent analysis. Once again, the firm declining to provide revenue data was a locally owned firm, again implying

greater reluctance among local firms to supply performance data. In this case, however, it reported a higher level of profit satisfaction by comparison with the mean level of the other firms, as can be seen in Table 3.8. This difference was not significant compared to other flower exporters that provided revenue data to test for any source of bias. The mean responses for satisfaction with improvement in profitability were computed. The mean results are presented in Table 3.8.

Table 3.8 Variation in profit satisfaction levels between the companies which provided revenue data and the one which did not in the Ugandan flower export sector

Data status	Statistic	Satisfaction with improvement in profitability over the previous four years 2001-2004 (*original responses from each respondent*)	Satisfaction with improvement in profitability over the previous four years 2001-2004 (*mean response for each firm*)
Responses from the company that did not provide revenue data (revdata = .00)	Mean N Std. Deviation Std Error Mean	4.0000 2 .00000 .00000	4.0000 2 .00000 .00000
Responses from companies that provided revenue data (revdata = 1.00)	Mean N Std. Deviation Std Error Mean	3.6400 50 .80204 .11343	3.6400 50 .44078 .0623

Source: Field survey

The above results indicate that the flower firm which did not provide revenue data had a higher level of satisfaction with profitability (M = 4.0000) compared to the ones that provided revenue data (M = 3.6400). The t-test for equality of means was used to test for significance in these mean differences. The result of the test shows that the difference was not significant: t-test for equality of means, t (50) p=0.532 for the original variable, and p=0.258 for the variable with mean responses for each firm; it represents small sized effect r = .16.

Further analysis was carried out to test for differences in the level of profit satisfaction by ownership to determine whether there was any bias based on ownership among the flower

exporters that took part in the study. Again the flower sample was dominated by locally owned firms (10) with (4) foreign firms and (2) jointly owned firms. The mean responses for the three categories of ownership: local, joint local and foreign, and foreign for the level of satisfaction with improvement in profitability among the flower exporters in the previous four years were computed. These mean results are presented in Table 3.9.

Table 3.9 Variation in satisfaction with performance according to ownership among Ugandan flower exporters

Ownership	Statistic	Satisfaction with improvement in profitability over the previous four years 2001-2004 (*original responses from each respondent*)	Satisfaction with improvement in profitability over the previous four years 2001-2004 (*mean response for each firm*)
Respondents from locally owned firms	Mean N Std. Deviation	3.6667 33 .73598	3.6667 33 .44194
Respondents from jointly local & foreign owned firms	Mean N Std. Deviation	3.6250 8 .74402	3.6250 8 .13363
Respondents from foreign owned firms	Mean N Std. Deviation	3.6364 11 1.02691	3.6364 11 .58127
Total	Mean N Std. Deviation	3.6538 52 .78926	3.6538 52 .43767

Source: Field survey

In general, foreign companies reported a slightly lower level of satisfaction with improvement in profitability (M = 3.6338) compared to the local companies (M = 3.6667), but were similar to the joint companies (M = 3.6250). A one-way independent analysis of variance (ANOVA) test was also carried out to test for the differences in the means. The results of the ANOVA test indicate that there was no significant impact of ownership on satisfaction with improvement in profitability. The differences are not significant $F(2, 49) = 0.012$, p=0.988 for the original variable and $F(2, 49) = 0.039$, p=0.962 for the variable with mean responses for each firm.

3.7 Data processing and analysis

Different data processing techniques were used for the three sets of data details of which are provided below.

3.7.1 Quantitative data

Quantitative data in this empirical study consisted of estimates of revenue and costs related to the different innovation activities, and data derived from the scales in the questionnaires. Scale data was edited and analyzed using the Statistical Package for Social Scientists (SPSS) computer software package. Revenue and cost data were used to develop models of profitability in Excel computer software package. Details of the analytical approach used in the study are presented in sections 4.4.1, 4.4.5 and 4.5 of chapter 4 and sections 5.4.1, 5.4.5 and 5.5 of chapter 5.

3.8 Limitations of the study

This empirical study has the following limitations which in themselves do not invalidate the results. The results of this study, by their very nature, are not generalizable. The study starts with the premise that there is no guarantee of positive financial outcome in innovation activity and that innovation projects have to be evaluated on a case by case basis. In both the fish and flower sectors, the study identifies examples of innovation activity which appear to be financially successful and examples of which appear to be less successful. The reasons for project outcomes are distinct in each case and cannot be generalized either within a sector or between sectors. Thus, the value of the study lies not in the generalizability of the results, but rather in the usefulness of the results for the stakeholders in the two Ugandan agro-commodity export sectors themselves and in the generalizability of the research approach and method, as a means of exploring the financial sustainability of innovation activity in agro-commodity export sectors in SSA. However, the depth of insight achieved by this level of analysis comes at a price. The primary and secondary data collection, the financial modeling and the regression analysis are time-consuming undertakings. Therefore, the value of the insights has to be weighed

against the cost and time involved. It is suggested that the usefulness of the results may well justify similar studies in future, both among researchers and industry practitioners.

Another limitation of this study is that it is based on an analysis of fairly short time periods 2002-2004 for the fish sector and 2001-2004 for the flower sector. Indeed these time periods are relatively short to capture all of the recent major changes in these sectors and neither are they sufficiently long to capture the longer-term financial impact of each of the innovations which were examined. However, it should be noted that the primary purpose of this thesis was not a detailed study of long term technical changes in either of these sectors, but rather its chief purpose was to examine the short-term financial impacts of specific innovation projects. The reason for this emphasis is that survival of these firms requires that they generate positive financial returns in the short term from their innovation activities. For this reason, the time periods chosen for each sector both capture significant innovations and offer sufficient time period to examine the financial impacts of those innovations and thus would seem to be entirely appropriate for a study of this nature.

3.9 Chapter conclusion: research approach fit with research design parameters

This chapter has presented a comprehensive discussion of the strength and weaknesses of the research approach adopted in the empirical study reported in this thesis. This section presents a summary of the different choices made to frame the research design.

- **Research Method**: The *mixed methods* approach was selected as the most appropriate method to engage in an "analytical" effort on the subject of innovation management and value creation. As indicated in Table 3.3, this research endeavor is both exploratory and analytical in nature. It therefore qualifies to be the most suitable approach to probe the "*what*" question of the different innovations adopted, the "*how*" question relating to the capabilities for managing the innovations effectively, and the "*why*" question relating to the justification for undertaking innovation, that is value creation and financial sustainability. The "*what*", "*how*" and "*why*" framework was the most suitable for exploring and analytically probing the research questions set for this study.

- **Data Collection Methods**: The choices made were to use *semi-structured interviews, questionnaires* and *observation*. The purpose of selecting these three data collection devises was to straighten the validity of the insights gained from the evidence, by providing a means of "triangulation" of the different sources of evidence. Although this approach to data collection is often challenging, it is the most suitable in providing rich insights into the dynamics of innovation management and its influence on value creation and financial sustainability.
- **Data Collection**: The *pilot study* was helpful in facilitating the testing of the interview guide and questionnaire. This enabled the researcher to identify questions that were unclear to the respondents and improved them accordingly. The *interviews* were important in enabling the researcher to establish the depth of innovation activities undertaken by the producers in the two export sectors. The interviews also gave deep insights into the interactions between the different innovation activities, and how together they contributed to value creation or destruction. The observations were therefore important in putting into context what was gathered in the interviews. The questionnaire was important in gathering perceptual data on innovation and performance.
- **Data Analysis**: The analytic techniques for both the qualitative and quantitative data involved the use of three computer software programs: NVivo for the qualitative data, SPSS for the scale data and Microsoft Excel for the quantitative data on costs and revenue. In the case of the qualitative data the analytical tools developed by Miles & Huberman (1994) were utilized in the study to facilitate the identification of patterns of similarities and differences in the data. The quantitative data analytical tools were utilized to develop the financial models used in estimating the profitability impact of innovation activity and in determining the drivers of innovation profitability in the two sectors.

The next chapter presents results of an analysis of different combinations of innovation activities, their impact on value creation and financial sustainability, and the capabilities that are driving innovation profitability in the fish processing and export sector in Uganda.

Chapter 4: Analysis and Presentation of Results - Fish Export Sector in Uganda

4.1 Introduction

This chapter reports results from the analysis of innovation management and financial performance in the Ugandan fish export sector. The chapter is structured into six sections. Section 4.2 presents a summary of indicators on respondents' satisfaction with firm performance. Section 4.3 presents the overview of innovation activity and its anticipated benefits in the Ugandan fish export sector. Section 4.4 presents a set of financial models that estimate the overall impact of innovation management on profitability in the Ugandan fish export sector. Section 4.5 presents results on the main firm-level drivers of innovation profitability in the Ugandan fish export sector. Section 4.6 presents a summary of the key results and conclusions. Section 4.7 presents the chapter conclusion.

4.2 Indicators of respondents' satisfaction with firm performance

One of the main objectives of this study is to determine the extent to which innovation activities contribute to value creation. In consonance with that objective, this section presents preliminary indicative results of the level of satisfaction of respondents in the Ugandan fish export sector with the performance of their company. The analysis includes the full sample of fish companies – those that provided revenue data and the ones which did not. Three indicators of satisfaction are shown in Table 4.1. They are mean levels of satisfaction with improvement in US $ export prices, improvement in US $ export revenue, and improvement in profitability over the period 2002-2004. The original responses were in the form of a five-point Likert scale ranging from, 1 (*very dissatisfied*) to 5 (*very satisfied*).

Table 4.1 Mean levels of respondents' satisfaction with improvement in company performance in the Ugandan fish export sector (2002-2004)

Statistic	Satisfaction with improvement in US $ export prices	Satisfaction with improvement in overall growth in US $ export revenue	Satisfaction with improvement in profitability
Mean	3.2917	3.5417	3.7500
N	48	48	48
Std. Deviation	.79783	.84949	.66844
% of respondents who indicated either "satisfied" or "very satisfied"*	41.7%	62.6%	70.8%

Source: Field survey

Notes.

The analysis includes the full sample of fish companies – those that provided revenue data and those which did not.

* These correspond to codes 4 and 5 on a Likert Scale in which 3 corresponded with indifference between satisfied and unsatisfied.

The results indicate that the respondents were least satisfied with the improvement in US $ export prices over the period 2002 to 2004 (M = 3.2917), somewhat more satisfied with overall growth in US $ export revenue (M = 3.5417), and most satisfied with profitability growth (M = 3.7500)[1]. The mean scores for satisfaction with revenue and profits are both significantly higher than that for changes in US $ export prices. The differences in the level of satisfaction were further explored in terms of the percentage of respondents who indicated either "satisfied" or "very satisfied". In this respect, 41.7% of the respondents indicated "satisfied" or "very satisfied" with the improvement in US $ export prices, 62.6% in the case of improvement in overall growth in US $ export revenue, and 70.8% in the case of improvement in profitability.

The relatively low level of satisfaction with changes in US $ export prices should not be surprising because prices of fish products sold in the European Union (the main market of fish exports from Uganda) declined in the period 2002-2004 as indicated in Table 4.2.

[1] The probability of equal means for "Satisfaction with improvement in profitability" and "Satisfaction with improvement in export revenue" is given as $p = 0.040$. The probability of equal means for "Satisfaction with improvement in profitability" and "Satisfaction with improvement in US $ export prices" is given as $p = 0.000$. The difference is significant at 0.1%.

The present study focused on the analysis of trade in Nile perch exports from Lake Victoria particularly Uganda and destined for the EU. This is justified by the observation that trade in processed Nile perch fillets (frozen and fresh chilled) constituted approximately 99% of total fish exports from Uganda to the EU in the period 2002-2004 the rest being whole fish or gutted and headless tilapia (GoU-MTTI, 2006). Accordingly, changes in the price of Nile perch traded in this market have important implications for sustainability of the industry.

As indicated in Table 4.2, the US $ and Euro prices of the two main Nile perch products (frozen and chilled fillets) declined between 2002 and 2004. Although the prices of fish fillets sold in the EU are quoted in Euro, Ugandan fish exporters receive their revenue in US $. Throughout this period, the chilled Nile perch fillets fetched higher prices in the wholesale export markets in comparison to the frozen fillet in the same market, a topic which is addressed in more detail in later sections.

Table 4.2 Average f.o.b prices of Ugandan Nile perch fillet exported to the EU wholesale market

Fillet type	2002 €/Kg (US $/Kg)	2003 €/Kg (US $/Kg)	2004 €/Kg (US $/Kg)
Chilled fillets	5.2 (*4.91*)	3.9 (*4.41*)	3.8 (*4.73*)
Frozen fillets	3.9 (*3.69*)	3.2 (*3.62*)	2.7 (*3.36*)

Source: Field survey & UFPEA

Notes.

The figures in parentheses are the prices in US$ computed using the Annual Average US Dollar Exchange Rates obtained online at http://www.federalreserve.gov/released/January 2008. Accessed on October 3rd, 2008.

The Euro and US $ price decline in the period 2002 to 2004 is thought to have been the result of increased competition from the relatively cheap Pengasius (basa catfish) from Vietnam that had become common in the EU markets (Josupeit, 2006). Another likely cause of the pressure on export prices appears to be the increase in the export volumes (by weight) of Nile perch fillets from the three East African countries: Tanzania, Uganda and Kenya as indicated in the Table 4.3. This was a demonstration of the increased consumer confidence in the Nile perch products from Lake Victoria as a result of

adoption of improved processing and quality control techniques in compliance with EU regulatory requirements (Kiggundu, 2006). There was a 42% increase in total weight of fish exported from Lake Victoria to the EU between 2002 and 2004, and yet a small decline in total revenue, and thus a significant decline in terms of trade for the region. As shown below, however, the pattern was uneven for the countries around Lake Victoria.

Table 4.3 Exports of Nile perch fillets from Lake Victoria into the EU over the period 2002 to 2004 (value and weight)

Product	Data	2002	2003	2004
Fresh Fillets	Value (€ 1 000)	164 760	141 302	170 533
	Weight (tons)	31 767	36 161	47 329
Frozen Fillets	Value (€ 1 000)	29 529	28 583	21 901
	Weight (tons)	7 536	8 952	8 760
Total value		194 289	169 884	192 434
Total weight		39 304	45 113	56 089

Source: FISH INFO network Market Report Published in August 2006, FAOSTAT

The split in weight and value of Nile perch exports from Lake Victoria into the EU from the three East African countries: Kenya, Tanzania and Uganda is shown in Table 4.4. This table shows that the regional composition of Nile perch fillet exports from Lake Victoria changed somewhat over the period 2002 to 2004, with Tanzanian volumes rising slowest off a high base and Kenyan volumes rising fastest off a low base. Ugandan fish export volumes grew by about 50% over the period but their total value grew by less than 15%. Table 4.4 reveals that Ugandan price of Nile perch is higher than that for Tanzania and quite similar to that of Kenya. This might be because buyers in Europe have a higher level of confidence in the quality of Ugandan Nile perch or that Ugandan Nile perch exporters have been able to negotiate better prices than their counter parts in Tanzania and Kenya. Alternatively, it might reflect different mixes between frozen and chilled fish between the three countries. It was not possible to obtain disaggregated data on frozen and chilled Nile perch exports for Tanzania and Kenya and hence it was not possible to

undertake a comparative analysis of trends in exports of the two main forms of Nile perch fillets.

Table 4.4 Total exports of Nile perch fillets from Lake Victoria into the EU by the three exporting countries over the period 2002 to 2004 (value and weight)

Country	Data	2002	2003	2004
Kenya	Value (€ 1 000)	19,375	19,134	23,433
	Weight (tons)	3,972	5,086	6,737
Tanzania	Value (€ 1 000)	114,235	99,701	99,510
	Weight (tons)	23,119	26,965	30,813
Uganda	Value (€ 1 000)	60,679	51,049	69,491
	Weight (tons)	12213	13062	18539
Total	Value (€ 1 000)	194,289	169,884	192,434
	Weight (tons)	39,304	45,113	56,089

Source: FISH INFO network Market Report Published in August 2006, FAOSTAT

As indicated in Table 4.4, Tanzania leads in terms of proportion of total exports of Nile perch from Lake Victoria followed by Uganda and then Kenya. This split is consistent with the size of the lake surface area occupied by each of these countries in that Kenya occupies (6%), Tanzania (51%) and Uganda (43%) of Lake Victoria.

Returning to the evidence on respondent satisfaction levels with the performance of their companies, the fact that fish exporters were significantly more satisfied with growth in their revenue and profitability suggests that they may have been able to cope with and respond effectively to the increasing price pressure in international markets for fish products. If correct, then it would presumably be because they had been able to undertake other measures such as efficiency improvement which might have enabled them to more than offset the declining US $ export prices in order to be able to increase their levels of profits over the period. Further investigation of this represents one of the objectives of this chapter. The next section presents an overview of the innovations undertaken by the Ugandan Nile perch exporters and their expected benefits.

4.3 Overview of innovation activity in the Ugandan fish export sector

The main fish products exported from Uganda are derived from the Nile perch (Bahiigwa & Keizire, 2003, Kiggundu, 2006). The Nile perch is a highly perishable fresh water fish that requires extreme care and an appropriate combination of choices regarding product form, processing, and supply chain management in order to preserve its market value (Bykowski & Dutkiewicz, 1996). Its market value depends on the form in which it is processed and packed, its nutritional value, the convenience with which it can be cooked, and the market channel through which it is sold. Thus, a combination of improvements in product form, processing techniques and marketing approaches is likely to enhance the market value of the Nile Perch (Henson & Mitullah, 2004; Henson & Jeff, 2006).

Empirical results presented in Table 4.5 indicate that different product, process, marketing and supply chain improvements were implemented by Ugandan Nile perch exporters prior to and between 2002 and 2004. Table 4.5 reports the views of respondents on their reasons for engagement in innovation rather than the actual demonstrated financial benefits. An expectation of a certain benefit does not necessarily mean that it was realized in practice. Similarly, in as much as some of the respondents volunteered the information, more than half of the companies in the sample do not specifically monitor the benefits of individual innovation projects. Further discussions with industry experts revealed that no previous systematic attempts from within the industry had been taken to assess and isolate the financial impact of each individual innovation activity implemented by the fish exporters.

Table 4.5 Firm innovation activity and expected benefits in the Ugandan fish processing and export sector (2002-2004)

Innovation activities	Expected benefits
Product innovation	
▪ Adoption of chilled fish fillets. ▪ Adoption of value added (VA) fish products. ▪ Improving packaging (from bulk packing to individual packing)	▪ Introduce products which achieve higher prices per kg. ▪ Increase in percentage of total revenue coming from higher-priced fish products. ▪ Improvement in relative cash flow cycle. ▪ Increase revenue and profits per kilogram of processed fish.
Process innovation	
▪ Adoption of good manufacturing & cleaner production technologies. ▪ Upgrading processing plants and adopting HACCP production principles (*individual quick freezing and rapid cooling technologies, quality control and food hygiene practices*). ▪ Upgrading microbiological testing laboratories (*pesticide residual and microbial testing*). ▪ Adoption of modern cool chain management principles (*Upgraded ice plants insulated/refrigerated delivery trucks*). ▪ Upgrading processing tools (*bone saw machine and knives*) ▪ Upgrading waste management & adoption of dry cleaning techniques. ▪ Adoption of modern quality control techniques based on computerized information management systems.	▪ Improved control of the production process. ▪ Improved fish quality. ▪ Improved fish yields. ▪ Reduced waste and rejects. ▪ Improved employee attitudes towards quality and waste management. ▪ Lower final product costs. ▪ Improved sales price per kilogram. ▪ Improved profitability. ▪ Reduced risk of product rejection. ▪ Attainment of ISO certification. ▪ Improved reputation in key markets and market segments.
Marketing & supply chain innovation	
▪ Adoption of e-marketing practices. ▪ Adoption of joint promotion of fish products with other exporters in the industry. ▪ Upgrade marketing expertise of staff. ▪ Joint handling of shipment & logistics by the exporters. ▪ Entry to the higher margin fish market channels (e.g. direct to retail not via wholesalers). ▪ Collaborative branding of value added fish products.	▪ Reduced costs and improved profitability. ▪ Greater markets reach with limited resources. ▪ Gaining access in higher price market segments. ▪ Increased reliability in cold chain logistics. ▪ Reduced delivery times. ▪ Improved cash flow. ▪ Improved stability in trade relationships.

Source: Field survey.

Table 4.5 reports all of the expected benefits mentioned by all the respondents. There were minor differences in benefit expectations of the respondents which were not reported here as they were not considered to be of particular interest. It is clear that

several of the innovation activities have multiple and often overlapping benefits. Each different innovation activity is associated with a range of expected benefits, and the realization of such benefits may be dependent on other types of innovation. For example, supply chain, marketing and process innovations may be required for a higher-priced product innovation to be successful in the market in order to justify the additional costs. The table suggests that these respondents expect all the different types of innovation to have the potential to contribute to improved profitability and that isolating the impact of a single innovation on financial performance might prove difficult. The main innovations undertaken by the Ugandan Nile perch exporters are discussed and summarized below.

4.3.1 Product innovation activities and expected benefits

The main product innovation in the Ugandan fish export sector in terms of expected market and financial benefit was the introduction of chilled fish products (Ponte, 2005; Kiggundu, 2006). The introduction of the latter was because of the declining customer interest in frozen fish (Josupeit, 2006) which presumably meant that the Ugandan producers were experiencing declining profits (although there was no empirical evidence to that effect) on that product and hence the justified move to the more preferred chilled fish. Some of the fish processors also explored the introduction of value added fish products. Value added fish are premium products which involve further processing of the fish products in order to add consumer value through the incorporation of attributes which add various benefits to the consumers such as nutritional qualities and improved convenience (for example fish fingers, steak or portions). Additional product improvements involved the shift from bulk packing to individual fillet packaging for both frozen and chilled products (refer to *appendix 2.1* for details of product innovations in the Ugandan fish export sector). Bulk packing is where many fillets are wrapped in one pack while individual packing is where each fillet is wrapped in its own pack. These product improvements were expected to achieve higher prices, increase revenue, improve cash flow and ultimately improve profits for the exporters.

4.3.2 Process innovation activities and expected benefits

The main process improvements in the Ugandan fish export sector involved upgrading the fish processing infrastructure (processing machinery, freezing technology and the shift from bulk to individual quick freezing and cold storage), quality control procedures, cold chain management and employee skills (refer to *appendix 2.2* for the details of the process innovations in the Ugandan fish export sector). This was necessary to meet modern standards that comply with international Hazard Analysis and Critical Control Point (HACCP) production principles. The HACCP is an obligatory standard which applies to the food processing industry in general and fish in particular (Tall, 1997). It requires all food processing companies to identify each aspect of their activities which has a bearing on the safety of the foodstuffs and ensure that suitable safety procedures are established, applied, maintained and revised from time to time. In addition, five fish processors adopted the use of Good Manufacturing and Cleaner Production Technologies with support from United Nations Industrial Development Organization. The industry received some financial and technical assistance to this effect from UNIDO, but the exact amounts of money provided to each fish processor is not known (Ponte, 2005).

The above mentioned process improvements were expected to complement product innovations by improving productivity, reducing waste or rejects, improving shelf life as far as possible and providing consistent high quality fish products that are attractive and appealing to consumers. For example, the introduction of chilled fish required an improvement in the cold chain management and processing system to cope with the strict quality controls needed to meet the high standards for chilled fish. As mentioned above, some of these process changes were non-negotiable and hence investing in them was a pre-requisite for meeting the food and safety standards necessary for continued supply of fish products to the EU markets. The context of these choices may have therefore been difficult for the fish exporters who had to decide between facing firm closure due to failure to implement required process innovations in order to meet the necessary hygiene and food safety requirements or the continuation of business after implementation of costly and risky process innovations. Care was therefore needed in the implementation of the process innovations amidst uncertainties regarding whether or not there would be any

positive financial returns. The focus of process innovation was largely to complement product innovations and to help improve efficiency in the fish processing companies. The financial implication of process innovations in this sector is explored later in this chapter.

4.3.3 Marketing innovation activities and expected benefits

There were also some important changes undertaken in export marketing. One of the marketing innovations was more effective use of information and communications technology (e-marketing) facilitated through a financial grant from the United States Agency for International Development (USAID). This innovation enabled Nile perch exporters to improve communication and coordination of marketing activities through the use of e-mail and on-line product ordering systems and ultimately also an improvement in logistics management. Another marketing innovation undertaken by Nile perch exporters involved the handling of chilled product shipment and logistics through a joint company called Fresh Handling Limited (FHL) starting in 2002. This joint initiative helped maintain the quality of the fish products, improve the reliability of the supply chain and keep a check on the door-to-door freight costs to the export markets. The FHL innovation was therefore, an essential pre-requisite to successful entry to the chilled fish market in that it facilitated the increase in the volumes of the chilled fish exported. However, the launch of FHL was costly and this would not have been justifiable or affordable for any one of the producers (Kiggundu, 2006). It was therefore necessary to bring all the players in the fish and horticulture export industries together to cooperate and with financial support from the United States Agency for International Development (USAID), to make this innovation affordable. A spin-off of this cooperation is that they increased volumes going through a single logistics chain which has resulted in a lowering of unit costs in comparison with previous periods, and improving the reliability of the supply chain. The sustainability of FHL depended on high and sustained levels of cooperation among the exporters which in turn depended on commitment from them based on the envisaged benefits of the collaboration. Without such cooperation, many of the changes would either have been too costly or simply beyond the capabilities of any single firm (Ponte, 2005).

Another marketing innovation adopted by Nile perch exporters was the switch from selling through the wholesale export market channel to selling directly to retail market channels. This was started in 2002 by three fish exporters. By 2004 seven fish exporters were exporting fish directly to foreign retailers, though quantities into this channel remained relatively small. Nevertheless, this channel is considered important because it can be more attractive in terms of price. However, it is also more demanding in terms of the requirements for competence in processing, retail packaging, product differentiation, handling, flexibility and consistency in meeting volume, quality and delivery requirements. Refer to *appendix 2.3* for details regarding the different marketing innovations undertaken by Uganda fish exporters in the period 2002-2004.

The product, process and marketing innovations developed by Ugandan fish exporters were expected individually and collectively to improve the positioning and market value of the fish products. The evidence from Section 4.2 above is encouraging in this regard, suggesting that a majority of firms in the industry experienced an overall improvement in profitability over the period 2002-2004, despite the negative movements in product prices. However, several unanswered questions remain. What are the reasons for the apparent disparities in profit performance across companies in the industry, as indicated by the differences in levels of satisfaction with profit performance? Are these disparities linked in any way to differences in the management of innovation between the firms? Can differences in the extent or mix of innovation activities across the firms help to explain the apparent performance differences? Can differences in the way in which innovation projects are implemented in these firms explain the apparent performance differentials? What can we learn, if anything, about effective management of innovation in the Ugandan fish industry by examining how the firms with the highest levels of profit satisfaction approached their innovation? A systematic analysis that estimates the financial outcomes of specific innovation activities in the fish industry would be necessary to examine these questions further. This would involve detailed analysis of the costs and benefits associated with improvements in products, production processes, marketing and supply chain management undertaken by Ugandan Nile perch exporters. This is the focus of the next section.

4.3.4 The net financial impact of innovation activity in the Ugandan fish export sector

There was extensive and widespread innovation activity in the period 2002-2004 among the sample of firms analyzed. Many of these innovations involved considerable expense and risk. To some extent, the size of these risks was reduced through intervention from international assistance, for example, through aid organizations such as the United States Agency for International Development (USAID) and the United Nations Industrial Development Organization (UNIDO). Nevertheless, the evidence suggests that Ugandan fish exporters made considerable investments themselves in new equipment, new processes, new quality control systems, new products and new business relationships.

As noted previously, there is encouraging evidence of some success achieved in these activities. For example, investment in an improved cold chain and transport system appears to have been carefully coordinated and have broad and consistent support from the exporters of chilled fish products, and that Ugandan chilled fish products appear to have been well accepted in the EU markets. Calculating the net financial impact of these activities overtime is not a trivial exercise as it requires estimation of the different cost structures associated with each particular innovation, different yield rates and different wastage levels associated with different production techniques, as well as changes to input costs and product prices overtime

No respondents indicated that they had attempted to quantify the net financial impact of their innovation activity either at the level of individual innovation projects or for linked projects, for example, combination of product, process, marketing and supply chain innovations which are mutually dependent. It was also reported earlier that, in spite of there being a number of studies on innovation in the fish processing and export sector in Uganda, there is still no published work that links these innovations to financial performance and sustainability. In an attempt to address this gap in the literature and to gain insights to the financial implications of innovation management in the fish export sector in Uganda, financial models that estimate the profit margins associated with different operating configurations were developed.

The term "operating configuration" is used to refer to an appropriate set of mutually dependent innovation projects involving product form, processing technique, supply chain management and target market channel. Each operating configuration represents a steady state of business activity. However, the concept of an operating configuration is directly linked to the primary focus of this study, namely innovation, in that the introduction of a new operating configuration can be viewed as the result of a combination of different innovations. This approach allows us to analyze the mix of different operating configurations adopted in the sample companies and their respective financial performance, and thereby gain insight into the financial impact of innovation in each of these companies. It was found that there are essentially only five major operating configurations in the fish export industry in Uganda, as can be seen in Table 4.6 in the next section.

Although the term "operating configuration" is new, the concept behind it is not. As noted earlier, Bykowski and Dutkiewicz (1996) argue that innovation in the fish industry requires an appropriate combination of choices regarding product form, processing, and supply chain management in order to preserve its freshness and nutritional value to the end consumer. Similarly, it can be argued that it also requires an appropriate choice of target market and marketing channel. It would therefore be important to analyze such an appropriate combination of choices together rather than to analyze each choice in isolation.

4.4 Modeling financial impact of innovation activity in the Ugandan fish export industry

The empirical results presented in this section are important in contributing to the debate over whether agro-commodity exporters from poor SSA countries can indeed capture value from their innovation investments by providing what is believed to be the first empirical estimates of the impact of innovation on financial performance. They also highlight the differences in the extent and emphasis of innovation activity (as represented by differences in the mix of operating configurations) between companies in the sector. To the extent that none of the fish exporters was willing to reveal the exact costs incurred

in each of their innovation initiatives, a more pragmatic methodology had to be developed to estimate the profitability of their different operating configurations. Details of this methodology were presented in summary form in section 3.5.3 and in greater detail in the next section.

4.4.1 Methodology for estimating the financial performance of different operating configurations

This section presents details of the methodology used in estimating the profitability associated with different operating configurations in the Ugandan fish export industry. The main profit measure used is profit before interest and tax (EBIT) mentioned in section 3.5.3. For analytical purposes it is defined as the price per kilogram of fish product less the total costs attributable to that kilogram of fish product. These costs are divided into four broad categories: production costs, freight and marketing costs, overhead costs and investment/depreciation costs. Care was taken to ensure that the cost structure captured all the relevant costs involved in the processing, transportation and marketing of fish through the different export market channels. After all these considerations, the following costs were identified and included in the financial models:

- Variable production cost: This is the cost of materials, labor and other expenses directly involved in production. This cost category includes the raw materials, labor, water and ice, chemicals (calcium hypochlorite), cleaning detergents, packaging and electricity.
- Freight and marketing cost: This is the cost that can be directly attributed to delivering the fish products to the markets and the expenses incidental for the purposes of facilitating the sale of fish products such as the handling charges and commission payable to the sales agents in the export markets. This cost category includes freight, clearing and forwarding in Uganda, handling expenses in the export market, marketing costs and agent fees.
- Overhead cost: This is already defined above and it includes fuel and local transportation, waste management, training and supervision, consultancy fees, communication, management costs (executives and board), laboratory testing

expenses, monitoring and certification fees, insurance, foreign travel, administrative expenses, fixed asset maintenance, and miscellaneous expenses.

- Investment or sunk cost: This is the written down value (depreciation) of assets previously purchased and installed to create the operating capacity for the fish processing plant. This cost category includes depreciation of (fish processing infrastructure, production facilities and the insulated motor vehicles and equipment).

The revenue (price) was derived from field survey and published data on prices (Globe Fish, 2002, 2004), and primary data on export volumes obtained from the individual firms. The profit margins in the financial models incorporate the revenue and cost estimates for the frozen, chilled and value added fish fillet products processed using the old processing technology or the upgraded processing technology and exported through the wholesale or retail export market channels. The processing operations in 2002 used the "old fish processing technology", while the processing operations in 2004 had changed to the use of the "upgraded fish processing technology."

The profit margin model takes the following simplified form:

$$\mathbf{PM = PX - [\Sigma\ X\ (PC + MC + OC + IC]}$$

Where,

PM = Operating Profit Margin

PX = Total revenue of the firm

P = Unit price of fish fillet in US $ per kg,

PC = Variable Production costs: US $ per kg,

MC = Freight & marketing: US $ per kg,

OC = Overhead costs: US $ per kg,

IC = Investment (depreciation) costs: US $ per kg,

X = Output produced and exported (kilograms)

To analyze the profit impact of the innovations in the Ugandan fish export sector, combinations of different operating configurations (see Table 4.6 below) were created

and the financial model described above was used to estimate profits using both primary and secondary data (Globe Fish, 2002, 2004; Josupeit, 2006). The main purpose for this financial model was to estimate the impact of each operating configuration on financial performance, how this impact changed overtime with changes in relative prices, and what the impact of variations in the mix of different operating configurations was across the different firms. In essence, it is the switch between different operating configurations that represents an innovation, for example the switch from operating configuration 1 to operating configuration 3 represents the innovation of chilled fish. Thus, the best indication of the financial impact of the switch is the difference in profitability between the two operating configurations. The full details of the revenue and costs associated with the individual operating configurations are presented in *appendix 3.1*, and the workings used to derive the costs are presented in *appendices 3.2, 3.3, 3.4 and 3.5*.

Table 4.6 Operating configurations used to estimate the financial performance impact of innovation in the Ugandan fish export sector

Operating Configuration	Year	Process Technology	Product Category	Market Category
1a	2002	Old fish processing	Frozen fillet	Whole sale
1b	2004	Upgraded fish processing	Frozen fillet	Wholesale
2a	2002	Old fish processing	Chilled fillet	Wholesale
2b	2004	Upgraded fish processing	Chilled fillet	Wholesale
3a	2002	Old fish processing	Frozen fillet	Retail
3b	2004	Upgraded fish processing	Frozen fillet	Retail
4a	2002	Old fish processing	Chilled fillet	Retail
4b	2004	Upgraded fish processing	Chilled fillet	Retail
5a	2002	Old fish processing	Value added fillet	Retail
5b	2004	Upgraded fish processing	Value added fillet	Retail

Source: Field survey

Notes.

Old fish processing technology: A collection of procedures and techniques used in fish handling, processing and preservation which involves storing fish in ice, filleting, packaging and freezing using blast freezers and block ice with a high concentration of activities in one place and a high risk of violating the principles of safety and hygiene.
Upgraded fish processing technology: A collection of upgraded procedures and techniques used in fish handling, processing and preservation which involves storing fish in ice, filleting, packaging and freezing using bulk spiral freezers and flake ice with the segregation of processing activities into separate work rooms and following a uni-directional process flow or the forward motion principle to minimize cross-contamination. This approach uses a collection of practices aimed at improving or maintaining high quality of product through the adoption of Good Manufacturing Practices (GMP) and is consistent with the Hazard Analysis and Critical Control Point (HACCP) principles of hygiene and safety.

The operating configurations outlined above focus on the unique combination of process technology, product category, and market category. These operating configurations relate to the three different areas of innovation activity (product, process, marketing and supply chain) in that each innovation effectively enables a firm to either add a new operating configuration or to switch from an old configuration to a new configuration. The summary of the actual financial model that incorporates the entire mix of the operating configurations is shown in Table 4.7. These operating configurations are used to estimate the overall profitability in the industry and how this is likely to have changed over time.

Changes in the estimate of sector profitability over time indicate whether or not the industry is likely to have moved toward improved financial sustainability (Porter, 1990).

For purposes of analysis, this study was restricted to five (5) operating configurations indicated in Table 4.6 above because of limited access to data on the operations of the companies under study. Thus, not all changes in the operations of the firms, for example, the adoption of the "new packaging" approaches were included in the financial models. This is because the modeling approach could only be applied to a limited number of operating configurations due to lack of secondary data relating to some of the innovations. The proportion of the total Ugandan fish exports in 2002 and 2004 represented by the relevant operating configuration is indicated in Table 4.7.

It is acknowledged that the financial model used in the study has some limitations. The primary limitation of the modeling approach was that it did not incorporate all the differences that exist between companies in the industry. The choice of operating configurations to be included in the analysis was largely based on the availability of revenue and cost data that could permit financial modeling, and more specifically the estimation of profit. Secondary sources of data could only provide prices for frozen and chilled fish in the wholesale markets (Josupeit, 2006) and not prices of frozen, chilled fish and value added fish products in retail markets. Data on the prices of frozen and chilled fish products was obtained through interviews in the industry. Thus, the financial model was only able to incorporate differences in the operating configurations by incorporating data from both primary and secondary sources. Differences by firm in prices paid on raw materials and prices received on finished products could thus not be incorporated in the models.

It should also be noted that the models could not take full account of differences between the firms in how well they executed each of the innovations. For example, it is highly likely that in the process of implementing similar innovations across different firms, the extent of teething problems would have been greater in some firms than others. These differences can result in significant disparities in the total costs involved in implementing

the changes. It was not possible to obtain data on such differences because of the sensitive and competitive nature of precise data on production costs of each firm. In reality, such differences will indeed exist and it means that some firms get more value from the same innovation than others. The impact of this limitation is that the models are likely to understate the extent of differences in financial benefit obtained by different firms. However, the researcher was careful to gather data on the problems which each firm had experienced in the process of implementing its innovations and the analysis of this qualitative data will be provided in later section and linked to the firm-level quantitative analysis. In spite of the limitation discussed above, these models are the most extensive attempt to date to estimate the financial impact of the major innovations in this industry, and these represent the predominant operating configurations in the industry. The modeling approach is applied both at the industry and at the firm level and the latter allowed the researcher to estimate the financial impact of different operating configurations in each firm.

A further limitation of the models was the quality of data with which to populate the models. Neither the available primary nor secondary data on their own were sufficient to create realistic models. For this reason, data from several different sources had to be combined. Naturally, secondary sources only provide data at the sector level rather than the firm level. While every effort was taken by the researcher to ensure that the data used to populate the models is the most reliable from what is available, it is acknowledged that differences will exist between the estimates of costs here and the actual costs incurred by individual firms. This would mean that the actual differences in profitability between firms may be slightly different from the estimates made in these financial models.

In spite of the above limitations, it would be argued below that the modeling exercise provides useful indications of the profitability associated with different operating configurations. The primary basis for this argument is a correlation analysis presented in section 4.4.5 which shows significant correlation between the level of satisfaction with profit performance (reported in section 4.2) and a firm-level estimate of profitability based on the modeling exercise described above. The correlations suggest some validity

to the estimates of profitability at the level of operating configurations. The next three sections examine various implications of the results of the modeling exercise described above.

4.4.2 Industry level estimates of the financial impact of innovation activity

The industry level impact of innovation on financial performance in the Ugandan fish export sector was estimated using financial models of operating profit for five separate operating configurations. These financial models estimate the overall operating profit margin accruing to a fictitious company with a representative mix of the five separate operating configurations for both 2002 and 2004. For the purpose of this analysis, the fictitious company with a representative mix of operating configurations is taken to be a company with a weighted average mix of the five operating configurations of all fish sector companies in the sample for each of the years 2002 and 2004. These averages were calculated using the volumes of frozen, fresh chilled and value added fish products exported through the wholesale and retail market channels for the sampled companies for the years 2002 and 2004. The averages for each category of innovation for 2002 and 2004 are shown in the first row of figures in Table 4.7. The industry average shares for volume, revenue and profit for the frozen, chilled and value added fish fillet products sold in the wholesale and retail markets are presented in Table 4.7.

Table 4.7 Estimated average shares of volume, value and operating profit margin for a Ugandan fish exporter with a representative mix of operating configurations in 2002 and 2004*

Description of operating configurations	Frozen fillets in wholesale markets		Chilled fillets in wholesale markets		Frozen fillets in retail markets		Chilled fillets in retail markets		Value added fillets in retail markets		Total for firm	
Operating configuration	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b		
Year	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004
Share of total volume (%)	42.6	26.7	47.6	61.5	4.6	6.7	4.0	2.8	1.2	2.4	100	100
Share of total revenue (%)	35.4	20.6	52.7	66.7	4.9	6.4	5.5	3.6	1.5	2.6	100	100
Estimated share of operating profit (%)	3.6	7.6	72.2	56.4	5.0	17.8	15.4	9.7	3.8	8.6	100	100
Estimated operating margin (%)	0.6	1.5	8.2	3.5	12.2	11.4	16.9	11.0	15.6	13.6	6.0	4.2

Source: Own calculations using primary data from this research and secondary data from (Globefish 2002, 2004)

Notes.

Value added fish products were not sold into wholesale markets in 2002 or 2004.

As indicated in Table 4.7, a decision in 2002 to reduce volumes of frozen fillets to wholesale customers and switch to producing chilled fish fillets for those same customers is estimated to have improved the operating margins from 0.6% to 8.2%. Up until 2002, the switch from frozen to chilled fish was a saving grace with 76% of the operating profits coming from chilled fish sales to wholesalers. Selling chilled fish fillets to retail customers in 2002 is estimated to have increased operating margins to 16.9%. Similarly, shifting volumes of frozen fillets from wholesale customers to retail customers in 2002 is estimated to have improved operating margins from 0.6% to 12.2%. The adoption of frozen value added fish products for export to the retail markets improved the operating profit margin to 15.6%.

By 2002, the switch from selling frozen fish fillets in wholesale markets to the chilled fillets in wholesale markets was well advanced with the volume of the latter (47.6% of total volume) exceeding that of the former (42.7%). By 2004 frozen fillets exported to wholesale markets had dropped to 26.7% of overall volume. By contrast, the volume of chilled fish sold to the wholesale markets had increased to 61.5% of total volume in 2004. It is shown that between 2002 and 2004 the value of chilled sales to wholesalers actually declined significantly in spite of the substantial increase in their volumes. The reason is the estimate of a significant decline in operating margin on this operating configuration. These findings indicate that the industry was undergoing change in the fish products traded and particularly shifting from frozen fish to chilled fish.

The extent of this shift in the fairly short period of time 2002-2004 is remarkable given that product, production and market changes take time and can be expensive and risky to implement. The results suggest that the fish processors and exporters were shifting out of frozen fish sold to wholesalers at a fairly rapid pace. Herein, too, perhaps lies the seed of the negative secondary impact of this large scale innovation. The primary driver in this shift was the dramatic decline in the prices paid by the wholesalers for frozen fish in export markets and the relatively high prices obtained for chilled fish in the wholesale markets. It is possible that the rapid switch into the production of chilled fish may have resulted in the relatively large decline in the price of chilled fish compared to frozen fish

between 2002 and 2004, as noted in section 4.2 above. The switch into chilled fish in Uganda coincided with a global shift into chilled fish and the impact on global prices of shifts among fish exporting countries is likely to have dwarfed that of the Ugandan fish sector. This can be seen in the dramatic fall in profitability of this category from 8.2% to 3.5% between 2002 and 2004, largely as a result of the decline in prices obtained from wholesalers. Nevertheless, within the wholesale market the profitability of chilled fish (3.5%) remained well above that of frozen fish (1.5%). Thus, it is partly because of the dynamic change in the industry that it is necessary to conduct careful analysis of the likely net financial impact of innovation at different points in time.

The switch into selling chilled fillets into retail markets was negligible by comparison, even though the profitability in this category remained well above that for chilled fillets in wholesale markets throughout the period. Chilled fillets sold to retailers accounted for only 4.0% of the overall export volume in 2002 and declined to 2.8% of overall export volume in 2004. The adoption of the frozen value added fillets exported to the retail markets was even more muted at 1.2% of the overall export volume in 2002 and even after doubling was a mere 2.4% of overall export volume in 2004. Thus, the share of operating profit of chilled fillets into retail markets declined between 2002 and 2004, although volumes in this line were actually declining.

The low volume of value added fish products as a proportion of total export volume is likely to be associated with the problems earlier noted in section 4.3 above. The only company to make significant progress in value added fish products had partnered with a foreign company in order to obtain the necessary skills and access the necessary market channels. Notably, it was sales of frozen fillets – the traditional export product from Ugandan fish processors that represented the bulk of volume, revenue and profit from retailers. By 2004, profit from frozen fillets sold to retailers is estimated to have accounted for 17.8% of total profit in the industry. Although retailers purchased only 11.9% of Ugandan fish export volumes in 2004, profits from this category is estimated to have accounted for 36% of total industry profit, with the bulk of this profit coming from frozen fillets rather than the more complex chilled fillet and value added products.

Importantly, the prices offered by retailers did not decline to levels anywhere near as low as was the case in wholesale markets, which was a key factor in maintaining reasonable margins.

These results suggest that although switching into new products with more attractive margins did provide some protection from declining profits, albeit somewhat temporary, a more beneficial form of innovation appears to have been the switch into new market channels, and particularly the shift to selling directly to retailers, even if that involves sale of traditional products such as frozen fillets. The key factor which results in the retail channel remaining more attractive than the wholesale channel is branding, and the knowledge which underpins brand management. It is the existence of powerful supplier brands which limits the extent of competition among supplier to retailers. Whereas wholesalers can switch relatively easily between different suppliers, retailers cannot, as a significant proportion of their customers will exhibit brand loyalty. In order to gain access to a retail channel, a Ugandan producer either has to be appointed as a supplier for the retailer's own house brand or it has to be appointed as a preferred supplier to an independent brand holder. This is because there are no Ugandan-owned fish product brands represented in EU retail channels. Nevertheless, the inability of Ugandan fish exporters in being preferred suppliers to the EU based retailers is because of the lack of capabilities in processing branded fish products, reliability and consistency in the supply of volumes required by the EU retailers.

The view that the primary factor governing access to attractive price segments is brand is further reinforced by the experience of the only Ugandan exporter which has achieved some limited success in value added products. This limited success appears to be intimately linked to its strategic partnership with a well-established international fish company based in South Africa with an established brand and relationship with retailers locally and in Europe. Even then, value added fish products constituted only 9% of its total exports value in 2004. It also remains unknown as to why given the apparent good margins, the South African company does not take more volumes from them. Possible answers might lie in weaknesses regarding fish quality, packaging, lead times or delivery

requirements. Additional research may be needed to clarify on this. This is a demonstration that in spite of making attempts to brand fish products and get into the retail market segment, there is still limited success for the possible reasons mentioned above.

The above discussion indicates that in spite of the significant innovation effort observable in the Ugandan fish export sector, progress in the area of indigenous brand development is non-existent and progress in supplying retail ready product to foreign brand-owners appears to be limited. The Ugandan fish exporters have made very limited attempt to establish their identity in the export markets. Their lack of identity or brand name makes it difficult to undertake more advanced form of marketing such as fish product promotion and differentiation which could shield them more effectively from price competition. This is because they lack the necessary knowledge, skills, experience and sometimes also financial resources to establish a brand identity which could shield them more effectively from price competition. This calls for further analysis into the possible strategic steps that could be undertaken to improve the potential of these exporters to shift from being predominantly commodity suppliers to the large wholesale European food companies and instead develop operational capabilities to supply retail-ready products in larger volumes to brand owners in the EU. In addition, there is need to develop a Ugandan brand that could enable them to penetrate premium retail market segments in Europe where higher profits may be earned.

In spite of significant progress in the area of product, process and supply chain innovation therefore, Ugandan fish exporters appear in the main still to be suppliers of bulk fish to the wholesalers in the export markets. Nearly 90% of volumes still go through wholesale channels which leave the exporters exposed to more severe price competition. The profitability of the remaining volumes to retailers is threefold that to wholesalers. But the relatively small proportion of Ugandan exports going directly to retailers accounts for the apparent decline in overall industry profitability between 2002 and 2004 as implied by the results in Table 4.7. The implications of this apparent decline in profitability are discussed in more detail in the next section.

4.4.3 Counterfactual analysis of the impact of innovation on financial performance at industry level

The financial models in Table 4.8 show the operating profits per kilogram of fish fillet (using an industry-average mix of operating configurations based on the "share of volume" data from Table 4.7 above) and the profit margin percentage as the ratio of the profit to the price per kilogram of fish fillet. The operating profit is calculated as the difference between the price per kilogram of fillet and the summaries of the main costs incurred per kilogram of fillet by the average fish exporter. A total of three financial models were created for the counterfactual analysis in Table 4.8.

Table 4.8 Estimates of operating profit margins in 2002 and 2004 for a Ugandan fish exporter with a representative mix of operating configurations

Particulars	Profit margin estimates of frozen, chilled and value added fish fillets in wholesale & retail markets		
	Model I (US $ per kg using 2002 prices and the average innovation mix for 2002)*	Model II (US $ per kg using 2004 prices and average innovation mix for 2002)	Model III (US $ per kg using 2004 prices and the average innovation mix for 2004)**
Sub-Totals			
Production Costs	2.64	2.51	2.45
Freight & Marketing	1.05	1.07	1.26
Overhead Costs	0.26	0.27	0.21
Investment Costs	0.25	0.26	0.26
Total Costs	4.17	4.09	4.17
Revenue (US $ per kg)	4.43	4.16	4.36
Profit Before Tax	0.266	0.07	0.19
Profit Margin (%)	6.0%	1.6%	4.2%

Source: Primary data from field research and secondary data from Uganda Fish Processors and Exporters Association and the Department of Fisheries Resources.
Notes.
* The predominant production techniques used in 2002 were based on the "ordinary fish processing technology."
** The predominant production techniques used in 2004 were based on the "modern advanced fish processing technology."

The three financial models presented in Table 4.8 above are discussed henceforth. Model I estimates the profit margin for the average fish exporter with a representative average

product and marketing mix for 2002. This financial model is based on cost and revenue estimates of filleting operations using the old fish processing technology. Table 4.8 shows that the combined effect of a representative mix of operating configurations yielded an operating profit margin before tax of 6.0% for 2002, the same figure shown in Table 4.7.

The counter-factual analysis presented as Model II in Table 4.8 estimates that the profit margin would have been 1.6% in 2004 if no further innovation had occurred between 2002 and 2004 and thus the mix of operating configurations in 2004 was precisely what it had been in 2002. This analysis provides insights into how the markets for final products and input costs were changing over the period. It is estimated that the overall profit margin before tax would have been 1.6%. This is a decline from industry profitability in 2002 of 6.0%. It is an indication that profitability in the industry would have declined to a far greater extent if the sector had continued with the same mix of operating configurations in 2004 as in 2002. As indicated in Table 4.8, the overall operating margin for the industry in 2004 is estimated in Model III to have been 4.2%. This is lower than the profit margin of 6% estimated for 2002 but higher than the counterfactual profit margin of 1.6% in 2004. This implies that the innovation activity in the industry partly but not fully offset the negative impact of changes in external markets on the profitability of these firms.

As noted in Table 4.1 above, the evidence on the levels of satisfaction with profitability suggests strongly that profitability increased over the period 2002-2004, despite the negative movement in prices. Clearly these two sets of results are not compatible. The most likely explanation for this discrepancy is that the estimates of industry profitability in this section understate the positive impact of innovation on profitability. It is quite possible that the financial models do not take adequate consideration of the extent of productivity improvements and internal cost reductions over this period. This discrepancy between the two different approaches to estimating changes in financial performance raises the important question of whether financial models of operating configurations such as was outlined above have any value or whether they are too crude to be of any real

use. Clearly, the preliminary evidence in this section suggests that they may be of limited use, at least for the purpose of estimating aggregate industry profitability changes over time. However, this does not preclude the possibility that such models may be of use in exploring differences in profit performance between companies in the industry. The reason for suggesting this is that even though the models suffer from imperfections in terms of their accuracy for estimating changes in aggregate profitability over time, those imperfections will be applied equally across firms. Thus, if the models provide useful indications of the relative changes in profitability of different operating configurations over time, then they might still provide useful indications of profitability differences between companies on the basis of the different mix of operating configurations in each company. The next section investigates this further by presenting empirical results on the variation in profitability across a range of different innovations among Ugandan fish exporters.

4.4.4 Firm-level variation in profitability in the fish sector in Uganda

This section presents empirical results from an analysis of firm-level profitability of Ugandan fish exporters over the period 2002-2004. The aim of this analysis is to estimate the likely financial impact of innovation activity on individual Ugandan fish export companies in the period 2002-2004. The empirical results on export revenue from the fish products and estimates of overall operating profit margins for the fish exporters in Uganda in 2002 and 2004 are presented in Table 4.9. The estimates for overall operating margin for each company draw on the estimates of profitability associated with the five operating configurations as shown in Table 4.7 together with data from each company on their actual volumes in each of the operating configurations in 2002 and 2004.

Table 4.9 Absolute (proportionate %) export revenues from the fish products and overall operating margins for Ugandan fish exporters for the years 2002 and 2004

Operating Config.	Export revenue of frozen fillets to wholesale markets in millions of US $ (%)		Export revenue of chilled fillets to wholesale markets in millions of US $ (%)		Export revenue of value added frozen fillets to retail markets in millions of US $ (%)		Export revenue of chilled & frozen filets to retail markets in millions of US $ (%)		Overall estimated operating margin for the firm (%)		Estimated change in operating margin
	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	
Firm Code	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002-2004
FH01	2.04 (23)	1.31 (13)	7.01 (77)	8.75 (87)	0	0	0	0	6.49	3.24	-3.25
FH02	1.93 (36)	1.30 (19.7)	3.41 (64)	5.33 (80)	0	0	0	0.02 (0.3)	5.46	3.77	-1.69
FH03	3.29 (43)	1.28 (15.6)	4.36 (57)	6.89 (83)	0	0.09 (1)	0	0.03 (0.4)	4.94	4.34	-0.60
FH04	2.53 (39)	2.04 (30)	3.97 (61)	4.76 (69)	0	0.07 (1)	0	0	5.25	3.02	-2.23
FH05	2.92 (25)	2.88 (24)	8.97 (76)	9.23 (76)	0	0	0	0	6.28	3.03	-3.25
FH06	2.58 (38)	0.88 (11)	4.20 (62)	6.84 (89)	0	0	0	0	5.32	3.27	-2.05
FH07	2.32 (32)	1.52 (19)	4.83 (68)	6.61 (81)	0	0	0	0	5.74	3.13	-2.62
FH08	11.99 (100)	8.09 (44)	0	9.32 (51)	0	0.08 (1)	0	0.81 (4)	0.62	3.24	2.62
FH09	1.38 (35)	1.7 (20)	2.44 (63)	6.41 (74)	0.08 (2)	0.12 (1)	0	0.42 (5)	5.68	4.06	-1.62
FH10	4.11 (49)	3.47 (38)	4.34 (51)	5.67 (62)	0	0	0	0	4.51	2.74	-1.77
FH11	1.64 (53)	1.47 (23)	1.46 (47)	4.65 (74)	0	0	0	0.20 (0.3)	4.18	3.61	-0.57
FH12	3.45 (18)	3.00 (13)	15.54 (79)	18.45 (77)	0.17 (1)	0.38 (2)	0.45 (2.3)	2.15 (9)	7.28	4.85	-2.43
FH13	1.92 (48)	1.40 (16)	2.08 (52)	5.60 (81)	0	0	0	0.23 (3)	4.56	3.69	-0.87

Source: Computed by author using primary data from the fish exporters and secondary data from the Department of Fisheries Resources in the Ministry of Agriculture Animal Industry and Fisheries (Uganda) and Globe Fish (2002, 2004).

The results presented in Table 4.9 show the firm-level profitability for different operating configurations. As noted in section 4.4.1 above, the true differences in profitability are likely to be higher than what is presented in Table 4.9. This analysis therefore only accounts for part of the financial impact of innovations among Ugandan fish exporters and only estimates the relative levels of profitability associated with the implementation of the different innovations in the industry. The estimates suggest very substantial differences in profitability between the companies in the industry. For example, in 2002, FH12 obtained approximately 80% of its export revenue from chilled fillets and value added fillets which is estimated to have resulted in a profit margin of 7.3%. By contrast, FH08 obtained all of its revenue in 2002 from frozen fillets and it is estimated to have achieved a profit margin of 0.62%. In this respect, differences in product mix in 2002 between these two companies are estimated to have resulted in more than a ten-fold difference in profitability between them. By any standards this is a dramatic difference.

The results also suggest that due to the high levels of innovation investment, particularly among the fish exporters which performed worst in relative terms in 2002, the profitability disparities between them had declined by 2004. The extent of differences in the product mix across the companies declined dramatically. This suggests that even the worst performing fish exporters were able to assemble the necessary resources in order to be able to introduce new products and processes successfully. The industry therefore converged toward relatively high dependence on the chilled fish in 2004. In contrast, it converged toward a relatively low volume of value added fish fillets in the same period. This implies that although some progress was made in areas of innovation which are relatively easy to enter, the fish exporters made limited progress in more demanding forms of innovation.

However, there is no evidence in the data which suggests that latecomers to an innovation are excluded from its benefits, although by the time they had switched into chilled fish, the prices of chilled fish had already declined significantly. The only company that is estimated to have achieved an improvement in its profitability over the period 2002-2004 that is, FH08 was barely above break-even point at the start of the period. The results also

indicate that in the cases of FH03, FH11 and FH13, it is estimated that profitability dropped only marginally during the period 2002-2004 because these companies made dramatic shifts out of less profitable innovation activities into more profitable activities. Overall the extent of innovation activity in the high margin products such as the value added fish fillets, and export to retail markets were still negligible. Even the companies that attempted value added fish products had very low volumes in these products. This outcome might suggest that the fish exporters lack the critical resources, capabilities, are risk averse or are faced with some structural constraints that hinder them from successfully pursuing these market opportunities. This will be explored further below.

In spite of the dramatic decline in the terms of trade for both frozen and chilled fish fillets, several fish exporters appear to have been able to virtually offset the negative impact of price declines and sustained far smaller declines in their profitability. However, there is a discrepancy between this finding and the finding reported in section 4.2 that the companies were on average far more satisfied with profit improvement than with US $ price improvement. This could be because of the limitations in the approach adopted for modeling innovation profitability among the fish exporters. As noted above, the modeling approach appears to have limited usefulness for approximating changes in profitability overtime, but this does not exclude the possibility that it could provide a useful approximation of cross-sectional variation in profitability, a topic to be explored further in the next section.

What is striking is that in the most attractive markets segments, namely, value added fish products and retail channels, none of the fish exporters in Uganda had made significant progress. For this reason, perhaps, it should not be surprising that by 2004, more than half of the fish exporters had not entered these segments. Entry into these market segments seem to be problematic for Ugandan exporters. They require a sustained effort to upgrade fish processing, packaging, branding and marketing to target them. It is evident that these are areas in which Ugandan Nile perch exporters lack experience, knowledge and skill, and hence, many are not inclined to take the risks of investing heavily in the production of value added products for which the market is still uncertain.

Results in the Ugandan fish export sector clearly indicate that there are differences in the types of innovations that create value in one period from those that do so in another period and hence, there is a strong case for companies to diversify their innovation activities in order to optimize their potential for value creation. Good examples of companies which diversified their innovation activities include FH03, FH09 and FH12 (see Table 4.9). This point can be illustrated with the observation that if a company focused solely in switching from frozen fillets sold in wholesale markets to chilled fillets in wholesale markets, they would have done relatively well in the period up to 2002. However, thereafter, they are likely to have suffered from a sharp decline in profitability on sales of chilled fillets to wholesale between 2002 and 2004 (see for example FH05, FH06 and FH07 in Table 4.9). Similarly, if a company had focused solely on switching from frozen fillets sold in wholesale markets to frozen fillets sold in retail markets, they could in theory have done better in both 2002 and 2004. However, the volumes of frozen fillets to retail markets remained a tiny fraction of overall industry volumes, and therefore the company might have found it very difficult to achieve sufficient sales volumes of frozen fillets sold to retail for their business to be viable. Similarly, focusing exclusively on value added fillets to retail might also have represented a challenge given the tiny volumes on that operating configuration as well. Thus, diversification of innovation activity and the need to switch volumes between different operating configurations would enable the fish exporters to optimize profitability at any one time.

4.4.5 Validity checks on the profitability estimates

A correlation analysis was undertaken to determine whether there was any relationship between the self-reported levels of satisfaction with profitability improvement, referred to in section 4.2 above, and the firm-level estimates of profitability changes between 2002 and 2004 as reported in section 4.4.4. If indeed the estimates of changes in profitability in section 4.4.4 and the estimates of profitability of the five operating configurations indicated in section 4.4.1 have any validity, then one would expect that they would be positively correlated with data on satisfaction levels with profit improvement. The results of the correlation analysis are presented in Table 4.10. The results of this analysis are

consistent with an earlier observation in which key players in the industry expressed interest in the outcome of the study, and the responses of a limited number of these industry players to the final results of the estimates of the financial impact of the innovation activities were positive.

Table 4.10 Correlation matrix of the different measures of performance for the Ugandan fish export sector

Description of item			1	2	3	4	5
1.	Profitability (company's performance1)	Pearson Correlation	1				
		Sig. (1-tailed)					
		N	43				
2.	improve1_mean	Pearson Correlation	.813**	1			
		Sig. (1-tailed)	.000				
		N	43	43			
3.	profm02	Pearson Correlation	-.124	-.152	1		
		Sig. (1-tailed)	.215	.165			
		N	43	43	43		
4.	profm04	Pearson Correlation	.234	.288*	.322*	1	
		Sig. (1-tailed)	.065	.030	.018		
		N	43	43	43	43	
5.	profmd42	Pearson Correlation	.229	.282*	-.917**	.082	1
		Sig. (1-tailed)	.070	.033	.000	.301	
		N	43	43	43	43	43

Notes.
improve1= satisfaction with improvement in profitability over the period 2002-2004 (*original responses from each respondent*)
improve1_mean= satisfaction with improvement in profitability over the period 2002-2004 (*mean response for each firm*)
profm02=estimated company profitability in 2002
profm04=estimated company profitability in 2004
profmd42= estimated growth increase in profitability in the period 2002-2004 (difference between profm04 and profm02)
*. Correlation is significant at the 0.05 level (1-tailed), **. Correlation is significant at the 0.01 level (1-tailed).

There was a significant positive correlation between the mean satisfaction level with improvement in profit performance (improve1_mean) and both the estimates of profitability for each company in 2004 (profm04) and the estimates of improvement in profitability between 2002 and 2004 (profmd42). The correlation between satisfaction

with improvement in profitability over the period 2002-2004 (*mean response for each firm*) and estimated company profitability in 2004 is significant, with coefficient r =.288, p (one-tailed) <.05. Similarly, the correlation between satisfaction with improvement in profitability over the period 2002-2004 (*mean response for each company*) and estimated growth in profitability in the period 2002-2004 is significant, coefficient r = .282, p (one-tailed) <.05. It should be noted that the one-tailed test is the appropriate one because a negative correlation between these variables would be meaningless.

The level of correlation is not particularly high. This is not entirely surprising, given that the approach taken in the modelling of profit margins necessarily excluded many of the firm-level differences for which industry-level data was required and in addition the evidence from sections 4.4.2 and 4.4.3 suggests that the financial models understate the extent of contribution to profitability made by innovation activity over the period. In spite of the limitations of the variables themselves and the relatively modest level of correlation between them, the significant positive relationship provides compelling evidence that the financial models used in the study and the estimates of profitability derived provide a valid and useful indication of variation in financial performance across the companies and therefore also provide a useful indication of the relative levels of profitability between different operating configurations. The next section presents the empirical results on the main drivers of innovation profitability or the critical company capabilities that seem to determine innovation profitability in the Ugandan fish export sector.

4.5 Drivers of innovation profitability in the Ugandan fish export industry

Section 4.4 of this chapter explored the profitability associated with different operating configurations in the Ugandan fish export industry and thereby provided insights into the impact of key innovation choices on financial performance. This section presents results of systematic analysis of how the broader approach to innovation management influences profitability at the level of the company. As stated earlier, oone of the key objectives of this study was to determine the influence of innovation management on financial sustainability in the Ugandan fish export sector. This was achieved in part through

obtaining data from the companies about their level of satisfaction with the improvement in their profitability (refer section 4.2) and partly by creating financial models that estimate the profit margins associated with different operating configurations. The latter provided useful insights into how the mix of operating configurations influences the profitability of the companies. In particular, those configurations provide estimates of the impact on profitability of switching into more profitable operating configurations earlier than other companies or to a greater extent than other companies. As noted in the previous section, it seems clear that these innovation choices do have a significant positive association with firm-level profitability.

However, the effectiveness of innovation management depends on far more than choices in the mix, timing and extent of innovation activity (Adam, Bessant & Phelp, 2006). It is widely recognised that effective innovation management depends on a range of other management practices. These include processes for gathering market information in a timely manner, processes for identifying and managing innovation risks, processes for monitoring and evaluating innovation projects (Davenport, 1993), and that these in turn depend on a variety of management practices relating to areas such as leadership, organizational culture, and communication within the organization and between the organization and external stakeholders (Biloslavo, 2005; Zerfass & Huck, 2007). And to the extent that differences in these management practices exist between companies, it is likely that the outcomes of similar innovation activities across different companies will be different.

In view of data limitations, it was beyond the scope of the financial modelling exercise in section 4.4 above to take account of all such differences between the companies. The purpose of the regression analysis in this section, therefore, is to explore the impact of differences in other areas of innovation management practice on "satisfaction with improvement in profitability" of the companies in the sample. This dependent variable was considered to be the most robust measure of profit performance in the sample, given that the profit margins from the financial modelling exercise were known to be estimates which necessarily excluded important dimensions of profit performance. The choice of

dependent variable is consistent with earlier observation that subjective measures of performance are useful in situations where managers may be reluctant to disclose actual performance data if they consider it commercially sensitive or confidential (Dess & Robinson, 1984) as was the case in this study.

Theory was used as the basis for identifying predictor variables. Although there are numerous factors that can influence innovation and its impact on financial performance, for example corporate strategy and general environmental conditions their individual effect is not very high (Souitaris, 2002). A search of the literature identified five important predictor variables with high potential for predicting satisfaction with improvement in profitability, namely;

(i) Penetration of premium export markets (Kaplinsky & Morris, 2006);

(ii) Sales of new products in new export markets (Charlet & Henneberry, 1992; Shaw & Young, 2000);

(iii) Trust among employees (Chiesa, Coughlan & Voss, 1996);

(iv) Maintenance of close social relationships with input suppliers and export customers (von Hippel, 1988; Porter, 1990; Atuahene-Gima, 1995);

(v) Sharing of information with staff in government, donor agencies and private sector development institutions (Lane & Lubatkin, 1998; Batra & Mahmood, 2001).

In addition to the above variables, it was decided that the estimate of change in operating profit margin, reported in Table 4.9 above should also be included as a predictor variable. The reasoning behind this was as follows. Given that this variable was based upon estimates of the profitability of different operating configurations in the fish industry and the unique mix of these operating configurations within each firm, it therefore could serve as a proxy variable for the profit impact of "innovation project choices" in each company (Cooper & Kleinschmidt, 2007). The inclusion of this variable serves two purposes. Firstly, it provides us with an additional opportunity to test whether the earlier estimates of firm-level profitability are correlated (in a multi-variable regression) with levels of satisfaction with profit improvement over the period, and hence whether the financial models provide useful estimates of the impact of innovation choices on

improvement in profitability across the firms. Secondly, if it is found to be a useful predictor, of profit satisfaction level, then its inclusion on the regression provides a means to isolate the impact of innovation project choices and to examine which other aspects of innovation management practice influence profit improvement. The regression analysis controlled for the effect of ownership, age and size (number of employees) (Shan, Walker & Kogut, 1994).

To capture the simultaneous effect of the predictor and control variables on financial performance, three multiple regression analysis (MRA) functions were estimated with "satisfaction with improvement in profitability" as the dependent variable. All the regression models are presented in Table 4.11. Model 1 predicts the simultaneous effect of the control and explanatory ((i) – (v) above) variables on satisfaction with improvement in profitability. This model includes the companies that provided revenue data as well as the ones which did not. Model 2 predicts the simultaneous effect of the control and explanatory ((i) – (v) above) variables on satisfaction with improvement in profitability and includes only the companies that provided revenue data. Model 3 predicts the simultaneous effect of the control and explanatory variables including the variable for the estimate of profit improvement as a proxy variable for "innovation project choices" on satisfaction with improvement in profitability. It uses only the companies that provided revenue data, and for which profit margin estimates could be calculated.

Table 4.11 Regression models for the Ugandan fish export sector

Dependent variable	Model 1 SATIMPROFIT		Model 2 SATIMPROFIT		Model 3 SATIMPROFIT	
Independent variables	Beta	SE	Beta	SE	Beta	SE
(Constant)		.102		.114		.241
Controls						
Dummy for foreign ownership	.360	.098***	.359	.104**	.600	.108***
Dummy for joint foreign and local ownership	-.012	.087	-.027	.094	-.255	.096
Firm age	-.043	.070	-.041	.079	-.246	.081
Number of employees	.058	.174	.088	.194	.018	.173
Main effects						
Satisfaction with improvement in penetration of premium export markets	.441	.081***	.417	.092***	.412	.081***
Satisfaction with improvement in sales of new products in new export markets	.215	.075*	.165	.085	.070	.078
We encourage trusting relationships among employees	.422	.073***	.440	.077***	.347	.070**
We maintain close social relationships with suppliers and export customers	.280	.085**	.299	.091*	.472	.089***
We mutually share information with staff in support institutions	-.220	.074*	-.224	.083	-.018	.084
Estimated improvement in profit margin 2002-2004					.602	.224***
N	47		42		42	
Adj. R2	0.525		0.499		0.611	
F	6.765		5.646		7.602	
Sig. F	0.000		.000		.00	
Highest condition index	3.1		3.0		8.8	
White test	5 (df=44)		5 (df=40)		4 (df=40)	

Notes.

SATIMPROFIT = Satisfaction with improvement in profitability 2002-2004.

* Significant at $p \leq 0.05$, ** Significant at $p \leq 0.01$, *** Significant at $p \leq 0.001$

Model 1 results indicate that the control and predictor variables simultaneously explained 52.5% of the variation in satisfaction with improvement in profitability. With the exception of sharing information with support institutions, the direction of the effect of all explanatory variables is positive, as predicted. The highest contribution is from penetration of premium export markets followed by trust among employees. Sale of new products in new export markets and the maintenance of close social relationships with suppliers and export customers each had a somewhat smaller contribution. The sharing of information with staff in support institutions has a negative association with satisfaction with profitability.

Model 2 indicates that the control and predictor variables simultaneously explained 50% of the variation in satisfaction with improvement in profitability. This slightly lower explanatory power should not be surprising because of the reduction in the number of observations. Once again, with only one exception, the direction of the effects on all the variables is positive, as predicted. The three factors that had significant positive contribution to satisfaction with profitability in descending order were; trust among employees followed by penetration of premium export markets and to a lesser extent the maintenance of close social relationships with input suppliers and export customers.

Model 3 indicates that the control and predictor variables simultaneously explained 61% of the variation in satisfaction with improvement in profitability. This indicates that the inclusion of the variable for the estimated improvement in profitability, a proxy variable for the contribution of innovation project choices, significantly improves the explanatory power of the regression. Indeed, the size of its coefficient suggests that this variable is the most highly correlated with the dependent variable and has the greatest explanatory power. Other variables that demonstrate explanatory power are maintenance of close social relationship with suppliers and export market customers, satisfaction with improvements in penetration of premium export markets, and trust among employees.

The predictive power of Models 1 and 2 are moderate and somewhat lower than for Model 3. This is in part explained by the contribution of estimated improvement in

profitability in the period 2002-2004. All three models indicate that satisfaction with improvement in the penetration of premium export markets, trust among employees, and the close social relationship with suppliers and export market customers are associated with a higher level of satisfaction with improvement in profitability. However, they indicate that sharing of information with staff in support institutions is associated with a lower level of satisfaction with improvement in profitability. The latter finding is consistent with recent empirical results from investment climate surveys (World Bank, 2004) which suggest that institutional support for private sector development in Uganda may be weak and of poor quality.

Meanwhile the strong positive effects of a focus on the penetration of premium export markets, trust among employees, and the social relationships with input suppliers and export customers is consistent with theory and earlier empirical observations (Ancona, 1990; Griffin, 1997a; Teece, Pisano & Shuen, 1997). For example, penetration of premium export markets and sale of new products in new export markets have been associated with improvement in performance in export markets (Charlet & Henneberry, 1992; Shaw & Young, 2000; Kaplinsky & Morris, 2006). The existence of trust among employees has also been associated with innovation profitability (Cooper, 1991; Chiesa, Coughlan & Voss, 1996). Lastly, social relationships with input suppliers and export customers have also been associated with success in export markets (Porter, 1990). In particular, linkage with input suppliers is an important source of technological knowledge (von Hippel, 1988), while linkage with export customers is considered to be an important source of market knowledge (Hart, Webb & Jones, 1994; Li & Calantone, 1998). Thus, both technological and market knowledge are important components of a company's innovation strategy and they each have roles to play in determining the financial performance outcome of innovation. Both technological and marketing capabilities require improvement in skills.

In order to validate results from the above regression models, tests were carried out to determine whether there was any co-linearity among the explanatory variables. Preliminary tests involved generating a correlation matrix of the explanatory variable

(refer to appendix 9.1 of the thesis). It was found that there was only one pairing with a correlation coefficient of above 0.4, that is between two of the control variables namely, the number of employees and the dummy for foreign ownership, with a correlation coefficient of -0.467. In general, co-linearity is thought only to present a problem in cases where correlation coefficients are in the region of 0.80. Furthermore, the co-linearity statistics showed no variance inflation factor (VIF) value of higher than 1.5, thereby confirming that co-linearity is not a problem. Although additional tests showed that the highest condition index for the model 33.8 which is sufficiently high to be suggestive of a serious co-linearity problem, this was later found to be a false flagging of co-linearity. Once the independent variables had been standardized, the highest condition index for model 1 dropped to 3.1 (refer to Table 4.11). The highest condition index for the subsequent models was found to be 3.0 (model 2) and 8.8 (model 3) from Table 4.11. Thus, there were no problems regarding co-linearity in any of the models for the fish sector. In addition, heteroscedasticity tests (White test) were done to ensure that the beta coefficients reported in the regression models are not biased due to co-linearity. The results reported in Table 4.11 show that for model 1: White test = 5 (*df= 44*), *p=.4*, model 2: White test = 5 (*df=40*), *p=.4* and model 2: White test = 4 (*df=40*), *p=.5*. These results indicate that heteroscedasticity will not be a problem, thus the null hypothesis of homoscedasticity should not be rejected.

The results from the above analysis have implications for the management of innovation activity among the Ugandan fish exporters and in particular the pace and quality of learning that takes place across the companies, and the need for the coordination of a mix of management practices aimed at enhancing internal communication and relating with external stakeholders along the value chain. Important managerial considerations include: careful selection of innovation projects based on a rigorous analysis and evaluation regarding their potential contribution; integration of the technical, marketing and management capabilities in order to support innovation strategy and project selection, and development of a culture of continuous learning and human capital development. They also point towards the primary challenges to further progress among the companies and

what should be done by the exporters to address these challenges. These results should however, be interpreted with care because they are based on a specific industry context.

4.6 Summary of key results and conclusions

This empirical study has attempted to explore the innovations adopted by Ugandan fish exporters and determine the extent to which they were able to create and appropriate value from the innovations in the period under study. To achieve the latter, the study explored the different operating configurations used by the fish exporters to assess the extent of innovation activity. Changes in the operating configurations and the differences in profitability associated with those changes were used to estimate the likely level of profit associated with innovation. The results revealed useful insights.

The findings indicate that Ugandan fish exporters have made significant internal changes to improve efficiency and quality of the fish products. These changes include the adoption of modern fish processing practices based on Good Manufacturing Principles and Hazard Analysis and Critical Control Point procedures for food hygiene and safety. They also made a remarkable shift from low margin frozen to the higher margin chilled fish products sold in wholesale markets. Empirical results show that up until 2002, the switch from frozen to chilled fish was the saving grace for the industry with 76% of the operating configuration coming from chilled fish sales to wholesalers. However, between 2002 and 2004, the value of chilled sales to wholesalers declined significantly in spite of a substantial increase in their volumes. This is because of the estimate of a significant decline in operating margins on this operating configuration.

A further observation was that the share of operating profit of chilled fillets into retail markets also declined between 2002 and 2004, although volumes in this line were actually declining. It is also noted that the fish exporters were relatively slow in adopting value added fish products, brand development and moving into retail market segments. Thus, it can be argued that up to 2002, the switch from frozen to chilled fillets was value adding. After 2002, it seems that most of the value creation was achieved through the switch from wholesale to retail, at least for frozen and value added products. It is also

noted above that the value of chilled fillets to retail appears to have declined. The only part of wholesale which was doing better than previously was frozen fillets, but this was off a very low base and in any case the margin on frozen to wholesale was a small fraction of the margin on frozen to retail, hence there was limited value being created on selling frozen to wholesale. Overall therefore, the preliminary results indicate that there was to some extent a planned approach to the innovation activities in the industry. These results refute earlier observations that there is limited planned innovation activity in agro-commodity export sectors in SSA (Kaplinsky, 2004).

In spite of the relatively low volumes of fish exports to retail markets, much of the profit improvement in the industry appears to have come from switching from wholesale to retail markets. This suggests that there may be good potential for improved profitability in the industry if the fish exporters develop capabilities to meet all the requirements to sell into retail markets on a large scale. At this stage, all Ugandan fish producers selling into retail markets do so under house brands or to EU brand owners. Sustaining growth of sales into retail channels may require the development of own brands. This is an area in which Ugandan fish exporters are still relatively weak. The low level of branding in the industry in Uganda is likely to be because of lack of marketing and branding skills or limited financial resources to invest in brand development. This result therefore is an indication that Ugandan fish exporters are more inclined toward innovation activities that are less technically, managerially and financially demanding, and in this respect they may find it difficult to shield themselves from further increases in competition and declines in prices. This is because they lack technical expertise, experience or resources in engaging in more advanced forms of product and marketing innovation (Mytelka, 2000; Oyelaran Oyeyinka, 2006).

Although the empirical results show that there was remarkable shift from frozen to chilled fish products sold in wholesale markets, this was started in 1998 seven years after the Kenyan and Tanzanian Nile perch exporters had ventured into chilled Nile perch products (Gibbon, 1997). This may indicate that the Ugandan fish export industry was slower in making the necessary transition from less profitable product categories to the

more profitable products than the competing Nile perch export value chains in Kenya and Tanzania. The late adoption of product innovation could be attributed to the relatively better developed airfreight supply chain from Kenya to Europe as a result of its long history of development in the international supply chain for fresh agricultural produce destined for the European markets, particularly the United Kingdom.

The empirical results for levels of satisfaction with profit improvement indicate that after the fish exporters have taken account of declining prices in export markets, the increasing cost of certain inputs, and provision for the additional investment associated with the innovation in the industry, the companies were on average financially better-off at the end of the period 2002-2004 than they were at the beginning. While the financial modeling exercise that followed suggests the reverse, namely, that the companies were worse off at the end of the period than at the beginning, this discrepancy is likely to be because of the limitations of the financial modeling exercise. In spite of these limitations, however, it was shown that when the financial models of profitability of different operating configurations are used to estimate differences in profitability at the company level, that these estimates are positively correlated with the variable for satisfaction levels with the improvement in profitability over the period.

It would appear that Ugandan fish exporters have done fairly well in export markets because they have been able to effectively create and absorb part of the additional value in spite of operating in a commodity export value chain in which they face challenges related to fluctuating and indeed declining prices. Thus, in spite of the external environment moving against them in terms of lower prices and higher costs, a consequence of which was the decline in profitability over the period 2002 – 2004, the fish exporters have managed to contain these environmental constraints and sustained the operations in the industry. In particular, the pressure on revenue experienced by the Ugandan fish exporters as a result of absolute declines in nominal prices was offset partly by switching into products which obtained higher and not lower prices and from which they had the potential to earn higher profits. Thus, by maintaining an appropriate mix of new products and markets with improved approaches to marketing, the fish exporters

were able to earn some returns to their innovation investments. This is an important achievement considering the high cost structure of the industry and other structural constraints such as low fish supply, low capacity utilization and high freight costs that effectively reduce profitability.

The empirical results further revealed that there were substantial differences in profitability between the companies in the industry. This is attributed to differences in product mix between the companies. It is also because of the effect of effective cost management practices such as rational use of fuel, water, packaging and fleet control. In addition, it can be attributed to improvements in product quality and reduction in waste because of improved quality control practices. However, the extent of product mix between the companies declined as all the companies undertook investments in new product innovation, notably the switch to chilled fish products. In this respect the companies were showing a high convergence towards chilled fish products but low volumes of value added products. Overall therefore, there was progress in relatively easy areas of innovation but less in the more demanding forms of innovation.

The empirical results also revealed that some fish exporters made larger changes to their product and market mix than others. This is because they were already under pressure and were therefore forced to make big changes in order to save the company, but if this were the case it would mean that the changes were achieved at a point in time when cash resources were limited due to low profitability. It is also likely to be because of their improved capabilities in managing innovation projects as a result of protracted efforts to learn. This further demonstrates the importance of internal capabilities in driving and sustaining innovation at company level and in particular the capability to learn and continuously improve effectiveness in innovation management.

Effectiveness in innovation management to a large extent depends on having skill and competence in some crucial areas of management practice that have been identified as crucial for enhancing innovation performance and firm profitability. These include: management of internal resources, making effective use of external resources, managing

innovation project risks, and managing tensions between different functions and the effective coordination of their innovation priorities. For example, trust among employees, innovation project choice, penetration of new export markets and the management of external resources through the development of close social relationships with suppliers and export markets customers have been associated with satisfaction in the level of improvement in profitability.

Overall, the above empirical results indicate that the lines of business that are associated with the highest profitability in one period, change over time and in this case it confirms the need for and potential benefits to be gained from innovation. For this reason, there would appear to be a strong case for companies in a commodity export value chain such as fish to diversify their innovation activities as indicated earlier in section 4.4.4 above. The results therefore have implications for methods development, management practice public policy. Thus, the results show the importance of industry structure and competitiveness in determining innovation patterns. It also shows how a strong orientation to export markets is important in determining the nature of product innovations that must be undertaken to meet customer needs and the internal resources and capabilities needed to effectively manage those innovations. Details of these implications will be discussed in chapters 6 and 7.

4.7 Chapter conclusion

This empirical study set out to identify and investigate the impact of innovation activities in the Ugandan fish export industry. The empirical results indicate that fish exporters have undertaken improvements in different forms of product, processing technology and marketing operations. These changes were implemented using internal company resources, through collaborations at industry level, and using external technical and financial support from development and aid agencies such as USAID and UNIDO. The financial impact of these changes has been mixed, but the highest contribution to industry profitability seems to be associated with the switch from selling frozen fish products in wholesale to retail markets. There have been limited attempts at upgrading to more sophisticated forms of value added fish products and exports to the premium retail export

markets. The industry seems to lack the technical and marketing capabilities for pursuing more advanced innovations such as value added fish products and branding. Whereas it is important to carefully integrate different forms of innovation in order to increase the potential for improved financial performance, more efforts should be put towards developing more advanced fish products that utilize a higher proportion of the fish body and branding that can effectively shield the exporters from price competition. It is also important that these exporters develop critical internal capabilities in product development, process technologies, and marketing and supply chain management to effectively manage innovation projects. This calls for continuous learning using both internal and external knowledge resources. The next chapter presents empirical results on innovation activity and value creation in the Ugandan flower export sector.

Chapter 5: Analysis and Presentation of Results - Flower Export Sector in Uganda

5.1 Introduction

This chapter reports results from the empirical analysis of innovation activity and financial performance in the Ugandan flower export sector covering the period 2001-2004. The period 2001-2004 was chosen because this was the time at which the industry was making remarkable changes in an attempt to expand company operations and exports. The approach adopted in this chapter is similar to that in chapter four which examined the impact of innovation activity in the Ugandan fish processing and export sector. Whereas fishing is an established local tradition and Uganda has a fairly long history of fish exports to East African regional markets spanning approximately 25 years (Keizire, 2004), the floriculture sector is relatively new and its produce is not a traditional Ugandan export. Commercial floriculture production started in 1992 and quickly became one of the fastest growing sectors in non-traditional export agriculture in Uganda (Dijkstra, 2001). For these reasons, the study of innovation in the Ugandan floriculture export sector provides a useful basis for comparison and analysis of innovation in the fish processing and export sector.

The rest of this chapter is structured as follows. Section 5.2 gives indicators of respondents' satisfaction with company performance in the Ugandan flower export sector. Section 5.3 presents an overview of innovation activity and its anticipated benefits in the Ugandan flower export sector. Section 5.4 presents a set of financial models that estimate the overall impact of innovation activity on profitability of Ugandan flower exporters. Section 5.5 presents a discussion of the main managerial and organizational capabilities that drive innovation profitability in the Ugandan flower export sector. Section 5.6 presents a summary of results and main conclusions on the Ugandan flower export sector. Section 5.7 gives the chapter conclusions.

5.2 Indicators of respondents' satisfaction with performance in the flower sector

As mentioned in chapter four, section 4.2, one of the main objectives of this study is to determine the extent to which innovation activities are contributing to value creation.

This section presents preliminary indicative results of the level of satisfaction of respondents in the Ugandan flower export sector with the performance of their company. The analysis includes the full sample of Ugandan flower exporters – those that provided revenue data and those which did not. Three indicators of satisfaction are shown in Table 5.1. They are mean level of satisfaction with improvement in US $ export prices, improvement in US $ export revenue, and improvement in profitability over the period 2001-2004. The original responses were in the form of a five-point Likert scale ranging from, 1 (*very dissatisfied*) to 5 (*very satisfied*). The results of this analysis are presented in Table 5.1.

Table 5.1 Respondents' satisfaction with innovation performance in the Ugandan flower export sector

Statistic	Satisfaction with improvement in US $ equivalent export prices	Satisfaction with improvement in overall growth in US $ export revenue	Satisfaction with improvement in profitability
Mean	3.2115	3.7692	3.6538
N	52	52	52
Std. Deviation	.89303	.75707	.78926
% of respondents who indicated either "satisfied" or "very satisfied"	36.5%	65.4%	67.3%

Source: Field survey

The results indicate that the respondents were least satisfied with improvement in US $ export prices over the period 2001-2004 (M = 3.2115), more satisfied with profitability growth (M = 3.6538), and most satisfied with overall growth in US $ export revenue (M = 3.7692)[2]. The mean scores for satisfaction with revenue and profits are both significantly higher than that for changes in US $ export prices. The relatively lower level

[2] The probability of equal means for "Satisfaction with improvement in profitability" and "Satisfaction with improvement in export revenue" is given as $p = 0.332$. The probability of equal means for "Satisfaction with improvement in profitability" and "Satisfaction with improvement in US $ export prices" is given as $p = 0.005$. These results demonstrate significant differences in satisfaction levels between improvements in profitability and improvements in US $ export prices for both the fish and flower sectors, thus confirming the argument that these variables do indeed possess discriminating power.

of satisfaction with prices is not entirely surprising given that the prices of flowers in the Dutch Auctions (the main point of sale for flower export from Uganda to the EU and the world) increased only marginally during the period 2001-2004 as indicated in Table 5.2[3].

Table 5.2 Average f.o.b prices of Ugandan flowers exported to Amsterdam-Netherlands

Flower variety	Auction prices US $ per stem				Direct wholesale market prices US $ per stem			
	2001	2002	2003	2004	2001	2002	2003	2004
Sweet heart	0.09	0.09	0.10	0.10	0.10	0.11	0.10	0.11
Intermediate	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.14

Source: Data from Uganda Flower Exporters Association (UFEA), Fresh Handling Ltd (FHL) and field survey

Only 36.5% of the respondents indicated "satisfied" or "very satisfied" with the improvement in US $ export prices. However, there were relatively high levels of satisfaction in overall growth in US $ export revenue and with growth in profits (as demonstrated by higher levels of 65.4% and 67.3% respectively) in responses that indicated "satisfied" or "very satisfied" respectively. These results suggest that in spite of the marginal increase in flower prices, the exporters were on average more successful in achieving sales growth and profitability improvements over the previous four years. The improvement in sales and profitability may have been a result of the achievement of better quality of flowers thereby reducing wastage and rejects, and higher yields due to improvements in flower production techniques and efficiencies. Later sections of this chapter will explore the extent and source of growth and profit improvement in the Ugandan flower export sector in more detail.

[3] It is interesting to note that the average level of satisfaction with US $ price changes in the flower industry was slightly lower than in the fish industry, despite the fact that the actual price changes over the period increased in the case of flowers and worsened in the case of fish. This may be an indication that flower exporters had expected bigger price increases for their flowers than what was actually achieved.

5.3 Overview of innovation activity in the Ugandan flower export sector (2001-2004)

In the short period since its inception, the Ugandan flower export sector experienced many operational challenges. These challenges include coping with the rapidly changing flower preferences among the consumers in the international markets, increasing cost of inputs and new international regulations that require the use of environmentally sustainable flower production techniques (Wijnands, 2005). These challenges induced Ugandan flower producers to adopt innovations which included new flower varieties, new production technologies, improved post-harvest handling techniques, cold supply chain management and export marketing approaches (Asea & Kaija, 2000; Dijkstra, 2001; VEK-World Bank, 2004). These innovations entailed investment in capability development with the aim of improving flower quality and attaining cost efficiency in post-harvest cold chain delivery systems. However, little is known about the impact of these innovations on financial performance and sustainability, and the organizational capabilities that were driving performance improvement in the industry. The empirical results on innovation and financial performance, and organizational capabilities that drive innovation profitability in the Ugandan flower export sector are presented in later sections of this chapter.

An inclusive approach to innovation was adopted in this study and innovation activities were grouped into three broad categories namely: product, process/production and marketing/supply chain management innovations. This classification is consistent with the approach followed in chapter four on the Ugandan fish export sector. The innovation activities and expected benefits are presented in Table 5.3 which is identical to the approach used in Table 4.5 of chapter four, hence its interpretation follows a similar format.

Table 5.3 Company innovation activities and expected benefits in the Ugandan flower export sector (2001-2004)

Innovation activities	Expected benefits
Product Innovation	
▪ Adoption of new sweet heart & intermediate rose flower varieties. ▪ Adding value to the flowers (bouquets). ▪ Adoption of improved flower packaging techniques.	▪ Introduce flowers which achieve higher prices. ▪ Increased revenues and profits. ▪ Increase in percentage of total volume coming from higher-priced flowers.
Process Innovation	
▪ Adoption of hydroponics production technology. ▪ Adoption of plant propagation technology. ▪ Adoption of modern crop agronomic, disease and pest management practices. ▪ Adoption of modern cool chain management. ▪ Upgraded waste management & MPS certification	▪ Improved flower quality. ▪ Improved crop yields. ▪ Reduced cost of cultivars. ▪ Reduced flower waste and rejects. ▪ Lower final flower production costs. ▪ Improved profitability. ▪ Lower production and operational costs.
Marketing/Supply Chain Innovation	
▪ Adoption of e-marketing. ▪ Adoption of joint flower promotion among the flower exporters. ▪ Entry to higher margin flower market channels (e.g. direct flower markets). ▪ Joint handling of shipment & logistics among the flower exporters.	▪ Reduced costs and improved profitability. ▪ Increased reliability in cold chain logistics. ▪ Improved consistency, quality and shelf-life of flowers delivered to the export markets. ▪ Improved efficiency in flower deliveries. ▪ Gaining access to higher price market segments. ▪ Greater reach with limited resources.

Source: Compiled by the author from field interviews with the technical staff of the flower producers and experts from Uganda Flower Exporters Association (UFEA)

5.3.1 Product innovation and expected benefits

Ugandan flower exporters adopted a number of new flower varieties in the period following the inception of the industry in 1992 and between 2001 and 2004. The initial high grade T-Hybrid roses (long stems and large flower buds) that pioneers in the industry produced, performed poorly because they were not suitable for the Ugandan climatic and soil conditions (Asea & Kaija, 2000). As a consequence most flower

exporters at that time experienced financial difficulties with some companies going bankrupt (Susman, 2000; Dijkstra, 2001). By 2001, all the flower producers in Uganda had ceased the production and export of T-Hybrid flowers. But, no empirical attempts have so far been made to estimate the extent of losses sustained by the surviving flower producers.

The poor performance of T-Hybrid roses compelled flower producers to abandon it in favor of the sweet heart and later the intermediate rose varieties. Prior to 2001, four flower growers (FR04, FR07, FR10 and FR15 – refer to *appendix 5.1*) had adopted the sweet heart rose flower varietals (short stem and small flower buds). This quickly diffused in the industry and by 2001, all the fifteen flower producers were growing them for export. Other varietals called the intermediate roses were adopted by two flower producers in 2001, and subsequently all the fifteen flower producers in the industry had adopted them by 2003. The intermediate rose varietals have larger flower buds and longer stems than the sweetheart roses (Wijnands, 2005). The new flower varietals had been tested through field trials and were therefore envisaged to be better suited to the Ugandan climatic conditions and to have the attributes that match the export market demand requirements. They were therefore expected to have higher yields and fetch higher prices in export markets.

In addition, all flower exporters improved their packaging techniques in the period 2001-2004. However, the cost of the improved packaging approach could not be established. In 2003, four flower producers (FR04, FR06, FR10 and FR14 - refer to *appendix 5.1*) also started exploring possibilities of flower value addition through the preparation of bouquets. Bouquets give flower exporters the opportunity to mix colors in unique patterns, shapes and sizes, this in turn enhances the appeal of the flowers to the buyers and position them in the premium retail market segments where prices are expected to be higher. The preparation of bouquets was expected to improve the appeal and utility of the flowers to buyers.

Although product innovations adopted by Ugandan flower exporters were aimed at improving the appeal and positioning of the flowers in the key export markets, it cannot be presumed that these changes automatically resulted in improved financial performance for the flower exporters. There were considerable costs and risks incurred in form of field trials, planting of major tracks of the new varietals, additional training of employees to cope with challenges of new diseases and pests, and the preparation of bouquets, as well as other risks of loss in quality, damage or incurring higher costs to the extreme of rejection by buyers in the export markets. The flower exporters were also uncertain regarding the yields from the new flower varieties. Experience had shown that quite often there were differences in yield results between what was achieved during the field experimental trials prior to adopting the new varieties, and the actual yield on the farms. Thus, a systematic analysis is needed which can take into account the price premium obtained as well as the additional costs to determine which of the flower varieties was more profitable. This analysis is presented later in this chapter.

5.3.2 Process innovation and expected benefits

Ugandan flower exporters undertook a number of improvements in production, harvesting, post-harvest handling and shipment of flowers to the export markets. The most important process innovation in terms of resource outlays and expected benefits was the adoption of computerized flower production technology commonly referred to as "*hydroponics*" (UFEA, 2006). This integrated technology uses computerized irrigation and fertigation systems. It was introduced to Uganda by a leading flower exporter in 2002 and by 2004, 10 out of the sample of 15 flower exporters had adopted it. The use of hydroponics technology was expected to improve flower yields and quality. Its adoption corresponded closely to the adoption of improved greenhouse structures from the use of wooden to the metallic structures.

Other upgrades were in form of improvements in plant propagation technology, modern agronomic practices such as pruning and bending of stems to improve flush, and the on-farm cold chain system. Five flower producers (FR03, FR07, FR10, FR11 and FR12 - refer to *appendix 5.2*) had adopted modern plant propagation facilities prior to 2001. By

2004, there were nine flower producers that were using in-house plant propagation facilities. Additional innovations adopted between 2001 and 2004 were in form of new agronomic practices that focused on the development of pest and disease control technologies. Further to the above innovations, cold chain upgrades were undertaken starting with seven flower producers (FR03, FR04, FR07, FR10, FR11, FR14 and FR15 - refer to *appendix 5.2*). It involved improvement in the speed of delivery of flowers to the pack house, installation of refrigeration facilities in the cold stores, and the acquisition of refrigerated trucks for flower delivery to the airport for onward shipment to the export markets.

The adoption of process innovations among Ugandan flower exporters was expected to improve flower yield, quality, and overall company performance. The combination of product and process innovations was expected to improve the competitiveness of the sector through attainment of higher flower productivity and quality, reduced production cost as well as reduction in waste. This would in turn enable the exporters to attain certification and accreditation under the Milieu Project Sierteelt (MPS) system, an achievement that was expected to increase consumer confidence in Ugandan produced flowers. As with product innovations, it cannot be presumed that the process innovations would automatically yield higher profits for the flower exporters. A systematic analysis which takes account of the improvement in revenue, changes in operational costs, and the required investment is therefore necessary to determine profitability and sustainability of the sector.

5.3.3 Marketing innovation and expected benefits

The main marketing and supply chain improvements undertaken by Ugandan flower exporters included adoption of e-marketing, joint flower promotion in export markets, joint management of cold chain and logistics, and entry into direct flower markets (for details refer to *appendix 5.3*). The flower exporters adopted the use of Information and Communications Technologies (ICT) both for logistics management and communication. This was started in 2003 by eight flower exporters that developed an integrated ICT system that could allow online booking by clients, and maintenance of regular

communication with customers and suppliers. An additional innovation was the incorporation of Fresh Handling Limited (FHL) in 2002 to undertake joint handling of cargo shipments to the export markets. As mentioned in chapter four, FHL negotiates for bulk cargo space and lower freight rates on behalf of flower exporters. Collectively the flower exporters were also able to undertake joint flower promotion in the export markets. These joint initiatives were aimed at facilitating flower exporters in undertaking the above cargo shipment and promotional activities at lower cost.

A further marketing innovation undertaken by the flower exporters was the switch from selling flowers exclusively through the auction to selling directly to both the wholesale and retail markets. This innovation was expected to give the flower exporters access to alternative market channel that are more transparent and offer higher and more stable prices compared to the traditional auctions. The diversification in export market channels was started by three flower exporters in 2002 (FR04, FR10 and FR15 - refer to *appendix 5.3*), and was subsequently adopted throughout the industry. By 2004 all flower exporters were selling through both the auctions and direct wholesale export market channels in different proportions. Selling to retail markets was also started in 2003 by 4 flower exporters (FR04, FR06, FR10 and FR14) and it involved the preparation and export of flower bouquets. However, in comparison to auctions, direct markets are more demanding in terms of flower grading, color mixing, packaging, flexibility in supply chain management and effective trade relationship management with the buyers making them more risky to sell to. This partly explains why Ugandan flower exporters have continued to diversify export markets to both auctions and direct export market channels. Thus, the expectation that this innovation would give flower exporters more reliable access to export market channels in which premium prices can be realized should be judged against the costs that are likely to be incurred. This is necessary to determine the contributions of these innovations to financial performance.

The product, process and marketing innovations implemented by the Ugandan flower exporters were expected individually and collectively to improve the positioning and market value of flowers. The evidence from Section 5.2 indicates that a majority of

companies in the industry experienced an overall improvement in profitability over the period 2001-2004 in line with the upward movement in prices of sweet heart and intermediate flowers in the auctions and direct wholesale markets. As observed earlier in Section 5.2 of this thesis, it is unclear as to what caused the apparent disparities in profit performance across companies in the industry, at least judging from the differences in levels of satisfaction with profit performance. Possible explanations to these disparities could be differences in the way innovations are being managed by the companies, differences in extent or mix of innovation activities across the companies or differences in the way innovation projects are being implemented. This calls for an analysis of how effectively innovation projects were being managed in the Ugandan flower industry by examining how companies with the highest levels of profit satisfaction had approached their innovation activities. To achieve this, a systematic analysis of the estimates of financial outcomes of specific innovation activities in the flower export industry would need to be undertaken. This would certainly involve detailed analysis of revenue and costs associated with improvements in products, processes, marketing and supply chain management in the industry. This is the focus of the next section.

5.3.4 The net financial impact of innovation activity in the Ugandan flower export sector

There was extensive and widespread innovation activity in the period 2001-2004 among the sample of companies analyzed. As was the case with the fish export sector results presented in chapter five, innovations in the flower export sector involved considerable expense and risk. Although the size of these risks was reduced through intervention from international assistance such as in the case of technical support provided by the United States Agency for International Development (USAID), the impact of these risks on the financial sustainability of innovation activities remains unclear. Empirical evidence also suggests that the Ugandan flower exporters on their own made considerable investments in new equipment, new flower varieties and growing processes, new yield improvement and quality control systems, as well as new export market channel relationships but it also remains unclear as to whether the innovations are financially sustainable.

As was the case with the fish export sector, there is encouraging evidence of some success achieved in these activities. For example, the introduction of new flower varieties, new production techniques, improved crop agronomy, improved flower handling and cold chain management was associated with improved flower yields, higher flower quality, reduced wastage and consistent growth in the volume of exports. This was achieved to some extent, for example, through improvements in quality control which resulted in a drop in the level of flower rejects from 4.2% in 2001 to 1.8% in 2004 at industry level. These estimates are based on computations made by the researcher using empirical data obtained from field interviews. The improvement in quality was a result of coordination of the different activities in the supply chain, in particular, improvements in post-harvest flower handling which resulted in reduction in mechanical damage and more effective flow through the cool chain system.

Although calculating the net financial impact of the innovation activities overtime is important, it is demanding because it requires estimation of different costs associated with each particular innovation, different yield rates, and different wastage levels associated with different production technologies, and the changes in input costs and flower prices overtime. This is necessary because no empirical analysis on the impact of innovation activity on financial performance in the Ugandan flower export industry has been reported. This necessitated the development of financial models that estimate the profit margins associated with different "operating configurations." The term "operating configuration" is used in the same sense here as explained in chapter four.

5.4 Modeling the financial impact of innovation activity in the Ugandan flower export industry

It was noted above that there is no published empirical evidence regarding the impact of innovation activity on financial performance and sustainability in the Ugandan flower export industry. It was also established during the discussions with respondents that at least some of the firms have not attempted to estimate the financial impact of their own innovation activities, and would therefore find estimates of the financial impact of innovations useful in providing insights into more effective management of the different

innovation activities. To analyze the impact of innovation on profitability, the different combinations of operating configurations used by the Ugandan flower exporters were used to develop financial models with the help of both primary and secondary data. The methodology adopted in this regard is similar and consistent with the one presented in Section 3.5.3, has been presented in greater detail in Section 4.4.1 and further in the next section.

5.4.1 Methodology for estimating the financial performance of different operating configurations

The main purpose of this analysis, and the basic methodological approach used is the same as the one presented in Section 4.4.1 of this thesis. Consistent with this methodological approach, the following costs were identified and included in the financial models:

- Variable production costs which include: direct labor, chemicals, water and fertilizers.
- Packaging freight and marketing costs which include: packaging, freight, handling charges in Uganda and in the export markets, marketing costs and agent fees.
- Overhead costs which include: electricity and fuel, repairs and maintenance, training and supervision, consultancy fees, communication, inspection and certification fees, insurance and licenses, foreign travel, administration and bank costs, and miscellaneous expenses.
- Investment costs which include: land and infrastructure, plant materials and production facilities, vehicles and equipment.

As stated in chapters three and four, the profit margin model takes the simplified form of:

$$\mathbf{PM = PX - [\Sigma\ X\ (PC + MC + OC + IC]}$$

Where,

PM = Operating Profit Margin

PX = Total revenue of the flower exporter

P = Price in US $ per stem,

PC = Production costs: US $ per stem,

MC = Marketing, freight & packaging costs: US $ per stem,

OC = Overhead costs: US $ per stem,

IC = Investment costs (depreciation): US $ per stem,

X = Output produced and exported after adjustment for rejects at farm level

The individual operating configurations from which the integrated financial models were derived take a specific product type, the production technology used, and the market channel through which it was exported as indicated in Table 5.3. There were found to be nine basic operating configurations in the Ugandan flower export industry, five of which did not exists on any scale in 2001 but were widely adopted by 2004. The full details of the revenue and costs associated with the individual operating configurations are presented in *appendix 6.1* and the workings used to develop the flower sector operating configurations are presented in *appendices 6.2, 6.3, 6.4 and 6.5*.

Table 5.4 Operating configurations used to estimate the financial performance impact of innovation in the Ugandan flower export sector

Operating configuration	Year	Production technology	Product category	Market category
1a	2001	Soil & imported planting material	Sweet heart roses	Auctions
1b	2004	Soil & imported planting material	Sweet heart roses	Auctions
2	2004	Hydroponics & self-propagated planting material	Sweet heart roses	Auctions
3a	2001	Soil & imported planting materials	Sweet heart roses	Direct wholesale
3b	2004	Soil & imported planting materials	Sweet heart roses	Direct wholesale
4	2004	Hydroponics & self-propagated planting materials	Sweet heart roses	Direct wholesale
5a	2001	Soil & self-propagated planting materials	Intermediate roses	Auctions
5b	2004	Soil & self-propagated planting materials	Intermediate roses	Auctions
6	2004	Hydroponics & self-propagated planting materials	Intermediate roses	Auctions
7a	2001	Soil & imported planting materials	Intermediate roses	Direct wholesale
7b	2004	Soil & imported planting materials	Intermediate roses	Direct wholesale
8	2004	Hydroponics & self-propagated planting materials	Intermediate roses	Direct wholesale
9	2004	Hydroponics & self-propagated planting materials	Sweet heart roses	Retail

Source: Author using primary data from field survey

As was the case in chapter four, the operating configurations outlined above focus on the unique combination of process technology, product category, and market category in each of the years in which they were applicable. Once again, the operating configurations relate to the three different areas of innovation activity (product, process and marketing) in that each innovation effectively enables a firm to either add a new operating configuration or to switch from an old configuration to a new configuration. The analysis presented later in this chapter is restricted to nine operating configurations indicated in Table 5.4 above, five of which were only applicable in 2004. Due to data limitations, not all changes in the operations of the companies, for example, the adoption of "new

packaging" and the development of in-house plant propagation techniques were included in the financial models. The limitations of the modeling approach discussed in chapter four - section 4.4.1 also apply to this analysis. The next three sub-sections present estimates of the financial performance of each of the nine operating configurations.

5.4.2 Industry level estimates of the financial impact of innovation activity

Models of operating profits were used to estimate the impact of operating configurations on overall financial performance in the Ugandan flower export industry. There is a separate financial model for each of the operating configurations (*as shown in appendix 6.1*). These financial models were used to estimate the overall operating profit margin accruing to a fictitious company with a representative (average) mix of nine operating configurations for the two points in time 2001 and 2004. The flower producer with the representative mix of operating configurations is defined as a company with a weighted average mix of the nine operating configurations of all Ugandan flower exporters in the sample for each of the years 2001 and 2004. This weighted average was calculated using the volume of sweet heart, intermediate and flower bouquets produced using soil-based or hydroponics technology and exported through the auctions and direct flower export market channels for the sampled companies in the sector for the years 2001 and 2004. The average share of industry volume for each operating configuration for 2001 and 2004 is shown in the first row of figures in Table 5.5. The industry average shares for revenue and profit are also presented in Table 5.5.

Table 5.5 Estimated average shares of volume, value and operating profit margin for a Ugandan flower exporter with a representative mix of operating configurations in 2001 and 2004

Proportionate shares & profit margins for the Financial Models I & III	Sweet heart from soil-based technology to the auctions		Sweet heart from hydroponics technology to auctions	Sweet heart from soil-based technology to direct wholesale markets		Sweet heart from hydroponics technology to direct wholesale markets	Intermediate from soil-based technology to auctions		Intermediate from hydroponics technology to auctions	Intermediate from soil-based technology to direct wholesale markets		Intermediate from hydroponics technology to direct wholesale markets	Sweet heart (bouquets) from hydroponics technology to retail markets	Total for representative export firm	
Operating configuration	1a	1b	2	3a	3b	4	5a	5b	6	7a	7b	8	9		
Year	2001	2004	2004	2001	2004	2004	2001	2004	2004	2001	2004	2004	2004	2001	2004
Share of total volume (%)	48	10.1	12.3	13.8	12.2	15.0	27	15.1	18.5	11.2	5.8	7.0	4.0	100	100
Share of total revenue (%)	41.5	8.4	10.3	13.2	11.2	13.7	31.3	16.4	20.0	14	6.7	8.2	4.9	100	100
Estimated share of operating profit (%)	34.2	6.0	7.2	26	12.9	20.3	18.8	5.4	20.5	21	6.6	13.3	7.8	100	100
Estimated operating margin (%)	6.7	7.6	7.5	16.1	11.4	15.9	4.9	3.5	11.0	12.2	10.5	17.3	17	8.2	11

Source: Own calculations using primary data from field interviews and secondary data from UFEA (2005)[4]

[4] Secondary data on flower prices was obtained from Uganda Flower Exporters Association (UFEA). The Comext database was not used because it only provides export volume and revenue data at the nation al level for each industry. Such aggregated data would not have been practically useful for the nature of analysis conducted in this study which primarily required firm level data on prices and costs.

As indicated in Table 5.5, the overall profit margin of the flower exporter with the representative mix of operating configurations is estimated to have improved from 8.2% in 2001 to 11% in 2004. The improvement in profitability is in line with the upward movement in average prices of sweet heart and intermediate roses in both auction and direction wholesale markets as indicated in Table 5.2. Unlike in the fish sector, the estimates of profitability changes and the actual price changes in the flower sector are positive. This improvement in profitability over the period is consistent with the earlier result that there was a relatively high average level of satisfaction with profit improvement over this period from flower sector respondents. The estimated overall improvement in profitability is a result of several different changes in the Ugandan flower export sector, some of which were more beneficial than others. The main changes here include the increasing share of intermediate roses relative to sweet heart roses, the increasing use of hydroponics-based production technologies, and the growing share of sales to direct wholesale markets channels and of flower bouquets to retail markets. A more detailed analysis of the financial impact of these changes is presented below.

The decision to shift from sweet heart roses for auction using soil-based technologies to intermediate roses for the same market and using the same technology is associated with an estimated reduction in operating margins from 6.7% to 4.9% in 2001. The disparity in profitability grew wider and by 2004, the operating margins of sweet heart roses for auction using soil-based technologies was 7.6% compared to 3.5% for intermediate roses. The reason for these declines in profitability is that intermediate roses appear to be less suited to soil-based growing in the Ugandan environment than is the case with sweet heart roses. The introduction of hydroponics appears to have caused a considerable shift in the relative profitability of sweet heart and intermediate roses. In 2004, the profitability of sweet heart roses for auction from hydroponics production is estimated to have been 7.5% by comparison with 11% for intermediates. It is not surprising, therefore, that the volume of hydroponics intermediates for auction exceeded that for hydroponics sweet hearts for auction in 2004 (18.5% and 12.3% respectively).

For sales to wholesalers from hydroponics production, the disparity was smaller with profitability of sweet hearts estimated to have been 15.9% by comparison with 17.3% for intermediates. Interestingly, the growth in volume of hydroponics intermediates to wholesalers was far smaller than that of hydroponics sweet heart to wholesalers (7% and 15% respectively), which is counter-intuitive given the estimates of their relative profitability. The likely reason why the Ugandan producers were struggling to get the hydroponics intermediates to the wholesale markets was that the flowers could not attain the required grades of stem length and bud size and hence this is likely to have affected the reputation of the Ugandan flower exporters among EU wholesalers. This in effect implies that Ugandan flower producers were likely to be struggling to produce sufficient volumes of intermediates which met the demanding quality requirements of the wholesalers.

The above results indicate that for traditional soil-based production methods and sales to auctions, the adoption of the intermediate rose varieties was less profitable than sweet heart roses. This was contrary to industry expectation that the new intermediate roses which were considered to have longer stems and larger buds than sweet heart roses would fetch higher prices and hence earn higher returns to the exporters. The reality, however, was that, the higher price attainable for the intermediate rose was insufficient to make up for its lower yield compared to sweet heart roses in the context of soil-based production technology in the Ugandan environment. It appears that a large section of the industry may have misjudged this reality by investing in considerable soil-based plantings of intermediates. By 2001, intermediates grown in soils accounted for 38.2% of total volume and the estimates of profitability suggest that this shift into growing intermediates in soils was negative for profitability in the industry, and may have had the effect of dragging industry profitability down from what it would have been if the producers had focused on sweet heart production. Not surprisingly, therefore, there was a rapid shift from soil-based intermediate production to hydroponic intermediate production. The total volume of intermediates in soil-based production had fallen to 20.9% of volume by 2004, and the total volume of intermediates in hydroponics had risen to 25.5% of total industry volume.

These results clearly demonstrate the importance of appropriate combination of activities for an operating configuration to be profitable. The results suggest that the industry has undertaken experimentation in order to find the most profitable combinations of innovation activities, for example, first in T-Hybrid production and then in soil-based intermediate production, but that these experiments may have been unnecessarily large and costly. Perhaps the shift into soil-based intermediates was so rapid because of the losses incurred in T-Hybrid production, and despite the relatively low profitability of soil-based intermediate production, it nevertheless represented a major step forward from the loss-making T-Hybrid activities. Furthermore, the fact that the volumes of the most profitable combinations (namely hydroponics production for wholesalers and retailers) represent a fairly small proportion of total industry production (26% altogether) suggest that the industry may still be facing challenges in terms of the quality of flowers produced (particularly hydroponics intermediates) and in terms of gaining access to the most profitable markets. The shift from sweet heart to intermediate roses was marginal in relative terms probably because the flower exporters were cautious as they were not able to achieve the high yields that they had expected from hydroponics production of intermediates.

In terms of export market channels, in 2001, auctions accounted for 75%, while the direct wholesale markets accounted for 25% of the total volume of exports of flowers in Uganda. In 2004, the auctions accounted for 56% while the direct wholesale markets accounted for 44% of the total volume of exports of flowers in Uganda. This clearly indicates that although the flower producers maintained a presence in the auction market, they were increasingly exploring direct markets in addition to auctions. The increase in export volumes to the direct wholesale markets was quite remarkable given that it was a relatively new experience in the international marketing of a perishable commodity among the Ugandan flower exporters. In spite of this remarkable development in accessing an alternative and higher margin market channel, Ugandan flower exporters were still unable to make any significant in-roads in the retail markets. This is consistent with the results presented in chapter five where fish exporters were reported to be making very limited entry to the alternative retail export markets for the fish products because of

their inability to develop branded fish products. Thus, the patterns of market development in the Ugandan fish and flower export sectors are similar in that while exporters in both sectors were progressing relatively well in the wholesale markets, they were experiencing difficulties in breaking into retail markets probably for the same reason.

Although the Ugandan flower export industry still relied heavily on sweet heart roses and exports to the auctions, the results suggest that it was nevertheless better off in terms of profitability in 2004 than in 2001. The overall profitability rose to 11% in 2004 from 8.2% in 2001. The estimated improvement in profitability over the period appears to have been associated with the move into more profitable market channels and upgrading production technology. Thus, in the period 2001-2004 the profitability of the industry improved largely because of the use of new production technologies and access to new and more profitable export market channels and not because of the adoption of new flower varieties. The new flower varieties notably, intermediate roses were actually less profitable than the sweet heart roses.

An additional innovation which has not been included in the above financial models relates to the industry starting to grow its own planting materials. This is likely to have given a number of benefits to the industry such as reliability in the use of planting materials more suited to Uganda's climatic conditions, improved quality, higher yields and a reduction in other related production costs. For example, it was estimated that this could have reduced the cost of planting materials by over 50%, although it is likely to be difficult to estimate the actual impact on profitability.

Despite significant progress in the area of product, process and marketing innovation, Ugandan flower exporters were still relying almost entirely on the auctions and wholesale markets. In 2004, exports of flower bouquets to the retail markets constituted 4.0% of total share of export volume and it contributed only 4.9% of export revenue, and 7.8% of total operating profit. This is in spite of an estimated operating profit margin of 17% of selling flower bouquets in retail markets. This is a clear indication that Ugandan flower exporters lack the capabilities for preparing, shipping and selling flower bouquets on a

reliable basis to the retail markets in the EU. Improvements in the capabilities for preparing, shipping and selling flower bouquets to the retail markets would have the potential of raising overall industry profitability and hence might require further consideration and development.

The foregone discussion has observed that up until 2001, the switch from sweet heart produced on soil and sold in auctions to sweet hearts produced on soil and sold in wholesale markets was a major contributor to value creation as the operating profit margin of the latter was 16.1% compared to 6.7% for the former. However, between 2001 and 2004, the value of sweet hearts from soil to wholesale markets declined. This is because of the estimated decline both in volume and operating profit margin on this operating configuration. Additional important contributors to value creation in the period 2001 to 2004 were the intermediates from hydroponics production technology to direct wholesale markets and sweet hearts (bouquets) from hydroponics production technology to retail markets although the latter was from a low base. The implications of these profit results are discussed in more detail in the section that addresses the predictors of innovation profitability in the industry.

5.4.3 Counter-factual analysis of the impact of innovation on financial performance

The financial models presented in Table 5.6 show the operating profit per stem of flowers (using an industry-average mix of operating configurations based on the "share of volume" data from Table 5.4 above) and the profit margin percentage as the ratio of the operating profit to the price per stem of the flower for a flower exporter with a representative mix of operating configurations. The financial models incorporate the revenue and cost estimates for the sweet heart and intermediate flowers produced using the soil-based and the hydroponics technologies and exported through the auctions and the direct wholesale market channels, as well as the flower bouquets exported through the retail market channels. Basic data for the company with the representative mix of operating configurations was obtained by calculating the weighted average mix of the volume of sweet heart and intermediate roses produced using either the soil-based production technology or the modern hydroponics technology and exported through the

auctions and/or the direct market channels. This is for the sample of companies in the industry for the years 2001 and 2004. The results presented in Table 5.6 are based on three financial models created using the same counterfactual analysis approach applied earlier in section 4.4.3 of this thesis.

Table 5.6 Estimates of operating profit margins for a Ugandan flower exporter with a representative mix of operating configurations in 2001 and 2004

Particulars	Profit margin estimates of sweet heart, intermediate and flower bouquets in auctions, direct wholesale and direct retail markets		
Sub-totals (costs and revenue per stem)	Model I (US $ per stem using 2001 prices and the average operating configurations for 2001)*	Model II (US $ per stem using 2004 prices and average operating configurations for 2001)	Model III (US $ @ stem using prices and the average operating configurations for 2004)**
Production costs	0.0186	0.0188	0.0177
Freight & marketing	0.0464	0.0540	0.0563
Overheads costs	0.0108	0.0114	0.0116
Investment costs	0.0197	0.0228	0.0215
Total costs	0.0955	0.1070	0.1071
Revenue (price per stem)	0.1040	0.1140	0.1200
Profit before tax	0.0085	0.0070	0.0129
Profit margin	8.2%	6.1%	11%

Source: Computed by author using data from field research and secondary data from Uganda Flower Exporter's Association (UFEA)
Notes.
* Flower production using the soil-based production technology.
** Flower production using partly soil-based and hydroponics production technologies as indicated in Table 5.3

The same counterfactual approach used in chapter five has been adopted in this chapter resulting in the development of the three financial models presented in Table 5.6. Model I estimates the influence of operating configurations on financial performance of the company with the representative mix of operating configurations in 2001. It is based on the revenue and cost estimates of producing and exporting Ugandan flowers using the soil-based production technologies in 2001. The model shows that the combined effect of all the innovations in 2001 yielded an operating profit margin of 8.2%.

The counter-factual analysis presented as Model II estimates what the profit level would have been in 2004 if no further innovation had occurred between 2001 and 2004. This part of the analysis provides insights into how the markets for flowers and the inputs costs were changing over the period. The model uses the relative prices of 2004 and the representative mix of sweet heart and intermediate flowers exported through the auctions and the direct wholesale market channels in 2001 on the overall output of the flower exporter with the representative mix of operating configurations in 2004. It estimates that the operating profit margin would have been 6.1%. This is a decline from industry profitability in 2001 of 8.2%. This demonstrates that the industry would have experienced a profit decline from 8.2% in 2001 to 6.1% in 2004 if the flower exporters had continued with their mix of product, process technology, and marketing approaches of 2001 in 2004.

These results imply that the flower exporters were able to take advantage of the external market opportunities by adopting production technologies and quality control procedures that enabled them to improve farm productivity as well as reduce post-harvest wastage and further used these gains to explore the direct flower markets that offered higher prices than the auctions. In particular, flower prices moved upwards in their favor and through improved efficiency and productivity they were able to earn higher profits. Thus, by adopting innovations in the period 2001-2004, the flower exporters were able to avoid the likely decline in profitability to 6.1% as indicated in Model II but instead sustained it and improved to an 11% operating profit margin in 2004 as presented in Model III. The innovations adopted accounted for the 4.9% profit differential compared to if no innovation activities were implemented.

This result provides further indication that the flower exporters were on average financially better off as a result of innovations in the period 2001-2004. This suggests that it is indeed possible for the agro-commodity exporters in poor SSA countries to create value, improve their financial performance and sustain export operations through innovation. This result challenges previous suggestions by Daviron and Gibbon (2001) that agro-commodity exporters in poor countries lack the capacity to improve their

performance in the competitive export markets because the latter are controlled by the large and powerful lead firms in the export markets.

5.4.4 Firm level variation in profitability in the Ugandan flower export sector

The results presented in the previous section focused on the analysis of the profitability outcome for a flower exporter with a representative mix of operating configurations in the industry. This section presents empirical results from an analysis of disparity in profitability between Ugandan flower exporters in 2001 and in 2004. The aim of this analysis is to estimate the likely differences in financial performance across companies in the flower export sector, by taking into account differences in their mix of products, production processes, and export market channels. Table 5.7 presents estimates of overall profitability at the firm-level as well as information on the product mix in each company. The estimates for overall operating margin for each company draw on the estimates of profitability associated with the nine operating configurations as shown in Table 5.4 together with data from each company on their actual volumes in each of the operating configurations in 2004 and in 2001 as appropriate.

Table 5.7 Firm-level export revenue and operating profit margin for Ugandan flower exporters in 2001 and 2004

	Export revenue of sweet heart roses to auctions in millions of US $ (%)		Export revenue of intermediate roses to auctions in millions of US $ (%)		Export revenue of sweet heart roses to wholesale markets in millions of US $ (%)		Export revenue of intermediate roses to wholesale markets in millions of US $ (%)		Export revenue of flower bouquets to retail markets in millions of US $ (%)		Total export revenue for the firm in millions of US $		Estimated profit margin percentage (%) for the firm		Estimated change in operating margin
Op.Config	1a	1b&2	5a	5b&6	3a	3b&4	7a	7b&8	NA	9					
Code	2001	2004	2001	2004	2001	2004	2001	2004	2001	2004	2001	2004	2001	2004	2002-2004
FR01	0.31 (36)	0.39 (14)	0.51(59)	1.20 (44)	0.02 (2)	0.29 (11)	0.03 (3)	0.86 (31)	0	0	1.00	3.35	6.04	12	5.96
FR02	0.85 (100)	0.38 (26)	0	0.04 (2)	0	0.97 (66)	0	0.09 (6)	0	0	1.00	1.68	6.72	10	3.28
FR03	0.39 (38)	0.13 (5)	0.59 (57)	1.32 (53)	0.02 (2)	0.09 (4)	0.03 (3)	0.95 (38)	0	0	1.18	2.64	6.07	7	0.93
FR04	0.32 (24)	0.20 (12)	0.59 (44)	0.18 (10)	0.15 (11)	0.66 (39)	0.27(21)	0.57 (34)	0	0.09 (5)	1.51	2.27	8.11	11	2.89
FR05	0.64 (36)	0.84 (42)	0.85 (48)	0.33 (16)	0.12 (7)	0.61 (30)	0.16 (9)	0.24 (12)	0	0	0.90	2.20	7.02	10	2.98
FR06	0.84 (61)	0.91 (27)	0	0	0.55 (39)	1.60 (46)	0	0	0	0.94 (27)	1.49	4.58	10.4	14	3.6
FR07	1.54 (81)	1.00 (24)	0.25 (13)	0.55 (14)	0.09 (5)	1.65 (40)	0.01(1)	0.90 (22)	0	0	2.19	4.55	6.97	13	6.03
FR08	0.22 (42)	0.31(21)	0.28 (53)	0.25 (17)	0.01(2)	0.51(35)	0.02 (3)	0.40 (27)	0	0	0.52	1.54	7.4	7.6	0.2
FR09	0.73 (100)	0.75 (68)	0	0	0	0.35 (32)	0	0	0	0	0.86	1.26	6.72	8	1.28
FR10	0.65 (22)	0.84 (10)	0.68 (23)	2.51(29)	0.62 (21)	0.75 (9)	1.00 (34)	3.79 (43)	0	0.82 (9)	3.42	11.75	9	13.8	4.8
FR11	0.60 (62)	0.83 (41)	0.37(38)	0.98 (48)	0	0.10 (5)	0	0.12 (6)	0	0	1.10	2.16	6.03	7	0.97
FR12	0.67 (80)	1.26 (62)	0.12 (15)	0.12 (6)	0.04 (4)	0.59 (29)	0.01(1)	0.05 (2)	0	0	0.93	2.17	6.94	7	0.06
FR13	0.76 (61)	0.62 (29)	0.25 (20)	0.61(29)	0.17 (14)	0.46 (21)	0.06 (5)	0.44 (21)	0	0	1.40	2.42	7.9	7	(0.9)
FR14	0.88 (91)	0.42 (18)	0	0	0.09 (9)	1.85 (82)	0	0	0	0	1.10	2.53	7.54	10	2.46
FR15	1.14 (76)	1.34 (49)	0	0.20 (7)	0.36 (24)	0.49 (18)	0	0.07 (2)	0	0.66 (24)	1.70	3.53	8.95	12	3.05

Source: Computed by author using primary data from flower exporters and secondary data from Uganda Flower Exporters Association (UFEA)

The limitations attributable to the analysis presented in Table 4.9 also apply here. Accordingly, it was not possible to incorporate all the differences in the operating configurations undertaken by each company, for example, the differences in how each company planned and implemented the introduction of a particular innovation were not addressed. As a result the true disparities in profitability could well be higher than the figures in Table 5.7 suggest, if the best endowed companies were likely to adopt an innovation sooner and take greater care over its introduction. Nevertheless, the analysis here is likely to account for a substantial part of the differences in innovation activity across the Ugandan flower exporters.

The results in Table 5.7 suggest relatively small differences in profitability between the companies in 2001, and larger disparities in 2004. In 2001, the highest profit margin of 10.4% was obtained by FR06 which is 72% higher than the lowest profit margin of 6.03% obtained by FR11. In contrast, in 2004, the highest profit margin of 14% was obtained by FR06, which is 100% greater than the lowest profit margin of 7% obtained by four flower exporters: FR03, FR11, FR12 and FR13. This implies that differences in the innovation choices between companies resulted in growing performance differentials between the best and the worst companies. This observation is further reinforced by the significance of the Pearson correlation coefficient for the estimated profit margins in 2001 and 2004, coefficient $r = 0.61$, p (one-tailed) $< .05$ (refer to Table 5.8). This indicates that those companies with above average profitability in 2001 were more likely to have achieved above average profitability in 2004 and vice versa. This implies sustained and perhaps growing capability disparities between companies. In particular, it implies that those companies which had discovered the most appropriate combinations of innovations were adapting more quickly and effectively to extract themselves from the less profitable combinations and switch to more profitable combinations.

The results also suggest that the investments that the flower exporters undertook in the period prior to and between 2001 and 2004 had mixed results. Whereas the extent of differences in the product mix across the companies declined dramatically as more flower exporters adopted the intermediate flower varieties, there were big differences in the adoption of the process innovations, particularly the use of the hydroponics production technology. This suggests that there were differences in the ability of the flower producers to assemble the necessary resources in order to be able to introduce suitable combinations of different technologies

concurrently. Accordingly, whereas the industry converged on a high level to the growing of the intermediate flower varieties, there was relatively slow adoption of hydroponics production technology. It further demonstrates that although some progress was made in areas of innovation which are relatively easy to enter such as adopting new flower varieties, the progress of the flower farmers was slow in the costly and technically more demanding forms of innovation such as the use of hydroponics production technology and the preparation of flower bouquets for the retail export markets.

The results further suggest that there was widespread improvement in the overall estimated operating profit margin for the flower exporters in the industry. The only company that is estimated to have declined in profitability is FR13. Four flower exporters are estimated to have experienced only marginal profitability improvements, namely FR03, FR08, FR11 and FR12. This indicates that these flower exporters had made a relatively bigger shift to intermediate varieties but without any shift into hydroponics and thus were experiencing lower profitability associated with soil-based production of intermediates relative to soil-based production of sweet heart roses.

Overall the extent of innovation activity in the high margin flower bouquets and export to retail markets were still negligible. Even the companies that attempted to do so in this respect had very low volumes in these innovation activities. This outcome might suggest that the flower exporters face formidable challenges in adding value to the flower and shipping them through the alternative retail markets channels. It could also suggest lack of familiarity with the demands of flower retailers and lack of sufficient and cost effective logistical support for supplying flower bouquets to the retail channels.

In spite of the dramatic shift to the intermediate flower varieties that turned out to be less profitable because of their lower yield in comparison to the sweet heart roses, the flower exporters were able to take advantage of the marginal improvement in the prices of the sweet heart and intermediate roses. This appears to have helped them to offset the negative impact of lower yields of the intermediate roses and to have paid off through improved profitability. The improvement in profitability may also be attributed to a combination of developments such as the improvement in flower yield associated with the adoption of hydroponics production technology and the use of modern crop agronomic practices that together helped to improve the quality of the flowers for which the exporters were able to attain the higher

prices. Similarly, the improvements in cool chain management coupled with the new approaches to the post-harvest handling of flowers helped in maintaining the quality and hence a reduction in the flower reject rate.

However, what is striking is that in the most attractive market channels, namely, the retail markets for the flower bouquets none of the flower exporters in Uganda had made any significant progress. Entry into these market segments seem to be problematic for the Ugandan flower exporters. The retail markets require attention to detail in the consistent and reliable supply of high quality flowers. This in turn requires a sustained effort to upgrade flower packaging and shipment to the markets. However, these are the areas in which the Ugandan flower exporters face structural constraints such as lack of experience and skill, and a reliable and cost effective means of shipping flower bouquets.

The results suggest that certain flower exporters made larger changes to their product and market mix as well as the production technology than others. The evidence is consistent with the more innovation-intensive companies having previously experienced greater financial success and therefore having access to greater internal financial resources to continue investment in innovation. This is important in that it provides an insight into the drivers of innovation decisions and their relationships with profit disparities in an agribusiness export value chain in general, and the flower export value chain in Uganda in particular.

The innovation profitability results presented in this section are based on the financial modeling exercise which estimated operating profit margins accruing from the different combinations of the operating configurations undertaken by the flower exporters. However, additional performance measures used in the study consisted of the respondents' level of satisfaction with improvements in profitability. These two sets of performance results were compared through a correlation analysis to validate them. The results of this correlation analysis are presented in next section.

5.4.5 Validity checks on the profitability estimates

A correlation analysis was undertaken to determine whether there was any relationship between the self-reported levels of satisfaction with profitability improvement, referred to in section 5.2 above, and the firm-level estimates of profitability changes between 2001 and

2004 as reported in section 5.4.4. If indeed the estimates of changes in firm profitability in section 5.4.4 and the estimate of profitability of the operating configurations in section 5.4.1 have any validity, then one would expect that they would be positively correlated with data on satisfaction levels with profit improvement. The results of the correlation analysis are presented in Table 5.8.

Table 5.8 Correlation matrix of the different measures of performance for the Ugandan flower export sector

Description of item		1	2	3	4	5
1. Profitability (company's performance1)	Pearson Correlation	1				
	Sig. (1-tailed)					
	N	43				
2. improve1_mean	Pearson Correlation	.550**	1			
	Sig. (1-tailed)	.000				
	N	50	50			
3. profm01	Pearson Correlation	.24	.043	1		
	Sig. (1-tailed)	.436	.384			
	N	50	50	50		
4. profm04	Pearson Correlation	.205	.372*	.611*	1	
	Sig. (1-tailed)	.077	.004	.000		
	N	50	50	50	50	
5. profmd41	Pearson Correlation	.241*	.439*	.154	.872**	1
	Sig. (1-tailed)	.046	.001	.158	.000	
	N	50	50	50	50	50

Notes.
improve1= satisfaction with improvement in profitability over the period 2001-2004 (*original responses from each respondent*)
improve1_mean= satisfaction with improvement in profitability over the period 2001-2004 (*mean response for each firm*)
profm01=estimated company profitability in 2001
profm04=estimated company profitability in 2004
profmd41= estimated growth increase in profitability in the period 2001-2004 (difference between profm04 and profm01)
*. Correlation is significant at the 0.05 level (1-tailed)
**. Correlation is significant at the 0.01 level (1-tailed).

There was a significant positive correlation between the mean satisfaction level with improvement in profit performance (improve1_mean) and both the estimates of profitability for each company in 2004 (profm04) and the estimates of improvement in profitability between 2001 and 2004 (profmd41). The correlation between satisfaction with improvement in profitability over the period 2001-2004 (*mean response for each company*) and estimated

company profitability in 2004 is significant, with coefficient r =.372, p (one-tailed) <.01. Similarly, the correlation between satisfaction with improvement in profitability over the previous four years (*mean response for each company*) and estimated growth in profitability in the period 2001-2004 is significant, coefficient r = .439, p (one-tailed) <.01. As noted in chapter four, the one-tailed test is the appropriate one because of the strong positive correlation between the variables.

The level of correlation reported above is moderately high. This is slightly stronger than the correlations reported in chapter four section 4.4.5. As mentioned in chapter four, this should not be surprising because the approach taken in the modelling of profit margins had weaknesses that were discussed in chapter four and reiterated in this chapter. Further to the limitations of the modelling approach, the results of the correlation would be attributed to the differences in profit expectations between the foreign and locally owned companies. In spite of the limitations of the variables themselves and the moderate level of correlation between them, the significant positive relationship provides compelling evidence on the usefulness of the financial modelling approach and the estimates of profitability derived from them in providing differentials in financial performance across the companies as mentioned in chapter four. The results of the correlation analysis of measures of company performance presented in this section are therefore consistent with the results in chapter four thereby validating the financial modelling approach adopted and the measures of performance used in the study. The next section reports on the key drivers of innovation profitability in the Ugandan flower export sector.

5.5 Drivers of innovation profitability in the Ugandan flower export sector

A similar approach to the one adopted in chapter four section 4.5 was used to determine the drivers of innovation profitability in the Ugandan flower export sector. This involved the use of multiple regression analysis (MRA) to explore the impact of differences in other areas of innovation management practice on "satisfaction with improvement in profitability" of companies in the sample. Thus, the dependent variable and the predictor variables used were the same as the ones used in the regression reported in chapter four and were chosen for the same reasons mentioned in chapter four section 4.5.

To capture the simultaneous effect of the predictor and control variables on financial performance, three multiple regression analysis (MRA) functions were estimated with "satisfaction with improvement in profitability" as the dependent variable. The results of the three regression models are presented in Table 5.9a. Model 1 predicts the simultaneous effect of the control and predictor variables on "satisfaction with improvement in profitability" and it includes the companies that provided revenue data and the one which did not. Model 2 predicts the simultaneous effect of the control and predictor variables on "satisfaction with improvement in profitability" and includes only the companies that provided revenue data. Model 3 predicts the simultaneous effect of the control and explanatory variable on the estimated improvement in profit margin 2001-2004, and uses only the companies that provided revenue data, and for which profit margin estimates could be calculated.

Table 5.9a Regression models for the Ugandan flower export sector

Dependent variable	Model 1 SATIMPROFIT		Model 2 SATIMPROFIT		Model 3 ESTIMPROFIT	
Independent variable	Beta	SE	Beta	SE	Beta	SE
(Constant)		.121		.138		.293
Controls:						
Dummy for foreign ownership	-.030	.102	-.030	.146	.041	.310
Dummy for joint foreign and local ownership	.022	.118	.031	.135	.067	.287
Firm age	-.044	.142	-.034	.157	.097	.334
Number of employees	.071	.095	.094	.108	.506	.230**
Main effects:						
Satisfaction with improvement in penetration of premium export markets	.252	.103	.254	.118	.132	.250
Satisfaction with improvement in sales of new products in new export markets	.103	.121	.100	.159	-.147	.337
We encourage trusting relationships among employees	.216	.109	.200	.128	.178	.273
We maintain close social relationships with suppliers and export customers	.028	.097	-.006	.110	.020	.235
We mutually share information with staff in support institutions	.191	.107	.231	.122	.171	.259
N	58		49		49	
Adj. R2	0.083		0.051		0.302	
F	1.580		1.290		3.361	
Sig. F	0.148		0.273		0.004	
Highest condition index	2.8		3.0		3.0	
White test	5 (df=50)		5 (df=48)		5 (df=48)	

Notes.
SATIMPROFIT = Satisfaction with improvement in profitability 2001-2004.
ESTIMPROFIT = Estimated improvement in profit margin 2001-2004.
* Significant at $p \leq 0.05$, ** Significant at $p \leq 0.01$, *** Significant at $p \leq 0.001$

Surprisingly, none of the three regression models presented above had any predictor variables that explained variation in the outcome variable. This implies that the primary determinants of profitability in the flower sector are markedly different from those in the fish sector.

Accordingly, the researcher introduced three other variables that according to theory and previous empirical studies were associated with improvement in export performance, namely;

(i) Penetration of new export markets relative to local competitors (Chakravorti, 2004);

(ii) Mechanisms for copying best practices from local competitors (Antonelli & Calderini, 1999; Cebon & Newton, 1999; Maskell, 2001);

(iii) Formalization of the processes for developing new products (Cooper, 1991).

To test for the explanatory impact of these new variables, three regression functions were estimated: Model 4, 5 and 6 and their results are presented in Table 5.9b. The regression models follow the same approach as the one presented in section 4.5 of chapter four with the exception that the latter have three additional explanatory variables as indicated in Table 5.9b below. In addition, Model 6 includes a measure for the estimated improvement in profit margin in the period 2001 to 2004.

Table 5.9b Regression models for the Ugandan flower export sector

Dependent variable	Model 4 SATIMPROFIT		Model 5 SATIMPROFIT		Model 6 SATIMPROFIT	
Independent variable	Beta	SE	Beta	SE	Beta	SE
(Constant)		.087		.095		.135
Controls:						
Dummy for foreign ownership	-.014	.076	-.033	.108	-.040	.109
Dummy for joint foreign and local ownership	-.252	.090	-.275	.101	-.282	.102
Firm age	-.193	.103	-.203	.110	-.210	.112
Number of employees	-.067	.069	-.081	.076	-.121	.087
Main effects:						
Satisfaction with improvement in penetration of premium export markets	-.047	.080	-.044	.086	-.054	.088
Satisfaction with improvement in sales of new products in new export markets	-.027	.087	-.004	.109	.007	.111
We encourage trusting relationships among employees	-.108	.087	-.109	.096	-.122	.099
We maintain close social relationships with suppliers and export customers	-.121	.074	-.141	.081	-.142	.081
We mutually share information with staff in support institutions	.064	.078	.099	.085	.088	.087
Satisfaction with improvement in penetration of new export markets relative to local competitors	.455	.080***	.437	.087***	.432	.088***
We have a mechanism for copying best practices from local competitors	.608	.077***	.633	.082***	.628	.083***
We have a formalized process for developing new products	.354	.078**	.408	.086***	.419	.087***
Estimated improvement in profit margin 2001-2004					.076	.132
N	57		49		49	
Adj. R2	0.527		0.553		0.544	
F	6.283		5.946		5.413	
Sig. F	0.000		0.000		0.000	
Highest condition index	3.5		3.9		4.3	
White test	N.A.		N.A.		N.A.	

Notes.
SATIMPROFIT = Satisfaction with improvement in profitability 2001-2004.
* Significant at $p \leq 0.05$, ** Significant at $p \leq 0.01$, *** Significant at $p \leq 0.001$

Model 4 results indicate that the addition of three new predictor variables caused the explanatory power of the regression to improve from 8.3% to approximately 53%. With the exception of satisfaction with improvement in penetration of premium export markets, satisfaction with improvement in sales of new products in new export markets, trust among employees and close social relationships with suppliers and export customers that had a negative direction in prediction, the direction of the effects of other predictor variables is positive, as predicted. The highest positive contribution is from mechanisms for copying best practices from local competitors, followed by satisfaction in penetration of new export markets relative to local competitors, while the formalization of processes for developing new products to a lesser extent had a positive contribution. Sharing information with staff in support institutions had a much smaller and not significant positive contribution to satisfaction with improvement in profitability.

The results of Model 5 indicate that the addition of three new predictor variables caused the explanatory power of the regression to improve from 5.1% to approximately 55.3%. Once again, satisfaction with improvement in penetration of premium export markets, satisfaction with improvement in sales of new products in new export markets, trust among employees and close social relationships with suppliers and export customers had a negative direction in prediction while the direction of the effects of other predictor variables is positive, as predicted. It is surprising that in spite of the reduction in the number of cases used for the regression, the predictive power has increased. As was the case with Model 4 above, the highest contribution to the predictive power of Model 5 is from mechanisms for copying best practices from local competitors, followed by the penetration of new export markets relative to local competitors and the formalization of processes for developing new products, while sharing information with staff in support institutions had a much smaller and not significant positive contribution to satisfaction with improvement in profitability.

Model 6 indicates that the addition of the four new variables increased explanatory power from 30.2% to approximately 54.4%. Three variables, namely, satisfaction with improvement in the penetration of premium export markets, trust among employees and close social relationship with suppliers and export customers had a negative and insignificant direction in prediction of satisfaction with improvement in profitability. The explanatory variable with the highest power and positive direction in the prediction of satisfaction with improvement in profitability were mechanisms for copying best practices from local competitors, followed by

satisfaction with improvement in penetration of new export markets relative to local competitors and formalized processes for developing new products. However, the inclusion of estimated improvement in profit margin in the period 2001-2004 had a very weak and insignificant positive contribution to satisfaction with improvement in profitability. Similarly, satisfaction with improvement in the sale of new products in new export markets, and, sharing information with support institutions had weak and insignificant positive contribution to satisfaction with improvement in profitability.

The predictive power of Models 4, 5, and 6 is moderate. All the three Models indicate that satisfaction with improvement in penetration of new export markets relative to local competitors, copying best practices from local competitors and formalization of the process for developing new products are significantly associated with satisfaction in improvement in profitability. These results are consistent with theory and earlier empirical observations.

The fact that penetration of new export markets relative to local competitors to a large extent explains managers' satisfaction with improvement in profitability is consistent with previous empirical research (Dolan & Humphrey, 2000; Wijnands, 2005). These studies earlier observed that innovations in form of being among the early companies to explore new export markets relative to counterparts in the local market was an important contributor to success in export markets. This is because being among the first in exploring a market gives exporters the opportunity to identify user needs early and to use this knowledge to improve or adapt the product better to meet the user needs hence improving the potential for increased sales and profits. But there is also an inherent risk in being the first to explore a market and so managers should undertake it cautiously.

The association between having mechanisms for copying best practices from local competitors and respondent' satisfaction with improvement in profitability is also consistent with earlier empirical studies that recognised the role that imitation plays in innovation among firms in poor countries. In particular, Kaplinsky (2001) pointed out the reliance by most SSA agro-commodity exporters on imitation as a way of technological acquisition. Similarly, Oyelaran-Oyeyinka (2006) pointed out that most companies in SSA rely on process innovations acquired through purchase of machinery and equipment. Thus, having competencies for imitating best practices from other companies can be a faster and cheaper way of acquiring technological knowledge and hence can help the technologically

disadvantaged flower exporters in Uganda to acquire knowledge on best practices which may then enable them to produce and export flowers profitably.

Lastly, the association between having formalized processes for developing new products and managers' satisfaction with improvement in profitability relates to theory and previous empirical work especially literature on procedures for new product development (NPD) (Wheelwright & Clark, 1992; Hauptman & Hirji, 1996; Ulrich & Eppinger, 2000). The internal/operational perspective to NPD focuses on the operational outcome measures such as project work execution aimed at improved product quality, reduced unit cost and the minimization of development time (Wheelwright & Clark, 1992; Hauptman & Hirji, 1996), while the external or marketing perspective to NPD focuses on capturing marketplace outcomes such as product sales, customer satisfaction and profitability (Cooper & Kleinschmidt, 1993; Shankar, 1999). Thus, having a formalized process for developing new products enables the flower exporters to critically assess the feasibility of introducing and adopting new flower varieties through experimental trials that are used to assess yield and susceptibility to pests and diseases under the Ugandan ecological conditions. It also gives them the opportunity to assess user needs in the export markets and the likely risks associated with the adoption of new flower varieties, knowledge of which can be used to implement the innovation projects more cautiously in order to increase the chances of success.

As was reported on page 131, validity tests were also undertaken for the regression models reported in Table 5.9a and 5.9b. In particular, a correlation analysis of the explanatory variables was undertaken and the results reported in appendix 9.2a and 9.2b. These correlations show that the highest correlation coefficient was 0.518, again not sufficiently high to be likely to cause any co-linearity problem. The co-linearity statistics showed no variance inflation factor (VIF) value higher than 1.8, confirming that co-linearity is not a problem in the flower sector regression models. Once the independent variables had been standardized, the highest condition index for model 1 dropped from above 30 to 2.8. The highest condition index for subsequent models was found to be 3.0 (model 2) and 3.0 (model 3) as reported in Table 5.9a. The highest condition indexes for the models in Table 5.9b were found to be 3.5, 3.9 and 4.3 for models 1, 2 and 3 respectively. Thus, there were no problems regarding co-linearity in any of the models for the flower sector. Additional tests for heteroscedasticity (White test) were also done for the flower sector to ensure that the beta coefficients reported in the regression models are not biased due to co-linearity. The results reported in Table 5.9a show that for model 1: White test = 5 (*df= 50*), *p=.3*, model 2: White

test = 5 (*df=48*), *p=.4* and model 3: White test = 5 (*df=48*), *p=.4*. As was the case with the fish sector results, these results indicate that heteroscedasticity will not be a problem, thus the null hypothesis of homoscedasticity should not be rejected. However, as for the regression models reported in Table 5.9b, owing to the additional three variables used in these models, there are insufficient degrees of freedom to be able to calculate the residuals (res 2) for the White test. Accordingly, it is not possible to apply the White test in these cases. That notwithstanding, it can be safely assumed that the results of the White test from Table 5.9a indicate that heteroscedasticity will not be a problem in this second set of models.

5.6 Summary of key results and conclusions

The empirical study reported in this chapter has explored the innovations adopted by Ugandan flower exporters and determined the extent to which these innovations were able to create financial value. In this regard, the study analyzed the different operating configurations used by the flower exporters so as to determine the extent of innovation activity. Changes in the operating configurations and the differences in profitability associated with them were used to estimate the extent to which value was created. In addition, the study analyzed firm-level capabilities that were associated with innovation profitability in the industry. The results of these analyses provide new insights on innovation management and value creation in agro-commodity export industries in SSA.

Preliminary results indicate that there was widespread innovation adoption in the industry. In particular, flower exporters adopted new plant varieties, new production technologies, new post-harvest flower handling techniques, and new approaches to marketing. It is also reported that there were high expectations among the flower exporters in terms of improvement in competitiveness through the attainment of better quality and reduced wastage, higher prices, reduction in production costs and efficiencies in accessing the new direct wholesale and retail markets. In spite of the high expectations among the flower exporters, empirical results presented in this chapter have shown a mixture of positive and negative outcomes from the different operating configurations examined.

Results indicate that whereas the shift from the T-Hybrid flower varieties to the sweet heart roses paid off through improved profitability, the adoption of the intermediate roses did not yield higher profits as had been expected. This is consistent with earlier empirical observations that product innovation is often faced with many uncertainties (Cooper, 1994;

Christensen, 1997) and hence may not necessarily result in higher financial returns. Although the shift to intermediate rose varieties based on soil production in 2001 did not pay off as expected because of the lower-than-expected yields in comparison to sweet heart roses, the results show that intermediate roses produced using hydroponics technology in the period 2001-2004 and sold to direct wholesale markets actually created value. This is because the use of hydroponics technology in combination with other flower growing techniques was associated with improvement in productivity and hence enabled the flower exporters to improve their operating profit margins. Thus, empirical results show that flower exporters were in most cases able to improve their overall profitability between 2001 and 2004.

The improvement in profitability is a result of correct choice in the combination of different innovations. In particular, flower exporters were able to take advantage of the higher prices in the export markets and by switching into the flower varieties which obtained higher prices and from which they had the potential to earn higher income. They also shifted from the auctions to the direct export market channels that are more transparent and give slightly higher prices. Thus, by maintaining an appropriate mix of new products and markets with improved approaches to marketing, the flower exporters have continued to earn increasing returns to their innovation investments. This is an important achievement considering the high cost structure of the industry and other structural constraints such as high freight costs that effectively reduce profitability.

It can therefore be inferred that up until 2001, the switch from sweet hearts sold in auctions to sweet hearts sold in wholesale markets was value adding. After 2001, most of the value creation was achieved through the switch to intermediates produced using hydroponics technology and sold in wholesale markets as well as sweet hearts (bouquets) produced using hydroponics technology and sold in retail markets. Based on the above observation, the two key changes which seem to have contributed the most to improving financial performance in the industry were the shift to sweet-hearts via hydroponics sold to wholesalers, and intermediates via hydroponics sold to either auctions or wholesalers. It is particularly interesting that the performance of intermediates via hydroponics to auctions should have contributed so much, and notable that although intermediates via hydroponics to wholesalers is so profitable, that the industry has not succeeded in raising its volumes in this configuration as much as one would like. It would be interesting for additional studies to be undertaken to determine why this is so. As was noted in chapter four, it can be inferred from the above

discussion that the lines of business that are associated with the highest profitability in one period change over time, thus confirming the need for and potential benefits to be gained from innovation.

The variation in the value creation potential of innovation activity from one period to another suggests a strong case for companies in the Ugandan flower export value chain to diversify their innovation activities. Examples of companies with an appropriately diversified approach are FR04, FR10 and FR15 (see Table 5.7.). If a company focused solely in switching from sweet hearts produced in soil and sold in auctions to sweet hearts produced in soils and sold in wholesale markets, they would have done relatively well in the period up to 2001. On the contrary, any switch to producing using soil and selling intermediates in 2001 would result in losses. However, thereafter, they would have suffered from the decline in profitability on sales of sweet hearts to direct wholesale markets between 2001 and 2004 (see for example FR08, FR12 and FR13 in Table 5.7). Similarly, if a company had focused solely on switching from soil-based sweet hearts sold in direct wholesale markets to hydroponics sweet hearts (bouquets) sold in retail markets and hydroponics intermediates sold in direct wholesale markets, they would have been better both in 2001 and 2004. In spite of that the volumes of hydroponics sweet hearts (bouquets) to retail markets and of hydroponics intermediates to wholesale markets remained a tiny fraction of overall industry volumes, and therefore the company might have found it very difficult to achieve sufficient sales volumes of hydroponics sweet hearts (bouquets) sold to retail and hydroponics intermediates sold in wholesale markets for their business to be viable.

Whereas Ugandan flower exporters have made significant internal changes to improve efficiency and quality of the flowers, their efforts to improve profitability and competitiveness were being hindered by structural challenges such as the high costs of airfreight to the export markets in comparison with their competitors in Kenya. In spite of this structural disadvantage, the Ugandan flower exporters have done remarkably well in managing the shift from the T-Hybrid to the sweet heart and intermediate rose varieties, from soil-based to the modern hydroponics production technology, and from the auctions to the direct markets. The empirical evidence indicates that they have been able to improve profitability in spite of the on-going structural disadvantages experienced in the sector. This is an indication of the commitment of management in these companies to invest in continuous

learning in an attempt to upgrade as earlier observed through a study involving innovation among agro-producers in Latin America by Giuliani et al. (2005).

The results further indicate that there is limited empirical evidence that the additional value which has been created through innovation is being unfairly captured by powerful market players downstream in the export markets because a reasonable portion of the additional value is being absorbed by the flower exporters. This is contrary to earlier findings such as Humphrey and Mamedovic (2006) and Kaplinsky (2006) in which it is shown that agro-commodity exporters from poor SSA countries are at the mercy of large and powerful downstream retailers based in the developed markets. In this respect, it would appear that internal capabilities have played an important role. For example, empirical results demonstrate that some internal capabilities were driving innovation profitability in the industry. In particular, capability to penetrate new export markets relative to local competitors, capability for copying best practices from local competitors, and capability for developing new products were found to be significantly associated with improvement in innovation profitability.

However, the incremental and generic nature of the innovations adopted in the sector lead to faster diffusion of these innovations, hence making it difficult for the flower exporters to sustain their competitiveness in the industry. Ugandan flower exporters being latecomers in this global industry should therefore focus more on how to catch-up with more advanced competitors such as the Kenyan flower exporters. This has implications for the future sustainability of the industry. It also points towards the need for the development of more capabilities necessary for the flower exporters to improve their ability to appropriate more value from innovations.

In sum, the discussion on innovation activity and value creation in the Ugandan flower industry has emphasized that pursuing a range of different innovations is probably the best approach, even if not all of them generate as much profit. The benefit of pursuing a range of different innovations is that it helps to reveal which ones are the most or least profitable at any point in time and therefore to adjust the volumes going through the respective operating configurations accordingly. In addition when external conditions change, and the optimal mix of operating configurations changes, it means that the company will be in a better position to adapt its mix quickly to respond effectively to the changing conditions and make sure that it

is generating as much profit as possible. Further to that, the flower industry does display the interesting phenomenon of seeming to make sudden and large switches into new innovations before they are adequately tested, and then slowly retreating from those innovations once it becomes clear that they are not as profitable as was previously thought. Thus, the general approach that seems to make economic sense in value creation is one that involves openness to conducting small experiments in the different configurations and being ready to reduce volumes through the least profitable ones and increase volumes through the most profitable ones according to changes in the external environment.

5.7 Chapter conclusion

The empirical results presented in this chapter indicate that the financial performance of innovation efforts adopted by Ugandan flower exporters was mixed. It has been shown that in some cases wrong choices were made thereby resulting in financial losses while in other cases innovation clearly led to value creation. These results show that effectiveness in innovation management largely depends on the capabilities of making the right choices in the different combinations of innovation activities or skills in inter-functional management. These results also show that context matters in the choice of innovations to adopt. This implies that managers must have the capabilities to constantly question the environment in order to assess the opportunities offered and the likely risks associated with undertaking any innovation. In general terms therefore the adoption of different innovations appears to have helped the exporters to survive in the competitive global flower export markets. The next chapter presents a discussion of empirical results.

Chapter 6: Discussion of Results

6.1 Introduction

This chapter presents a discussion of empirical results reported in chapters four and five. The discussion is presented according to the research questions set out in chapter one and is positioned within the context of literature reviewed in chapter two. The chapter has three objectives:

- To present the discussion of results;
- To highlight the contributions of this empirical study;
- To draw conclusions on the study's research questions.

The rest of this chapter is structured as follows. Section 6.2 presents the discussion of results, the key findings, and the contributions of the study. Section 6.3 presents the overall conclusions of the chapter.

6.2 Discussion of results

As reported in chapter one, the main aim of this study is to determine whether or not Ugandan fish and flower exporters are able to generate positive returns from their innovation activities and to analyze firm-level capabilities that determine the relative financial performance of firms in the two sectors. Accordingly, chapters four and five presented in-depth analyses of innovation activities undertaken by the companies and their contributions to financial performance and sustainability. This section presents discussion of results according to the four research questions set for this study.

6.2.1 Research Question 1

To what extent are the Ugandan fish and flower exporters able to increase their profitability through value creating innovation activity?

The results for the level of satisfaction with profit improvement provide strong evidence that both the Ugandan fish and flower exporters, on average, experienced improvement in their overall profitability for the period understudy (2002-2004 for the fish sector and 2001-2004 for the flower sector). These periods saw fairly intensive innovation activity in both sectors. The apparent improvement in profitability among fish exporters is particularly noteworthy as the terms of trade appear to have moved against Ugandan fish exporters during this period. Together these findings suggest that in aggregate, innovation activities in both sectors resulted in improved profitability.

This finding is broadly consistent with the idea that companies in these sectors, while subject to considerable pricing pressure from competitors and influence from powerful, well-resourced customers overseas, were able to overcome the impact of these pressures and achieve improved financial performance. The only caveat is that both the fish and flower sectors benefited from donor assistance in a variety of different forms. While it was not possible to quantify the extent of this assistance, it is probable that performance improvements within these sectors would not have been achievable without such external assistance. Similarly, performance improvements in these sectors might not have been sustainable without continued external assistance and were possibly artificial in the sense that if the extent of external assistance could be accounted for that they might negate the performance improvements over this period. These possibilities would seem to be worthy of further research. In the interim, it is worth noting that there is some evidence from the regressions for the fish sector that there is a negative association between satisfaction with profit improvement and the closeness of a company's relationship with donor and support agencies. The corresponding relationship was not significant in the flower sector. This broadly suggests that there is not a high level of dependence by companies on these agencies, in either the fish or flower export sectors in Uganda. This is in stark contrast with previous empirical studies such as Asea & Kaija (2000) and VEK-World Bank (2004) that identified donor support as one of the key drivers of export growth in the Ugandan flower export industry. This evidence seems to suggest that the improvement in financial performance of the Ugandan fish and flower exporters is not due to donor support and can be attributed largely to their intensive innovation efforts and the effectiveness with which they were managed.

Although innovation activity in both sectors over the period of study appears to be associated with improved profitability in aggregate, the financial models suggest a wide variety of profit outcomes at the project level. In case of the flower export sector, the estimates suggest that some innovation projects, for example, the introduction of intermediate roses grown in soil and sold in auctions, have resulted in operating profits lower than all pre-existing lines of business. Arguably therefore the net financial impact of such innovations was negative. This suggests that the adoption of product innovations can have different performance outcomes depending on the specific context of the industry. This result is consistent with previous innovation research (e.g. Christensen, 1997) which found that innovation is often associated with uncertainty, risk and financial losses. However, the majority of innovations appear to

have been associated with improved levels of profitability. Some of the increases in profitability are estimated to have been substantial, and in some cases, in excess of 10 percentage points. Overall, the Ugandan fish and flower exporters appear to have been able to create value and capture part of it for themselves in spite of the challenges facing the industries.

The above finding contrasts sharply with earlier studies such as Kaplinsky (2004) and Mytelka et al. (2004) that presented pessimistic views on the level of innovation among SSA companies and also expressed doubts on the likelihood of improved profitability as a result of innovation activity among these companies. The results of this study therefore complement earlier findings on innovation in agro-commodity export sectors in SSA in which technological capability development and innovation is associated with improvement in export volume and revenue (Jaffe, 1998; Kaplinsky & Fitter 2004). In particular, it attempts to overcome a major weakness of previous studies which relates to the use of export volume and revenue as measures of performance, and yet these measures do not provide any guarantee that there was an improvement in profitability. In that respect, the results of this study show improvement in export volumes and revenue and more importantly, it provides evidence on value creation and profitability arising from innovation activity.

However, an important question that may be raised is why the flower exporters would continue to produce and export less profitable flower varieties? In an attempt to answer this question, it can be observed that the exporters seemed to employ a strategy of trying to limit the risk of temporary relative price fluctuations over time through product and market diversification and shifts in volume between different product lines. Such shifts can help to offset the negative effects of temporary relative declines in profitability in certain product lines by shifting volumes to those lines showing relative improvement in profitability. A similar strategy was being followed in the fish industry with the fish exporters processing and exporting less profitable frozen fish products alongside fresh chilled fish. The likely reason for continuing to produce and export frozen fish products is that the exporters could not find markets for enough chilled fish products and had no option but to export some of the volumes as frozen, even though it gave them lower returns. What matters overall is that there is an aggregate shift towards higher volumes of more profitable products. It also suggests that companies in the Ugandan fish and flower export sectors were becoming better at finding ways of limiting their volumes in product lines which had the lowest profitability.

As earlier observed, there were low levels of penetration into the premium export market channels. In the case of fish exporters there was very limited penetration into retail markets. This may be attributed in part to the commodity nature of the product and hence the difficulties in product differentiation in the retail channel, especially for suppliers that lack their own brand. It could also be because of the difficulties in attaining the necessary volumes required to meet the order requirements of retail buyers, the high cost and other difficulties associated with developing retail brands, and the absence of sufficient volumes to justify such expenditure. Additional constraints could be in form of lack of operational capabilities such as consistent and reliable logistics for meeting demanding retail market requirements. A similar situation was observed among Ugandan flower exporters in that they could only increase capacity to supply flowers to the direct wholesale markets away from the auctions, but made limited progress in penetrating retail markets. This finding is consistent with earlier observations by Giuliani et al. (2005) and Porter (1985) that commodity exporters can appropriate higher returns by upgrading to higher value market segments with differentiated or value added products but also highlights the difficulties faced by the exporters in penetrating retail markets. This study is therefore able to demonstrate for the first time that even though these firms appear to have made limited in-roads into the premium market segments, they do appear to have been able to achieve improved profits in those segments.

Overall, the evidence presented in this thesis provides new insights into the profitability outcomes of innovation activity and the fact that firms in these sectors do indeed appear to have been able to improve their profitability through innovation. Accordingly, companies in both the Ugandan fish and flower export sectors were creating value and generating positive returns to innovation activities. This also demonstrates the need for managers to develop mechanisms for evaluating the potential financial implications of their innovation activities in line with recommendations by Cooper and Kleinschmidt (2007) because it gives them the opportunity to assess and eliminate bad innovation projects early before they take up substantial resources from the organization.

6.2.2 Research Question 2

How important are the interactions between the different innovation activities in order to create value?

Investigating this question depended on finding a technique to analyze value creation at the level of innovation projects. This research therefore applied a novel approach for estimating the financial impact of innovation activity. The method is based on financial models of operating profit (EBIT) for specific operating configurations using a combination of primary and secondary data. While the modeling approach is subject to a number of limitations, it was found that for both the fish and flower export sectors the resulting estimates of firm-level profit improvement over the study period were significantly positively correlated with satisfaction levels with profitability changes over the period. In spite of the degree of correlation not being particularly high, this finding is indicative of some validity in the modeling approach. In the context of a multivariate regression, this relationship remained significant for the fish sector but was found to be insignificant for the flower sector, implying somewhat less validity for the estimates in the case of the flower than the fish industry.

Given the novelty of the modeling approach adopted in this study, these findings are encouraging and suggest that there may be value in further research using this approach. Most importantly, this approach paved the way to what is believed to be the first detailed insights into value creation at the level of innovation projects in agro-commodity export sectors in SSA. In this respect, it is an improvement on earlier approaches developed to estimate profitability in value added fish in Uganda (Bambona, 2002), flower export industry in Uganda (VEK-World Bank, 2004) and sorghum production in Nigeria (Baiyegunhi & Fraser, 2009) in that it provides estimates of profitability at the level of product lines and therefore gives insights into profitability of different combinations of product, process and market innovations. The study therefore contributes to methodological developments in assessing the financial impact of innovation through the use of a new financial modeling approach as an attempt to overcome the difficulties associated with obtaining profitability data directly from the companies as earlier observed by (Ramachandran & Shah, 1998).

The methodology adopted in this study was used to analyze interactions between product, process and marketing innovations and their impact on profitability. For example, the initial switch into growing intermediates in soil for sale at auctions resulted in lower profitability

than for sweet hearts grown in soil. However, when intermediates for sale at auctions were grown using hydroponics technology, their profitability rose more than threefold. By contrast, there is only a small difference in the profitability of sweet hearts for sale at auctions whether they are grown in soil or using hydroponics technology. However, hydroponic sweet hearts to the wholesale channel are 57% more profitable by comparison with soil-grown sweet hearts to the same channel. Thus, the profitability associated with a particular product innovation can be highly dependent on an appropriate combination of production technique and market channel which offer the best possible alignment. It would therefore seem that the combination of different innovations in the areas of product, process and market selection can have a significant impact on the potential to create financial value and this can only be demonstrated through an appropriate methodology. This finding is an important addition to the earlier empirical results on the Ugandan fish sector (Ponte, 2005; Kiggundu, 2006) and the Ugandan flower sector (Dijkstra, 2001; Wijnands, 2005) that identified the different innovations undertaken by the producers but did not logically assess the interactions and degree of alignment between them and hence could not empirically demonstrate the extent of value creation.

Whereas product changes in the fish export sector were limited to processing raw fish into other product forms in line with market requirements, product changes in the flower export sector were driven by a combination of factors such as suitability to local soil and climate, as well as export market customer needs. Yet in the latter case, the optimal outcome could not be obtained immediately but rather could only be achieved through trial and error. For example, while careful experimentation was done on certain flower varieties, notably sweet heart and intermediate, there was a tendency for producers to rush into large scale production of the varieties expected to generate higher prices as was the case with the switch to intermediates roses. This highlights the need for continuous monitoring of changes in export markets on the basis of which companies can determine which combinations of innovation to pursue and how they should be aligned. This is consistent with and reinforces findings from earlier studies (e.g. Dolan et al., 1999; Lall & Pietrobelli, 2002) that identified competence in the absorption of new technologies as a prerequisite for the determination of which innovations to develop.

The results of this study therefore use profit-based data to substantiate findings from previous research on innovation in agro-commodity export sectors in SSA (e.g. Dolan et al., 1999;

Ponte, 2005; Kaplinsky, 2006; Kiggundu, 2006) which suggested that an optimal combination of innovations was important, but lacked product-level profit data to demonstrate the point conclusively. In particular, it shows that an optimal combination of product, process and market innovations is important and potentially contributes to improved value creation as has been demonstrated by the sweet heart-hydroponics-wholesale example above. In this respect, the study deepens our understanding on the importance of the degree of alignment between all aspects of a company's innovations and operations and how this contributes to value creation and improvement in financial returns for the company.

6.2.3 Research Question 3

To what extent are the financial benefits of innovation activity in the two sectors increasing overtime?

The discussion in section 6.2.1 indicated that exporters in both the Ugandan fish and flower export sectors invested significantly in innovation activity and that there were indications of positive returns to innovation with the flower exporters experiencing an overall higher improvement in profitability in the period 2001-2004, than the fish exporters in a comparable period 2002-2004. Further empirical evidence indicates that there were growing disparities in the profitability of individual companies in both sectors but more so among the flower exporters. Given that innovation activity was extensive among all firms in the sample during the study period, this suggests that there are significant differences between firms in their ability to increase their financial returns to innovation activities overtime. This is relatively new evidence in SSA on the profitability differences between companies arising from innovation activities overtime. It substantiates findings from previous agro-commodity innovation research in SSA (e.g. Kaplinsky & Readman, 2005; Stevens & Kennan, 2005; Wood & Kaplan, 2005; Lall et al., 2006) which reported performance differentials as indicated by differences in product price changes and revenue changes but have not provided specific estimates of profit changes overtime.

In spite of the general observation that both the Ugandan fish and flower exporters were increasing their profitability from innovation activities over time, it appears that they found it difficult to expand the volume and value of sales in the most profitable operating configurations due to difficulties experienced in gaining access to and maintaining their position in the premium market segments. By way of illustration, the most profitable

operating configurations in both the fish and flower export sectors in 2004 represented only 2.4% and 4% of total volume in those sectors respectively. It appears that the most profitable operating configurations involve selling to the most demanding type of customer, namely large retailers. In this regard, it becomes clear that while some Ugandan producers have made small in-roads with European retailers, they have some way to go before they can deliver to retailer requirements on a large scale. Thus, in spite of some of the producers having entered into some lines of business which appear to be highly profitable, these tend to contribute a relatively small proportion of overall net profit because the volumes in the most profitable lines remain small. Nevertheless, there have been small increases in the proportion of total volumes in the most profitable lines of business and thus there would appear to be progress. This evidence provides new insights on the profitability impact associated with entry into premium market segments and hence complements earlier empirical findings (Kaplinky, 2006) which reported that success of new food products in export markets depends to a large extent on the exploitation of new premium market segments but did not show its profitability.

Empirical evidence from this study therefore suggests that in order for a company to create real value through innovation, access to the most attractive segment is very critical. However, this requires a combination of resources and capabilities such as mastery of key production processes, consistent high quality, reputation, a retail brand and the financial resources to support it effectively, knowledge of the market and the ability to combine all these capabilities in order to produce and deliver high quality products on a consistent basis. Even though some exporters made more progress than others in acquiring the necessary resources, the relatively limited penetration of premium export markets suggests that even the best firms have some way to go in acquiring the necessary resources and unless significant progress is made in this regard, it may be difficult to achieve continued profit in future. Most notably the branding of agro-commodity products has been highlighted as an important step in the development of differentiation strategies for penetrating premium markets (Brooks & Lucatelli, 2004) and for positioning in those markets (Jaffee & Masakure, 2005; Kaplinsky & Morris, 2006) but it had remained unclear as to how profitable and sustainable it is. This study therefore provides new empirical evidence to demonstrate the profitability impact of adopting strategies for competition in premium export markets for agro-commodity products from SSA. It also highlights the challenges associated with developing sustainable business operations in such markets.

It is also observed that in both the fish and flower sectors, there appears to have been significant change in the relative profitability of different lines of business overtime. By way of illustration for example, the most profitable use of 1 kg of fish fillet in 2002 did not correspond with the most profitable use of that same resource in 2004. This implies that producers will tend to face uncertainty as to the optimal use of their existing resources. An appropriate response in such circumstances would be to diversify the activities of the company across different products, production processes and customer type, and to vary the quantities in each overtime according to prevailing market prices. The scope for diversification of activities appears to be greater among flower companies than in fish. Accordingly, there is evidence of growing diversification in the flower industry in terms of reduced reliance on individual products or customers. No line of business in the flower industry accounted for more than 20% of total volumes in 2004, whereas just short of 50% of total volumes was accounted for by a single line of business in 2001.

By way of contrast, the opposite appears to be true in the fish industry. There appears to have been growing reliance on chilled fish sales to wholesalers in the fish industry. For example, the proportion of chilled fish in total industry volumes grew from 48% to 62% between 2002 and 2004, despite what appears to be a decline in profitability in this line of business over the period. Clearly, producers were trying to reduce their sales of frozen fish to wholesalers which were even less profitable. By 2004, sales to wholesale markets still accounted for over 85% of total fish industry volumes, largely unchanged from 2002. In contrast, the flower industry reduced its dependence on a single customer type. Flower industry reduced the proportion of its total sales to auctions from 75% to 56% and increased the share of sales to wholesalers from 25% to 40% over the period 2001-2004. Thus, it appears that the fish industry made far less progress towards diversification, particularly in terms of customer mix. This is an indication that the fish industry might be subject to greater risk of undue influence from wholesale customers, a suggestion which is consistent with the very low margins on sales to that channel. This might be a function of the context in which fish producers find themselves, rather than a lack of capability on the part of managers in the fish industry to respond effectively. Either way, this would seem to imply somewhat less progress in the fish sector than in the flower sector, and may also be indicative of somewhat less potential in the fish industry than the flower industry to sustain profit improvement over time.

The findings discussed above constitute an important addition to the results of previous innovation research in SSA for example Dollan & Humphrey (2000), Kaplinsky and Fitter (2001a) and Wood and Kaplan (2005) that analyzed the performance of agro-commodity exporters at one point in time. It particularly gives new evidence on the profitability impact associated with diversification and the level of progress being made by the exporters towards gaining entry to more profitable export market segments over time. Overall it has been shown that exporters are increasing the volumes and value of exports to new markets and hence are able to contribute to value creation and long-term financial sustainability over time.

6.2.4 Research Question 4

What are the main firm-level capabilities that determine the profitability of innovation activity in the two sectors and how effectively are they being managed?

The conclusions drawn in sections 6.2.1, 6.2.2 and 6.2.3 are consistent with and reinforce the findings of the regression models for the fish and flower sectors. Results from regression analysis indicate that there are different sets of factors which are associated with profitability changes of companies in the fish and flower sectors. By way of illustration, given the limited penetration of the premium markets (namely retail) in the Ugandan fish industry and the relatively small number of leading companies which made significant in-roads in that channel (only 4 out of 15 companies achieved sales more than 2% of total volume into retail), it should not be surprising that "satisfaction with improvement in penetration of premium export markets" is significantly positively associated with satisfaction with profit improvement in the fish industry. Similarly, given that growing penetration into premium markets (in their case wholesale) was universal among all flower producers, it should also not be surprising that "satisfaction with improvement in penetration of premium export markets" should not be correlated with level of satisfaction with profit improvement in the flower industry. This result reinforces earlier findings from studies such as Li and Calantone (1998), Crick et al. (2000), and Kaplinsky and Fitter (2004) on the importance of developing capabilities for entering premium export markets by providing evidence on how it contributes to profitability.

Furthermore, given the greater potential for product innovation in the flower industry and the high costs associated with new plantings and the introduction of hydroponics which was a requirement for successful cultivation of intermediates, one would expect the management of innovation risks to be more critical in the flower industry. It should not be surprising,

therefore, that “a formalized process for developing new products” and “having mechanisms for copying best practices” should be significantly positively correlated with firm profitability in the flower sector but not in the fish sector. These two capabilities helped the exporters to improve their innovation capacity by fast tracking the adoption of new flower varieties, production techniques and exploration of new markets. In particular, the development of capabilities for copying best practices from local competitors has potential for significantly reducing the time taken to adopt the innovations and hence helps a company to quickly master the innovations resulting in improvement in product quality, cost reduction, consistency and flexibility in operations. Prioritization of these activities is therefore likely to reduce the risks associated with innovation in the flower industry.

Additional empirical evidence shows that being among the first in exploring premium export markets is associated with satisfaction with improvement in profitability in the fish export sector. This is consistent with earlier observations by (Kaplinsky & Morris, 2006) regarding the importance of entry to premium export market segments. This capability is important in that it gives the company opportunity to identify user needs early and to use this knowledge to improve or adapt its product, packaging and delivery systems to meet user needs and by so doing improve the potential for increased sales and profits. Speed in entry to foreign markets is therefore important in learning and development of capabilities for managing international business operations. This in turn provides potential for improving profitability of innovation activities.

Trust among employees was also identified as an important capability associated with satisfaction in profitability particularly among employees in the fish export sector. This enabled the employees to learn faster and increase the speed of innovation development. Through improved learning and innovation, fish exporters were able to undertake innovation activities with cost advantages and or with the capacity to enhance product quality which enabled them to sell more in the export markets.

In addition, the development of networking capabilities based on close social relationships with suppliers and buyers was also identified as a critical determinant of profitability of innovation activity. This helped the exporters in different ways. For example, they were exploring the use of collaborative efforts in product development and branding. This was important because most of the exporters lacked internal capacity to undertake advanced

product development and branding. Thus, the most immediate approach to overcoming this technical constraint was to collaborate with external partners that are more advanced and experienced in new product and brand development. This attempt was seen to be yielding fruit in the case of the leading fish exporter that collaborated with a South African based company to develop Nile perch into brands under the foreign partner's brand names.

A further firm-level capability that was associated with satisfaction in improvement in profitability is innovation project portfolio choice. The estimated improvement in profit margin due to changes in the mix of products, processes and markets in the period under study was used as a proxy for this variable. It was empirically found that there is a strong association between innovation project choice and satisfaction with profitability improvement among fish exporters thereby demonstrating the importance of careful innovation project choice. Although empirical results in the flower sector do not provide strong support for the role of innovation project choice in enhancing company profitability, careful selection of innovation projects helps managers to critically evaluate and weed out innovation projects that may not have promising returns and concentrate their resources on projects with higher potential for increased profitability. This gives potential for higher profitability from innovation activity as companies will concentrate their resources where it is most optimally utilized.

The above factors had a moderate association with satisfaction in improvement in profitability. This suggests that there are many factors that are associated with improvement in profitability of innovation activity with none of them individually showing a strong association but rather each demonstrates a certain degree of association. This provides further evidence to support the previous suggestion that innovation is complex and its performance is determined by a combination of many different factors. These results also offer additional empirical evidence to support the 'contingency' school of thought, which argues that the important determinants of innovation performance are highly context dependent (Porter, 1990; Calvert et al., 1996) and was reinforced by the fact that some factors identified in the literature did not have any association with satisfaction with improvement in profitability. This shows that whereas there may be general recipes for innovation management from which suggestions for effective 'management practices' can be derived, they must be customized to particular types of organizations and geographical contexts in order to increase the potential for improved financial performance (Souitaries, 1999; Tidd et al., 2001).

In view of the evidence of value creation both at the project level and at the aggregate level, and the evidence of careful planning and execution of certain specific innovation activities, it can be noted that many aspects of innovation activity are being effectively managed in the Ugandan fish and flower export sectors. In particular, some innovations were introduced to reinforce gains made through earlier innovations. For example, improvements in cool chain management systems were introduced in order to maintain product freshness and quality attained through improvements in the processing methods as was the case in both the fish and flower export sectors. This shows the importance of effective management of innovation and its contribution to improvement in financial value in agro-export industries.

This is not to say that there is not significant scope for improvements in the way that innovation is managed in these sectors. It is clear that some negative outcomes could have been avoided or at least their extent limited by a more cautious, experimental approach to the introduction of certain innovations, for example, intermediates grown in soils. But it is likely that important lessons have already been learnt in this regard in both industries. Perhaps more important is the challenge associated with increasing the penetration of the most demanding and lucrative markets such as retail. Although there are encouraging signs of progress there, it would seem that both of these industries have some way to go before they can meet the requirements of European retailers on a large scale. The implication here is that managers in the two sectors ought to think carefully and determine which set of capabilities or variables matter most in improving the potential for improved profitability in the industry.

6.3 Chapter conclusion

This study provides new evidence of a generally positive impact of innovation activity on the financial performance of firms in the Ugandan fish and flower sectors. This positive impact was by no means universal for all innovation activities. However, there is also evidence of some innovations which resulted in a deterioration of financial performance. In the main however, it appears that firms in these sectors have found combinations of product, process and market innovations which have enabled them to improve their financial performance over time. However, there appears to be significant and growing disparities in the ability of companies in these sectors to extract value from innovation activity, and these differences are associated with differences in specific management capabilities between firms. The management capabilities associated with superior performance at the company level are

different for the fish and flower sector, suggesting that the ability to extract value from innovation depends on context specific capabilities. Overall, there appears to be limited progress in both sectors in terms of penetration of premium markets, and an associated general weakness in resources to create and build retail brands. Nevertheless, there are indications of improved financial performance and improved capacity to manage innovation activities effectively. The next chapter presents limitations of the study and implications for future research, management practice and public policy.

Chapter 7: Limitations of the Study and Implications for Future Research, Management Practice and Public Policy

7.1 Introduction

This chapter presents a summary of limitations of the empirical study and the implications for future research, management practice and public policy. The rest of this chapter is structured as follows. Section 7.2 presents a summary of the main limitations of the study and implications for future research. Section 7.3 outlines the implications of the study for management practice. Section 7.4 outlines the implications of the study for public policy. Section 7.5 presents the overall conclusion of the study.

7.2 Limitations of the study and implications for future research

Although this study makes valuable and original contributions to method, management practice and public policy, it has some limitations which have implications for the appropriate interpretation of its results. A key limitation of this study is that it relates to specific industry context which necessarily limits generalizability of the findings. The results reported in chapters four and five served to highlight how different are the requirements for effective innovation management in the two sectors under study. A deep understanding of the industry context is vital for identifying appropriate innovation activities and managing them effectively. Therefore, there is no expectation that the conclusion of this study regarding the management practices which explain the performance disparities in either the fish or flower industries in Uganda would necessarily be relevant to other industries or country environment. That notwithstanding, there is scope to apply the methodology developed here in future studies of innovation in other agro-commodity export sectors in Uganda and other countries operating under similar socio-economic contexts. Another limitation of this study relates to short periods under study, 2002-2004 for the fish sector and 2001-2004 for the flower sector. Indeed these time periods are relatively short to capture all of the recent major changes in these sectors and neither are they sufficiently long to capture the longer-term financial impact of each of the innovations which were examined. Thus, the results of this study should be interpreted with care.

An additional limitation of this study relates to accuracy of the estimates of operating profits derived from the financial models. It was noted that while great care was taken to obtain reliable data, in certain cases it was necessary to rely on secondary data as adequate primary

data was not available. This meant that some of the data in the financial models was not as fine-grained as would be ideal. For this reason, the precision in financial models is limited to some extent by the quality of the available data. Nevertheless, it is believed that the financial models provide a rich and useful picture of the profitability impact of specific innovation activities. This view is corroborated by expert industry respondents. If industry players in these two or indeed other agro-commodity industries could be convinced of the usefulness of models to estimate the financial benefits of innovation at the project level, and could be persuaded under suitable non-disclosure agreement to share project level innovation data, it might be possible to conduct more fine-grained and precise analysis of the financial returns to innovation across different projects, companies and industries, and the management practices associated with superior innovation performance. This would seem to offer a promising avenue for future research. The outcome of this study therefore has implications for future research.

An overall finding of this study is that while effective innovation management on average leads to firm value creation and financial sustainability, the lines of business that are associated with the highest profitability in one period change over time, thus confirming the need for and potential benefits to be gained from innovation. It is also shown that factors that determine profitability from innovation activity vary from one industry to another depending on context. There is therefore need for additional studies to explore and test this finding in other related industries. There is also need for further application of the concept of operating configuration to collect detailed revenue and cost data in research on innovation. In addition, the use of data on satisfaction levels with profitability appears to be useful in providing insights on profitability differences between firms, especially in contexts where it is difficult to obtain reliable data from firms on their actual profit levels. This can also be extended to other future studies on innovation management in other industry or geographical contexts in SSA countries in order to test for its validity. In particular, similar studies could be carried out in other countries with industries operating under similar conditions for example Kenya, Tanzania and Ethiopia. In this respect, the technique developed in this study could be used to evaluate the financial benefits to innovation and hence also the sustainability of innovation activity in similar sectors in those countries. This study therefore contributes significantly to methodological development in the field of innovation management and value creation in SSA countries.

7.3 Implications for management practice

This study provides insights on how managers in agro-commodity sectors can adopt an analytical approach to the management of innovation activities. In particular, the study suggests that careful analysis, testing and monitoring of the profitability of each different line of business can be a useful guide to innovation choices. The implications of this study for management can therefore be categorized into:

1. Given the clear evidence from this study that innovation has the potential to both create and destroy value, it should serve to emphasize once again the importance of practitioners formulating appropriate responses. An obvious example is the value of conducting small experiments in order to evaluate the value potential of an innovation. It appears that in the case of the flower industry, financial losses on failed innovations could potentially have been avoided or at least significantly reduced had there been more thorough experimentation.
2. In view of the evidence that the relative attractiveness of different operating configurations is likely to change overtime, there would appear to be a good case for considering greater diversification in terms of distinctive lines of business, as a means to spreading financial risk. With greater diversification, certain kinds of agro-commodity producers may have greater flexibility to shift their production away from product lines for which returns are becoming poorer and into lines for which returns are improving.
3. It is important to note, however, that any such decisions must be informed by careful, on-going monitoring and analysis of the relative returns on different operating configurations. Good innovation decisions depend crucially on the quality of information available to the decision makers. It should be noted that detailed and accurate information on the relative profitability of different lines of business cannot be assumed, even in companies with relatively sophisticated accounting practices. Accounting practice does not prescribe that profitability is accurately determined for every line of business (Drury, 1990). For this reason, many companies continue to assess performance at the overall organizational level. This was found to be the case in many companies in the fish and flower sectors.

Based on the implications to management practice pointed out above, there is need for the managers to develop firm-level capabilities. Managers should therefore give priority to the development of appropriate value-enhancing capabilities in the critical areas of product

development, production processes, and marketing practices. This can be achieved through continuous learning with a focus on the development of technical, marketing and innovation project management skills. These skills are needed to adopt and successfully implement new technologies and approaches to export marketing. This to a large extent can help in improving the potential for better realization of value from innovation activities.

These exporters should also consider focusing on specific premium markets, especially retail market channels in which there are opportunities to differentiate and position products cost-effectively based on product origin, production method, attached services, value added processing and other customer valued quality features. This competitive approach would be adopted where there is a demand for variety and quality among international fish and flower buyers as observed in earlier studies such as Ibeh et al. (2005).

As indicated earlier, managers need to be aware of the nature of strategies and decisions that should be taken to enhance value creation from innovation activities. They also need skills in resource management particularly how to effectively allocate those resources to the different innovation projects so as to optimize the utilization of the scarce resources. The findings of this study therefore offer a set of important lessons for the managers of companies engaged in agricultural commodity exports whose aim is to improve financial returns to their innovation efforts. Among the lessons that managers can draw from this study is with regard to the bundle of value enhancing capabilities and practices needed to become preferred suppliers to the retailers in Europe. These capabilities include development of appropriate products, production processes and cost-effective branding and product promotion. Thus, results of this study give insight to managers on which capabilities to emphasize in order to be able to undertake more advanced value addition and improve the potential for value creation from innovation activity. The results of the study also give managers the tools to evaluate the financial impact of innovation activity. These are useful in developing strategies for managing risks in innovation projects.

7.4 Implications for public policy

The present study has provided insights regarding the complex relationship between innovation activity and firm profitability. This gives opportunity for policy makers (especially Ugandan practice) to compare the theorized benefits of stimulated innovation and upgrading practices with the results from firm-level innovation activity.

Based on the empirical evidence from this study, public policy should be focused on reducing the risks to innovation activity and enhancing the returns to innovation activity. A primary concern of policy, therefore, should be to encourage broad recognition of the risks associated with innovation, the need for careful experimentation, assistance with cost-effective experimentation at the industry level and the importance of dissemination of information on good management practice in innovation. This implies that public research bodies could play a valuable role in supporting thorough experimentation of new innovations in order to help to reduce the risk associated with innovation in agro-commodity industries. In addition, efforts must be taken to facilitate the dissemination of the new technologies to the companies through a well-developed and coordinated extension service. This could also involve training of technical staff in the companies.

Another way in which the state can reduce the risks associated with innovation is to intervene when complex innovations are required that are likely to be beyond the resources of individual companies and which may require the coordinated effort of many companies. An example is the development of the cold chain company Fresh Handling Limited that was involved in the effective coordination of large-scale innovation, involving as it did consultation with different players in several industries, including fish and cut flowers. In this respect support could take the form of initial seed capital for starting up such a company. Perhaps the greatest challenge both for these industries and for government will be to find ways of overcoming the challenge of launching and building effective retail brands to support penetration of premium export markets. Given the limited resources of individual firms, there are good reasons for thinking that this challenge will require careful coordination and hence a role for government.

Additional policy programs can also take the form of incentives for value addition in form of tax rebates, and policies that promote networking and learning through the development of sector associations. Further to that, other policy areas include improvement in infrastructure so as to complement the efforts of the companies, for example extending road network and electricity to remote high altitude areas in order to provide incentives for the production of large bud flowers that may be targeted at the retail markets in Europe.

7.5 Overall conclusion

This study has shown that careful and effective management of innovation activity can lead to improvement in the financial performance of a company. However, this can only be achieved through a careful alignment of different innovations and effective risk management based on assessment of specific industry contexts. The results of this study have implications for method, management practice and public policy. In particular, the methodology developed for this study shows promise for future application in similar innovation studies. The study has also highlighted the importance for managers to develop technological, marketing and coordination capabilities that can support the transition of the industry to higher value adding activities. Further to that, it has highlighted the role that government research institutions can play in helping the exporters overcome risks to innovation through careful experimentation and the dissemination of best practice innovation risk management practices. This study therefore provides insights on the methodology for assessing innovation profitability and the need for coordinated roles of managers and public sector institutions in helping the companies develop capabilities needed to improve the potential for creating value from innovation and hence push the industries forward on a sustainable basis.

References

Adams, R., Bessant, J. & Phelp, R. (2006), 'Innovation Management Measurement: A Review', *International Journal of Management Reviews*, 8(1): 21-47.

ADC/IDEA (1998b), 'Performance of Rose Varieties Grown Commercially in Uganda 1993-98'. Evaluation Report 9/98, Kampala: ADC/IDEA.

Adler, A., Everett, A.M. & Waldron, M. (2000), 'Advanced Management Accounting Techniques in Manufacturing: Utilization, Benefits and Barriers to Implementation', *Accounting Forum*, 7(2): 32-41.

Afuah, A. (1998), *Innovation Management: Strategies, Implementation, and Profits*. New York: Oxford University Press.

Aksoy, S. & Kaynak, E. (1994), 'Export Behaviour of Fresh Produce Marketers: Towards a Co-ordination with General Theory of Exporting', *International Marketing Review*, 11(2): 16-32.

Alexander, S.S. (1962), revised by Solomons, D. 'Income measurement in a dynamic economy'. In Baxter, W.T. and Davidson, S. (eds.), *Studies in Accounting Theory*, Sweet and Maxwell,139.

Antonelli, C. & Calderini, M. (1999), The dynamics of localized technology change. In Gambardella, A. & Marleba, F. (eds.), *The organization of Economic Innovation in Europe*, New York, NY: Cambridge University Press, 158-76.

Ary, D., Jacobs, L. C., Razavieh, A. & Sorenson, C. (2007), *Introduction to research in education* (7th ed.). Belmont, CA: Wadsworth.

Asea, P.K. & Kaija, D. (2000), *Impact on the flower industry in Uganda. Geneva*. ILO. Working Paper WP 148, 2000.

Atuahene-Gima, K. (1995), 'An Exploratory Analysis of the Impact of Market Orientation on New Product Performance: A Contingency Approach', *Journal of Product Innovation Management,* 12(4): 275-293.

Atuahene-Gima, K. (1996), 'Market orientation and innovation', *Journal of Business Research*, 35(2): 93-103.

Avermaete, T., Viaene, J., Morgan., E.J. & Crawford, N. (2003), 'Determinants of innovation in small food firms', *European Journal of Innovation Management*, 6(1): 8-17.

Avermaete, T., Viaene, J., Morgan., E.J., Pitts, E., Crawford, N. & Mahon, D. (2004), 'Determinants of product and process innovation in small food manufacturing firms', *Trends in Food Science and Technology*, 15: 474-483.

Bambona, A. (2002), Marketing Opportunities of Ugandan Nile Perch (*Lates Niloticus*) in the EU. Final Project Report, United Nations University (UNU) Fisheries Training Program.

Bahiigwa, G. & Keizire (2003), 'Significance of fisheries to the economy'. A document to support the Poverty Eradication Action Plan (PEAP), Environment and Natural Resources Sector Working Group, Kampala.

Bard, J.F., Balachandra, R. & Kaufmann, P.E. (1988), 'An interactive approach to R&D project selection and termination', *IEEE Transactions on Engineering Management EM*-35: 139–146.

Barney, J.B. (1991), 'Firm resources and sustained competitive advantages', *Journal of Management*, 17(1): 99-120.

Baiyegunhi, L.J.S. & Fraser, G.C.G. (2009), 'Profitability in Sorghum Production in three Villages of Kaduna State Nigeria', *Journal of Applied Science Research,* 5(10): 1685-1691.

Batra, G. & Mahmood, S. (2001), 'Direct Support to Private Firms: Evidence on Effectiveness', Washington D.C.: Private Sector Advisory Services, The World Bank.
Bessant, J. & Francis, D. (1997), 'Implementing the new product development process', *Technovation*, 17(4): 189-197.
Bessant, J. (2003), *High Involvement Innovation: Building and Sustaining Competitive Advantage through Continuous Change*. Chichester: John Wiley.
Bettis, R. & Hitt, M. (1995), 'The new competitive landscape', *Strategic Management Journal*, 16: 7-19.
Biloslavo, R. (2005), 'Use of the knowledge management framework as a tool for innovation capability audit', *International Journal of Innovation and Learning*, 2(4): 402-424.
Birkinshaw, J., Hamel, G. & Mol, M.J. (2008), 'Management Innovation', *Academy of Management Review*, 33(4): 825-845.
Biggs, T. (2007), 'Assessing Export Supply Constraints: Methodology, Data and Measurement', African Economic Research Consortium, Available at http://www.aercafrica.org.
Biggs, T., Shah, M. & Srivastava, P. (1995b), *Technological Capabilities and Learning in African Enterprises*, World Bank Technical Paper No. 288, Washington D.C. The World Bank.
Biggs, T., and Srivastava, P. (1996), *Structural Aspects of Manufacturing in sub-Saharan Africa*, World Bank Discussion Paper No. 346, Washington D.C. The World Bank.
Bigsten, A., Collier, P., Dercun, S., Fafchamps, M., Ganthier, B., Gunning, J.W., Oduro, A., Oostendorp, R., Pattillo, C., Soderbom, M., Teal, F. & Zenfack, A. (2004), 'Do African Manufacturing Firms Learn from Exporting?', *Journal of Development Studies* 40 (3): 115-171.
Bigsten, A. & Soderbom, M. (2006), What have we Learnt from a Decade of Manufacturing Enterprise Surveys in Africa?" World Bank Research Observer. 21(2): 241-265.
Boag, D. A. & Rinholm, B.L. (1989), 'New Product Management Practices of Small High Technology Firms', *Journal of Product Innovation Management, 6*(2): 109-122.
Bonaglia, F. & Fukasaku, K. (2003), Export diversification in low-income countries: an international challenge after Doha, OECD Development Centre Technical Papers, 209.
Borch, O.J. & Forsman, S. (2000), *The competitive tools and capabilities of micro firms in the Nordic food sector: A comparative Study*. Nordland Research Institute of Bodø and Agricultural Economic Research Institute of Helsinki.
Boudouropoulos, I.D. & Arvanitoyannis, I.S. (2000), 'Potential and perspectives for application of environmental management system (EMS) and ISO 14000 to food industries', *Food Review International*, 16(2): 177-237.
Bowman, C. & Ambrosini, V. (2000), 'Value creation versus value capture: towards a coherent definition of value in strategy', *British Journal of Management*, 11: 1-15.
Brooks, J. & Lucatelli, S. (2004), International competitiveness of the A-B-C agro-food sector. Chapter 4 in Trade and Competitiveness in Argentina, Brazil and Chile: Not as easy as A-B-C, Paris: OECD.
Brown, S. L. & Eisenhardt, K.M. (1995), 'Product development: past research, present findings, and future directions', *Academy of Management Review*, 20(2): 343-

378.
Brown, S.L. & Eisenhardt, K.M. (1997), 'The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations', *Administrative Science Quarterly,* 42: 1-34.
Brusco, S. (1982), 'The Emilian Model: Productive Decentralization and Social Integration', *Cambridge Journal of Economics*, 6: 167-184.
Burgelman, R. & Rosenbloom, R. (1989), 'Technology strategy: an evolutionary process perspective', *Research on Technological Innovation, Management and Policy*, 4: 1-23.
Bughin, J. & Jacques, J.M. (1994), 'Managerial efficiency and the Schumpeterian link between size, market structure and innovation revisited', *Research Policy*, 23(6): 653-659.
Bykowski, P. & Dutkiewicz, D. (1996), Freshwater fish processing and equipment in small plants, FAO Fisheries Circular. No. 905. Rome, FAO. 59p.
Calantone, R.J. & Di Benedetto, C.A. (1988), 'An integrative model of the new product development process: an empirical validation', *Journal of Product Innovation Management*, 5(3): 201–215.
Caloghirou, Y., Kaskelli, I. & Tsakanikas, A. (2004), 'Internal capabilities and external knowledge sources: complements or substitutes for innovative performance?', *Technovation,* 24: 29-39.
Calvert, J., Ibarra, C., Patel, P. & Pavitt, K. (1996), Innovation outputs in European industry. Paper presented in the conference. Innovation Measurement and Policies, Luxembourg.
Cameron, A.C. & Trivedi, P.K. (2005), *Micro-econometrics: Methods and Applications*. New York: Cambridge University Press.
Chakravorti, B. (2004), 'The new rules for bringing innovations to market', *Harvard Business Review*, 82: 58-67.
Charlet, B. & Henneberry, S.R. (1992), *A profile of food consumption trends and changing market institutions*. Available at http://osuextra.okstate.edu/pdfs/F-511web.pdf.
Chandler. G.N., Keller, C. & Lyon, D.W. (2000), 'Unraveling the determinants and consequences of an innovation supportive organization culture', *Journal of Business Venturing,* 8: 391-408.
Chartered Institute of Management Accountants (1984), Management Accounting: Official Terminology, 1984.
Chiesa, V., Coughlan, P. & Voss, C.A. (1996), 'Development of a Technical Innovation Audit', *Journal of Product Innovation Management*, 13: 105-136.
Christensen, C.M. (1997), *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Boston MA: Harvard Business School Press.
Christensen, C.M. & Bower, J.L. (1996), 'Customer power, strategic investment, and failure of leading firms', *Strategic Management Journal*, 17(3): 197-218.
Chryssoichoidis, G.M. (1996), 'Greek food manufacturing exporters: an exploratory investigation into major aspects of their export strategy', *Journal of International Food and Agribusiness Marketing*, 8: 23-47.
Cebon, P. & Newton, P. (1999), Innovation in firms: towards a framework for indicator development. Melbourne Business School Working Paper 99-9.
Ciborra, C. (1991), Alliances as learning experiences: cooperation, competition and change in high-tech industries. In Mytelka, L. (ed.), *Strategic Partnerships and the World Economy*. Pinter Publishers.
Clark, N. G. (1987), 'Similarities and Differences between Scientific and Technological

Paradigms', *Futures*, 19(1): 26-42.
Clark, K.B. & Fujimoto, T. (1991), *Product Development Performance: Strategy, Organization and Management in the World of Auto Industry*, Boston, MA: Harvard Business School Press.
Clarysse, B., Van Dierdonck, R., Gabriels, W. & Uytterhaegen, M. (1998). Strategische verschillen tussen innovative KMOs: een kijkje in de zwarte doos. Publication N. 5, IWT, Brussels.
Coe, N.M., Dicken, P. & Hess, M. (2008), 'Global production networks: Realizing the potential', *Journal of Economic Geography*, 8 (3): 271-293.
Cohen, W.M. & Levinthal, D.A. (1990), 'Absorptive Capacity: A New Perspective on Learning and Innovation', *Administrative Science Quarterly*, 35(1): 128-152.
Collinson, C.U., Kleih, D., Burnett, A., Muganga, J., Jagwe, & Ferries R.S.B. (2005), Transaction cost analysis for selected crops with export potential in Uganda, prepared for the Plan for the Modernization of Agriculture by the Natural Resource Institute, UK and the International Institute for Tropical Agriculture, Nigeria. ASARECA/IITA Monograph 6, IITA, Ibadan Nigeria. 168pp.
Collis, D., (1994), 'How valuable are organizational capabilities?' *Strategic Management Journal*, 15: 143-152.
Conner, K.R. (1991), 'A Historical Comparison of Resource-Based Theory and Five Schools of Thought within Industrial Organization Economics: Do we have a New Theory of the Firm', *Journal of Management*, 17(1): 121-154.
Cooper, R.G. (1983), 'The impact of new product strategies', *Journal of Industrial Marketing Management*, 12: 243-256.
Cooper, R.G. (1984a), 'New Product Strategies: What distinguishes the top performers?', *Journal of Product Innovation Management*, 2: 151-164.
Cooper, R.G. (1984b), 'How new product strategies impact on performance', *Journal of Product Innovation Management,* 2: 4-18.
Cooper, R.G. (1991), 'New product processes at leading industrial firms', *Industrial Marketing Management*, 20(2): 137-147.
Cooper, R.G. (1994), 'Perspective third-generation new product processes', *Journal of Product Innovation Management*, 11(1): 3-14.
Cooper, R.G. (2006), 'Managing Technology Development Projects', *Research Technology Management*, 49(6): 23-31.
Cooper, R.G. & de Brentani, U. (1991), 'New industrial financial services: What distinguishes the winners', *Journal of Product Innovation Management*, 8: 75-90.
Cooper, R.G., Edgett, S.J. & Kleinschmidt, E.J. (1999), 'New product portfolio management: practices and performance,' *The Journal of Product Innovation Management*, 16(4): 333–351.
Cooper, R.G., Edgett, S. & Kleinschmidt E.J. (2001), 'Portfolio management for new product development: results of an industry practices study', *R&D Management*, 31(4): 361-379.
Cooper, R.G. & Kleinschmidt E.J. (1987), 'New products: What separates winners from losers?' *Journal of Product Innovation Management*, 4: 169-184.
Cooper, R.G. & Kleinschmidt, E.J. (1993), 'Major New Products: What Distinguishes the Winners in the Chemical Industry?', *Journal of Product Innovation Management*, 10(2): 90-111.
Cooper, R.G. & Kleinschmidt, E.J. (1995), 'Performance Typologies of New Product

Projects', *Industrial Marketing Management*, 24: 439-456.
Cooper, R.G. & Kleinschmidt, E.J. (2007), 'Winning Business in Product Development: The Critical Success Factors', *Research Technology Management*, 50(3): 52-66.
Covin, J.G. & Miles, M.P. (1999), 'Corporate entrepreneurship and the pursuit of competitive advantage', *Entrepreneurship Theory and Practice*, 23(3): 47-63.
Craig, C.S. & Douglas, S.P. (1996), 'Developing Strategy for Global Markets: An Evolutionary Perspective', *Columbia Journal of World Business*, 1: 70-81.
Creswell, J.W. (1999). *Mixed-method research: Introduction and application*. In G.J. Cizek (ed.), *Handbook of educational policy*. San Diego, CA: Academic Press, 455-472.
Creswell, J.W. & Plano Clark, V.L. (2009), *Designing and Conducting Mixed Methods Research*, (2nd ed.). SAGE Publications.
Crick, D., Chaudhry, S. & Batstone, S. (2000), 'Revising the concentration versus spreading debate as a successful export growth strategy: the case of UK SMEs exporting agricultural-related products', *Entrepreneurship and Regional Development*, 12: 49-67.
Csaszar, F.A. & Siggelkow, N. (2010), 'How Much to Copy? Determinants of Effective Imitation Breadth', *Organization Science*, 21(3): 661-676.
Daft, R. (1992), *Organization theory and design*, St. Paul: West Publishing Company.
Danneels, E. & Kleinschmidt, E.J. (2001), 'Product innovativeness from the firm's perspective: Its dimensions and their relation with project selection and performance', *Product Innovation Management Journal,* 18(6): 357-373.
Damanpour, F. (1991), 'Organizational innovation: A meta-analysis of effects of determinants and moderators', *Academy of Management Journal*, 34(3): 555-590.
Damanpour, F. (1995), Is your creative organization innovative? In Ford, C. & Gioia, D. (eds.), *Creative action in organizations*. Thousand Oaks, CA: Sage, 125–131.
Datar, S., Jordan, C., Kekre, S., Rajiv, S. & Srinivasan, K. (1997), 'New Product Development Structures and Time-to-Market', *Management Science,* 43(4): 452-464.
Davenport, T.H. (1993), Process innovation: reengineering work through information technology, Ernst and Young.
Daviron, B. & Gibbon, P. (2002), 'Global Commodity Chains and African Export Agriculture', *Journal of Agrarian Change*, 2(2): 137-161.
Day, G.S. (1990), *Market Driven Strategy: Processes for Creating Value.* New-York, NY: Free Press.
Day, G.S. (1994), 'The Capabilities of Market-Driven Organizations', *Journal of Marketing,* 58: 37-52.
Dayasindhu, N. (2002), 'Embeddedness, knowledge transfer, industry clusters and global competitiveness: A case study of the Indian software industry', *Technovation*, 22(9): 551–560.
Denzin, N.K. (1994), The Art and Politics of Interpretation. In Denzin, N.K. & Lincoln, Y.S. (eds.), *Handbook of Qualitative Research*. Thousands Oak, Cal. SAGE Publication.
Diamantopoulos, A. (1999), 'Export performance measurement: reflective versus formative indicators', *International Marketing Review*, 16(6): 444-457.

Del Canto J.G. & Gonzalez I.S. (1999), 'A resource-based analysis of the factors determining a firm's R&D activities', *Research Policy*, 28: 891-905.
Dess, G.G. & Robinson, R.B. Jr. (1984), 'Measuring organizational performance in the absence of objective measures: The case of the privately-held firm and conglomerate business unit', *Strategic Management Journal,* 5: 265-273.
De Toni, A., Fillipinno, R. & Forza, C. (1992), 'Manufacturing strategy in global markets: An operations management model', *International Journal of Operations & Production Management*, 12(4): 7-18.
Diederen, P., van Meyl, H. & Wolters, A. (2000), Innovation in agriculture: innovators, early adopters, and laggards. Paper presented at the 24th International Conference of Agricultural Economists, Berlin.
Dijkstra, T. (2001), Export Diversification in Uganda: Developments in Non-Traditional Agricultural Exports. African Studies Centre-Netherlands, Working Paper 47/2001, pp. 13-37.
Diyamett, B. & Wangwe, S. (2006), Innovation indicators within sub-Saharan Africa: A Specific case of Tanzania. Chapter 12 in Blankley, W., Scerri, M. & Molotja, N. (eds.), *Measuring innovation in OECD and non-OECD countries*: Selected Seminar Papers.
Dolan, C., Humphrey, J. & Harris-Pascal, C. (1999), 'Horticulture commodity chains: the impact of the UK market on the African fresh vegetable industry', *IDS Working Paper 96.*
Dolan, C. & Humphrey, J. (2000), 'Governance and Trade in Fresh Vegetables: The Impact of the UK Supermarkets on the African Horticulture Industry', *Journal of Development Studies*, 37(2): 147-176.
Dolan, C. & Humphrey, J. (2004), 'Changing Governance Patterns in the Trade in Fresh Vegetables between Africa and the United Kingdom', *Environment and Planning*, 36(3): 491-509.
Dossi, G. (1988), 'Sources, procedures and microeconomic effects of innovation', *Journal of Economic Literature*, 36: 1126-1171.
Dollinger, M., Golden, P. & Saxton, T. (1997), 'The effect of reputation on the decision to joint venture,' *Strategic Management Journal*, 18: 127-140.
Doty, D.H. & Glick, W.H. (1998), 'Common Methods Bias: Does Common Methods Variance Really Bias Results?', *Organizational Research Methods*, 1(4): 374-406.
Dougherty, D. (1992), 'Interpretive barriers to successful product innovation in large firms', *Organization Science*, 3(2): 179-202.
Drake, M.P., Sekkab, N. & Jonash, R. (2006), 'Maximizing return on innovation investment', *Research Technology Management*, 49(6): 32-41.
Drucker, P.F. (1985), *Innovation and Entrepreneurship*. London: Heinemann.
Drucker, P.F. (1998), 'The Discipline of Innovation', *Harvard Business Review*, 76(6): 149-157.
Drury, C. (1990), *Managerial and Cost Accounting*, (2nd ed.). Pitman (Chapters 1 and 2).
Dyer, J.H. & Nobeoka, K. (2000), 'Creating and managing a high-performance knowledge sharing network: The Toyota case', *Strategic Management Journal*, 21: 345-367.
Dyer, J.H. & Singh, H. (1998), 'The relational view: cooperative strategy and sources of interorganisational competitive advantage', *Academy of Management Review,* 23: 660-679.
Dyerson, R. & Mueller, F.U. (1999), 'Learning, Teamwork and Appropriability: Managing Technological Change in the Department of Social Security,'

Journal of Management Studies, 36 (5): 629-652.
Edwards, T., Battiti, G. & Neely, A. (2004), 'Value creation and the UK economy: a review of strategic options', *International Journal of Management Review*, 5(3): 191-213.
Edwards, E.O. & Bell, P.W. (1961), *The Theory and Measurement of Business Income*, University of California Press.
Ekvall, G. (1996), 'Organizational Climate for Creativity and Innovation', *European Journal of Work and Organizational Psychology*, 5(1): 105-123.
Eriksson, K., Johanson, J., Majkgård, A. & Sharma, D. (1997), 'Experiential knowledge and cost in the internationalisation process,' *Journal of International Business Studies*, 28 (2): 337-360.
Ewert, J. & Henderson, J. (2004), How Globalisation and Competition Policy Inhibit Poverty Reduction: The Case of the South African Wine Industry (CRC Working Paper No. 107). Manchester: Centre on Regulation and Competition. Available at http://www.competitionregulation.org.uk/publications/working papers/WP107.pdf.
FAO (2006), FISH INFO, Market Study, FAO ROME.
Field, A. (2009), *Discovering Statistics using SPSS*, (3rd ed.). London: Sage Publications.
Fisher, I. (1969), Income and Capital. In Parker, R.H. & Harcourt, G.C. (eds.), *Readings in the Concept and Measurement of Income*, Cambridge University Press, 40.
Flick, U. (1998), *An introduction to qualitative research*. Thousand Oaks, CA: Sage.
Freeman, C. (1982), *The Economics of Industrial Innovation*. London: Frances, Pinter.
Freeman, C. (1987), *Technology and Economic Performance: Lessons from Japan*. London: Pinter.
Freeman, C. (1994), 'Critical survey: the economics of technical change', *Cambridge Journal of Economics*, 18: 463-514.
Freeman, C., Clark, J. & Soete, L. (1982), *Unemployment and Technical Innovation: a Study of Long Waves in Economic Development*, Frances Pinter.
Freeman, C. & Soete, L. (1997), *The Economics of Industrial Innovation and Technical Change*. London: Pinter Publishers.
Frick, J. R. & Grabka, M.M. (2005), 'Item-non-response on income questions in panel surveys: incidence, imputation, and the impact on inequality and mobility', *Allgemeines Statistisches Archiv*, 89: 49-61.
Galende, J. & Manuel de la Fuente, J. (2003), 'Internal factors determining a firm's innovation behavior', *Research Policy*, 32: 715-736.
Galbrath, J. (2005), 'Which resources matter the most to firm success? An exploratory study of resource-based theory', *Technovation*, 25(9): 979-987.
Gatignon, H. & Robertson, T.S. (1985), 'A propositional inventory for new diffusion research', *Journal of Consumer Research*, 11(3): 849-866.
Gatignon, H. & Xuereb, J-M. (1997), 'Strategic Orientation of the Firm and New Product Performance', *Journal of Marketing Research*, 34(1): 77-90.
Gedajlovic, E. & Shapiro, D. (2002), 'Ownership Structure and Firm Profitability in Japan', *Academy of Management Journal,* 45(3):565-575.
Geroski, P. (1994), *Market Structure, Corporate Performance, and Innovative Activity*. Oxford : Oxford University Press.
Geroski, P., Machin, S. & Van Reenen, J. (1993), 'The profitability of innovating firms', *RAND Journal of Economics*, 24(2): 198-211.
Gereffi, G. (1994), 'The organisation of buyer-driven global commodity chains: how US retailers shape overseas production networks'. In Gereffi, G. &

Korzeniewicz, M. (eds.) *Commodity Chains and Global Capitalism*. Westport, CT: Prager, 95–122.
Ghemawat, P. (1991), *Commitment: The Dynamic of Strategy*. New York: Free Press.
Gibbon, P. (1997), *Of Saviors and Punks: The political economy of the Nile perch marketing chain in Tanzania*. Centre for Development Research (CDR) Working Paper No. 97.3 Copenhagen, Denmark.
Gibbon, P. (2001), 'Upgrading Primary Production: A global Commodity Chain Approach', *World Development*, 29(2): 345-363.
Gibbon, P. (2005), *Trading down? Africa, value-chains and global capitalism*. Philadelphia : Temple University Press.
Gibbon, P., Lazaro, E. & Ponte, S. (eds.) (2010), *Global Agro-Food Trade and Standards: Challenges for Africa*, New York: Palgrave Macmillan.
Giuliani, E., Pietrobelli, C. & Rabellotti, R. (2005), 'Upgrading in Global Value Chains: Lessons from Latin American Clusters', *World Development*, 33(4): 549-573.
Glautier, M.W.E. & Underdown, B. (1990), *Accounting Theory and Practice* (3rd ed.). Pitman (Chapters 3, 17 and 18).
Glazer, R. (1991), 'Marketing in an Information-Intensive Environment: Strategic Implications of Knowledge as an Asset', *Journal of Marketing*, 55: 1-19.
Godin, B. (2002a), "The Rise of Innovation Survey: Measuring a Fuzzy Concept." Canadian Science and Innovation Indicators Consortium, *Project on the History and Sociology of S&T Statistics, Paper no. 16*, Communication presented at the International Conference in Honor of K. Pavitt "What we know about Innovation", 13-15 November 2003, SPRU, University of Sussex, Brighton (UK). Downloadable from www.csiic.ca.
Goedhuys, M. & Mytelka, L.K. (2005), 'Innovation Surveys: Implications for Data Analysis', UNU/Intech Technology Policy Briefs, 4(1), 12.
Goffin, K. & Mitchell, R. (2005), *Innovation management: Strategy and implementation using the Pentathlon Framework (2nd ed.)*. Basingstoke: Palgrave Macmillan.
Goffin, K. & Pfeiffer, R. (1999), *Innovation Management in UK and German Manufacturing Companies*. London: Anglo-German Foundation for the Study of Industrial Society.
Gorard, S. & Taylor, C. (2004), *Combining methods in educational and social research*. Buckingham, UK: Open University Press.
Gourville, J. (2005), 'The Curse of Innovation: Why New Products Fail', Report 05-117, Boston, MA: Marketing Science Institute.
Government of Uganda, Ministry of Finance, Planning and Economic Development (MFPED) 2004: Poverty Eradication Action Plan 2004/5-2007/8. Available at: http://chet.org.za/manual/media/files/chet_hernana_docs/Uganda/National/Uganda%20Poverty%20Eradication%20Action%20Plan%202004-2008.pdf.
Government of Uganda, Ministry of Finance, Planning and Economic Development (MFPED) 2005: *Background to the Budget* 2005/2006.
Government of Uganda, Ministry of Tourism, Trade and Industry (MTTI) 2006: UGANDA Diagnostic Trade Integration Study-Report, Volume II p 25. Available at: http://www.mtti.go.ug/docs/Volume%20II%20November%202006.pdf
Grant, R.M. (1996), 'Prospering in dynamically-competitive environments: organizational capabilities as knowledge integration', *Organization Science*, 7(4): 375-387.
Grant, K.P., Cashman, W.M. & Christensen, D.S. (2006), 'Delivering Projects on Time',

Research Technology Management, 49(6): 52-58.
Green, J.C., Caracelli, V.J. & Graham, W.F. (1989), 'Toward a conceptual framework for mixed-method evaluation designs', *Educational Evaluation and Policy Analysis*, 11(3): 248-269.
Greenfield, H. & Southgate, D.A.T. (2003), *Food composition data: Production, Management and Use*. Food and Agricultural Organization of the United Nations (FAO), Rome: Italy.
Greenley, G.E. (1994), 'Strategic Planning and Company Performance: An Appraisal of the Empirical Evidence', *Scandinavian Journal of Management*, 10(4): 383-396.
Griffin, A. & Hauser, J.R. (1996), 'Integrating R&D and Marketing: A Review and Analysis of the Literature', *Journal of Product Innovation Management*, 13: 191-215.
Grunert, K.G. & Ottowitz, T. (1997), 'Neumarkt Lammsbrau: brewing beer for greens'. In Trail, B. & Grunert, K.G. (eds.), *Product and Process Innovation in the Food Industry.* London : Blackie Academic & Professional, 1-37.
Gursoy, G. & Aydogan, K. (2002), 'Equity Ownership Structure, Risk Taking, and Performance', *Emerging Markets, Finance and Trade*, 38(6): 6-25.
Hall, A.J. (2005), 'Capacity Development for Agricultural Biotechnology in Developing Countries: An innovation systems view of what it is and how to develop it', *Journal of International Development*, 19(5): 611-630.
Hamel, G. & Prahalad, C.K. (1994), *Competing For the Future*. Boston: Harvard Business School.
Handy, C. (1993), *Understanding Organizations*, (4th ed.). London: Penguin Books.
Hansen, J.A. (1999), *Technology Innovation Indicators: A Survey of Historical Development and Current Practice*, SRI.
Hansen, J.A. (2001), Technology, Innovation Indicator Surveys. In Jankowski, J.E., Link, A.N. & Vonortas, N.S. (eds.), *Strategic Research Partnerships*, Proceedings of an NSF Workshop, NSF 01-336, Washington DC.
Hansen, M.T. & Birkinshaw, J. (2007), 'The Innovation Value Chain', *Harvard Business Review*, 6: 1-13.
Hart, S., Webb, J.R. & Jones, M.V. (1994), 'Export Marketing Research and the Effect of Export Experience in Industrial SMEs,' *International Marketing Review,* 11(6): 4–22.
Hauptman, O. & Hirji, K. (1996), 'The influence of process concurrency on project outcomes in product development: an empirical study of cross-functional teams', IEEE *Transactions on Engineering Management*, 43(2): 153-164.
Helfat C. (1997), 'Know-how and asset complementarity and dynamic capability accumulation: the case of R&D', *Strategic Management Journal*, 18: 339-360.
Henderson, J., Dicken, P., Hess, M., Coe, N. & Wai, H. (2002), 'Global production networks and the analysis of economic development', *Review of International Political Economy*, 9: 436-464.
Henderson, R. M. & Cockburn, I. (1994), 'Measuring competence? Exploring firm effects in pharmaceutical research', *Strategic Management Journal*, 15: 63-84.
Henson, S. & Jeff, S. (2006), A Strategic Perspective on the Impact of Food Safety Standards on Developing Countries. *Paper presented at the International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006.*

Henson, S. & Mitullah, W. (2004), 'Kenyan Exports of Nile Perch: Impact of Food Safety Standards on an Export-Oriented Supply Chain', *World Bank Policy Research Working Paper No. 3349*, Washington, DC: World Bank.
Hicks, J.R. (1946), *Value and Capital*, (2nd ed.). Oxford: Oxford University Press, 172.
Hitt, M.A., Bierman, L., Shimizu, K. & Kochlar, R. (2001b), 'Direct and moderating effects of human capital on strategy and performance in professional service firms: a resource-based perspective', *Academy of Management Journal*, 44: 13-28.
Hoopes, D.G., Madsen, T.L. & Walker, G. (2003), Guest editor's introduction to a special issue: Why is there a resource-based view? Towards a theory of competitive heterogeneity, *Strategic Management Journal*, 24: 889-902.
Horngren, C.T. (1998), *Cost Accounting: A Managerial Emphasis*, (8th ed.). Prentice Hall (Chapters 1, 2 & 3).
Hughes, A. (2000), 'Retailers, knowledge and changing commodity networks: the case of the cut flower trade', *Geoforum*, 31: 175-190.
Hughes, D. (1996), 'Reversing market trends: the challenges for UK fresh fruit sector', *British Food Journal*, 98(9): 19-25.
Humphrey, J. & Schmitz, H. (1995), Principles of promoting clusters and networks of SMEs: Small and Medium Enterprise Programme. Discussion Paper No.1 UNIDO, Vienna: Austria.
Humphrey, J. (2004), Commodities, Diversification and Poverty. Paper presented at the FAO Symposium on the State of Agricultural Commodity Market Research, Rome, 15-16 December 2003.
Humphrey, J. & Schmitz, H. (2001), 'Governance in global value chains', IDS Bulletin, 32 (3).
Humphrey, J. & Memedovic, O. (2006), Global Value Chains in the Agrifood Sector, UNIDO Working Paper Series, Vienna, 2006.
Hunt, S.D. (1983), *Marketing Theory: the Philosophy of Marketing Science*. New York: Richard D. Irvin.
Iansiti, M. & West, J. (1997), 'Technology Integration: Turning Great Research into Great Products', *Harvard Business Review*, 75(3): 69-79.
Iarossi, G. (2006), *The Power of Survey Design: A User's Guide for Managing Surveys, Interpreting Results, and Influencing Respondents*. Washington DC: The World Bank.
Ibeh, K.I.N. (2003), 'On the internal drivers of export performance among Nigerian firms: empirical findings and implications', *Management Decisions*, 41(3): 217-225.
Ibeh, K.I.N., Ibrahim, E. & Panayides, P.M. (2006), 'International market success among smaller agri-food companies: Some case study evidence', *International Journal of Entrepreneurship Behavior and Research,* 12(2): 85-104.
Institute of Chartered Secretaries and Administrators (1998), *Financial Accounting, ICSA Study Text: Professional Stage 1 Paper*, (4th ed.). BPP Publishing, Chapter 1.
Jaffe, S. (1998), Exporting high value food commodities: Success stories from developing countries, World Bank Discussion Paper 198.
Jaffe, S. & Henson, S. (2004), Standards and Agro-Food Exports from Developing Countries: Rebalancing the Debate: *World Bank Policy Research Working Paper* 3348, June 2004.
Jaffe, S., & Masakure, O. (2005), 'Strategic use of private standards to enhance international competitiveness: vegetable exports from Kenya and elsewhere', *Food Policy*, 30(3): 316-333.

Jaworski, B. J. & Kohli, A.K. (1993), 'Market Orientation: Antecedents and Consequences', *Journal of Marketing*, 57: 53-70.
Johnson, R. B., & Onwuegbuzie, A. (2004), 'Mixed methods research: A research paradigm whose time has come', *Educational Researcher*, 33(7): 14-26.
Johnson, R. B. & Turner, L. (2003), Data Collection strategies in mixed methods research. In Tashakkori, A. & Teddlie, C. (eds.), *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage, 297-320.
Josupeit, H. (2006), *The Market for Nile Perch*, FAO GLOBEFISH Research Programme, Vol.84 Rome: FAO.
Kaplinsky, R. (2004), Competition policy and the global coffee and cocoa value Chains. Paper prepared for UNCTAD, May, Institute of Development Studies, University of Sussex, and Centre for Research in Innovation Management, University of Brighton.
Kaplinsky, R. & Fitter, R. (2001a) 'Who Gains from Product Rents as The Coffee Market Becomes More Differentiated? A Value Chain Analysis', IDS Bulletin Paper, Institute of Development Studies: Sussex.
Kaplinsky, R. & Fitter, R. (2004), 'Technology and globalization: who gains when commodities are de-commodified?' *Int. J. Technology and Globalization*, 1(1): 5-28.
Kaplinsky, R. (2006), 'How can agricultural commodity producers appropriate a greater share of the value chain income'. In Sarris, A. & Hallam, D. (eds.), *Agricultural Commodity Markets and Trade: New Approaches to Analyzing Market Structures and Instability.* Cheltenham: Edward Elgar and FAO.
Kaplinsky, R. & Morris, M. (2002), *Handbook for value chain research*, IDRC. Available at http://www.ids.ac.uk/ids/global/pdfs/VchNov01.pdf (accessed: November 01 2007).
Kaplinsky, R. & Morris, M. (2006), The Structure of Supply Chains and their Implications for Export Supply. Paper prepared for the African Economic Research Consortium.
Kaplinsky, R., Morris, M. & Readman, J. (2002). 'The Globalization of Product Markets and Immiserising Growth: Lessons From the South African Furniture Industry', *World Development*, 30(7): 1159-1177.
Kaplinsky, R. & Readman, J. (2005), 'Globalization and upgrading: what can (and cannot) be learnt from international trade statistics in the wood furniture sector?' *Industrial and Corporate Change,* 14(4): 679-703.
Kanter, R. (1988), *When Giants Learn to Dance,* Boston MA: Harvard Business School Press.
Keizire, B.B. (2004), Implications of Liberalization of Fish Trade for Developing Countries. A Case Study of Uganda, Project PR 26109. Food and Agriculture Organization (FAO) of United Nations, Rome July 2004.
Kiggundu, R. (2004a). Learning to Close Deficiencies in Local Innovation System: Case Studies of Fisheries in Uganda. Paper presented to a regional conference in Tanzania on Innovation Systems and Innovative Clusters in Africa, Bagamoyo Tanzania.
Kiggundu, R. (2006), Technological Change in Uganda's Fishery Exports. In Chandra, V. (ed.), *Technology, Adaptation and Exports*. The International Bank for Reconstruction and Development / Washington, DC: The World Bank.
Kim, W.C. & Mauborgne, R. (1997), 'Value innovation: the strategic logic of high growth', *Harvard Business Review*, 75 (1): 103-112.

Kirk, J. & Miller, M.L. (1986), *Reliability and Validity in Qualitative Research*. Qualitative Research Methods, Vol. 1. Beverly Hills, Cal: SAGE Publications.

Kjollerstrom, M. Dallto, K. (2007), Natural resource-based industries: Prospects for Africa's Agriculture. Chapter 2.1 in …. (eds) *Industrial Development for the 21st, Century: Sustainable Development Perspectives*, United Nations, DESA 119-181.

Kline, S. & Rosenberg, N. (1986), An Overview of Innovation. In Landau, R. & Rosenberg, N. (eds.), *The Positive Sum Strategy: Harnessing Technology for Economic Growth*, Washington, D.C.: National Academic Press, 275-305.

Kogut, B. (1988), 'Joint ventures: theoretical and empirical perspectives', *Strategic Management Journal*, 9(4): 319-332.

Kogut, B. & Zander, U. (1992), 'Knowledge of the firm, combinative capabilities, and the replication of technology', *Organization Science,* 3: 383-397.

Kohli, A.K. & Jaworski, B.J. (1990), 'Market orientation: The Construct, Research Propositions and Managerial Applications', *Journal of Marketing*, 54 (2): 1-18.

Kotler, P. (1991), *Marketing Management: Analysis, Planning, Implementation and Control*, London: Prentice Hall.

Kotler, P. & Amstrong, G. (2001), *Principles of marketing* (9th ed.). New Jersey: Prentice Hall.

Lall, S. (1992), 'Technological capabilities and industrialization', *World Development*, 20 (2): 165-186.

Lall, S. (2001), *Competitiveness, Technology and Skills*. Edward Elgar, Cheltenham.

Lall, S. & Pietrobelli, C. (2002), *Failing to Compete: Technological Development and Technology Systems in Africa.* Edward Elgar Publishing.

Lall, S., Weiss, J. & Zhang, J. (2006), 'The 'sophistication' of exports: a new trade Measure', *World Development*, 34(2): 222-237.

Lane, P.J. & Lubatkin, M. (1998), 'Relative absorptive capacity and interorganisational learning', *Strategic Management Journal*, 19(5): 461-477.

Leake, L.L. (2000), 'Good listener: international customers served by insightful pork integrator', *Agri Marketing*, 38(7): 78-81.

Lee, C., Lee, K. & Pennings J.M. (2001), 'Internal capabilities, external networks, and performance: A study on technology-based ventures', *Strategic Management Journal,* 22: 615-640.

Lepak, D.P., Smith, K.G. & Taylor, M.S. (2007), "Value creation and value capture: A multilevel perspective', *Academy of Management Review*, 32(1): 180-194.

Leonard-Barton, D. (1992), 'Core capabilities and core rigidities: a paradox in managing new product development', *Strategic Management Journal*, (13): 111-125.

Li, T. & Calantone, R.J. (1998), 'The Impact of Market Knowledge Competence on New Product Advantage: Conceptualization and Empirical Examination', *Journal of Marketing*, 62: 13-29.

Likert, R. (1932), *A Technique for the Measurement of Attitudes*, New York: Pergamon Press.

Lin, C. & Chen, M. (2007), 'Does innovation lead to performance? An empirical study of SMEs in Taiwan', *Management Research News*, 30(2): 115-132.

Lundvall, B.-A. (1992), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, London: Frances Printer.

Lynn G.S., Skov, R.B. & Abel, K.D. (1999), 'Practices that support team learning and

their impact on speed to market and new product success', *Journal of Product Innovation Management*, 16: 439-454.
Machauer, A. & Weber, M. (1999), 'Bank behavior based on internal credit ratings of borrowers', *Journal of Banking and Finance*, 22(10-11): 1355-1383.
Majaro, S. (1988), *The Creative Gap – Managing Ideas for Profit*. London UK: Longman.
Maksimovic, V. (1990), 'Product market imperfections and loan commitments', *The Journal of Finance*, 45(5): 1641-1653.
Malerba, F. (2002), 'Sectoral Systems of Innovation and Production', *Research Policy,* 31: 247-264.
Malerba, F. & Orsenigo, L. (1995), 'Schumpeterian patterns of innovation', *Cambridge Journal of Economics*, 19(1): 47-65.
Mani, S. & Romijn, H. (2004a), *Innovation, learning and technological dynamism of developing countries*. United Nations University Press.
Mansfield, E. (1981), 'How economists see R&D', *Harvard Business Review*, 11(12): 98-106.
Mani, S. (2004), 'Government, innovation and technology policy: an international comparative analysis', *International Journal of Technology Globalization*, 1(1): 29-44.
Markusen, A. (1996), 'Sticky Places in Slippery Space: A Typology of Industrial Districts', *Economic Geography*, 72: 293-313.
Marshall, A. (1920), *Principles of Economics* (8th ed.). London: Macmillan.
Maskell, P. (2001), 'Towards a Knowledge-based Theory of the Geographical Cluster', *Industrial and Corporate Change,* 10(4): 919-941.
Mason, J. (2002), *Qualitative Researching* (2nd ed.). London: SAGE Publications.
Mather, C. (1999), 'Agro-commodity chains, market power and territory: re-regulating South African citrus exports in the 1990s', *Geoforum*, 30(1): 61-70.
Mauget, R. & Declerck, F. (1996), 'Structures, strategies and performance of EC agricultural cooperatives', *Agribusiness*, 12(3): 265-275.
Mayer, J., Butkevicius, A. & Kadri, A. (2002), Dynamic products in World Exports, UNCTAD Discussion Paper No.159.
Mayring, P. (2007), Introduction: Arguments for mixed methodology. In Mayring, P., Huber, G.L., Gurtler, L. & Kiegelmann, M. (eds.), *Mixed methods in psychological research*, Rotterdam/Taipei: Sense Publishers, 1-4.
McGee, J. & Segal-Horn, S. (1992), Will there be a European food processing industry? In Young, S. & Hamill, J. (eds.), *Europe and the Multinationals*, Aldershot: Edward Elgar, 21-46.
McWilliams, A. & Siegel, D. (2000), 'Corporate social responsibility and financial performance: correlation or misspecification?', *Strategic Management Journal*, 21(5): 603-609.
Mensch, G. (1975), *Das Technologische Patt*, Frankfurt: Umschau.
Miles. M.B. & Huberman, A.M. (1994), *Qualitative data analysis; an expanded sourcebook* (2nd ed.). SAGE Publications.
Moore, G. A. (2004), 'Innovating within established enterprises', *Harvard Business Review*, 82(7/8): 86-92.
Morgan, R.E. & Sarris, G. (1991), 'The International Market of Cyprus Wines: A Case Example – The UK Market', *International Journal of Wine Marketing*, 4(1): 44-63.
Morse, J.M. & Niehaus, L. (2009), *Mixed methods design: Principles and procedures*. Walnut Creek, CA: Left Coast Press.

Moser, C.A. & Kalton, G. (1985), *Survey Methods in Social Investigations.* Ashgate Publications.
Mytelka, L.K. (2000), 'Local Systems of Innovation in a Globalized World Economy' *Industry and Innovation*, 7(1): 15-32.
Mytelka, L. K., Goedhuys, M., Arundel, A. & Gachino, G. (2004), *Designing a policy-relevant innovation survey for NEPAD*, A study prepared pursuant to the Memorandum of Agreement between The Development Bank of Southern Africa Limited and the United Nations University Institute for New Technologies (UNU-INTECH).
Nahapiet, J. & Ghoshal, S. (1998), 'Social Capital, Intellectual Capital, and the Organizational Advantage', *Academy of Management Review*, 23(2): 242-266.
Narver, J. C. & Slater, S. F. (1990), 'The effect of market orientation on business profitability', *Journal of Marketing*, 54(4): 20-35.
Nassimbeni, G. (2001), 'Technology, innovation capacity, and the export attitude of small manufacturing firms: a logit/tobit model', *Research Policy*, 30: 245-262.
Neely, A., Filippino, R., Forza, C., Vinelli, A. & Hii, J. (2001), 'A framework for analyzing business performance, firm innovation and related contextual factors: perceptions of managers and policy makers in two European regions', *Integrated Manufacturing Systems*, 12(2): 114-124.
Neely, A.D., Gregory, M.J. & Platts, K.W. (1995), 'Performance measurement system design: a literature review and research agenda', *International Journal of Operations & Production Management*, 15(4): 80-116.
Nonaka, I. (1994), 'A dynamic theory of organizational knowledge creation', *Organization Science*, 5: 14-37.
Nonaka, I. & Takeuchi, H. (1995), *The Knowledge Creating Company*, New York: Oxford University Press.
Nooteboom, B. (1999), 'Innovation and inter-firm linkages: new implications for policy', *Research Policy*, 28(8): 793-805.
Nordhaus, W.D. (2004), Schumpeterian Profits in the American Economy: Theory and Measurement, NBER Working Paper, No. W10433.
North, D. & Smallbone, D. (2000), 'Innovation Activity in SMEs and Rural Economic Development: Some Evidence from England', *European Planning Studies*, 8(1): 87-106.
Nugent, R.A. (2001), Using economic analysis to measure the sustainability of urban and peri-urban agriculture: A comparison of cost-benefit and contingent valuation analyses. A paper presented at a workshop on Appropriate Methodologies in Urban Agriculture, Nairobi: Kenya.
Nyeko, D. (2005), Uganda's Fish subsector: A presentation for the Integrated Assessment for Fisheries Stakeholder Workshop for the Department of Fisheries Resources, Kampala, Uganda.
Organization of Economic Cooperation and Development/Eurostat (1997), The Measurement of Scientific and Technological Activities: *OECD Proposed Guidelines for Collecting and Interpreting Technological Innovation Data - Oslo Manual. Second Edition*, Paris: OECD.
Organization of Economic Cooperation and Development/Eurostat (2005), *OECD Guidelines for Collecting and Interpreting Innovation Data - Oslo Manual. Third Edition*, Paris: OECD.
O'Reilly, C. A. & Tushman, M.L. (2004), 'The ambidextrous organization', *Harvard*

Business Review, 82(4): 74-81.
Oyelaran-Oyeyinka, B. (2002), Global Governance of Technology and Africa's Global Exclusion. Paper presented at the Annual Workshop of the African Technology Policy Studies Network (ATPS), November 2002, Abuja: Nigeria.
Oyelaran-Oyeyinka, B. (2005), *Partnerships for Building Science and Technology Capacity in Africa*. United Nations University, Institute for New Technologies (UNU-INTECH), Maastricht: The Netherlands.
Oyelaran-Oyeyinka, B. (2006), *Learning to Compete in African Industry: Institutions and Technology in Development*. Hampshire, England: Ashgate Publishing Limited.
Pavitt, K., Robson, M. & Townsend, J. (1987), 'The size distribution of innovating firms in the UK: 1945-1984', *Journal of Industrial Economics*, 45: 397-306.
Pavitt, K. & Walker, W. (1976), 'Government policies towards industrial innovation: a review', *Research Policy*, 5(1): 11-97.
Patton, M.Q. (2002), *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.
Penrose, E.T. (1959), The Theory of the Growth of the Firm. New York: John Wiley.
Perreault, W.D. & McCarthy, E.J. (2005), *Basic Marketing: A Global Managerial Approach.* New York: McGraw-Hill.
Piore, M.J. & Sabel, C.F. (1984), *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.
Pisano, G.P. (1996), *The development factory: Unlocking the potential for process innovation*. Cambridge, MA: Harvard Business School Press.
Phillips, D.C. (1987), Philosophy, science, and social inquiry: contemporary methodological controversies in social science and related applied fields of research. Oxford: Pergamon Press.
Ponte, S. (2005), *Bans, Tests and Alchemy: Food Safety Standards and the Ugandan Fish Export Industry*. Danish Institute for International Studies (DIIS) Working Paper No.19, Copenhagen.
Porter, M.E. (1990), *The Competitive Advantage of Nations*. New York: Free Press.
Porter, M.E. (1985), *Competitive Advantage: Creating and Sustaining Superior Performance*, New York: Free Press.
Porter, M.E. (1998), 'Clusters and the new economics of competition', *Harvard Business Review*, 76(11/12): 77-90.
Powell, W.W., Koput, K.W. & Smith-Doerr, L. (1996), 'Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology', *Administrative Science Quarterly*, 4: 116-145.
Prahalad, C.K. & Hamel, G. (1990), 'The core competence of the corporation', *Harvard Business Review*, (5/6): 79-91.
Priem, R.L. (2007), 'A Consumer Perspective on Value Creation', *Academy of Management Review*, 32(1): 219-235.
Pyke, F. & Sengenberger, W. (1992), *Industrial Districts and Local Economic Regeneration*, Geneva IILS.
Ramachandran, V. & Shah, M.K. (1998), 'Firm Performance and Foreign Ownership in Africa: Evidence from Zimbabwe, Ghana and Kenya.' RPED Discussion Paper No. 81, Washington D.C.: The World Bank.
Reardon, T., Codron, J-M., Busch, L., Bingen, J. & Harris, C. (2001), 'Global Change in Agrifood Grades and Standards: Agribusiness Strategic Response in Developing Countries', *International Food and Agribusiness Management*

Review, 2(3/4): 421-435.
Riphahn, R.T. & Serfling, O. (2005), 'Item Non-response in Income and Wealth Questions', *Empirical Economics*, 30(2): 521-538.
Robertson, T.S. & Gatignon, H. (1986), 'Competitive effects on technology diffusion', *Journal of Marketing*, 50(7): 1-12.
Rogers, E.M. (1985), *Diffusion of Innovations* (3rd ed.). London: The Free Press.
Rosenberg, N. (1976), *Perspectives on Technology*. Cambridge University Press, London.
Rosenberg, N. (1994), *Exploring the Black Box: Technology, Economics, and History*, Cambridge: Cambridge University Press.
Rossman, G. B. & Rallis, F. (2003), *Learning in the Field: An Introduction to Qualitative Research* (2nd ed.). Thousand Oaks: SAGE Publications.
Rosseger, G. (1996), *The economics of production and innovation: An industrial perspective*, Oxford: Butterworth-Heinemann.
Rowley, T., Belirens, O. & Krachhardt, D. (2000), 'Redundant governance structures: An analysis of structural and relational embeddedness in the steel and semi-conductor industries', *Strategic Management Journal*, 21: 369-386.
Rumelt, R. (1987), *The Competitive Challenge*. Cambridge: Ballinger.
Ruppel, C.P. & Harrington, S.J. (2000), 'The Relationship of Communication, Ethical Work Climate, and Trust to Commitment and Innovation', *Journal of Business Ethics,* 25: 313-328.
Rutashobya, L. & Jaensson, J.E. (2004), 'Small firms' internationalization for development in Tanzania: Exploring the network phenomenon', *International Journal of Social Economics*, 31(1/2): 159-72.
Salavou, H. (2004), 'The concept of innovativeness: should we need to focus?', *European Journal of Innovation Management*, 7(1): 33-44.
Salavou, H., Baltas, G. & Lioukas, S. (2004), 'Organizational Innovation in SMEs: The importance of strategic orientation and competitive structure', *European Journal of Marketing*, 38(9/10): 1091-1112.
Salazar, M. & Holbrook, A. (2003), A Debate on Innovation Surveys, Paper presented at the conference in honor of K.Pavitt, "What do we Know about Innovation?", SPRU, University of Sussex, 12-15 November, 2003.
Samiee, S. & Walters, P.G.P. (1990), 'Influence of firm size on export planning and performance', *Journal of Business Research*, 29(3): 235-248.
Schmitz, H. (2006), 'Learning and Earning in Global Garment and Footwear Chains', *The European Journal of Development Research*, 18(4): 546-571.
Schmookler, J. (1953), The Utility of Patent Statistics, *Journal of Patent Office Society*, 34(6): 402-412, as cited in Godin (2002a), 4.
Schumpeter, J.A. (1942), *Capitalism, Socialism and Democracy*. New York: Harper & Row.
Sechrest, L. & Sidana, S. (1995), 'Quantitative and qualitative methods: Is there an alternative?' *Evaluation and Program Planning,* 18: 77-87.
Shan, W., Walker, G. & Kogut, B. (1994), 'Inter-firm cooperation and start-up innovation in the biotechnology industry', *Strategic Management Journal,* 15(5): 387-394.
Shankar, V. (1999), 'New product introduction and incumbent response strategies: their interrelationship and the role of multimarket contact', *Journal of Marketing Research*, 36(3): 327-344.
Shaw, S. & Young, S. (2000), Perspectives on Firm Growth and Internationalization: The case of the Scottish Food Industry. Proceedings of the 27th Annual Conference UK Chapter Academy of International Business, Glasgow.

Sheth, J.N. & Ram, S. (1987), *Bringing Innovation to Market: Breaking the Corporate and Customers Barriers*. New York: Wiley.
Sheth, J.N., Sisodia, R.S. & Sharma, A. (2000), 'The Antecedents and Consequences of Customer-Centric Marketing', *Journal of the Academy of Marketing Science*, 28(1): 55-66.
Silverman, D. (2000), *Doing Qualitative Research: A Practical Handbook*. Thousand Oaks, CA: Sage.
Smith, A., Stirling, A. & Berkhout, F. (2005), 'The governance of sustainable socio-technical transitions', *Research Policy*, 34(10): 1491-1510.
Sinkula, J.M., Baker, W.E. & Noordewier, T. (1997), 'A framework for market-based organizational learning: Linking values, knowledge, and behavior', *Academy of Marketing Science Journal*, 25: 305-318.
Sirmon, D.G., Hitt, M.A. & Ireland, R.D. (2007), 'Managing Firm Resources in Dynamic Environments to Create Value: Looking inside the Black Box', *Academy of Management Review*, 32(1): 273-292.
Song, X.M. & Parry, M.E., (1997), 'The determinants of Japanese new product success', *Journal of Marketing Research*, 34: 64-76.
Souitaris, V. (1999), 'Research on the determinants of technological innovation, a contingency approach', *International Journal of Innovation Management*, 3(3): 287-305.
Souitaris, V. (2001), 'External communication determinants of innovation in the context of a newly industrialized country: a comparison of objectives and perceptual results from Greece', *Technovation*, 21(1): 25–34.
Souitaris, V. (2002), 'Firm-specific competencies determining technological innovation: a survey in Greece', *R&D Management*, 32(1): 61-77.
Souder, W.E. & Jenssen, S.A. (1999), 'Management practices influencing new product success and failure in the United States and Scandinavia: a cross-cultural comparative study', *Journal of Product Innovation Management*, 16: 183-203.
Stadler, C. (2007), 'The Four Principles of Enduring Success', *Harvard Business Review*, (7/8): 62-72.
Stalk, G. & Hout, T. (1990), *Competing Against Time: How Time-Based Competition is Reshaping Global Markets*, New York: The Free Press.
Stanton, J. & Burkink, T.J. (2008), 'Improving small farmer participation in export marketing channels: perceptions of US fresh produce importers', *Supply Chain Management: An International Journal*, 13(3): 199-210.
Steen, T.S. & Pedersen, T. (2000), 'Ownership Structure and Economic Performance in the Largest European Companies', *Strategic Management Journal*, 21(6): 689-705.
Sternberg, R. (2000), 'Innovation Networks and Regional Development-Evidence from the European Regional Innovation Survey (ERIS): Theoretical Concepts, Methodological Approach, Empirical Basis and Introduction to the Theme Issue', *European Planning Studies*, 8(4): 389-407.
Stevens, C. & Kennan, J. (2005), *Botswana beef exports and trade policy*, Background study prepared for the World Bank-BIDPA Botswana Export Diversification Study, IDS Sussex, UK.
Strahan, P.E. (1999), Borrower Risk and the Price and Non-price Terms of Bank Loans. FRB of New York Staff Report No. 90. Available at SSRN: Available at http://ssrn.com/abstract=192769 or doi:10.2139/ssrn.192769.
Stuart, L. & Hart, S.L. (1995), 'A Natural-Resource-Based View of the Firm', *The*

Academy of Management Review, 20(4): 986-1014.
Subramanian, U. & Matthijs, M. (2007), Can Sub-Saharan Africa Leap into Global Network Trade? World Bank Policy Research Working Paper 4112, Pp 28.
Susman, R. (2000), 'Uganda: Where did it all go wrong?' In *Floriculture International*, April, pp. 24-26.
Talbot, J.M. (2002), 'Tropical Commodity Chains, forward integration strategies and international inequality: Coffee, Cocoa and Tea', *Review of International Political Economy*, 9(4): 701-734.
Tall, A. (1997), Current Status of HACCP application in African fisheries-problems and prospects. In Martin, R.L., Collette, & Slavin J.W. (eds.), *Fish Inspection, Quality Control and HACCP: A Global Focus*. Pennsylvania: Technomic, 693-699.
Tashakkori, A. & Teddlie, C. (1998). *Mixed methodology: combining qualitative and quantitative approaches*. Thousand Oaks, CA: Sage.
Tashakkori, A. & Teddlie, C. (2003). The past and future of mixed methods research: From data triangulation to mixed model designs. In Tashakkori, A. & Teddlie, C. (eds.), *Handbook of mixed methods in social & behavioral research*. Thousand Oaks, CA: Sage, 671–701.
Tatikonda, M.V. & Montoya-Weiss, M.M. (2001), 'Integrating Operations and Marketing Perspectives of Product Innovation: The Influence of Organizational Process Factors and Capabilities on Development Performance', *Management Science*, 47(1): 151-172.
Teddlie, C. & Tashakkori, A. (2003), Major issues and controversies in the use of mixed methods in the social and behavioral sciences. In Tashakkori, A. & Teddlie, C. (eds.), *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage, 3-50.
Teddlie, C. & Tashakkori, A. (2009), *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*. Sage Publications.
Teece, D.J. (1996), 'Firm organization, industrial structure, and technological innovation', *Journal of Economic Behavior and Organization* 31: 193-224.
Teece, D.J. & Pisano, G. (1994), 'The dynamic capabilities of firms: an introduction', *Industrial and Corporate Change*, 3(3): 537-56.
Teece, D.J., Pisano, G. & Shuen, A. (1997), 'Dynamic Capabilities and Strategic Management', *Strategic Management Journal*, 18(7): 509-533.
Thorpe, A. & Bennett, E. (2004), 'Market Driven International Fish Supply Chains: The Case of Nile Perch from Africa's Lake Victoria', *International Food and Agribusiness Management Review*, 7(4): 40-57.
Tidd, J. (ed.) (2000), *Measuring Strategic Competencies: Technological, Market and Organizational Indicators of Innovation*. London: Imperial College Press.
Tidd, J. (2001), 'Innovation management in context: environment, organization and performance', *International Journal of Management Reviews*, 3(3): 169-183.
Tidd, J. (2005), *Managing innovation: integrating technological, market and organizational change* (3rd ed.). New York: Wiley.
Tidd, J., Bessant, J. & Pavitt, K. (2001), *Managing Innovation: Integrating Technological, Market and Organizational Change (*2nd ed.). Chichester, UK: John Wiley.
Tirole, J (1995), *The Theory of Industrial Organization*, Cambridge, Massachusetts: MIT Press.

Trienekens, J., Ruud van Uffelen, Debaire, J. & Omta, O. (2008), 'Assessment of innovation and performance in the fruit chain: The innovation performance matrix', *British Food Journal*, 110(1): 98-127.
Trienekens, J. & Willems, S. (2007), 'Innovation and Governance in International Food Supply Chains: The Case of Ghanaian Pineapples and South African Grapes', *International Food and Agribusiness Management Review*, 10(4): 42-63.
Tushman, L.M. & O'Reilly, A.C. (1997), *Winning through innovation*. Boston, MA: Harvard Business School Press.
Uganda Bureau of Statistics Statistical (2005), Statistical Abstract. Entebbe: Uganda Government Printers.
Uganda Flower Exporters Association (2006), UFEA Annual Report 2006.
Uganda Fish Processors and Exporters Association (2005), EFPEA Annual Report 2005.
Uganda National Bureau of Standards (2002), A Guide To Good Manufacturing Practices For Fish Processing: UBOS.
Ulrich, K.T. & Eppinger S.D. (2000), *Product Design and Development*, (2nd ed.). New York : McGraw-Hill.
United Nations Industrial Development Organization (2001), *Development of Clusters and networks of SMEs*: The UNIDO Programme, Private Sector Development Branch; Discussion Paper No.5.
Utterback, J.M. (1993), *Mastering the Dynamics of Innovation*, Boston, MA: Harvard Business School Press.
_____ (1994), *Mastering the Dynamics of Innovation: How companies can seize opportunities in the face of technological change*. Boston MA: Harvard Business School Press.
Van de Ven, A. H., Polley, D.E., Garud, R. & Venkataraman, S. (1999), *The Innovation Journey*. New York: Oxford University Press.
Varzakas, T. & Jukes, D.J. (1997), 'The globalization of food regulation and market quality: a study of the Greek food market'. In Loader, R.J., Henson, S.J. & Trail, W.B. (eds.), *Globalization of the Food Industry: Policy Implications*, The University of Reading, Reading.
VEK-World Bank (2004), Uganda Hortifloriculture Sector Development Study - Agricultural Trade Facilitation and Export Promotion in Sub Saharan Africa, A Report Prepared for the ESSD and PSD. The World Bank. Washington D.C.
Verhaeghe, A. & Kfir, R. (2002), 'Managing Innovation in a Knowledge Intensive Technology Organisation (KITO)', *R&D Management,* 32(5): 409-417.
Von Hippel, E. (1988), *The Source of Innovation*, New York: Oxford University Press.
Wernerfelt, B. (1984), 'A resource-based view of the firm', *Strategic Management Journal*, 5:171-180.
Wheelwright, S. & Clark, K. (1992), *Revolutionizing Product Development*. New York, NY: The Free Press.
Whitaker, M. & Kolavalli, S. (2006), Floriculture in Kenya. In Chandra, V. (ed.), *Technology, Adaptation and Exports: How some African Countries got it Right*, Washington, DC: The World Bank.
Wiersma, W. & Jurs, S. G. (2005), *Research methods in education* (8th ed.). Boston: Allyn and Bacon.
Wijnands, J. (2005), 'Sustainable International Networks in the Flower Industry: Bridging Empirical Findings and Theoretical Approaches' *Scripta Horticulturae No.2.* International Society for Horticultural Sciences (ISHS),

The Hague Netherlands.
Wolfe, R.A. (1994), 'Organizational innovation: review, critique and suggested research direction', *Journal of Management Studies*, 31(3): 405-31.
Wood, E. & Kaplan, D. (2005), 'Innovation and Performance Improvement in the South African Wine Industry', *International Journal of Technology and Globalization*, 1(3/4): 381-399.
World Bank, (2004), Opportunities and Challenges for Developing High-Value Agricultural Exports in Ethiopia,' Washington D.C.: The World Bank.
World Bank (2004), "Competing in the Global Economy: An Investment Climate Assessment for Uganda", Washington D.C .: The World Bank.
World Bank (2006), *Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems?* Agriculture and Rural Development Department Washington, D.C: World Bank.
Yin, R.K. (1994), *Case Study Research Design and Methods* (2nd ed.). Thousand Oaks, U.S.: SAGE Publications.
You, J.I. & Wilkinson, F. (1994), 'Competition and cooperation: Towards understanding industrial districts', *Review of International Political Economy*, 6 (3): 259-278.
Zander, U. & Kogut, B. (1995), 'Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test', *Organization Science Quarterly,* 6(1): 76-92.
Zerfass, A. & Huck, S. (2007), 'Innovation, Communication, and Leadership: New Developments in Strategic Communication', *International Journal of Strategic Communication*, 1(2): 107-122.

Appendices

Appendix 1: Background to the Ugandan Nile perch processing and export sector

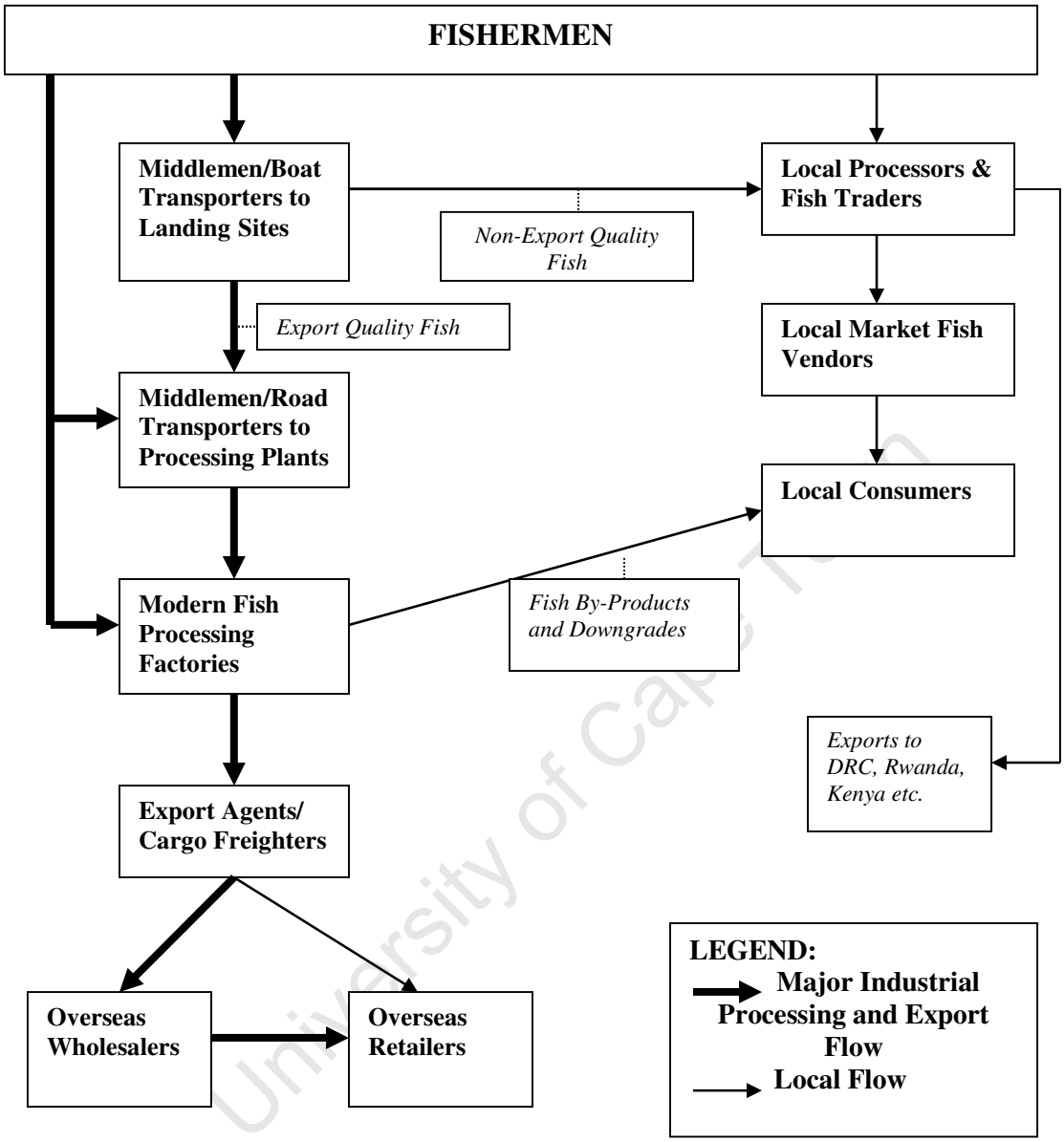
Introduction

The fishing industry in Uganda plays an important role in the economy. The Poverty Eradication Action Plan (PEAP) that was first developed in 1997 and revised in 2004 highlighted fisheries as a key sector that can contribute to poverty reduction and economic growth. PEAP estimates that fisheries contribute 6% of the national economy (Government of Uganda, 2004). It is further estimated that 300,000 people, including the majority of poor men and women, are directly involved in fishing, fish processing and trading. It is also estimated that more than 1.2 million people are directly dependent on the fisheries sector as the main source of household income. Fish feeds up to 17 million people within Uganda annually, thereby providing critical nutrients as well as food protein.

Nile perch processing and export chain

In recent years the Nile perch export sector has assumed an important economic role following the commercialization of the Victoria Nile perch (*Lates Niloticus*) fishery and development of the export chain (Keizire, 2004). The Nile perch is a fresh water fish with white and soft flesh rich in Omega 3 fatty acid which makes it popular in international export markets. The processing and marketing of Nile perch has grown into an elaborate supply and marketing chain that covers the local, regional markets in the neighboring countries and overseas export markets. Most notably, overseas markets and in particular the European Union, Middle East, USA, South East Asia and Australian markets are supplied with industrially processed fish in form of Nile perch fillets. Diagram 1 below in summary illustrates the local (internal) Nile perch fish supply, processing and export marketing value chains in Uganda.

Diagram 1: Nile perch supply, processing and export marketing value chain in Uganda.



Source: Author based on data from field survey

Description of local Nile perch processing and marketing

Fresh Nile perch fish are usually harvested from the main lakes and landed at the designated landing sites along the shores of Lake Victoria, Kyoga and Albert. They are transported in fishing or collection vessels owned either by the fishermen or traders. At most of the landing sites, there are local traders and, selectors and agents of the fish processors who have been trained to carefully select fish of the right quality, load them into iced and insulated trucks for onward transportation to the fish processing factories. The fish processing factories are located mainly in the towns close to the shores of Lake Victoria namely; Kampala, Jinja,

Entebbe, and Masaka. It is mainly the Nile perch and Nile tilapia that are processed for export to the premium export markets and these two species together constitute 100% of fish exports to overseas markets with the Nile perch alone accounting for approximately 98% of export volume (Keizire, 2004). This is largely because the two fish species can grow into big sizes that yield good quality white fish fillets which appear to be popular with consumers in the premium export markets in the EU countries (Ponte, 2005). In addition, these fresh water fish species have characteristics that make them highly desirable among consumers in those markets. The Nile perch is popular in the EU because of its advantages of having the firm white flesh, low cholesterol levels, abundance of Omega 3 (good for the prevention of heart diseases), and its ease and flexibility of use in cooking (UFPEA, 2005).

The rest of the fresh fish which is not taken to the fish processing factories is either sold to other waiting traders who transport it to the markets in trading centers and other towns in Uganda. Part of the fish may also be locally processed through sun-drying, smoking and salting and later distributed in the local markets in villages and towns, as well as the regional markets in the neighboring countries: Kenya, Rwanda, Democratic Republic of Congo (DRC) and Southern Sudan. The local trade in fish and fish products involves the buying and selling of fresh or processed fish in line with consumer preferences, storage conditions or the supply and demand conditions prevailing in the markets. Generally the poor road infrastructure, lack of cold storage transport facilities and the weak and fragmented marketing infrastructure make fresh and frozen fish distribution within Uganda difficult and so a substantial amount of the fish has to be locally processed through salting, sun drying and smoking.

The fish traders in Uganda can be grouped into four different categories (Keizire, 2004):

(a) Local traders/processors who buy and sell their fish on local markets a few kilometers away from the beaches;

(b) Long distance traders who buy and sell to distant markets and towns away from the beaches;

(c) The regional traders or processors who buy and sell to markets within the neighboring countries such as Kenya, DRC, Rwanda and Sudan; and

(d) The factory agents who buy and supply to the fish processing factories. Is this exclusively for overseas export? If not, please clarify what proportion is not exported overseas.

Most local traders do not normally have access to Nile perch of more than one kilogram because most of these are taken away by the fish factories for filleting and processing for exports. This has forced them to trade in small and juvenile fish and, recently have shifted to dealing in by-products of the industrial fish processing establishments, namely; fish frames, skins, off-cuts and swim bladders. Thus, owing to high competition, most traders have supply arrangements and cordial relationships with the fishers which involve the provision of fishing inputs and financial credit as a way to guarantee a commitment to steady supply from the fishers. This is more common with factory agents who are usually under contract to have a steady supply of good quality raw fish to the fish processing factories. In this regard, the fish traders have some organizational arrangements which help them to work together and overcome the many constraints they face in their businesses.

An example of the organizational arrangement is where local and regional traders are organized into formal groups and companies while a few local or regional traders operate independently. Cooperation between different traders is necessary for the purposes of collectively meeting the costs of transport and licensing, collective responsibility in case of a problem and quality concerns that could easily be traced, based on groups and companies as opposed to individuals. They distribute their fish both through the recorded and regulated channels and the unregulated channels. To this end however, thy face high risks of meeting tough and punitive government actions in form of confiscation of the consignment or paying fines and or both more so when a person is found transacting business in fish of the prohibited sizes. As a result there are many regulatory check points for both local government revenue collection and size/quality assurance and law enforcement.

Industrial processing and export of Nile perch in Uganda

Industrial fish processing and exports in Uganda is undertaken by both local and international companies (defined in terms of ownership) some of which are individually owned while others operate under joint ownership of either Ugandans only or of Ugandans and foreigners. At the time of the field work (January – July 2005) for this study there were about 20 registered fish processing establishments in Uganda, 17 of which were approved for export to the EU by the Department of Fisheries Resources (DFR) in the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). These fish processing establishments operated at an average of about 55% of their installed processing capacity mainly because of insufficient supplies of fresh fish to the factories (UFPEA, 2005). The fish processing and export

companies are all organized under the umbrella of the Uganda Fish Processors and Exporters Association (UFPEA) and by 2005 it had a membership of about 17 fish processing factories. Some key indicators of the sector are provided below. The basic characteristics of these fish processing companies are contained in Table I below.

Table I: Characteristics of companies in the fish processing and export sector in Uganda (2004).

Company Code	No. of Employees	Year Set Up	Capacity utilization (%)
FH01	145	1996	50
FH02	204	1997	60
FH03	278	1989	65
FH04	234	1989	52
FH05	365	1993	60
FH06	207	1998	53
FH07	217	1995	40
FH08	295	1992	45
FH09	158	1983	50
FH10	246	1989	63
FH11	183	1983	46
FH12	336	1994	48
FH13	259	1987	50

Source: Data from field survey and Uganda Fish Exporters and Processors Association (UFPEA)

Key indicators of the Ugandan Nile perch export sector

The fish processing sector in Uganda supplies about 98% of its exports to the EU markets, mainly Spain, France, Belgium, Holland, Germany and Italy (Josupeit, 2006). Hence, any changes in these markets in the form of new regulations, shifts in consumer tastes and preferences or the entry of new competitors into those markets, pose challenges for the

development of the sector in Uganda. Accordingly, the sector has undergone a lot of changes and with the help of UFPEA, it was possible for Uganda as a country to be granted the "harmonized" country status by the European Council in October 2000 in line with the EC Directive 91/493/EEC which governs trade in fishery products. This implies that according to the EC Directive 91/493/EEC, Uganda is put on **Harmonized List 1** of countries that are considered to comply fully with EU Directives and consequently, those companies in fish processing and export are eligible for the export of fishery products to any EC member country.

Considering the importance of the EU markets to the development of the fisheries export sector in Uganda, fish exporters and policymakers were under obligation to fully understand its regulatory framework governed by the EC Directive 91/493/EEC and its implications for fish exports development. This Directive lays down the health conditions for the production and placing on the market of all fishery products. It specifically deals with hygienic conditions in the process of handling, preparation, processing, packaging, storage and transportation of fish products. Accordingly, all Ugandan fish processors and exporters had to implement the Harzard Analysis and Critical Control Points (HACCP) protocols in particular get certification under:

- ISO 9001: 2000 Management Standards
- ISO 14000 Environmental Standards
- ISO 2200: 2005 which encompasses both quality and safety aspects that are in line with the new EU Food and feed Directive: 882/2004.

Traceability is a key component of the quality control system in the fish supply chain and each fish exporter in Uganda had to put in place a coding system to trace one step backwards and one step forward. This was mandatory after many episodes of failures in the quality control systems in the Nile perch export chain resulting in bans by the EU authorities on fish exports from Uganda.

The Ugandan fish exporters along with their counterparts in Kenya and Tanzania have been faced with bans and restrictions imposed by the EU authorizes. For example in 1996, *Salmonella* was detected in a number of consignments of Nile perch from Kenya, Tanzania and Uganda at the Spanish border and Spain immediately prohibited imports from the three East African countries. In April 1997, the European Commission introduced a requirement for *Salmonella* testing of all consignments of Nile perch from the region. These requirements

were eventually lifted by June 1998. In March 1999, a suspected case of fish poisoning with pesticide was identified in Uganda. The European Commission subsequently imposed a ban on exports of Nile perch in April 1999. However, these bans were immediately lifted upon rectification of the problems. In each case, the impact of these bans on Nile perch exports was immediate. Exports declined, although overtime these were partially offset by increased sales to other markets. Fish processing factories, most of which were already operating at less than 50% capacity, reduced their capacity and at least three factories closed with far reaching consequences of job losses and decline in foreign exchange earnings for the countries affected. Hence, the enforcement of food quality and safety control measures in line with the EC Directive 91/493/EEC became necessary.

The key feature of EC Directive 91/493/EEC is that all fishery products (whether fresh, chilled, frozen, canned, salted, smoked or dried) imported from third countries into the EU must come from a preparation, processing, packaging or storage facility which is approved by the competent body in the country concerned, and in the case of Uganda, the Department of Fisheries Resources (DFR) in the Ministry of Agriculture, Animal Industry and Fisheries. This competent authority compiles the list of companies that fully comply with those provisions for approval and sends it to the European Commission for endorsement and publication in the Official Journal of the EU. The main reason for this approval and registration procedure is to be able to guarantee the quality of fish products to the consumers in the EU. The Competent Authority also carries out regular tests on the fish, and water sediments to check for heavy metals, microbial tests and pesticide residue. Additional analysis is done by Chemiphar (U) Ltd, an internationally accredited private laboratory for pesticide and heavy metals and Uganda National Bureau of Standards (UNBS) laboratory. Thus, fishery products intended to be placed on the EU market, have to comply with rigorous hygiene rules applying to:

(a) personnel, premises, installation and equipment;
(b) supervision of the cold chain;
(c) the quality of water used in processing;
(d) the storage and disposal of (liquid) waste;
(e) procedures for handling, preparing, processing, packing and transport of the products.

This Directive is essentially based on the Hazard Analysis and Critical Control Point (HACCP) quality assurance approach which recognizes that microbiological hazards exist at

various points in the handling and processing of fishery products but that, through a rational approach and by applying the necessary measures, it is possible to control them. Its purpose is to avoid systematic detention, heavy sampling and laboratory checks at the point of entry in the EU. It therefore means a shift from the traditional end-product inspection and certification to this preventive assurance approach. Actual control is therefore placed in the third countries instead of at the point of entry in the EU and for that reason it has various implications for low income countries such as Uganda. Overall, regulations have to be updated, inspection services organized, and handling and processing improved. This approach has been successful to a large extent (Ponte, 2005).

As part of the implementation of this Directive, companies are supposed to allow certain investigations to be carried out during the production phase of the fish products and must record the data for a supervisory authority which in the case of Uganda is the Department of Fisheries Resources (DFR). At the country level, Uganda also has an obligation to submit complete legislation to the European Commission concerning the export of the fishery products, as well as a complete report on the functioning of its controlling authority, that is the DFR and the infrastructure within which it operates. Uganda undertook all these requirements, submitted the necessary documentation to the EU after which a delegation was sent to Uganda to visit some companies at random. Upon the successful inspection of the facilities in Uganda, the DFR in Uganda was then approved for recognition as the official controlling body in 2000.

In sum, the industrial fish processing and export companies in Uganda have been compelled to undertake a number of changes to comply with the EU regulatory requirements but also to keep up with the increasing competition in the fish export markets. Details of these innovations and developments are presented in chapters 2 and 4 of the main thesis. The main thrust of these developments involves sustained investment in workforce capacity building and facilities improvement. In this regard, the industry has been transformed into a modern processing subsector thereby making fish and fishery products the leading non-traditional export product from Uganda more than a decade. Most of the above mentioned developments in the Nile perch export chain in Uganda have been undertaken under the support of the Uganda Fish Processors and Exporters Association (UFPEA).

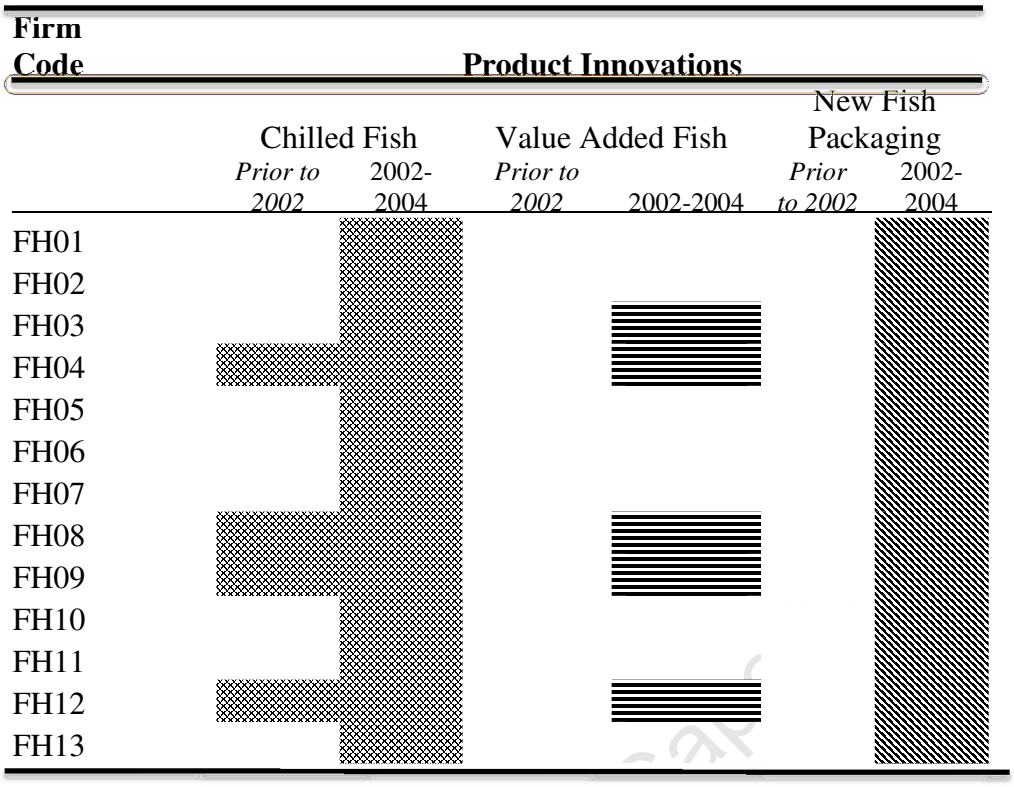
Uganda Fish Processors and Exporters Association

The Uganda Fish Processors and Exporters Association (UFPEA) was established in 1993 (based on information obtained on the website: http://www.ufpea.co.ug/). It is a non-profit making organization that brings together all industrial fish processors in Uganda. UFPEA provides business development services to its members and through the association, efforts are made to advocate for policies that favor the fish subsector. UFPEA has a secretariat which coordinates the activities and programs on behalf of the members. As an association the individual members work together to promote a sustainable, quality oriented, market focused and value added products in Uganda's fisheries sector. The association plays the following key roles:

- To coordinate all relevant information/activities and disseminate it to members.
- Lobby and mobilize technical assistance as requested by member companies.
- Initiate projects and programs for members.
- Advocate for appropriate policies and programs as well as resolving constraints and challengers facing the fish subsector in general and the processors in particular through dialogue and private-public partnership.
- Training of technical staff in the processing plants.
- Providing business development and advisory services to the members.
- Promotion of certification schemes.
- Driving the industry's involvement towards resource sustainability.
- Promoting the image of the industry both locally and internationally.
- Overseeing the development of "Quality Assurance Managers Association" (QAMA) which comprises of Quality Assurance Managers within the industry who pool their expertise to ensure a harmonized approach towards fish quality and safety issues.
- Promoting sustainability through the development of a memorandum of understanding with the Department of Fisheries Resources in which sanctions are used a deterrent measure to any fish factory that does not comply with the established sustainability measures.

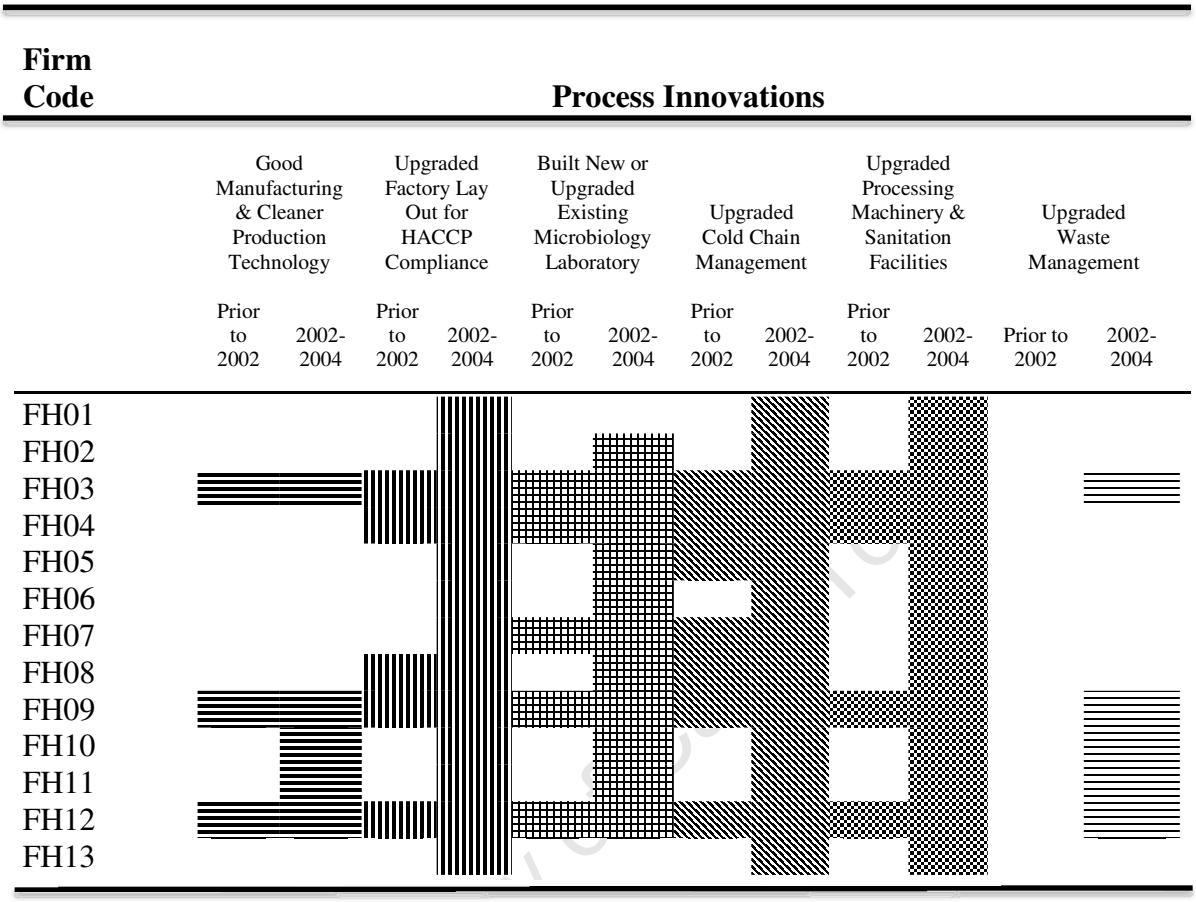
The Uganda Fish Processors and Exporters Association has therefore played a key role in the transformation of the Nile perch processing and export chain in Uganda.

Appendix 2.1: Patterns of product innovation in the Ugandan fish processing and export industry (2002-2004)



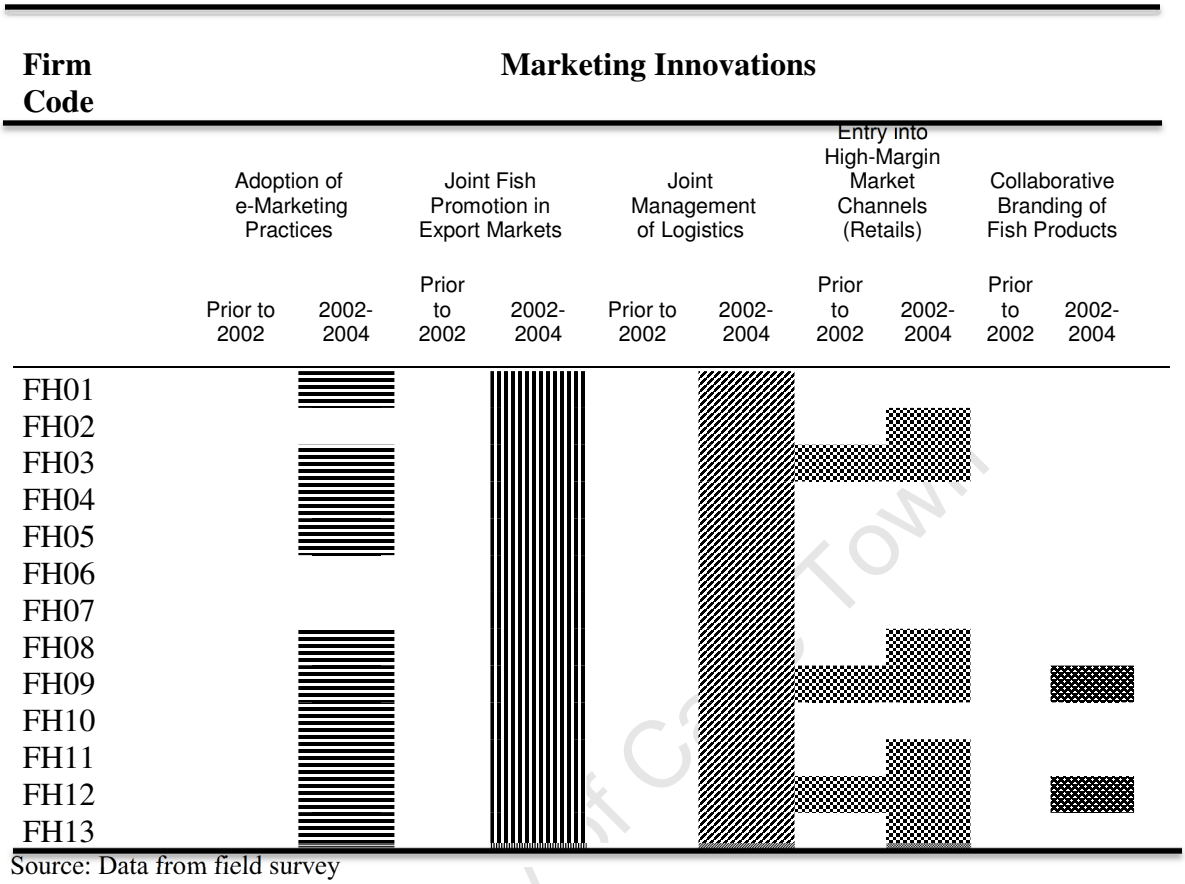
Source: Data from field survey

Appendix 2.2: Patterns of process innovation in the Ugandan fish processing and export industry (2002-2004)



Source: Data from field survey

Appendix 2.3: Patterns of marketing and supply chain innovations in the Ugandan fish processing and export industry (2002-2004)



Source: Data from field survey

Appendix 3.1: Revenue and cost estimates of individual operating configurations of Ugandan fish exporters

	Estimates of Revenue, Costs and Operating Margin (US $ per kilogram of fillet)									
Operating Configuration	**1a**	**1b**	**2a**	**2b**	**3a**	**3b**	**4a**	**4b**	**5a**	**5b**
Variable Operating Costs:										
Raw Material	2.25	2.10	2.25	2.20	2.25	2.10	2.25	2.20	2.25	2.10
Direct Labour	0.099	0.084	0.099	0.084	0.099	0.084	0.099	0.084	0.250	0.264
Water and Ice	0.008	0.006	0.008	0.006	0.008	0.006	0.008	0.006	0.008	0.006
Chemicals (Calcium Hypochlorite)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Cleaning Detergents	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Packaging	0.090	0.047	0.120	0.072	0.100	0.080	0.130	0.100	0.300	0.200
Electricity	0.130	0.124	0.110	0.105	0.130	0.124	0.110	0.105	0.130	0.124
Sub-Total Variable Costs	**2.589**	**2.372**	**2.599**	**2.478**	**2.599**	**2.405**	**2.609**	**2.506**	**2.950**	**2.705**
Freight and Marketing Costs:										
Freight Costs	0.440	0.330	1.200	1.400	0.440	0.330	1.200	1.400	0.440	0.330
Clearing and Forwarding (Uganda)	0.020	0.030	0.050	0.040	0.020	0.030	0.050	0.040	0.020	0.030
Handling Expenses (Export Market)	0.020	0.030	0.030	0.040	0.060	0.070	0.080	0.090	0.060	0.070
Marketing Costs	0.010	0.020	0.020	0.030	0.070	0.090	0.090	0.120	0.070	0.090
Agent Fees (Commission)	0.080	0.070	0.100	0.100	0.430	0.340	0.530	0.460	0.512	0.464
Sub-Total Freight and Marketing Costs	**0.570**	**0.480**	**1.400**	**1.610**	**1.020**	**0.860**	**1.950**	**2.110**	**1.102**	**0.984**
Overhead Costs:										
Fuel and Local Transportation	0.014	0.010	0.014	0.010	0.014	0.010	0.014	0.010	0.014	0.010
Waste Management	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003	0.005	0.003
Training and Supervision	0.011	0.009	0.011	0.009	0.011	0.009	0.011	0.009	0.011	0.009
Consultancy Fees	0.012	0.008	0.012	0.008	0.012	0.008	0.012	0.008	0.012	0.008
Communication	0.008	0.005	0.008	0.005	0.008	0.005	0.008	0.005	0.008	0.005
Management Costs (Executives & Board)	0.086	0.070	0.086	0.070	0.086	0.070	0.086	0.070	0.086	0.070
Laboratory Testing Expenses	0.017	0.014	0.017	0.014	0.017	0.014	0.017	0.014	0.017	0.014
Inspection, Monitoring and Certification Fees	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Insurance	0.009	0.007	0.009	0.007	0.009	0.007	0.009	0.007	0.009	0.007
Foreign Travel	0.006	0.005	0.006	0.005	0.006	0.005	0.006	0.005	0.006	0.005
Administrative Expenses	0.055	0.039	0.055	0.058	0.055	0.039	0.055	0.039	0.055	0.039
Fixed Asset Maintenance	0.021	0.018	0.021	0.018	0.021	0.018	0.021	0.018	0.021	0.018
Miscellaneous Expenses	0.007	0.006	0.007	0.006	0.007	0.006	0.007	0.006	0.007	0.006
Sub-Total Overhead Costs	**0.256**	**0.197**	**0.256**	**0.216**	**0.256**	**0.197**	**0.256**	**0.197**	**0.256**	**0.197**
Investment Costs (Depreciation):										
Fish Processing Infrastructure	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133
Production Facilities	0.094	0.100	0.094	0.100	0.094	0.100	0.094	0.100	0.094	0.100
Insulated Motor Vehicles& Equipment	0.026	0.028	0.026	0.028	0.026	0.028	0.026	0.028	0.026	0.028
Sub-Total Investment Costs	**0.253**	**0.261**	**0.253**	**0.261**	**0.253**	**0.261**	**0.253**	**0.261**	**0.253**	**0.261**
Total Operating Costs	**3.667**	**3.309**	**4.507**	**4.565**	**4.127**	**3.722**	**5.067**	**5.073**	**4.561**	**4.146**
Revenue (Price)	**3.690**	**3.360**	**4.910**	**4.730**	**4.700**	**4.200**	**6.100**	**5.700**	**5.400**	**4.800**
Operating Profit	**0.023**	**0.051**	**0.403**	**0.165**	**0.573**	**0.478**	**1.033**	**0.627**	**0.839**	**0.654**
Operating Margin (%)	**0.6%**	**1.5%**	**8.2%**	**3.5%**	**12.2%**	**11.4%**	**16.9%**	**11.0%**	**15.6%**	**13.6%**

Appendix 3.2: Analysis of costs of an average fish processing company/plant in US $ (Under old fish processing technology in 2002)

	Frozen Nile Perch Fillets		Chilled Nile Perch Fillets	
	Cost per plant	**Cost per kg**	**Cost per plant**	**Cost per kg**
Raw Material Cost:				
Estimated cost of fresh fish from suppliers (US $)		2.25		2.25
Direct Labor Cost	183,400	0.0987	183,400	0.10
Estimates of Other Production Costs:				
Water and Ice	14,870	0.008	14,870	0.008
Chemicals (Calcium Hypochlorite)	9,293	0.005	9,293	0.005
Cleaning Detergents	13,011	0.007	13,011	0.007
Packaging Materials Cost		0.090		0.12
Electricity Cost		0.130		0.11
Freight and Export Marketing Costs:				
Freight Costs		0.44		1.2
Clearing & Forwarding (Uganda)		0.02		0.05
Handling Expenses (Export Markets)		0.02		0.03
Marketing Costs		0.01		0.02
Agent Fees		0.08		0.1
Overhead Costs:				
Fuel & Local Transportation	25,600	0.014	25,600	0.014
Waste Management	9,500	0.005	9,500	0.005
Training & Supervision	19,800	0.011	19,800	0.011
Consultancy Fees	22,850	0.012	22,850	0.012
Communication	15,400	0.008	15,400	0.008
Management Costs (Executives & Board)	160,000	0.086	160,000	0.086
Laboratory Testing Expenses	31,300	0.017	31,300	0.017
Inspection, Monitoring and Certification Fees	9,500	0.005	9,500	0.005
Insurance	16,700	0.009	16,700	0.009
Foreign Travel	10,500	0.006	10,500	0.006
Administrative Expenses	102,957	0.055	102,957	0.055
Fixed Asset Maintenance	38,957	0.021	38,957	0.021
Miscellaneous Expenses	12,900	0.007	12,900	0.007

Source: Data from field survey

Notes.
Workings based on initial schedule of cost estimates provided by Uganda Fish Processors and Exporters Association (UFPEA) and on data obtained through field survey.

Appendix 3.3: Analysis of costs per average fish processing company/plant in US $ (Under upgraded fish processing technology in 2004)

	Frozen Nile Perch Fillets		Chilled Nile Perch Fillets	
	Cost per plant	Cost per kg	Cost/plant	Cost per kg
Raw Material Cost: Estimated cost of fresh fish from suppliers (US $)		2.10		2.20
Direct Labor Cost	192,600	0.08	192,600	0.08
Estimates of Other Production Costs:				
Water and Ice	12,864	0.006	12,864	0.006
Chemicals (Calcium Hypochlorite)	11,486	0.005	11,487	0.005
Cleaning Detergents	16,080	0.007	16,080	0.007
Packaging Materials Cost		0.047		0.072
Electricity Cost		0.124		0.105
Freight and Export Marketing Costs:				
Freight Costs		0.33		1.4
Clearing & Forwarding (Uganda)		0.03		0.04
Handling Expenses (Export Markets)		0.03		0.04
Marketing Costs		0.02		0.03
Agent Fees		0.07		0.1
Overhead Costs:				
Fuel & Local Transportation	22,528	0.010	22,528	0.010
Waste Management	6,650	0.003	6,650	0.003
Training & Supervision	19,800	0.009	19,800	0.009
Consultancy Fees	19,423	0.008	19,423	0.008
Communication	12,628	0.005	12,628	0.005
Management Costs (Executives & Board)	160,000	0.070	160,000	0.070
Laboratory Testing Expenses	31,300	0.014	31,300	0.014
Inspection, Monitoring and Certification Fees	8,550	0.004	8,550	0.004
Insurance	16,700	0.007	16,700	0.007
Foreign Travel	10,500	0.005	10,500	0.005
Administrative Expenses	88,543	0.039	88,543	0.039
Fixed Asset Maintenance	42,074	0.018	42,074	0.018
Miscellaneous Expenses	12,900	0.006	12,900	0.006

Source: Data from field survey

Notes.
Workings based on initial schedule of cost estimates provided by Uganda Fish Processors and Exporters Association (UFPEA) and on data obtained through field survey.

Appendix 3.4: Investment and production facilities costs based on old fish processing technology in 2002

	Dep. Rate	Initial Cost	*Recurrent* Cost	*Total* Cost	Cost/Plant/Yr.	*Cost* per Kg
Investments: Land and Fish Processing Infrastructure (HACCP Compliance):						
Land Purchase	2%	12,500		12,500	250	0.0001
Electricity Infrastructure and Transformer	5%	18,900	4,500	23,400	1170	0.0006
HACCP Compliant Processing Plant	10%	2,024,544	95,800	2,120,344	212,034	0.1141
Microbiological Testing Laboratory	10%	43,200	47,500	90,700	9,070	0.0049
Water Supply System	10%	58,700	38,600	97,300	9,730	0.0052
Sanitation Facilities and Rest Rooms	10%	33,500	27,800	61,300	6,130	0.0033
Waste Water and Affluent Management Facilities	15%	25,900	33,000	58,900	8,835	0.0048
Sub Total					***247,219***	**0.1330**
Production Facilities:						
Ice plant	10%	134,000	17,600	151,600	15,160	0.0082
Freezing and Chilling Equipment (Cold Storage)	10%	1,099,600	105,595	1,205,195	120,520	0.0648
Fish Cutting and Trimming Tools	33%	32,500	65,400	97,900	32,307	0.0174
Freezer Trays	25%	12,000	3,400	15,400	3,850	0.0021
Tables and Utencils	10%	23,400	5,500	28,900	2,890	0.0016
Sub-Total					***174,727***	**0.0940**
Insulated Motor Vehicles & Equipment:						
Delivery Trucks	25%	105,328	42,500	147,828	36,957	0.0199
Office Furniture and Communication Equipment	2%	32,560		32,560	651.2	0.0004
Stand-by Generator	20%	41,100	12,500	53,600	10,720	0.0058
Sub-Total					***48,328***	**0.0260**
Total Investment Costs					***470,274***	**0.2530**

Source: Data from field survey

Notes.
Workings based on initial schedule of cost estimates provided by Uganda Fish Processors and Exporters Association (UFPEA) and on data obtained through field survey.

Appendix 3.5: Investment and production facilities costs based on upgraded fish processing technology in 2004

	Dep. Rate	Initial Cost	Recurrent Cost	Total Cost	Cost/Plant/Yr.	Cost @ Kg
Investments: Land and Fish Processing Infrastructure (HACCP Compliance):						
Land Purchase	2%	12,500		12,500	250	0.0001
Electricity Infrastructure and Transformer	5%	18,900	4,500	23,400	1,170	0.0006
HACCP Compliant Processing Plant	10%	2,024,544	95,800	2,120,344	212,034	0.1141
Microbiological Testing Laboratory	10%	43,200	47,500	90,700	9,070	0.0049
Water Supply System	10%	58,700	38,600	97,300	9,730	0.0052
Sanitation Facilities and Rest Rooms	10%	33,500	27,800	61,300	6,130	0.0033
Waste Water and Affluent Management Facilities	15%	25,900	33,000	58,900	8,835	0.0048
Sub Total					**247,219**	**0.1330**
Production Facilities:						
Ice plant	10%	134,000	25,600	159,600	15,960	0.0086
Freezing and Chilling Equipment (Cold Storage)	10%	1,087,140	165,000	1,252,140	125,214	0.0674
Fish Cutting and Trimming Tools	33%	32,500	80,500	113,000	37,290	0.0201
Freezer Trays	25%	12,000	4,500	16,500	4,125	0.0022
Tables and Utencils	10%	23,400	9,500	32,900	3,290	0.0018
Sub-Total					**185,879**	**0.1000**
Insulated Motor Vehicles & Equipment:						
Delivery Trucks	25%	113,200	57,500	170,700	42,675	0.0230
Office Furniture and Communication Equipment	2%	32,560		32,560	651.2	0.0004
Stand-by Generator	20%	33,200	10,400	43,600	8,720	0.0047
Sub-Total					**52,046**	**0.0280**
Total Investment Costs					**485,145**	**0.2610**

Source: Data from field survey

Notes.
Workings based on initial schedule of cost estimates provided by Uganda Fish Processors and Exporters Association (UFPEA) and on data obtained through field survey.

Appendix 4: Background to Ugandan floriculture production and marketing value chain

The floriculture export industry in Uganda is a recent development among the non-traditional agricultural export sectors. Commercial production of flowers in Uganda started in 1992 and exports commenced in 1993. The sector focuses mainly on flowers and chrysanthemum cuttings and to a lesser extent on potted plants and herbs. In this study we focus mainly on the analysis of the production and exports of flower (roses) that constituted approximately 95% of the sectors' exports in 2004 (Wijnands, 2005).

There were approximately 18 flower farms that were operational in the Ugandan floriculture export sector at the time of the field study. The smallest company had an area of 7 hectares with 173 employees while the largest company had an area of 30 hectares with 850 employees. Exceptional cases are with a company that covers 8.5 hectares yet it has 320 employees mainly because it grows cuttings that are more labor intensive to produce. The basic characteristics of the companies are indicated in Table I below.

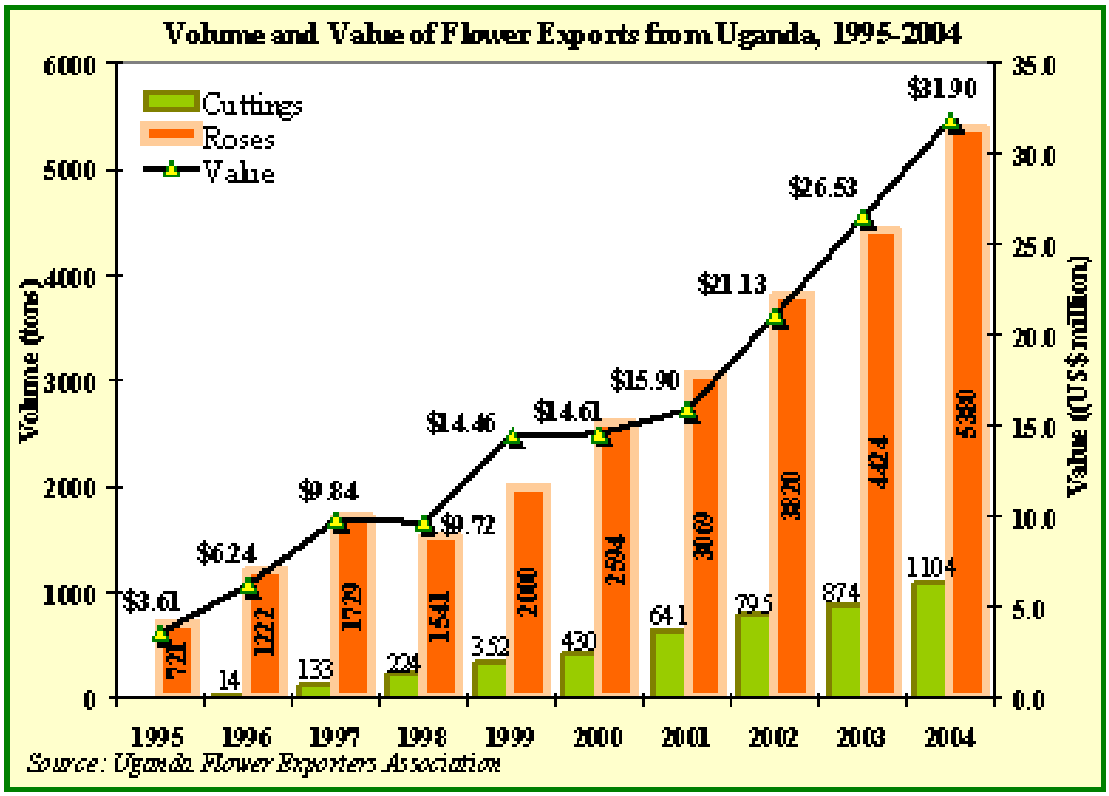
Table I: Characteristics of companies in the floriculture export sector in Uganda (2004).

Company Code	No. of Employees	Year Set Up	Size of the Farm (in Hectares)
FR001	285	1994	10
FR002	322	1997	11
FR003	288	1998	10
FR004	222	1996	8.5
FR005	261	1995	9
FR006	377	1995	13
FR007	435	1998	16
FR008	173	1995	7
FR009	200	1993	9
FR010	850	2000	30
FR011	262	1993	8.2
FR012	309	1998	11
FR013	191	1998	8
FR014	201	1994	8
FR015	205	1999	9

Source: Data from field survey and Uganda Flower Exporters Association (UFEA)

The sector has undergone a fairly consistent growth path since its inception. It expanded rapidly from 1993 for a few years, then retracted in 1997/8 because of a number of factors including but not limited to poor choice of flower varieties resulting in lower than expected yields and the declining prices in the international markets (Asea, and Kaija, 2000; Dijkstra, 2001). Further growth of the sector was however, enhanced in 1999 with exports reaching US $ 14.6 million and US $ 30.9 million by 2004 (details in ***diagram I*** below). At the time of this field study, the sector was covering 170 hectares of custom-built plastic green houses and pack houses, providing employment to about 6100 people (UFEA, 2005). It is therefore considered to be a success case in the development of non-traditional commercial agriculture aimed at serving the rapidly changing and competitive export markets.

Diagram I: **Volume and Value of Flower Exports from Uganda, 1995-2004**



Though a number of studies such as Asea, and Kaija (2000) and Dijkstra (2001) have reviewed the developments in this sector and attributed it to factors related to government policy reforms and increasing donor support, no systematic study has been undertaken to examine the levels of performance at firm level, and to what extent these can be explained using the firm innovation behavior perspective. It was therefore necessary to analyze the underlying factors behind the seemingly good performance and more specifically the changes (innovations) that these companies had to undertake and to what extent they can be related to the performance. The rest of this section briefly reviews the developments in the sector.

An important development in the sector has been the formation of the Uganda Flower Exporter's Association (UFEA) as the umbrella organization binding together all the flower growers and exporters in Uganda. It was established in 1995 through joint membership by all the flower growers and exporters in Uganda. Its primary aim was to enhance the development of the floriculture export sector in Uganda by facilitating its members in the acquisition and utilization of the necessary resources and technologies and by ensuring that they comply with all the international standards governing the flower export industry. At the time of this field

study January-July, 2005, the association had 17 members all of whom were flower growers in Uganda (UFEA, 2005). These members operate flower farms located mainly around the Lake Victoria basin in the districts of Kampala, Mpigi, Mukono and Wakiso.

The association has played an important role in boosting the international competitiveness of the industry in Uganda, largely through the encouragement and facilitation of its members in adopting innovative approaches to the production and marketing of flowers overseas. In this regard, the association has played a central role in facilitating its members to improve their competitiveness in the growing of selected varieties of flowers, careful post-harvest handling and shipment to the international markets. It has also lobbied government to provide investment incentives such as facilitation of the growers in getting additional land and the related infrastructural development, tax concessions, quick processing of VAT refunds, and the extension of loan facilities.

According to UFEA there were thirty six (36) varieties of roses commercially grown in Uganda in 2004, the majority of which were sweetheart types (short stem, small flower head). Another variety that had been adopted lately was the floribundas also called intermediates with slightly bigger flower buds and longer stems than the sweetheart roses (UFEA, 2005). The T-Hybrid (long stem, big flower head) initially grown in the early days of the development of the sector, were abandoned by most growers due to their poor performance. Within each of the types grown, there is a wide range of varieties available in different colors. The actual choice depends on adaptation to the climate, the projected market demand, and the market positioning strategy adopted by each individual farm. The production of the chrysanthemums cuttings are done through joint ventures with three Dutch companies.

While roses are the major export products of the Uganda floriculture sector, climatic conditions in the country do not favor some rose varieties especially the large flowered roses (T-Hybrid). This implies that, the Ugandan grown T-Hybrid roses cannot compete with those from major world producing countries such as Kenya, Ecuador and Holland because under the climatic conditions in Uganda, they cannot attain the bud sizes and qualities obtainable in the other competing countries. However, under the Uganda climatic conditions high yields of up to approximately 500 flower stems per square meter and good consistent quality can be achieved with some varieties of sweetheart roses and so most of the roses grown in Uganda are of the small flowered varieties (Wijnands, 2005).

The production of flowers is a highly scientific process. To achieve high quality output characterized by: yield (numbers of stems per unit area), high number of petals, long and strong stems, long flower neck, large bud sizes, color blind shoots and long vase-life, flowers require a lot of water, effective pest and disease control, highly regulated climatic conditions and careful post-harvest handling. The climatic conditions in the Lake Victoria basin of Uganda are suitable for the growing of the flowers because of the good temperature and the humidity. However, low relative humidity and high temperatures tend to attract pests called the spider mites and conversely, high relative humidity exposes the plants to serious fungal diseases. These environmental challenges are usually overcome through the creation of suitable conditions inside the green houses and the use of some agricultural and crop management techniques so as to ensure a good quality output.

Green houses are used to create the necessary condition for effective plant growth. Given that temperatures during the day around the producing areas sometimes go above 29˚C, and at night they may drop below 10˚C, this creates conditions that negatively affect the production and quality of the flowers. In this regard, green houses become necessary since they can be equipped with aeration facilities to maintain temperatures within the optimum range. To be able to achieve that, green houses should be of sufficient height to decrease the effects of temperature. Technically the height of the green house should be 3.5 to 4 meters with permanently open vents along the ridges and variable vents along the sides.

The processes used in the production of flowers are also changing and becoming more sophisticated. They now involve the growing of flowers under highly organized and controlled scientific procedures. This starts with the use of steel or aluminum greenhouse structures which are rapidly replacing wood. The structures are covered with transparent polythene materials to regulate the amount of sunlight and heat reaching the plants. These polythene materials also serve a number of other functions such as protecting the plants from adverse weather conditions like strong storms and keeping away pests from attacking the plants. This is followed with the identification of the right quality inputs.

The use of quality inputs such as cultivars, chemicals, fertilizers, equipment and packing materials is important. Only those plant varieties tested through trials and established to be suitable for the ecological conditions prevailing in the farm, and with a sound market potential, are selected for commercial growing. These planting materials or cultivars are now

obtained locally in Uganda through the representatives of the breeders who carry out plant propagation using techniques such as grafting and budding. The representatives of the breeders are themselves commercial flower farms that in addition to growing flowers for commercial purposes, have upgraded their competences to producing planting materials using trial and demonstration facilities set up under license from the breeders to whom they pay royalties. Other inputs such as chemicals and equipment are also obtained through a carefully evaluated procurement process and using reliable and reputable suppliers with experience in providing agricultural inputs.

Among the improved flower cultivation techniques adopted in Uganda include the use of the hydroponics technology in which plants are fed through computerized irrigation systems. Other production methods include the adoption of modern crop agronomic practices and integrated scientific means of diseases and pest control. In addition, there is need to maintain the quality of the flowers after harvest through careful handling and using an effective post-harvest cold chain management system. This requires having cold stores in the farms for purposes of cooling the flowers before they are packaged for shipment to the export markets. Delivery to the airport is undertaken in refrigerated or insulated delivery trucks. At the airport flowers have to be kept in cold stores awaiting palletization and loading onto the aircraft for the final shipment to the export market. These factors largely explain why the flower farms are located in the areas near Lake Victoria and closer to Entebbe airport, the main exit route to the export markets.

Additional developments in the sector facilitated by UFEA include the setting up in 2000 of a Research and Training facility on one of the producers' farms. This has been helpful in enabling the growers to select more suitable flower varieties or cultivars through experimental trials in conjunction with the representatives of the breeders. It also acted as a nucleus for a training program run in conjunction with Makerere University and in which supervisors and managers undertake regular theoretical and practical training on the growing, management and handling of flowers and also includes traveling to other countries such as Kenya and Holland to gain knowledge and experience in advanced production methods and the marketing of flowers.

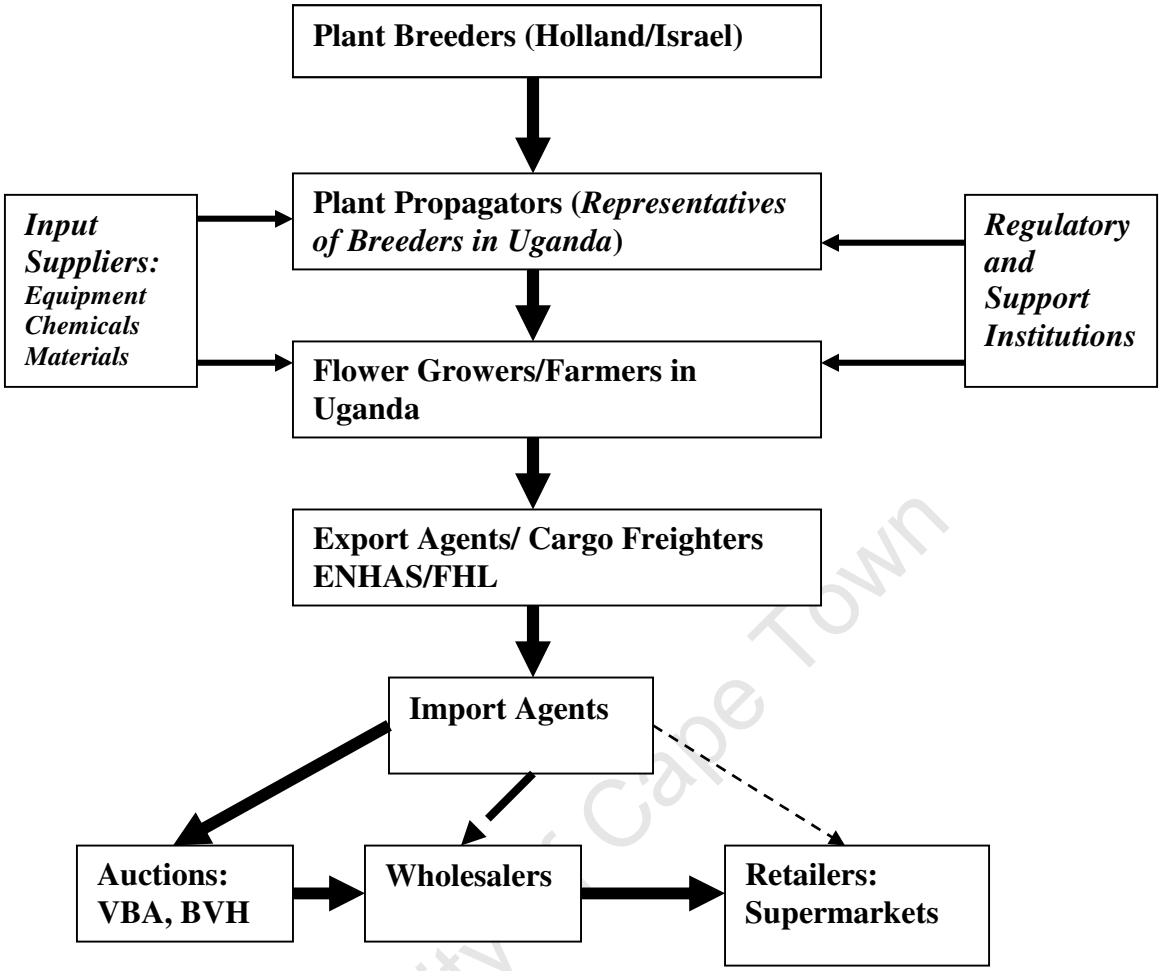
Uganda was also one of the earlier ACP countries to recognize the importance of developing a social and environmental Code of Practice that was subsequently incorporated into the

COLEACP harmonized Code that has been overtaken by other codes such as that under the MPS scheme. The Uganda Code of Practice emphasizes among other things: workers health and safety, fair remuneration and working conditions for the employees, consumer health and safety, control of environmental degradation, environment conservation, and careful use of chemicals. This Code is important in regulating the behavior of flower growers towards using safer and environmentally friendlier means of production and hence acts as a "license" for entry into the export markets.

Almost all the roses grown in Uganda are exported to Europe and then sold through the intermediaries (Dutch auction houses) and the Chrysanthemums cuttings are sold to the rooting companies. The main destinations of Ugandan flowers are the Netherlands, Germany, United Kingdom, France, Norway and Sweden. Flowers are sold through Dutch auctions or directly through agents then to the wholesalers and supermarkets. The two main auctions used by the growers in Uganda are the VBA and BVH. The marketing of flowers has been facilitated through the setting up of Fresh Handling Air Cargo Limited under UFEA. This company provides cold storage and handling facilities at Entebbe Airport for the flower and other horticultural and fish exporters in Uganda.

Auctions enable a producer to grow a limited range of varieties and also guarantees security of payment. The direct markets offer the best opportunities in that sales go through an approved packer then to the supermarkets. The majority of supermarkets require 40-50 cm stem length of small headed varieties which Uganda produces favorably. Supermarket sales offer the prospects of high volume sales and stable prices often on a long term contract basis to a consistent and high quality producer. Supermarket pricing is often more stable than the auction or open spot market price. However, a key challenge in the export marketing of flowers is that Uganda is still faced with the lack of regular airfreight capacity. Hence, there is need for further improvements through charter flights and more reliable services in the handling of flowers. An elaborate outline of the flower production and export marketing value chain in Uganda is illustrated in the Diagram II below.

Diagram II. Flower Production and Export Marketing Value Chain in Uganda



Source: Author based on data from field survey

International regulatory framework and market dynamics governing flower export trade

The most important export markets for the flowers from Uganda have traditionally been in the European Union. The EU market is one of the world's largest for flowers and has been growing rapidly both in quantity and quality. The EU market is also reported to be substantially segmented and differentiated in comparison to the other large flower markets such as USA and the Far East. However, due to the various developments, such as the harmonization of the EU, the introduction of the Euro, and the growing market share of international retail chains, the market is now increasingly showing specific "European Characteristics" which makes it an attractive but also complex market (VEK-World Bank, 2004).

The EU market however, has characteristics which impose constraining requirement for market access. For example, the responsibility for the risk is being increasingly moved upstream in the supply chain; from the consumer to the retailer then to the distributor and finally to the producer. The burden of proof lies with the producer who is responsible for all the risks and needs to demonstrate that all possible risks have been identified, analyzed, controlled and reduced. This has led to the development of standards and protocols such as MPS and Florimark to be followed by the growers so that they are guaranteed entry to the market.

The supply of flowers to the EU therefore requires the attainment of certain standards which demonstrate professionalism in production, logistics and risk management. This is more so because flowers are characterized by unique features such as: the mode of consumption (flowers are consumed fresh), the perishable nature of the product (flowers are perishable products), and the value-volume ratio (the value-volume ratio of the flowers varies depending on the variety and the target market). Hence, the marketing of flowers like other perishable food products is based on integrated concepts. Marketing starts by defining the final retail outlet (for example supermarket chains or florist shop). All the decisions that follow are then made (variety selection, production, and distribution infrastructure) subject to that initial choice. Thus, the flower sector is capital-intensive and relatively sensitive to access to information and management systems. Thus, a careful look at the international markets for flowers is necessary before venturing into commercial production on a large scale.

The world exports of floriculture was estimated at $ 7.3 billion in 2001 having reduced from about $ 8.3 billion four years earlier as a result of the lower prices per volume and the exchange rates variations between the Dollar and the Euro (VEK-World Bank, 2004). The Netherlands is the world's largest exporter of cut flowers with exports valued at approximately $ 2 billion or almost 55 percent of the market. Colombia and Ecuador are second and third exporters in the world. African countries represent 8 percent of world exports of flowers valued at almost $ 300 million. Kenya is the largest African exporter with 55 percent of the African market, followed by Zimbabwe (22 percent) and Zambia (6 percent). Uganda supplied about 3.8 percent of the flowers exported from Africa in 2001. Uganda is the third largest exporter of ornamental plants ranking with 11.5 percent behind Kenya and South Africa in 2001. This overview puts Uganda in a low position in terms of market dominance and to be able to grow sales, flower exporters should focus on the

segments that show prospects of growth and to which they can match their capabilities of production and marketing. This in turn requires a steady investment in capability development through networking and learning.

Learning and networking in the floriculture export sector in Uganda

UFEA has played a significant role in helping the flower sector in Uganda develop its technical and managerial capacities in the business of floriculture. There is an annual training program *"Applied Tropical Floriculture"* run in collaboration with Makerere University and other institutions in Kenya and Holland. This is organized for the supervisors and managers on the flower farms. This training involves hands-on training for the trainees, sharing experiences between farms and together come up with solutions to common problems. It encourages improving flower production on the farms. The training also involves visits to flower farms in Kenya and Holland to learn from them and hence improve skills for the production of high quality flowers. The auctions and other importers in Holland are also visited to enable the trainees learn about the operations and dynamics of the flower export markets. This training has been necessary given that the industry is moving to high technology involving the use of hydroponics, so there is need to have competent supervisors who can then train other employees on how to use the systems and equipment and also for them to be able to supervise well. If the industry is to double in size as envisaged in the strategic plan, there will be need for new people who must then be trained to support industry growth (UFEA, 2005).

They also undertake research which involves on-farm trials on different varieties in collaboration with the breeders and plant propagators. A lot of research has also been done jointly with Makerere University and plant breeders and propagators to identify the nematode species that attack flowers in Uganda. This was to encourage growers consider the option of using substrates versus soils in the growing of flowers. Other aspects of capacity building undertaken by the growers include the study groups organized by the Centre for Export Promotion (CBI) in Netherlands visiting Ugandan flower farms and sharing experiences. Growers on their own also meet regularly and they share experiences and ways of improving production on their individual farms. In addition issues like manpower handling as well as productivity and benchmarking on the farms are discussed.

Standards and the Code of Conduct:

UFEA also launched and encouraged its members to follow a Code of Practice which is in compliance with the MPS and EUREP-GAP standards. The Code of Practice addresses issues pertaining to:

- Workers health and safety.
- Fair remuneration and working conditions for the employees.
- Consumer health and safety.
- Control of environmental degradation.
- Environmental conservation.
- Careful use of chemicals and disposal of their packages and residues thereof.
- Other technical aspects of flower production.

All the members of UFEA commit themselves to meeting the requirements and standards governing conduct in the industry and are supposed to make themselves available for audit on a continuous basis. In addition UFEA is itself audited through random "spot checks" once or twice a year by the international accredited agency Burea Veritas thus ensuring that the high standards are maintained. Auditors from the MPS in Nairobi also come to audit the flower farms.

By the beginning of January 2004, 3 firm in Uganda had qualified for certification by MPS in the following categories: MPS(A) 1 Firm, MPS(b) 2 Firms. By January 2005 another 8 firms had qualified for certification by MPS bringing the number to 11 in the following categories: MPS(A) 3 Firms, MPS(B) 7 Firms and MPs(C) 1 Firm. It was hoped that by the end of 2005 there should be some firms qualifying for MPS-GAP. The certification standards of MPS are as follows:

1. **MPS:** Concentrates on the environment to ensure good and a safe and sustainable use of the natural resources.
2. **MPS-GAP**: For Good Agricultural Practice is meant to protect the environment, workers welfare, workers safety and the sustainable use of the natural resources. It gives advantage of a good reputation in the export markets. This helps in killing the curiosity of the flower buyers or consumers. This is done by providing stickers on the flower packages which show the standards attained and the level of compliance.

3. **MPS Social Chapter:** This concentrates on the social aspect of the working environment: worker safety and welfare, remuneration, labor rights etc.
4. **MPS Florimark:** This has no registered farms in Uganda as yet and includes among other things the social welfare of the workers, improved quality management systems and compliance with environmental standards.

Thus, in summary the principal roles of Uganda Flower Exporter's Association (UFEA) include:

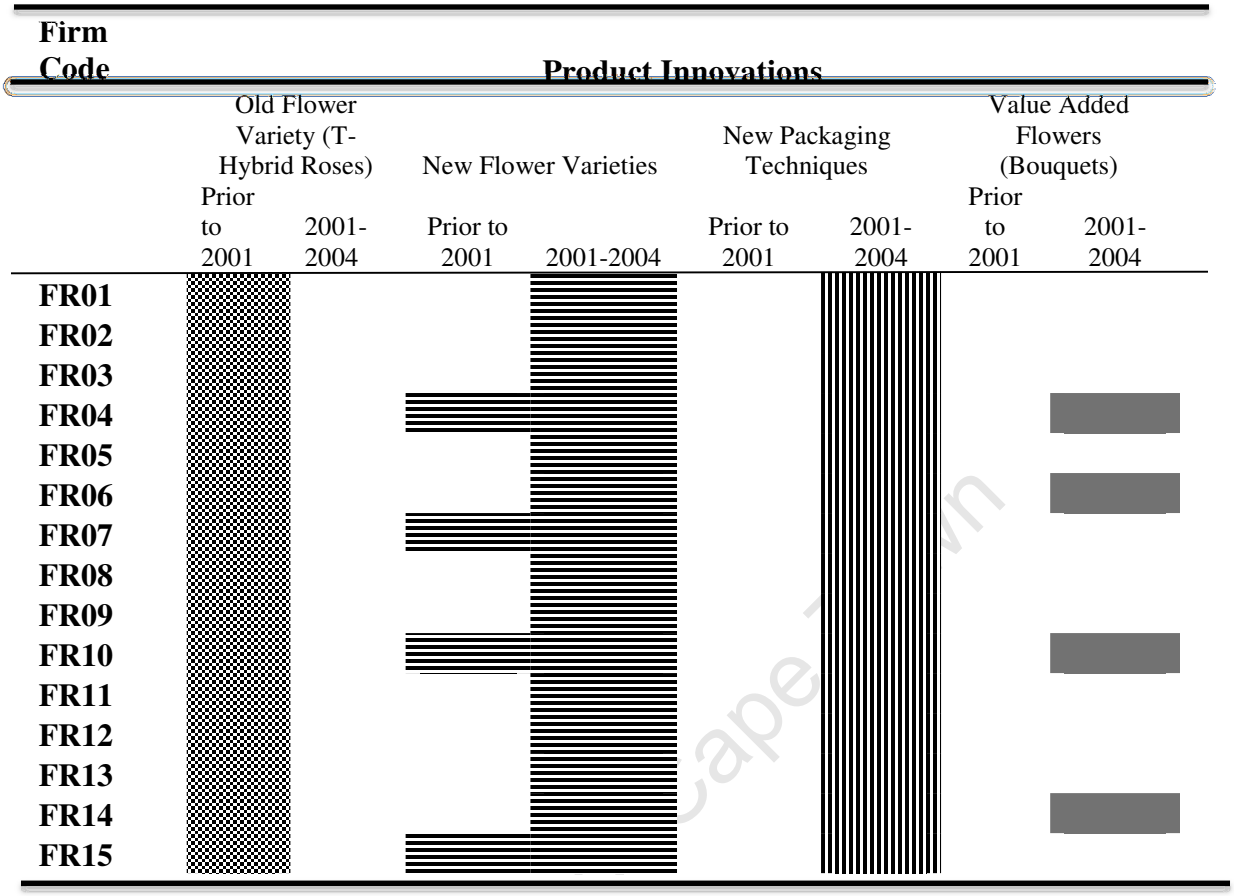
- Facilitating members in the selection of quality and high-yielding flower varieties (cultivars) which are adaptable to the Ugandan ecological and climatic conditions.
- Adoption and implementation of the industry Code of Best Practice, which is synonymous to and consistent with the MPS requirements.
- Facilitating the improvement and the handling of flowers by creating Fresh Handling Limited (FHL) so as to reduce transportation costs and losses in quality at the airport, and along the international supply chain.
- Helping the flower growers to constantly improve their production systems so as to ensure improved farm productivity and quality of the flowers.
- Helping the flower growers in accessing market information and jointly promoting the flowers in the international markets through organizing and participating in international flower fairs and shows.
- Working very closely with business support institutions, government, and donor agencies to mobilize resource support for the implementation of programs that facilitate the development of the flower export industry in Uganda.
- Facilitating and coordinating a number of training and capacity building programs that benefit all the flower farms in the industry. This is to be done with the support of Makerere University, government, and other development partners.
- Providing leadership for the members to jointly lobby government to provide a better enabling business environment for the growth and development of the industry.

Challenges to the Development of the Flower Sector in Uganda

The main challenge to the expansion and development of the flower sector in Uganda include:

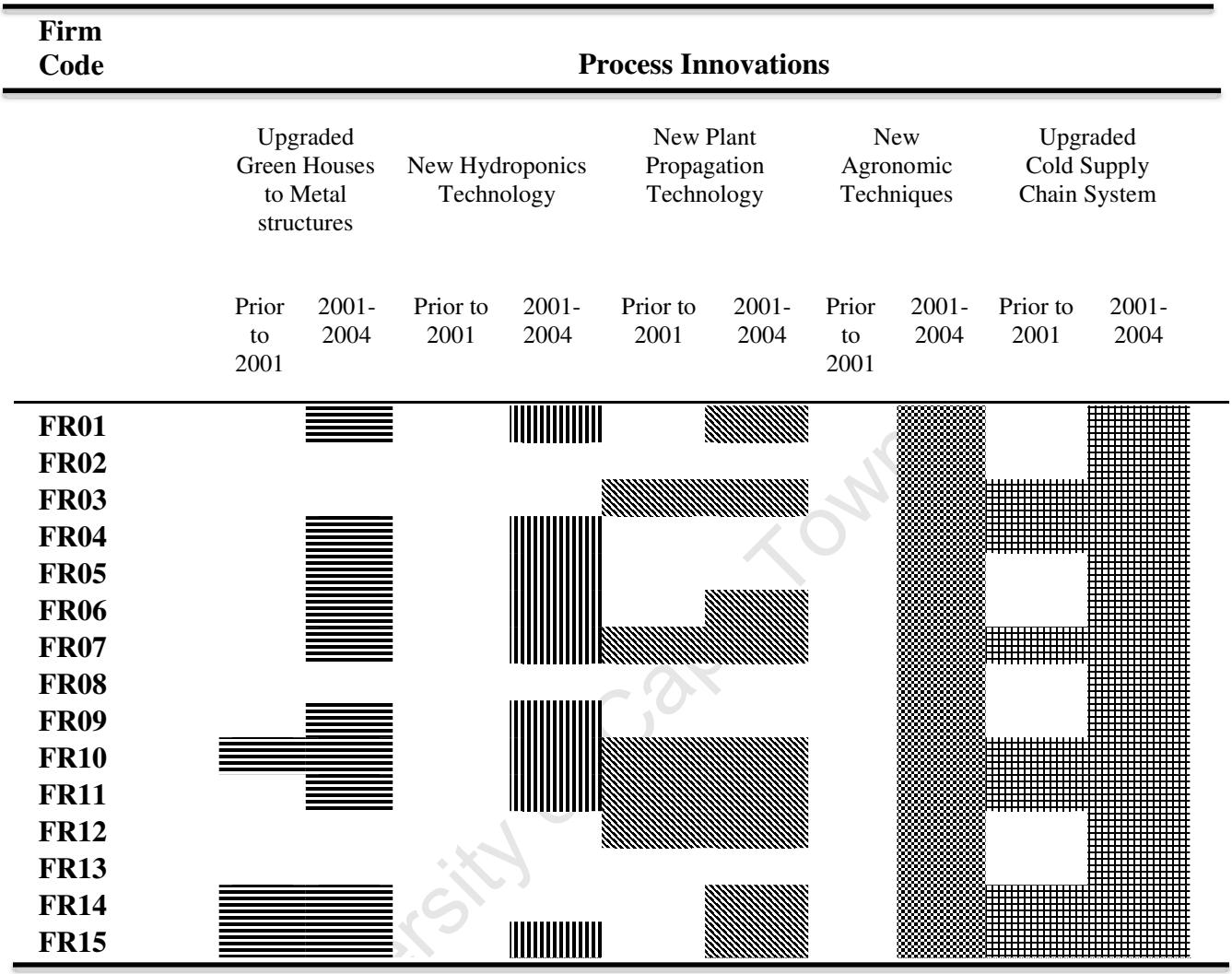
- Lack of access to affordable local investment finance. Where it is available the interest rates are very high, on average 20%-25% per annum and banks will also require borrowers to have collateral as security. Long term funding for agricultural development is lacking and yet it is important for investment in the upgrading and modernization of the farms. Investment in the flower business is very expensive and requires approximately per farm a minimum of US $ 1 million which is generally high by Ugandan standards (UFEA, 2005). Uganda is unable to have cheap financing partly because of restrictions imposed by the World Bank and International Monetary Fund (IMF). These institutions give a thresh hold below which the financial sector cannot lend for purposes of maintaining the macroeconomic fundamentals such as inflation.
- Lack of a good investment climate (incentives) compared to other competing African countries such as Kenya and Ethiopia.
- Uganda also faces a serious lack of volume to consistently satisfy the big buyers in the export markets, or to attract the airlines carriers at reasonable freight rates. This may be attributable to the small sizes of the flower farms in Uganda.
- High costs of utilities especially electricity. Related to that, is the fluctuations in power supply which generally poses a high risk to the farm equipments such as the water pump, the irrigation and the cold storage facilities. Hence, the cost of production and operations increases because of the need to run expensive standby generators to provide electricity to the farms.
- Occasional setbacks caused by the violent storms that destroy the green houses.
- The need to comply fully with the EUREP-GAP and MPS standards and the high costs associated with doing so. This requires putting in place systems to ensure full compliance and the training of the staff to be competent. Certification in Uganda is supposed to be done by MPS representatives in Nairobi Kenya. All these require meeting additional costs in investments and operations.

Appendix 5.1: Patterns of product innovation in the Ugandan flower export industry (2001-2004)



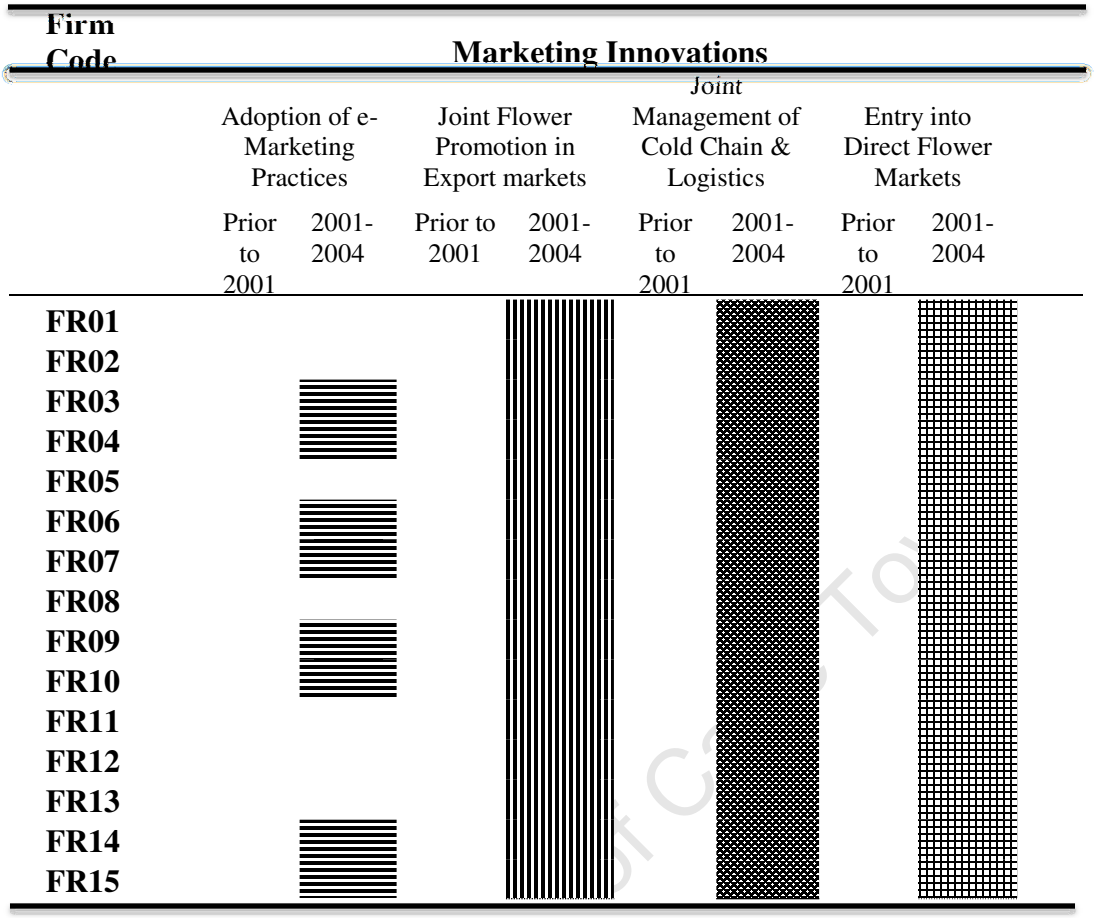
Source: Data from field survey

Appendix 5.2: Patterns of process innovation in the Ugandan flower export industry (2001-2004)



Source: Data from field survey

Appendix 5.3: Patterns of marketing and supply chain innovation in the Ugandan flower export industry (2001-2004)



Source: Data from field survey

Appendix 6.1: Revenue and cost estimates of individual operating configurations of Ugandan flower exporters

	Estimates of Revenue, Costs and Operating Margin (US $ per Flower Stem)								
Operating Configuration	**1a**	**2**	**3a**	**4**	**5a**	**6**	**7a**	**8**	**9**
Variable Production Costs:									
Direct Labour	0.0067	0.0068	0.0067	0.0068	0.0090	0.0068	0.0090	0.0068	0.0148
Chemicals	0.0054	0.0049	0.0054	0.0049	0.0072	0.0049	0.0072	0.0049	0.0049
Water	0.0008	0.0010	0.0008	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Fertilizers	0.0036	0.0033	0.0036	0.0033	0.0048	0.0033	0.0048	0.0033	0.0033
Sub-Total V-Production Costs	**0.0165**	**0.0161**	**0.0165**	**0.0161**	**0.0220**	**0.0161**	**0.0220**	**0.0161**	**0.0241**
Packaging, Freight and Marketing Costs:									
Freight Cost	0.0188	0.0220	0.0188	0.0220	0.0266	0.0312	0.0266	0.0312	0.0220
Handling Costs NL	0.0026	0.0032	0.0026	0.0032	0.0037	0.0046	0.0037	0.0046	0.0032
Handling Costs UG	0.0009	0.0006	0.0009	0.0006	0.0013	0.0009	0.0013	0.0009	0.0006
Packaging Materials	0.0018	0.0026	0.0018	0.0026	0.0026	0.0038	0.0026	0.0038	0.0180
Marketing Costs	0.0019	0.0023	0.0019	0.0023	0.0028	0.0033	0.0028	0.0033	0.0023
Auction/Agent Fees (Commission)	0.0144	0.0165	0.0144	0.0165	0.0192	0.0210	0.0192	0.0210	0.0237
Sub-Total Freight and Marketing Costs	**0.0404**	**0.0474**	**0.0404**	**0.0474**	**0.0561**	**0.0647**	**0.0561**	**0.0647**	**0.0699**
Overhead Costs:									
Electricity & Fuel	0.0013	0.0019	0.0013	0.0019	0.0018	0.0022	0.0018	0.0022	0.0019
Repair and Maintenance	0.0016	0.0019	0.0016	0.0019	0.0022	0.0023	0.0022	0.0023	0.0019
Consultancy Fees	0.0006	0.0008	0.0006	0.0008	0.0008	0.0010	0.0008	0.0010	0.0008
Communication	0.0006	0.0005	0.0006	0.0005	0.0008	0.0007	0.0008	0.0007	0.0005
Administration and Bank Costs	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0001	0.0001
Training and Supervision	0.0007	0.0010	0.0007	0.0010	0.0010	0.0012	0.0010	0.0012	0.0010
Inspection and MPS Certification	0.0005	0.0005	0.0005	0.0005	0.0007	0.0006	0.0007	0.0006	0.0005
Insurance and Licences	0.0004	0.0004	0.0004	0.0004	0.0006	0.0005	0.0006	0.0005	0.0004
Foreign Travel	0.0007	0.0007	0.0007	0.0007	0.0009	0.0008	0.0009	0.0008	0.0007
Others (board, management)	0.0030	0.0027	0.0030	0.0027	0.0039	0.0033	0.0039	0.0033	0.0027
Sub-Total Overhead Costs	**0.0096**	**0.0106**	**0.0096**	**0.0106**	**0.0128**	**0.0127**	**0.0128**	**0.0127**	**0.0106**
Investment Costs (Depreciation)									
Land & Infrastructure	0.0012	0.0014	0.0012	0.0014	0.0017	0.0016	0.0016	0.0016	0.0014
Planting Materials & Production Facilities	0.0138	0.0144	0.0138	0.0144	0.0184	0.0173	0.0183	0.0173	0.0144
Vehicles & Equipment	0.0024	0.0027	0.0024	0.0027	0.0032	0.0031	0.0032	0.0031	0.0027
Sub-Total Investment Costs	**0.0174**	**0.0185**	**0.0174**	**0.0185**	**0.0233**	**0.0222**	**0.0233**	**0.0222**	**0.0185**
Total Costs	**0.0839**	**0.0925**	**0.0839**	**0.0925**	**0.1141**	**0.1157**	**0.1141**	**0.1157**	**0.1231**
Revenue (Price)	**0.09**	**0.1**	**0.1**	**0.11**	**0.12**	**0.13**	**0.13**	**0.14**	**0.148**
Profit Before Tax	**0.0061**	**0.0075**	**0.0161**	**0.0175**	**0.0059**	**0.0143**	**0.0159**	**0.0243**	**0.0249**
Operating Margin	**6.7%**	**7.5%**	**16.1%**	**15.9%**	**4.9%**	**11.0%**	**12.2%**	**17.3%**	**17%**

Appendix 6.2: Estimated annual production and operational costs based on a 5 Hectare flower farm (in US $)

	2001	2001	2004	2004	2004	2004
Growth Medium	Soil	Soil	Soil	Soil	Hydroponics	Hydroponics
Flower Product Type	Sweet Heart	Intermediate	Sweet Heart	Intermediate	Sweat Heart	Intermediate
Units of Measurement	Per Hectare	Per Hectare	Per Hectare	Per Hectare	Per Hectare	Per Hectare
Variable Production Costs:						
Direct Labour	20,500	20,500	24,800	24,800	24,800	24,800
Chemicals	16400	16400	18000	18000	18000	18000
Water	2300	2300	3100	3100	3800	3800
Fertilizers	11000	11000	12000	12000	12000	12000
Overhead Costs:						
Electricity & Fuel	4000	4000	6200	6200	6800	6800
Repair and Maintenance	5000	5000	6000	6000	7000	7000
Consultancy Fees	1900	1900	2200	2200	3000	3000
Communication	1800	1800	2000	2000	2000	2000
Administration and Bank Costs	400	400	500	500	400	400
Training and Supervision	2200	2200	2800	2800	3600	3600
Inspection and MPS Certification	1500	1500	1800	1800	1800	1800
Insurance and Licences	1300	1300	1500	1500	1500	1500
Foreign Travel	2000	2000	2500	2500	2500	2500
Others (board, management)	9000	9000	10000	10000	10000	10000

Source: Data from field survey

Notes.

Workings based on an estimate of costs provided by Uganda Flower Exporters association and from data obtained through field survey.

Appendix 6.3: Estimated freight & marketing costs for Ugandan flower exports (in US $)

	2001 Sweet Heart	2001 Intermediate	2004 Sweet Heart	2004 Intermediate
Handling cost per stem				
Cost of handling & clearance NL ($/kg)	0.2	0.2	0.25	0.25
Cost of handling & clearance UG ($/kg)	0.07	0.07	0.05	0.05
Number of stems per box	850	600	850	600
Weight of each box (kg)	11	11	11	11
Cost of handling & clearance NL ($/stem)	0.0026	0.0037	0.0032	0.0046
Cost of handling & clearance UG ($/stem)	0.0009	0.0013	0.0006	0.0009
Marketing cost per stem				
Estimated marketing cost ($/kg)	0.15	0.15	0.18	0.18
Number of stems per box	850	600	850	600
Weight of each box (kg)	11	11	11	11
Total marketing cost per stem	0.0019	0.0028	0.0023	0.0033
Packaging cost per stem				
Estimated packaging cost ($/box)	1.55	1.55	2.25	2.25
Number of stems per box	850	600	850	600
Total packaging cost per stem	0.0018	0.0026	0.0026	0.0038
Auction cost per stem				
Selling price per stem	0.09	0.12	0.11	0.14
Auction Agent Fee (16% of selling price)	0.0144	0.0192	0.0165	0.021
Freight cost per stem				
Estimated freight cost ($/kg)	1.45	1.45	1.7	1.7
Number of stems per box	850	600	850	600
Weight of each box (kg)	11	11	11	11
Total freight cost per stem	0.0188	0.0266	0.0220	0.0312

Source: Data from field survey

Notes.

Workings based on an estimate of costs provided by Uganda Flower Exporters association and from data obtained through field survey.

Appendix 6.4: Estimated investment costs for an average 5 hectare Ugandan flower farm using soil with imported plants in 2001 (in US $)

	Depr. Rate	Initial Cost	Recurrent Cost	Cost per year	Cost per year/Ha
Investments:					
Land and Infrastructure					
15 hectares land	2%	15,000		300	60
land clearing (5ha) and road construction	2%	10,000		200	40
fencing	5%	5,000		250	50
bore hole and water reservoir	2%	35,000		700	140
office, stores and houses for staff	5%	200,000	10,800	10,540	2,108
electricity infrastructure and transformer	5%	116,500	8,500	6,250	1,250
Sub-Total: Land & Infrastructure				**18,240**	**3,648**
Plant Materials & Production Facilities					
5 hectares green houses	20%	220,000	61,300	56,260	11,252
Irrigation system	10%	100,000	20,000	12,000	2,400
Fertilization system	10%	20,000		2,000	400
5 hectares rose plants	25%	200,000	30,000	57,500	11,500
rose plant royalties	25%	240,000	48,000	72,000	14,400
Grading shade and equipment	10%	50,000		5,000	1,000
Coolers	10%	50,000		5,000	1,000
Sub-Total: Production Facilities				**209,760**	**41,952**
Vehicles and Equipment					
2nd hand cold trucks	25%	46,080		11,520	2,304
2 farm vehicles (pick-ups)	20%	40,000		8,000	1,600
stand-by generator	20%	40,000		8,000	1,600
Office, furniture and communication equip't	25%	15,000	5,000	5,000	1,000
Various small tools	33%	10,000	2,000	3,960	792
Sub-Total: Vehicles & Equipment				**36,480**	**7,296**
Total Investments		**1,412,580**		**264,480**	**52,896**

Source: Data from field survey

Notes.

Workings based on an estimate of costs provided by Uganda Flower Exporters association and from data obtained through field survey.

Appendix 6.5: Estimated investment costs for an average 5 hectare Ugandan flower farm using hydroponics with self-propagated plants in 2004 (in US $)

	Depr. Rate	Initial Cost	Recurrent Cost	Cost per year	Cost per year/Ha
Investments:					
Land and Infrastructure					
15 hectares land	2%	15,000		300	60
land clearing (5ha) and road construction	2%	10,000		200	40
fencing	5%	5,000		250	50
bore hole and water reservoir	2%	35,000		700	140
office, stores and houses for staff	5%	275,000	21,800	14,840	2,968
electricity infrastructure and transformer	5%	147,500	11,500	7,950	1,590
Sub-Total: Land & Infrastructure				**24,240**	**4,848**
Plant Materials & Production Facilities					
5 hectares green houses	20%	270,000	80,000	70,000	14,000
Irrigation system	10%	203,700	36,000	23,970	4,794
Fertilization system	10%	130,000		13,000	2,600
5 hectares rose plants	25%	192,000	21,500	53,375	10,675
rose plant royalties	25%	305,000	62,000	91,750	18,350
Grading shade and equipment	10%	50,000		5,000	1,000
Coolers	10%	50,000		5,000	1,000
Sub-Total: Production Facilities				**262,095**	**52,419**
Vehicles and Equipment					
2nd hand cold trucks	25%	80,760		20,190	4,038
2 farm vehicles (pick-ups)	20%	20,000		4,000	800
stand-by generator	20%	35,000		7,000	1,400
Office, furniture and communication equip't	25%	33,000	7,000	10,000	2,000
Various small tools	33%	13,700	3,800	5,775	1,155
Sub-Total: Vehicles & Equipment				**46,965**	**9,393**
Total Investments		**1,870,660**		**333,300**	**66,660**

Source: Data from field survey

Notes.

Workings based on an estimate of costs provided by Uganda Flower Exporters association and from data obtained through field survey.

Appendix 7: Data collection instrument - questionnaire

Introduction:

Dear Respondent,

This research study is being carried out to obtain your opinions, views and experiences on the innovation activities undertaken by your company and its impact on financial performance. Your company is one among others to take part in this study. You are therefore kindly requested to participate as your views and those of the other staff of your company who have been asked to complete this questionnaire are important for the study.

Your responses to the questionnaire will be completely ***confidential***. You are not required to indicate your name and that of your company anywhere on the questionnaire. I would most greatly appreciate if you could please spare me some of your time and give your valuable opinion and views by completing the questionnaire.

How to complete the questionnaire:

An introductory statement and scale is given at the beginning of each question. Please read the opening statement of each question carefully and follow the instructions it provides in completing the specific question. All sections have numbers 5 to 1 corresponding to the answers, please make sure in such cases you place a tick (✔) in the box under the number corresponding to your chosen answer.

---

1. The following statements are used to indicate the ***level of innovativeness*** in your company. Using the scale below show how you agree or disagree with them:

I Strongly Agree	I Agree	Iam Not Sure	I Disagree	I Strongly Disagree
5	4	3	2	1

Statement:	5	4	3	2	1
My company has a formalized process for developing new products					
My company has a formalized process for modifying products					
My company has a formalized process for developing new marketing processes					

2. This question is about your company's ***investments in innovations***. Use the scale below to indicate the extent to which you agree or disagree to the following statements as regards your company's ***investments in innovations.***

I Strongly Agree	I Agree	Iam Not Sure	I Disagree	I Strongly Disagree
5	4	3	2	1

Statements:	5	4	3	2	1

Our company has decided to research into and find alternative export markets for its products in the near future.					
Our company has decided to develop new or modified products in the near future.					
Our company has decided to find new or alternative export market channels for its products in the near future.					
Our company has decided to adopt new or alternative methods of foreign exchange risk management in the near future.					

3. For the most useful relationships that your company has with external partners: **Customers/Distributors; Government/Donor Institutions and Competitors**, kindly show the extent to which you agree or disagree with the following statements as regards the relationships between your company and the other external partner organizations:

I Strongly Agree	I Agree	Iam Not Sure	I Disagree	I Strongly Disagree
5	4	3	2	1

Relationships with Export Customers/Distributors

Statement:	5	4	3	2	1
We maintain personal ties with our export customers/distributors					
We maintain close social relationships with our export customers/distributors					
We know and collaborate with our export customers/distributors at a personal level					
Our export customers/distributors avoid making demands that can severely damage our interests					
Our export customers/distributors avoid taking advantage over us even if the opportunity arises					
We consider the staff of our export customers/distributors as individuals who keep their promises					

Relationships with Government/Donor Support Institutions

Statement:	5	4	3	2	1
We maintain personal ties with the staff in the government/donor support institutions					
We maintain close social relationships with staff in the government/donor support institutions					
We know and collaborate with the staff in the government/donor support institutions at a personal level					
Our export customers/distributors avoid making demands that can severely damage our interests					
Our export customers/distributors avoid taking advantage over us even if the opportunity arises					
We consider the staff of our export customers/distributors as individuals who keep their promises					

Relationships with Local Competitors (Members of the Fish Exporters' Association)

Statement:	**5**	**4**	**3**	**2**	**1**
We maintain personal ties with the employees of our local competitors					
We maintain close social relationships with the employees of our local competitors					
We know and collaborate with the employees of our local competitors at a personal level					
Our export customers/distributors avoid making demands that can severely damage our interests					
Our export customers/distributors avoid taking advantage over us even if the opportunity arises					
We consider the staff of our export customers/distributors as individuals who keep their promises					

4. How satisfied are you with the following aspects of your company's ***absolute performance*** in the last four (4) years:

Very Satisfied	**Satisfied**	**Neither Satisfied Nor Dissatisfied**	**Dissatisfied**	**Very Dissatisfied**
5	**4**	**3**	**2**	**1**

Statement:	**5**	**4**	**3**	**2**	**1**
Profitability					
Penetrating New Export Markets					
Utilizing new export marketing channels					
Penetrating New (Premium) Export Market Segments					

5. How satisfied are you with the ***improvements*** in the following aspects of your ***company's performance*** in the last four (4) years: (improve1-16)

Very Satisfied	**Satisfied**	**Neither Satisfied Nor Dissatisfied**	**Dissatisfied**	**Very Dissatisfied**
5	**4**	**3**	**2**	**1**

Statement:	**5**	**4**	**3**	**2**	**1**
Profitability					
Overall growth in $ export revenue					
Growth in export revenue relative to local competitors					
$ Equivalent export prices					
Penetration of new export markets relative to local competitors					
Penetrating New (Premium) Export Market Segments					

Particulars of the Respondent:

12. About the respondent:

(a) To which age bracket do you belong: Below 20 years ☐ 21-30 yrs ☐ 31-40 yrs ☐

41-50 yrs ☐ Above 50yrs ☐

(b) Sex: Male ☐ Female ☐

(c) Highest level of education attained

School ☐ College Diploma ☐ Bachelors Degree ☐ Masters Degree ☐

Doctorate Degree ☐

(d) What is your field of specialization?

Agriculture/Science ☐ Humanities/Social Science ☐ Law ☐

Business Administration/Finance ☐ Other (Specify)……..☐

(e) Approximately how many years have you spent in this company/industry:

0-2 years ☐ 3-5 years ☐ 5-8 years ☐ Above 8 years ☐

(f) What is your current job designation (title)……

Appendix 8.1: Interview guide for the Ugandan fish processing and export sector study

1. Which of the following best describes the ownership of your company: Locally owned, Foreign owned, Jointly owned (partly local and partly foreign)?
2. What were the main changes (innovations) developed by your company in the period 2001-2004 (Product, Process, Marketing and Supply Chain innovations)?
3. Were there any significant differences in the development and adoption rates of the different innovations? If so how?
4. What were the main factors driving these innovations?
5. Was there any external assistance to support innovation development (e.g. government, development partners or other organizations) and to what magnitude?
6. Has your company been able to meet the fish export market compliance requirements? Has your company experienced any problems in supplying processed fish to export markets? If so what problems and how long did they persist?
7. Kindly provide the following data about your company:

Item	**2001**	**2002**	**2003**	**2004**
Total Installed Processing Capacity (Tons).				
Average Processing Capacity (Tons).				
Export Volume (Tons): *Frozen Fillets* *Fresh Chilled Fillets* *Others*				
Revenue (US $): *Frozen Fillets* *Fresh Chilled Fillets* *Others*				
Average Fish Yield				
Average Beach price @ kg of unprocessed fish				
Export Market price @ Kg (Wholesale): *Frozen Fillets* *Fresh Chilled Fillets* *Value Added Fish Products*				
Export Market price @ Kg (Retail):				

Frozen Fillets *Fresh Chilled Fillets* *Value Added Fish Products*				
Direct Jobs.				
Indirect Jobs				

8. Are there any costs or risks associated with chilled fish or the value added fish products which are higher than those for frozen fish?
9. What are the main differences in the supply requirements of the wholesalers and retailers in the export markets? How do they exercise their market power?
10. What were the differences in costs of marketing in the different export market channels for the Ugandan fish processors and exporters (2001-2004)?

Channel Marketing Cost	**2001**	**2002**	**2003**	**2004**
Wholesale Markets: …… …… …… ……				
Retail Markets: …… …… …… ……				

11. Kindly provide data on the price and the average costs per kilogram of the different fish products for the period (2001-2004):

Price/Cost	Value Added Fish Fillets	Fresh Chilled Fish Fillets	Frozen Fish Fillets
Export Price: *Wholesale* *Retail*			
Capital Investment			
Production Cost:			

Energy *Labor* *Packaging* *Overheads*			
Transport: *Land Transport* *Sea Transport* *Air Transport*			
Marketing Costs: *Clearing Costs* *Commission*			

12. What was the cost structure of the fish (Nile Perch) processing and export value chain in Uganda in the period 2001-2004 in terms of the following?

Cost Structure Item	**2001**	**2002**	**2003**	**2004**
Production Costs: …… …… …… …… …… …… ……				
Packaging Costs				
Cold Storage at the airport				
Clearing and Forwarding				
Air transport to the export markets				
Handling charges (commission) in the export markets Other Costs: …… …… ……				

13. What are the main challenges to innovation in the fish processing and export industry in Uganda?

14. How is the Uganda Fish Processors and Exporters Association (UFPEA) helping its members to overcome these challenges?

15. To what extent is government and other development partners helping the industry to overcome challenges to innovation development and its commercialization?

Appendix 8.2 Interview guide for the Ugandan flower export sector study

1. Which of the following best describes the ownership of your company: Locally owned, Foreign owned, Jointly owned (partly local and partly foreign)?
2. What were the main changes (innovations) developed by your company in the period 2001-2004 (Product, Process, Marketing and Supply Chain Innovations).
3. Were there any significant differences in the development and adoption rates of the different innovations? If so how?
4. What were the main factors driving these innovations?
5. Was there any external assistance to support innovation (e.g. government, development partners or other organizations) and to what magnitude?
6. Has your company been able to meet the flower export market compliance requirements? Has your company experienced any problems in supplying flowers to export markets? If so what problems and how long did they persist?
7. Kindly provide the following data about your company.

Item	**2001**	**2002**	**2003**	**2004**
Total Area (Hectares)				
Number of Farms				
Average Farm Size				
Export Volume (Tons/Stems): *Large bud size roses* *Intermediate roses* *Small bud size roses*				
Revenue (US $): *Large bud size roses* *Intermediate roses* *Small bud size roses*				
Price @ Stem (US $): Auction: *Large bud size roses* *Intermediate roses* *Small bud size roses* Direct Wholesale: *Large bud size roses*				

Intermediate roses *Small bud size roses* Retail: *Large bud size roses* *Intermediate roses* *Small bud size roses*				
Yield @ M² (Stems @ Year) *Large bud size roses* *Intermediate roses* *Small bud size roses*				
No. of Direct Jobs				
No. of Indirect Jobs				

8. What are the key operational differences and characteristics (features) between the *Auctions* and the *Direct* flower markets?
9. What are the differences in costs of marketing in the different export market channels (*Auctions, Direct Wholesale, and Retail*) in the period 2001-2004?

Channel Marketing Costs	**2001**	**2002**	**2003**	**2004**
Auctions: …… ……... …… ……				
Direct Whole sale: …… …… …… ……				
Retail: …… ……				

10. What is the cost structure of the flower export value chain in Uganda? (Kindly provide data for the 2001-2004 as indicated below)

Cost Structure Item	**2001**	**2002**	**2003**	**2004**
Production Costs: …… …… …… …… ……				
Packaging Costs				
Cold Storage at the airport				
Clearing and Forwarding				
Air transport to the export markets				
Handling charges (commission) in the export markets Other costs: …… …… ……				

11. What were the relative costs of adoption of the new technologies and innovations (*product, process, marketing and supply chain management*)?
12. Did the structure of the flower industry in Uganda change at all as a result of the adoption of new technologies and innovations?
13. What are the main challenges to innovation in the flower export industry in Uganda?
14. How is the Uganda Flower Exporters Association (UFEA) helping its members to overcome challenges to innovation?
15. To what extent is government and other development partners helping the industry to overcome challenges to innovation development and its commercialization?

Appendix 9.1 Correlation matrix of explanatory variables - Ugandan fish export sector[a]

Description of Items (Variables)	1	2	3	4	5	6	7	8	9
1. We mutually share information with staff in support institutions	1.000								
2. Satisfaction with improvement in sales of new products in new export markets	.182	1.000							
3. Dummy for foreign ownership	.030	-.078	1.000						
4. Satisfaction with improvement in penetration of premium export markets	-.088	-.219	.223	1.000					
5. We encourage trusting relationships among employees	.105	-.013	.129	-.047	1.000				
6. Firm age	-.070	-.179	-.143	-.015	-.160	1.000			
7. We maintain close social relationships with suppliers and export customers	-.320	-.343	.119	.255	-.120	.100	1.000		
8. Number of employees	-.105	-.046	-.467	-.199	.122	-.122	-.079	1.000	
9. Dummy for joint foreign and local ownership	.283	.127	.147	.113	-.301	.222	.112	-.288	1.000

a. Dependent Variable: Satisfaction with improvement in profitability

Appendix 9.2a Correlation matrix of explanatory variables - Ugandan flower industry (first set of variables – for Table 5.9a)[a]

Description of Items (Variables)	1	2	3	4	5	6	7	8	9
1. We mutually share information with staff in support institutions	1.000								
2. Dummy for joint foreign and local ownership	.076	1.000							
3. We encourage trusting relationships among employees	-.099	.049	1.000						
4. Firm age	-.006	-.040	-.034	1.000					
5. We maintain close social relationships with suppliers and export customers	-.139	-.196	-.130	-.082	1.000				
6. Satisfaction with improvement in penetration of premium export markets	-.217	-.245	-.099	-.132	-.080	1.000			
7. Number of employees	.184	.423	-.053	.256	-.262	-.250	1.000		
8. Dummy for foreign ownership	.171	.394	-.250	-.065	-.055	-.232	.250	1.000	
9. Satisfaction with improvement in sales of new products in new export markets	-.077	.518	.089	.201	-.194	-.207	.406	.233	1.000

a. Dependent Variable: Satisfaction with improvement in profitability

Appendix 9.2b Correlation matrix of explanatory variables – Ugandan flower industry (second set of variables – for Table 5.9b)[a]

Description of Items (Variables)	1	2	3	4	5	6	7	8	9	10	11	12
1. We have a formalized process for developing new products	1.000											
2. We mutually share information with staff in support institutions	.026	1.000										
3. Number of employees	-.132	.216	1.000									
4. Satisfaction with improvement in penetration of new export markets relative to local competitors	.123	-.041	-.025	1.000								
5. Satisfaction with improvement in sales of new products in new export markets	-.095	-.027	.435	-.010	1.000							
6. Dummy for foreign ownership	-.158	.127	.241	-.135	.216	1.000						
7. Firm age	-.111	.034	.288	-.156	.232	-.031	1.000					
8. We maintain close social relationships with suppliers and export customers	-.089	-.068	-.171	-.219	-.118	.017	.011	1.000				
9. We have a mechanism for copying best practices from local competitors	.102	-.247	-.192	.052	-.197	.117	-.158	-.194	1.000			
10. We encourage trusting relationships among employees	-.341	-.057	.009	-.274	.119	-.183	.044	-.057	-.158	1.000		
11. Satisfaction with improvement in penetration of premium export markets	-.267	-.151	-.167	-.183	-.137	-.206	-.055	-.033	-.210	.106	1.000	
12. Dummy for joint foreign and local ownership	-.287	.104	.451	-.222	.525	.413	.049	-.053	-.173	.179	-.096	1.000

a. Dependent Variable: Satisfaction with improvement in profitability