



**SOUTH AFRICAN CITRUS FARMERS' PERCEPTIONS OF THE
BENEFITS AND COSTS OF COMPLIANCE WITH PRIVATE SECTOR
CERTIFICATION SCHEMES FOR CITRUS EXPORTS**

By

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MARCH 2010

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Most importantly, the Lord my God, for he has made this project a success too, by way of virtue that he has constantly prospered all my good ways all the time.

ABSTRACT

The main objective of this study was to analyse South African (SA) citrus farmers' perceptions of the benefits and costs of complying with quality assurance (QA) certification schemes for citrus exports to the European Union (EU). The study used an e-mail and postal survey questionnaire mailed to a stratified random sample of 260 SA commercial citrus growers during July 2007. The survey yielded 108 usable responses - a response rate of 10.8% from the target population of 1001 commercial SA citrus growers. The main factors motivating respondents to adopt QA certification were to keep and maintain access to existing markets; to improve customer confidence in their products; to access new markets; and to meet food safety and retailer requirements. Principal Component Analysis (PCA) identified six underlying dimensions of motivators, which suggest a drive by sampled respondents to gain certification to meet market requirements, achieve intra-farm benefits such as cost-reduction, and to remain competitive in existing and new foreign markets. The sampled respondents identified the main internal benefits from QA certification as the ability to retain existing markets; improved worker health and safety; better access to foreign markets; better farm organisation; and improved fruit safety and orchard management. The PCA identified six broad dimensions of these internal benefits. Comparing the motivator and perceived benefit dimensions, most of the motivators seem to have been in part realised by the respondents.

Respondents rated shared goals and values about the product; more joint decision making on fruit safety; more working together on quality assurance; a better business working relationship; improved coordination; and improved trust as the six major supply chain benefits from QA certification. The two dimensions identified from these external benefits by PCA were: (1) Improved working relationship and product quality benefits, and (2) Improved cooperation and contractual benefits. The major costs of implementing EUREPGAP certification related to initial investment costs and the recurrent annual costs of compliance. The respondents, on average, spent an estimated R70655 on initial compliance costs, mainly for infrastructure, additional buildings and employees training. Some 60% of respondents spent less than 1% of annual farm turnover on initial compliance costs, while most of the respondents (84%) spent less than 1% of annual farm turnover on recurrent costs of compliance. Growers that owned a pack-house had statistically significantly higher initial and annual costs of compliance. Most (63%) of the respondents had a relatively high level of overall satisfaction with QA certification.

analyse the determinants of SA citrus farmers' overall level of satisfaction. An Ordinary Least Squares (OLS) regression estimated that perceived dimensions of internal benefits, namely (1) Foreign market access benefits; (2) Intra-farm benefits; (3) Improved fruit safety and orchard management; (4) Quality and worker welfare benefits; and (5) Ability to retain existing markets, all had a statistically significant positive influence on the sampled growers' overall level of satisfaction with QA certification. Supply chain benefits also had a positive effect on overall level of satisfaction, although the effects were not statistically significant. Similarly, no statistically significant relationship could be established between farm size or the respondents' level of satisfaction with their certifying agents and their overall level of satisfaction with QA certification.

Record keeping is required by nearly all EUREPGAP control chapters and for farm audits. Crop protection is also perceived as a complex requirement of the EUREPGAP protocol. Policymakers thus need to be aware of the extra costs that protocols create for management. The Citrus Growers' Association of Southern Africa (CGA) could consider providing more extension advice to farmers on the technical requirements of certification (particularly best practices for implementing the control chapters). Comparing the motivator and perceived benefit dimensions, most of the motivators for QA certification seem to have been in part realised by the respondents. For instance, the drivers to improve business image/market competitiveness/market access requirements/farm profitability were realised via perceived reputation/input cost savings/foreign market and profit improvement benefits. The study results, therefore, provide some evidence that QA certification is a necessary strategy for maintaining competitiveness in EU citrus markets.



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INTRODUCTION

rest of the world have focused increasingly over the last decade on quality assurance for attributes such as food safety (Caswell *et al.*, 1998; Darroch, 2001; Burrell *et al.*, 2006). Quality assurance (QA) is defined as all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality (Harrigan & Park, 1991). Examples of QA schemes include ISO 9000, EUREPGAP (Euro-Retailer Produce Working Group Good Agricultural Practice) now known as GLOBALGAP (The Global Partnership for Good Agricultural Practice), the British Retail Consortium (The BRC, 2006), and Hazard Analysis Critical Control Points (HACCP). These schemes aim to manage food safety risk and liability, to promote enhanced quality along entire food chains, and increase consumers' confidence on food safety (Fearne *et al.*, 2001; Reardon & Farina, 2002; Henson *et al.*, 2005; EUREPGAP, 2005; GLOBALGAP, 2009). The key drivers for South African (SA) organizations in developing QA are increased competition on SA and international markets due to: trade liberalisation (broader sources of food supply to food markets); changes in consumer purchasing behaviour as consumers with relatively more purchasing power demand better quality differentiated products (Esterhuizen & van Rooyen, 2001; Ortmann, 2001); changes in the structure of food industries (larger retailers gaining more bargaining power in food supply chains) and increasing public focus on food safety after food scares such as Mad Cow Disease in Europe. In South Africa and many other countries, consumers are increasingly concerned with credence attributes such as food safety and process attributes (Unnevehr & Jensen, 1999; Jaffee & Masakure, 2005; Nagel & Glasheim, 2005; Ortmann, 2005; Kleinwechter & Grethe, 2006; Martinez *et al.*, 2006).

Producers, policy-makers, and economists are concerned about the risks and cost implications of adopting QA. Firstly, QA standards do not guarantee adopters the expected benefits (e.g. market access or higher product sales), but adoption is rather a prerequisite for supplying specific export markets. Furthermore, their success depends on whether the differentiated product does meet the effective preferences of the intended niche market (Burrell *et al.*, 2006), even though the differentiated product may not earn a price premium. Secondly, compliance costs may be prohibitive, particularly for relatively smaller firms (Turner *et al.*, 2000), whilst the benefits to food producers may be limited or intangible. Adoption of QA may also require considerable set-up and production costs (Henson *et al.*, 1999; Healy & Gunningham, 2003), and ultimately impede competition by creating technical trade barriers (Weyerbrock & Xia, 2000; Maskus *et al.*, 2004).

ty research has focused mainly on the use of HACCP by Henson *et al.*, 1999; Panisello *et al.*, 1999; Henson & Holt, Henson *et al.*, 2005; Maldonado *et al.*, 2005), and at retailer level (Fearne *et al.*, 2001; Martlock *et al.*, 2000 cited by Valeeva *et al.*, 2004). In South Africa, Turner *et al.* (2000) in a study of factors motivating adoption of ISO 9000 among SA agribusiness firms found that the desire to improve customer service, quality improvement and the need to improve operational efficiency were the most important factors motivating certification. Jooste *et al.* (2003) estimated that the costs of complying with Citrus Black Spot regulations and EUREPGAP to gain access to European Union (EU) markets on three different citrus farms in the Western Cape province of South Africa were 4% of annual revenue and up 10% if foregone trade opportunities were taken into account. Vermeulen *et al.* (2006) researched whether control points are integrated along the entire SA citrus supply chain to the EU, by assessing the behaviour of different actors in the chain. They found that these standards are adequately applied to the production and handling of fruit at the farm and pack-house levels, while subsequent stages (after the importing harbour in Europe) of this supply chain were not subjected to the same strict requirements laid out for producers, leading to fruit quality deterioration and financial losses for producers.

These few local studies indicate that there is lack of research on the economics of adopting QA on farms in South Africa. There is lack of empirical studies on the perceived benefits and costs of adopting private sector QA standards at producer level in South Africa. This dissertation, therefore, aims at contributing to filling this research gap by analysing SA citrus farmers' perceptions of the benefits and costs of complying with private sector QA standards applied to citrus exports to the EU. In particular, it aims to answer six research questions:

- (i) What QA control chapters do SA citrus growers face the most difficulty in implementing?
- (ii) What factors motivate SA citrus growers to adopt QA schemes?
- (iii) What are SA citrus growers' perceptions of the benefits and costs of QA certification?
- (iv) What constraints do SA citrus growers face when implementing QA schemes?
- (v) What link (if any) is there between SA citrus growers' perceived benefits and their overall satisfaction with QA schemes? and
- (vi) What key issues do SA citrus growers face in dealing with the organizations that certify their compliance with QA schemes?

study will be all SA citrus growers that export citrus to the to the SA citrus industry because the adoption of now a prerequisite for SA citrus exporters wanting to supply these markets, particularly the EU market (Bruwer, 2005).

Research on factors motivating the adoption of QA by SA citrus growers may also provide information to help improve the coordination of the SA citrus export supply chain. Market or cost reduction-related factors may, for instance, reflect initiatives by farmers to sustain market access when faced with increasing competition. Assessing the benefits and costs of compliance may also help to show the trade-offs associated with compliance and hence help the Citrus Growersø Association of Southern Africa (CGA) to identify key control chapters for revising in negotiations with private sector QA standard setters to reduce the costs of QA compliance (Hardman, 2005). In addition, it is envisaged that this research would provide a reference for the òthreshold costsö of compliance that potential adopters will face. Identifying perceived constraints associated with compliance can help the players in the SA citrus export supply chain to identify improvements needed to make the chain more competitive for mutual benefit.

The dissertation is organised as follows: Chapter 1 gives an overview of the SA citrus export industry and current food safety regulations. It also discusses examples of private sector QA protocols and some theoretical issues associated with food safety regulation. Chapter 2 describes the study research methodology, focusing on the questionnaire used to elicit SA citrus growersø perceptions of the benefits and costs of complying with these protocols. The second part of Chapter 2 presents the methodology used to sample SA citrus growers for the survey and to analyse their responses. Chapter 3 discusses the representativeness of the survey sample and the characteristics of the survey respondents, and the empirical results. A concluding section discusses some management and policy implications of the results.

This chapter gives an overview of the structure of SA citrus exports and production. It also discusses QA schemes for citrus in South Africa, and provides an overview of the economic implications of food safety regulation. The last three sections discuss the factors motivating the adoption of QA schemes, the potential benefits and costs of certification, and factors influencing grower satisfaction with certification, which informs the study research methodology in Chapter 2.

1.1 Citrus trade, production and value in South Africa

Fresh fruit exports contribute on average 27% of the annual value of total SA agricultural exports, with citrus fruits making up a dominant 11% during 2002-2004 (Perishable Products Export Control Board (PPECB), 2004). Table 1.1 below shows that citrus fruits were the second largest SA agricultural export by value in 2006.

Table 1.1 Top five South African agricultural exports by value, 2006

Commodity	Value (Rm)
Wine	3 564
Citrus fruits	2 979
Sugar	2 347
Grapes	2 103
Maize	1 996

Source: (Vermeulen *et al.*, 2006).

Citrus fruits - oranges, lemons, grapefruit, and soft citrus are grown in eight of the nine provinces in South Africa, but production is largely limited to the irrigation areas of Limpopo, Mpumalanga, the Eastern and Western Cape, and KwaZulu-Natal. Figure 1.1 shows annual production shares for the main citrus producing areas of Southern Africa in 2005. The Eastern Cape, Limpopo, and Mpumalanga are the top three production regions. The citrus season in South Africa extends from late February to early October, during which about a million tons of citrus is exported. Oranges are the major fruit, comprising about 60% of total production. Exports account for 86% of the total value of production, with oranges (70%), grapefruit (16%), lemons (8%) and mandarins (6%) the most important exports (Da Luz, 2005). South Africa's main export competitors are Argentina,

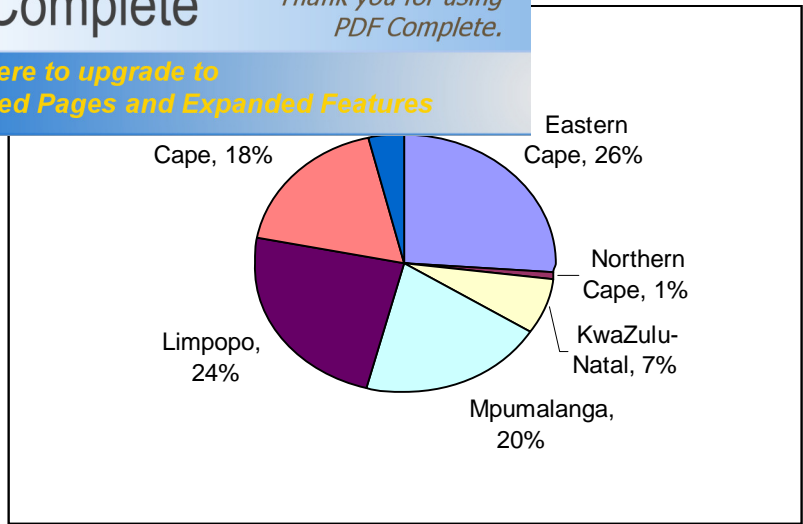


Figure 1.1 Major citrus production regions in Southern Africa, 2005
Source: CGA (2005).

Chile and Australia during the principal season, and Israel, Spain, Egypt and the United States of America (US) towards the end of the marketing season. The SA citrus industry currently earns about R3 billion a year, which is approximately 4.5 % of the total gross value of agricultural production. South Africa recently surpassed the US as the world’s second largest exporter of citrus (Rouillard, 2005), and its main export markets are the EU (35%), the United Kingdom (UK) (9%), Middle East (17%), and Japan (9%). Figure 1.2 below shows an upward trend in the physical volume of SA citrus exports since 1995, rising from about 400000 tons to some 750000 tons by 2004 (CGA, 2005).

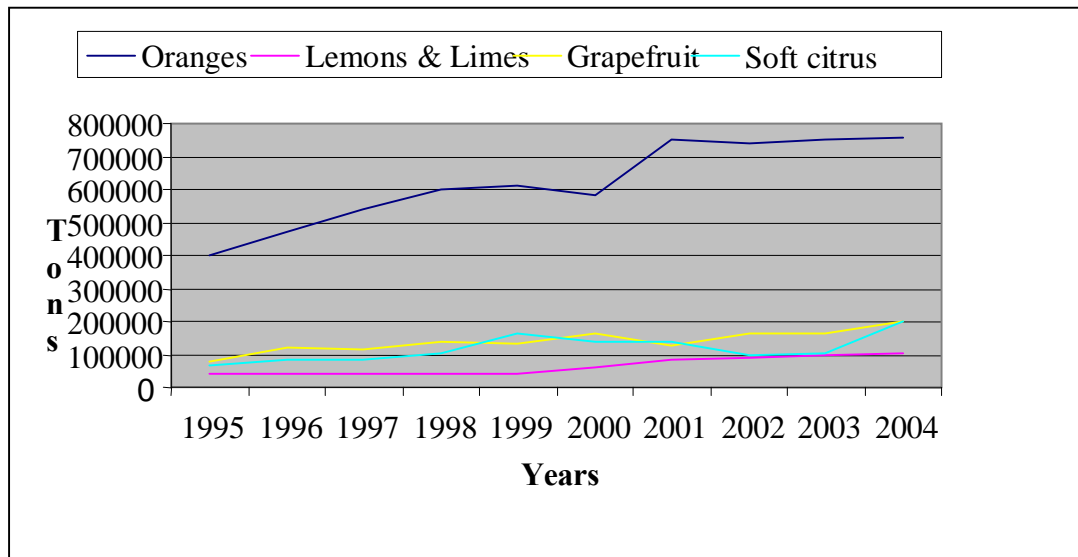


Figure 1.2 South African citrus exports (tons), 1995 – 2004
Source: CGA (2005).

exports contribute 86%, with 12% from the local markets, such as juices and dairy blends. Globally, the citrus industry supply of fresh fruit, and changing climate conditions that affect the existing fruit cultivars (Da Luz, 2005). Europe and the UK markets are slowly becoming saturated; however, SA citrus exports are expected to increase in the next 15 years, particularly with the opening up of the China market and possibly the India market (Hardman, 2006). Data on the major export destinations for SA citrus are given in Figure 1.3 and highlight the importance of complying with QA schemes, as about 45% of citrus exports go to Europe and the UK.

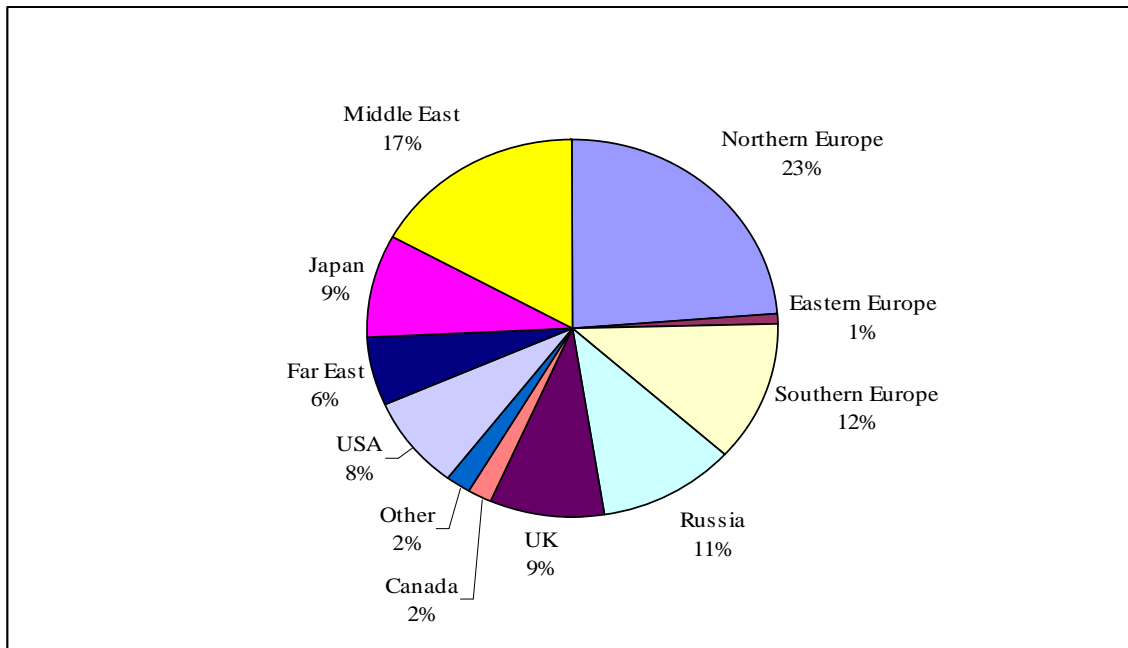


Figure 1.3 Major South African citrus export destinations, 2004
 Source: CGA (2005).

1.2 Quality assurance schemes for citrus in South Africa

The South African National Accreditation System (SANAS), a non-profit organization, backed by Cabinet Memorandum, and recognized by the SA Department of Trade and Industry (DTI), is the single National Accreditation Body within its defined scope of activity. The SANAS accredits Certification Bodies, Inspection Bodies, Proficiency Testing Scheme Providers, and Good Laboratory Practice (GLP) test facilities as competent to carry out specific tasks (Jooste *et al.*, 2003).

Food safety is more likely to be a concern in fresh food produce than for other types of agricultural products as fresh fruits are relatively more perishable and susceptible to damage through handling

(Unnevehr, 2000; Martinez & Poole, 2004). Figure 1.4 shows the supply chain flowing from input suppliers, through production and processing, to consumers, and the associated two-way information flow. Physical commodities flow from producers to consumers through various routes depending on the institutions in the market.

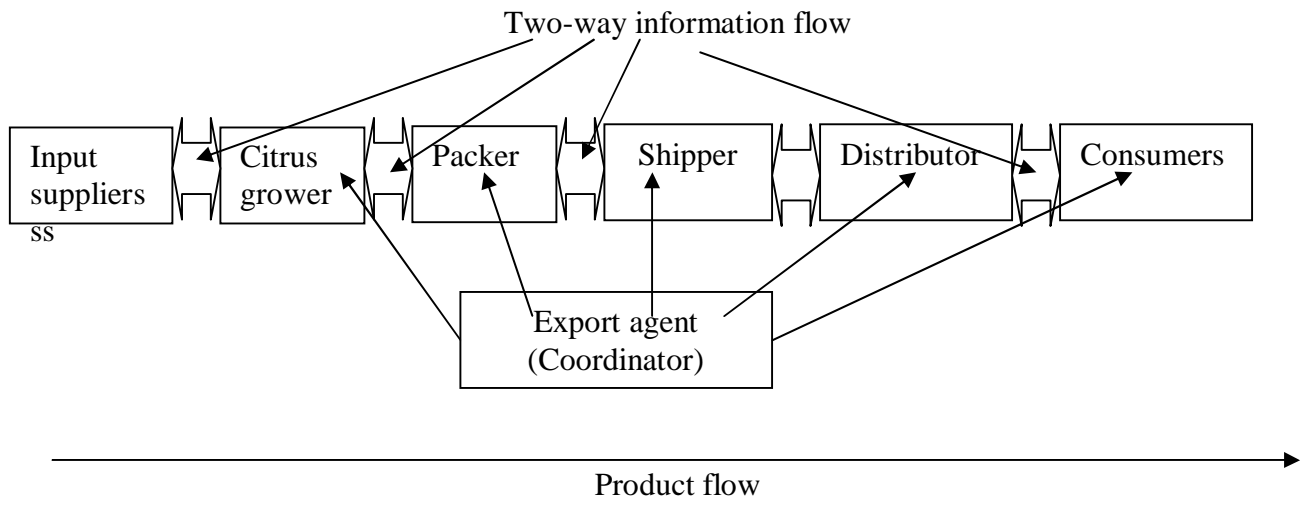


Figure 1.4 Information and product flows in a typical citrus export supply chain

Information on consumer demand and the requirements of the market flow from consumers back through the supply chain, whilst information on production techniques and traceability flows forward along the chain from producers to consumers. The effectiveness with which information on consumer demand reaches producers or information from growers to downstream retailers and consumers varies widely across supply chains. Good Agricultural Practice (GAP) approaches are a way of improving this two-way information flow (Hobbs, 2003), and may facilitate the production of food and the physical flow of agricultural products along the supply chain. Incentives for food firms to adopt GAPs will depend on their relative gains or losses from enhancing the physical product flow and/or the information flow through the supply chain. There are various QA schemes currently applicable to the SA citrus export supply chain as shown in Figure 1.5.

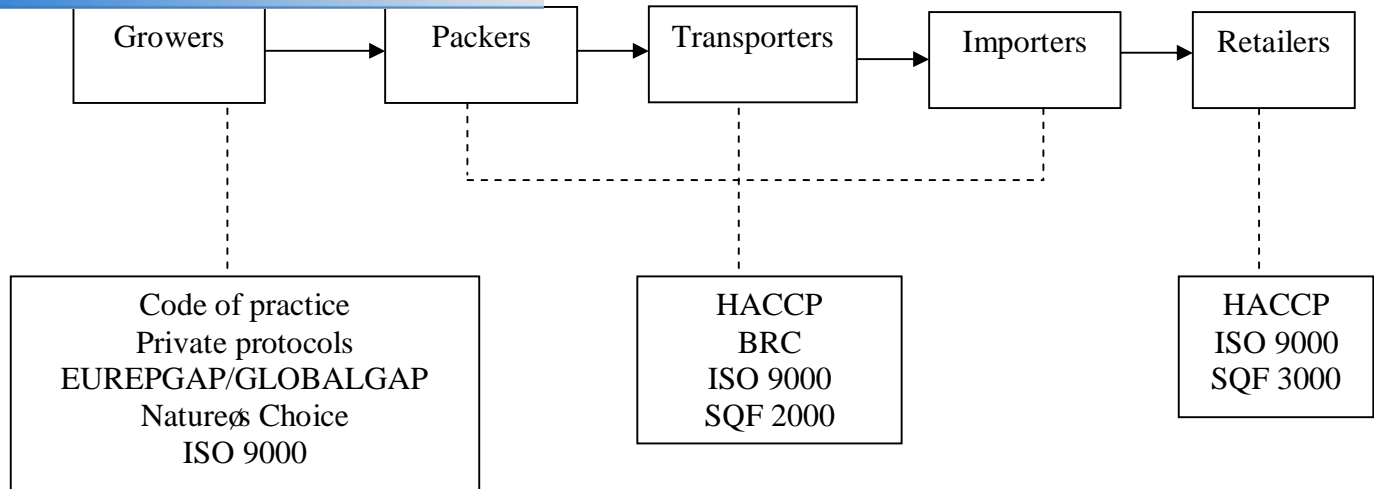


Figure 1.5 Existing QA schemes in the SA citrus export supply chain
 Source: Hardman (2006).

According to Hardman (2005), EUREPGAP and Nature's Choice at producer level, and BRC and HACCP at pack-house level are the most relevant QA schemes for the SA citrus export supply chain at present. Table 1.1 shows the estimated number of certifications to food safety standards by SA agricultural and food industries by 2005, with the largest number being for the EUREPGAP scheme.

Table 1.2 Estimated total certifications to food safety standards in SA agriculture and food industries, 2005

Standard	Level	Number of accredited role-players
EUREPGAP	Producer	2125
Nature's Choice	Producer	589
HACCP	Pack-house	231
BRC	Pack-house	34

Source: Vermeulen *et al.* (2006).

1.2.1 The EUREPGAP/GLOBALGAP scheme

EUREPGAP started in 1997 as a private sector body that set voluntary standards for the certification of agricultural production processes of products around the world. The scheme was driven by 22 large-scale food retailers in Europe, which formed the core members of the Euro-Retailer Produce Working Group (EUREP), and fresh produce suppliers and producers. Some of the leading retailers included Tesco, Safeways, Sainsbury, Continent, Delhaize, and Promodes. There were also associate members from the input and service side of agriculture, and certification bodies and consulting firms

not part of the EUREPGAP decision-making process. The not-for-profit organisation, fulfilled a secretariat function for EUREPGAP and provided the secretariat and administrative support for GLOBALGAP (see Figure 1.6) (Dankers, 2003; EUREPGAP, 2005; GLOBALGAP, 2009).

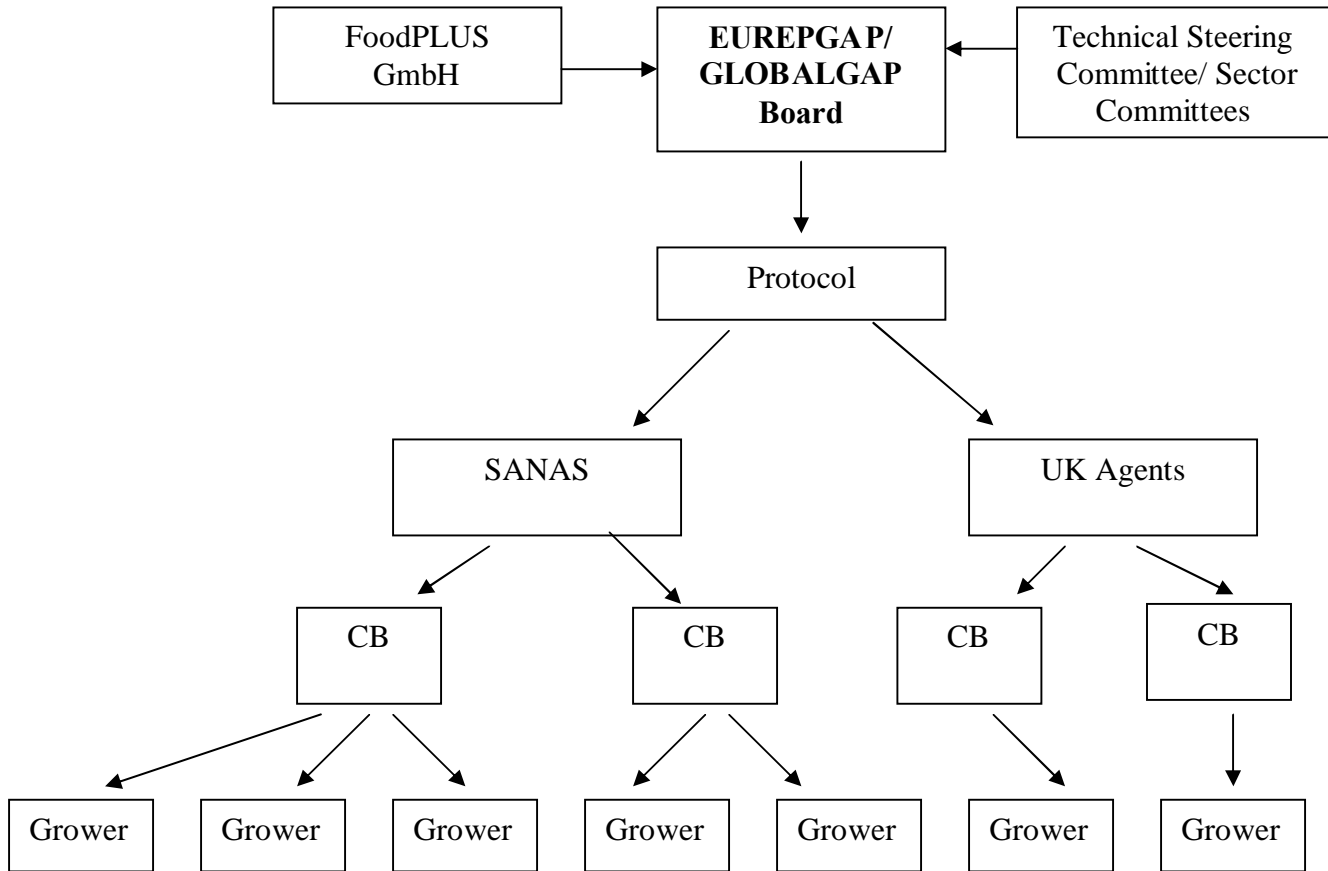


Figure 1.6 The EUREPGAP/GLOBALGAP structure with associated information links
 Source: Hardman (2005); GLOBALGAP (2009).

EUREPGAP was established as an initiative to harmonise and simplify the diverse range of current QA schemes in different countries in order to provide all producers and buyers with acceptable reference standards for safe and sustainable food production (EUREPGAP, 2005). The aim of the scheme was to control food safety-related aspects *at producer level* in response to growing community pressure for greater corporate social responsibility. Like HACCP, EUREPGAP intended to be a preventative measure that aims to deal with physical, biological, and chemical hazards. The protocol expressed the need for including crop management techniques such as integrated pest and crop management (IPM and ICM) - that are not usually employed in conventional cropping systems (Moll & Igual, 2005) - to obtain healthy food, while respecting the environment and contributing to long-term sustainable agriculture. Since 1997, more producers and retailers world-wide have been

Trade in food and agricultural products became more global. This led to a pre-eminent international standard for global practices, EUREPGAP as GLOBALGAP in September 2007 (GLOBALGAP, 2009). At the time of the survey for this study in June 2007, SA citrus growers were certified according to the control points of the 2004 version of the EUREPGAP protocol. Hence for the rest of the dissertation, the study analyses SA citrus farmers' perceptions of the benefits and costs of compliance with the EUREPGAP protocol.

The control points for the 2004 version of EUREPGAP were grouped into 14 chapters, covering sanitary issues ranging from planting to harvest such as traceability, record keeping, and worker health. The remainder were a range of technical and agronomic issues related to the varieties and rootstocks; site history and site management; soil and substrate management; fertilizer use; irrigation; crop protection, harvesting; post-harvesting treatment; waste and pollution management; and environmental issues. The scheme had 210 control points that formed the criteria for compliance: 47 of these control points must be fully met (the 'Major musts'), 98 control points must be 95% complied with (the 'Minor musts') and 65 control points have no compliance requirements (the 'Recommendations'). The EUREPGAP certification was valid for one year, after which a farmer must be audited and re-certified as compliant with these chapters. Apart from record keeping, which should be maintained for at least two years for all farming operations, a farmer must have implemented a fruit quality and traceability system (see EUREPGAP, 2005) for a full description of these chapter requirements). The annual certification costs paid by the growers to the certifying agents included an annual fee of R25 (about R300) payable to Food PLUS by the certifying agent. Farmers that have already implemented an existing QA scheme with third party verification could benchmark that scheme against EUREPGAP. If the scheme was accepted as equivalent, then the farm audit for that scheme would also serve as EUREPGAP certification (Dankers, 2003).

The EUREPGAP scheme at the time of the study was relatively new to SA citrus farmers but very relevant as most citrus exports go to Europe. South Africa held the third largest membership of EUREPGAP (255 members at the time of the study survey) behind the Netherlands (2015 members) and Spain (1011 members). Although SA farmers comprise 7% of members by number, the total area covered by these growers (16123ha) represented 26% of the total EUREPGAP registered area (61425 ha) (Chadwick, 2003). The scheme is not mandatory, but many growers viewed it as an inevitable step to gain access, or maintain access, to European markets in future. Some growers considered that many of these regulations were out of line with domestic norms, time consuming to



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on issue of the quality of the fruit they produce. Particular care is taken in the protocol that specifies washing facilities and procedures. In the SA deciduous fruit industry, farmers faced the problem of meeting the requirement of using only registered pesticides - farmers complained that registration could take about three years and is a very costly exercise (Wilson & Abiola, 2004)

There is some evidence that well-established commercial farmers in South Africa had some difficulties in meeting the EUREPGAP requirements (Humphrey, 2005; Bower, 2006). These growers were more concerned in 2006 about the Citrus Black Spot (CBS) Phytosanitary measure imposed on their exports to European markets. This measure banned any SA citrus export shipments found contaminated by the CBS fungus. For small-scale farmers, however, the challenge of QA compliance means that their access to export markets becomes increasingly dependent upon working with larger exporters. According to Wilson & Abiola (2004), SA citrus exporters had to comply with EUREPGAP at producer level and HACCP at pack-house level in order to export to Europe.

1.2.2 The Nature's Choice scheme

Nature's Choice is an integrated farm management scheme developed in 1992 by Tesco, one of the leading UK retailers. The protocol specifies EUREPGAP/GLOBALGAP control points of compliance and environmental standards that include plant protection, fertiliser and manure use; pollution and prevention; protection of human health; efficient use of energy, water and other natural resources; and wildlife and landscape conservation and enhancement, in addition to specifications for product shape, size, taste, variety and shelf-life requirements. Nature's Choice is unique to Tesco and represents a more differentiated form of EUREPGAP/GLOBALGAP in that it has higher environmental and social requirements. The Nature's Choice audit focuses on strict environmental care regulations and standards for the production and handling of the produce to enhance ecologically sustainable production. The scheme applies to producers and suppliers of fresh fruits and vegetables, flowers and other ornamental plants, and over 6000 farms in 41 countries are currently working towards the scheme's requirements (Tesco, 2006).

1.2.3 The British Retail Consortium (BRC) scheme

The objective of the BRC Global standard is to specify food and safety criteria to be met by a manufacturer supplying UK retailers. The standard was developed by UK retailers to assist them in fulfilling their legal obligations and to promote protection of the food consumer. The standard

of HACCP standards; a documented and effective quality control system; a safe environment standards, product, process, and personnel. HACCP is not only a quality product, but also a safe product. As a result, producers and pack-houses that supply European markets now have to implement various food safety-related systems. European retailers recognise the BRC standard as the standard against which pack-houses must be audited to verify that food safety control systems have been effectively implemented. The BRC standard is applicable to the preparation, processing, packaging, storage, transportation, and distribution, handling or offering for sale or supply of foodstuffs in retail markets (Andersen & Somarribas, 2004; Aloui & Kenny, 2005; The BRC, 2006).

1.2.4 The Hazard Analysis Critical Control Points (HACCP) system

The HACCP system provides a preventive approach to food safety that addresses biological, chemical and physical hazards through anticipation and prevention, rather than through end-product inspection and testing. The advantage of HACCP is that it focuses on ensuring food safety by controlling critical points in the production process, thereby reducing the need for final inspection. The system is widely recognised in food industries around the world as an effective approach to establishing good production, sanitation, and manufacturing practices that produce safe foods. The system can be applied to control any stage in the food system, and is designed to provide enough feedback to direct corrective activities (Unnevehr & Jensen, 1999; Deodhar, 2003; Nagel & Glassheim, 2005). HACCP has become a global standard for pack-houses and falls under the Codex Alimentarius Commission of the World Trade Organisation. The system is based on seven principles: assess the potential hazards; determine critical control points (CCPs) in the process; establish critical limits for each CCP; establish procedures to monitor each CCP; establish corrective actions to be taken when monitoring indicates a deviation; establish record keeping for the HACCP system; and establish procedures to verify that the HACCP system is working correctly (Deodhar, 2003; Unnevehr & Jensen, 1999). For a full description of HACCP see the Food and Agriculture Organisation of the United Nations (FAO) (1998) training manual on HACCP.

1.3 Overview of the economic implications of food safety regulation

Apart from the demand drivers to adopt QA standards, other researchers argue that food standards always prevail to some degree in trade, partly to correct for perceived market failure (Hobbs *et al.*, 2005; Kleinwechter & Grethe, 2006). Consumers often cannot detect food hazards at the time of

...e their demand for safer food through purchase decisions ó
 ...easily detectable when consumers purchase food. Such
 ...s that markets can fail to provide the level of safety that
 equates consumersø marginal utility with producersø marginal costs (Unnevehr, 2000; Hobbs, 2004). Standards can help serve to correct information asymmetries that often exist between producers and consumers and, thus, provide QA for consumers. Figure 1.7 shows the increase in the degree of information asymmetry that can occur in moving from product (e.g. freshness) to process-oriented attributes (e.g. less readily observable trade practices) (Kleinwechter & Grethe, 2006). Furthermore, a producer can proactively supply a differentiated product through certification and labelling, which will signal the added quality attributes that differentiate the product in the market, thus partly correcting market failure.

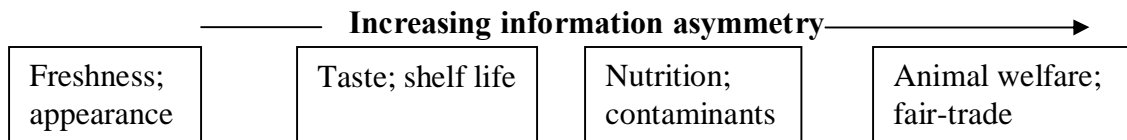


Figure 1.7 Increase in information asymmetry with the change in product attributes
 Source: Kleinwechter & Grethe (2006).

1.3.1 The impact of a food safety standard on food exports

Compliance with certification schemes requires that producers adhere to a set of control points, which is likely to increase production costs (Mitchell, 2003). These cost increases shift back the supply curve of a firm, which results in a new market equilibrium where the firm produces fewer goods at a higher price (see supply curve shift from S1 to S2 in Figure 1.8. Following this shift, it would seem logical that consumers will buy less of the product. In contrast, however, past studies showed that consumers with relatively higher incomes in developed countries are willing to buy the food products, since they are now getting a safer good for their money (Unnevehr, 2000) - this represents an outward shift of the demand curve to D2 in Figure 1.8. However, an individual is not able to capture all the benefits of a food safety assurance initiative as some of the benefits accrue to society (such as improved product quality or environmental characteristics such as less water pollution by pesticides). Despite their potential to enhance firm competitiveness and expand trade, standards may achieve the opposite outcomes - they could act to raise the compliance costs of some firms (e.g. new entrants) relative to established firms, thus restricting competition (Maskus *et al.*, 2004). Theory suggests that technical standards can either enhance or impede trade; therefore, there

about the impacts of food safety standards on food trade.

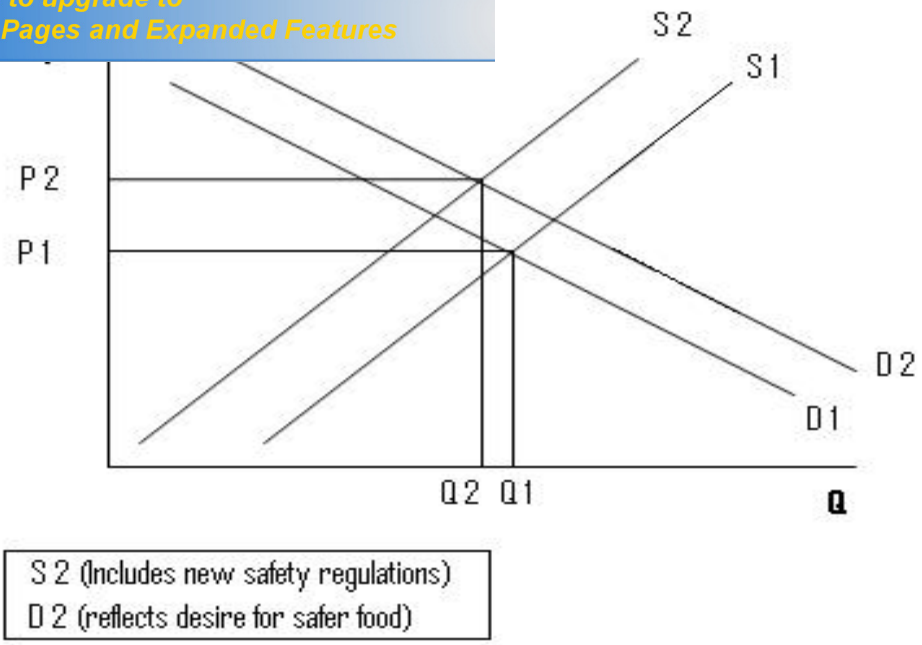


Figure 1.8 Market impact of a food safety regulation
 Source: Mitchell (2003).

In this study, the products of the citrus industry (within a citrus type) are considered relatively homogeneous. Together with many producers (1400), the industry conforms in some degree to firms in a monopolistic competition market structure in the effort to product differentiate but at the same time facing oligopolistic buyers (Tomek & Robinson, 1981). For example, vertical integration may be an important way to promote better access to key inputs/markets than rival producers (Roberts, 2004). In this case, a grower could vertically integrate with a pack-house or pack-house agent that has well-established market access to export markets. Relatively larger farmers (higher expected annual turnover) could benefit from economies of size (spreading fixed costs of investment or QA certification over a larger number of units produced). Finally, growers could differentiate their product by operating their own pack-houses and uniquely label their fruit to supply organic markets.

1.4 Factors motivating the adoption of QA schemes

Fouayzi *et al.* (2006) argue that the most likely motivations for firms to adopt QA schemes come from price premiums expected from selling a higher quality product, a reduction in production costs (although there are initial (sunk) implementation costs), and an improved understanding of the firms own quality systems. An understanding of own sources of quality problems often leads to better

Other motivating factors include less quality and product price; product rework; better management control; attraction of new customers; and increasing work environmental safety (Buttle, 1997; Zaibet & Bredahl, 1997; Turner *et al.*, 2000; Henson & Holt, 2000; Yiridoe *et al.*, 2003).

Besides consumer and social benefits, past studies have highlighted the following benefits for farmers of compliance with food safety standards: Better process design; production efficiency gains; longer product shelf-life; access to new markets; retention of consumers and promoted image; fewer product recalls; and fewer outbreaks of food-borne illnesses (Valeeva *et al.*, 2004; Henson *et al.*, 2005). Most of these benefits are rather obvious to many producers although it is difficult to assign a monetary value to them. Some benefits are indirect, such as improved organizational competencies (e.g. better record keeping), better use of resources and increased production due to adoption of sustainable farm practices.

Motivating factors for QA schemes can be internal and external. Internal factors relate to improvements in internal operations of the firm such as better record keeping improving management decision-making and leading to better allocation of inputs, or improved staff well-being that leads to greater employee motivation. External motivators relate to adopting a quality system to access new markets or to get a premium price for the quality product. Holleran *et al.* (1999) for example, found that 52% of British firms that adopted ISO 9000 as a quality management system were internally motivated, while 36% stated that adoption was externally driven. The next four sections discuss the potential benefits of implementing QA schemes.

1.4.1 External benefits from implementing QA schemes

Certification schemes such as Natureø Choice can serve as a competitive instrument through *branding*, especially in cases where public standards are less enforced. Private standards are usually more stringent and restore consumer faith in products, giving a significant market advantage for retailers. Consistent implementation of these standards, alongside certification, labelling and branding systems can create reputation and competitive advantage (Buttle, 1997; Henson *et al.*, 1999; Turner *et al.*, 2000; Reardon & Farina, 2002; Henson & Reardon, 2005; Maldonado *et al.*, 2005). Global supermarkets/retailers are increasingly demanding GAP-based production with preferred suppliers as a means of *differentiating* their fresh produce for traditional wholesale markets

These retailers have realised that relatively higher-income and food safety/quality (Fearne *et al.*, 2001; Hobbs, 2003).

Past studies also identify increased gross margins through *price premiums*, and *increased unit sales*, as incentives for farmers to adopt certification schemes. EUREPGAP compliance has led to ensured access to markets dominated by larger retailers such as those in the EU (Hobbs, 2003). According to Weatherspoon & Reardon (2003), the increased bargaining power of large supermarkets is becoming a global trend that may force suppliers to adopt quality standards. Furthermore, if the adoption of a QA scheme is market-driven (e.g. to produce pesticide-free food), then commercial production of food will increase gross margins due to premium prices for safe food. Past studies show that some consumers are willing and able to pay higher prices for commodities produced without the use of pesticides, growth hormones, or genetically-modified organisms (GMOs) (Kuperis *et al.*, 1999; Huffman *et al.*, 2003; Nayga *et al.*, 2004; Valeeva *et al.*, 2004). The adoption of QA schemes on a farm can also promote access to new markets and attract new customers, thus expanding market reach and sales volume. Another rationale for adopting QA schemes could be to try and *stabilise product yield*. Some of the EUREPGAP control chapters focus on improving farm management and production decisions to increase or stabilise yields, or increase revenue. Production techniques such as soil mapping that enhance or protect soil fertility lead to increased production per hectare. Moreover, improvements in post-harvest storage and handling techniques can reduce crop losses and damage, and hence increase produce availability (Henson *et al.*, 1999; Hobbs, 2003)

1.4.2 Adoption of QA schemes for cost reductions

Improved agricultural practices that result in more technically-efficient allocation of farm inputs can reduce average costs of production. Moll & Igual (2005) used a full-costing methodology to compare costs of citrus cultivated under EUREPGAP versus citrus cultivated under conventional methods. Results showed that conventional citrus had 34% higher costs than EUREPGAP citrus, as under EUREPGAP the use of chemicals is reduced due to IPM methods. Fixed costs are usually higher in the first year of certification due to initial investment costs. According to Hobbs (2003), the competitive pressure created by foreseen food safety standards in the EU led to significant improvements in the cost competitiveness of the Kenyan fresh vegetable sector. Another cost advantage of adopting private sector food standards is *costs and risks reduction along the supply chain*. The main cost comes from using process standards to coordinate procurement chains and



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which builds consumer confidence in the brand, and reduces & Reardon, 2005; Krieger & Schiefer, 2005).

The adoption of QA standards such as HACCP systems can also help to reduce the costs of searching for competent suppliers, thus *reducing transaction costs*. These are the costs of undertaking an exchange between customers (buyers) and suppliers (sellers) (Holleran *et al.*, 1999), and include the costs of supplier identification, contract negotiation, contract verification, and contract enforcement. HACCP systems enable supplier firms to reduce the costs of raw materials inspection, specification, inventory, and other costs associated with inputs. These schemes can signal enhanced product quality, thus mitigating the negative effects of quality uncertainty and verification, which usually increase costs (Zaibet & Bredahl, 1997; Hobbs *et al.*, 2005; Krieger & Schiefer, 2005). Supply chain management has become important as the geographic scope of food marketing has broadened (Ortmann, 2001). On the buyer's side, QA schemes can facilitate contracting by reducing the time and resources needed to identify qualified suppliers, negotiate contracts, inspect quality, and enforce contracts (Fouayzi *et al.*, 2006). Several studies also identify farmers seeking QA standards in order to improve supply chain coordination (Caswell *et al.*, 1998; Henson *et al.*, 1999; Ortmann, 2000; Reardon & Farina, 2002; Henson & Reardon, 2005).

Management of liability exposure is another important motivation for adopting QA schemes (Hobbs, 2004). Evidence suggests that firms will adopt QA systems to avoid being held liable for defective products or for not exercising due diligence (in this case exercising adequate food safety control plans). EUREPGAP/GLOBALGAP certification may allow firms to reduce insurance and financing costs. Firms sued for damages stemming from environmental accidents have been viewed favourably by the courts if they have a recognised environmental management system in place. Adoption of QA schemes also *reduces the risk of being banned* from exporting to foreign markets following non-compliance (Krieger & Schiefer, 2005; Fouayzi *et al.*, 2006).

1.4.3 Adoption of QA schemes to improve internal production efficiency

Good Agricultural Practices (GAPs) can be a means *to expand upon core competencies* within the farm enterprise. This is because GAPs offer farmers the opportunity to expand their knowledge and skills base through the training of personnel, and to acquire more skilled labour. The EUREPGAP specification of traceability enables individual farms to access knowledge that can be gathered along the supply chain from other players. This helps to reduce information asymmetries between supply

information to respond to market demands (Hobbs, 2003). Management and technical staff may lead to a *more rational use of* resources (Ragothaman & Korte, 1999). The adoption of GAPs that also cover workers' welfare may result in *fewer incidents of diseases, improved morale of workers* and lower absenteeism, all of which help to cut costs and improve productivity (Ortmann, 2000).

1.4.4 Other indirect benefits from adopting QA schemes

Compliance with QA standards such as EUREPGAP for export commodities can have spill-over effects beyond the direct commercial benefits, in that domestic markets may benefit through better working standards at the workplace, more demand for trained staff, and the creation of employment throughout individual supply chains (Aloui & Kenny, 2005). The indirect benefits of less use of pesticides include the sustainable use of non-renewable resources and the production of safer food.

1.5 Costs of adopting private sector voluntary QA standards

Adopting QA schemes incurs (sunk) costs, even though these schemes can eventually lower costs. Sunk costs are a concern for farmers in developing countries, particularly for relatively smaller farmers (Wilson & Abiola, 2004). In some cases, the prevailing conditions at the farm may be so weak that substantial investments are required to attain compliance. Incremental recurrent costs may undermine exporter competitiveness. Certification may, however, be necessary for improving product quality. To estimate compliance costs and their impact on markets, economists often use different modelling tools, such as direct cost accounting, variable cost functions, risk analysis models, and linear programming (Antle, 1999; Valeeva *et al.*, 2004). The costs associated with food regulation compliance can be divided into initial investment costs and future operational costs. Initial investment costs for EUREPGAP implementation include total farm upgrade costs (e.g. new buildings and storerooms), costs of investment in on-field and administrative infrastructure, and costs of staff training. Future operational costs include fertiliser, pesticides storage cost, annual auditing costs, management costs in supervising and monitoring compliance, etc. (Moll & Igual, 2005). Aloui & Kenny (2005) estimated annual expenses of US\$2524 /ha to implement the EUREPGAP standard on a 10ha tomato farm in Morocco. According to the authors, these costs accounted for 8% of the total farm gate costs for a highly efficient producer (see Table 1.3 overleaf).

is growing in the Comunidad Valenciana (Spain): 2003

	EUREPGAP		Conventional	
	€/ha	%	€/ha	%
Total variable costs	1628	68	2939	75
Total fixed costs	760	31	981	25
Total costs without certification	2388	-	3921	-
EUREPGAP certification costs	205	-	-	-
Total costs (€/ha)	2594	-	3921	-
Average production (kg/ha)	23000	-	30000	-
Average costs (€/kg)	0.11	-	0.13	-

Source: Aloui & Kenny (2005).

Vermeulen *et al.* (2006) estimate that a typical litchi and mango export farm in South Africa without a pack-house, invested R130000 on capital, extra management and training per farm to comply with EUREPGAP, while the annual audit and accreditation fees were close to R6000, and could rise to about R35000 on a farm that has a pack-house. At one SA grape pack-house, Wilson & Abiola (2004) estimated the costs of complying with EUREPGAP at R1 million for the new bar coding machine, R170000 to upgrade a pack-house and R120000 for the workshop. Jooste *et al.* (2003) estimated the costs of complying with CBS regulations and EUREPGAP on three different citrus farms in the Western Cape province of South Africa at about 4% of annual revenue and up to 10% when considering foregone trade opportunities (see Table 1.4).

Further research on the SA citrus sector estimates an initial audit fee of R3000, with the cost of compliance varying per individual farm (Mabiletsa, 2003). Burger (2002) reports that a SA grape grower spent R1200/ha on a 21ha farm to obtain EUREPGAP certification. A case study of EUREPGAP implementation in Peru by Kleinwechter & Grethe (2006) reported compliance costs of 3.8% of the total farm gate price per ton of mangoes. Implementing QA schemes also adds unquantifiable costs such as the risk of losing market share by fault of others, change in culture and attitude, and start-up learning costs. Finally, Jaffee & Masakure (2005) report that one large Kenyan vegetable exporter expected to spend around US\$300000 per year (3% of turnover) on annual food safety management costs, and around US\$150000 to upgrade pack-house facilities in order to meet the BRC requirements.



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ence on selected SA farms with QA standards being

	White Citrus Farm	Riverside Enterprise	Patensie Citrus	Average
Tons of citrus grown (2001)	2700	11000	15000	9567
Hectares used	40	150	200	130
Revenue received per ton (2001)	R2520	R1675	R1525	R1907
Annual costs of compliance per ton (2001-2002) with CBS	R19	R68	R27	R38
Annual costs of compliance per ton (2001-2002) with EUREPGAP regulation	R37	R9	R47	R31
Percentage of revenue lost due to costs of compliance with CBS and EUREPGAP regulations	2.2%	4.6%	4.9%	3.9%
Foregone estimated annual earnings of the cost of US CBS regulations (% of total revenue)	-	-	R10 million (10%)	-

Source: Jooste *et al.* (2003).

1.6 Adopters' satisfaction levels and perceived benefits from adopting QA schemes

Yiridoe *et al.* (2003) argue that despite wide documentation of the benefits of adopting QA schemes, satisfaction levels of adopters are often low due to the intangible nature of many benefits. They report only 15% overall satisfaction of Canadian managers after adopting the ISO 14001 environmental scheme. In contrast, Fouayzi *et al.* (2006) identified positive links between satisfaction levels of adopters and the perceived benefits of adopting QA schemes. Using bivariate analysis of correlations between experienced changes after adopting schemes and overall satisfaction with QA schemes, they found that higher intra-firm benefits (e.g. better farm management), higher inter-firm benefits (e.g. better coordination with supply chain partners) and cost savings from adopting standards lead to more overall satisfaction with the schemes. Santos & Escanciano (2006) investigated the relationship between perceived internal and external benefits and the overall satisfaction of firms gaining ISO 9000 certification in Spain. They found that business image had the most influence on the study firms' overall satisfaction with ISO 9000, and that after adopting the standard, firms tended to establish long-term business relationships with their suppliers or customers, which reduces transaction costs.

Based on the above literature review, this study will analyse SA citrus farmers' perceptions of the benefits and costs of implementing QA control chapters for SA citrus exports. In particular, the study aims to identify which control chapters they find most difficult to implement; the factors that



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ards; their perceived benefits and costs of certification; key certifying bodies; their overall level of satisfaction with QA that influence satisfaction; and the major constraints the respondents face in complying with QA certification. The next chapter discusses the research methodology used to survey a representative sample of the 1001 citrus growers in South Africa at the time of the study (Hardman, 2006), construct a survey questionnaire, and the statistical analysis of the sample growers' responses.

This chapter describes the study data source, the rationale for designing the study questionnaires, and the survey sampling method. The final section discusses the statistical techniques used to analyse the surveyed growers' responses.

2.1 Data source

Staff at the CGA provided the addresses for all 1001 SA citrus growers, and assisted with the posting of questionnaires to both certified and non-certified growers during July 2007 to May 2008. These growers were based in the main citrus production regions: Western Cape, Eastern Cape, Limpopo, Mpumalanga, KZN, Northern Cape, North West and Gauteng.

2.2 Survey questionnaire design and pilot study

A structured questionnaire with five sections was developed adapting material from the literature review ó in particular Buttle (1997); Henson *et al.* (1999); Henson *et al.* (2005); Maldonado *et al.* (2005); Fouayzi *et al.* (2006); and Kleinwechter & Grethe (2006). Discussions with Hardman (2006) and Darroch (2006) were used to further ascertain if the questionnaire fully addressed food safety issues pertinent to SA citrus farmers. The questionnaire was also analysed by the Chief Executive Officer of the CGA, Mr. Justin Chadwick, who was a member of the EUREPGAP steering committee and assured the researcher that the questionnaire addressed key issues (Chadwick, 2007). The questionnaire was further tested using a pilot survey with five citrus growers from the Ixopo region in KwaZulu-Natal. Two of the farmers were graduates of the University of KwaZulu-Natal and had in-depth experience with research surveys and pilot studies.

The questionnaire was applied to both QA-certified and non-certified growers, as interviews with non-certified growers could help to identify possible reasons for non-compliance. The questionnaire was also translated into Afrikaans by the researcher on the advice of the CGA that many of their growers would require an Afrikaans version. Both versions of the questionnaire were mailed to the sample growers via e-mail and by post with a covering letter from Mr Hardman explaining the aims of the research at the beginning of July 2007. An example of the English version of the final questionnaire is presented in Appendix B on page 77. The rationale for

2.2.1 Questionnaire for the sample survey of citrus growers in South Africa

Section A: Certification Schemes

This section elicits information on the type of QA scheme that a grower has adopted and the length of time they have been certified. Growers with longer QA certification periods probably have more experience of the benefits and costs of compliance. The first question in this section captures farmers' overall level of satisfaction with the QA schemes using a five-point Likert-type scale from 1 (Very dissatisfied) to 5 (Very satisfied). This information forms the dependent variable for a regression model of the determinants of satisfaction described in section 2.5.2 below. Next, farmers are asked for scheme details such as name, year of first certification and type of certification. Growers must then indicate their sources of information about QA schemes. Finally, the respondents must rank from lists of EUREPGAP and Nature's Choice control point chapters, the top five that they perceive as the most difficult to comply with (these two schemes are the most relevant for SA citrus growers (Hardman, 2005)). These rankings can provide information that CGA staff can use to better represent SA citrus growers in negotiations with standard setters on revising such controls.

Section B: Performance of Certification Agents

External audits by certification agents facilitate the certification process and disseminate information on the developments of food standards, but can also impede the implementation process (Henson *et al.*, 2005). In South Africa, the CGA reports a growing concern amongst citrus growers about the lack of harmonisation between different QA schemes and these agents in applying different procedures and charging different audit fees (Hardman, 2005). This may increase QA compliance costs for citrus growers and so impede their competitiveness. Growers were asked to indicate audit session hours to assess how different agents apply the audit. Questions also capture whether growers perceive that their agent applies standards at the same level as other agents; there are clear channels to relay problems they have with the standards; and whether the CGA should play a bigger role in trying to resolve such problems. Growers must then indicate the degree to which they agree or disagree with statements about the service provided by their

they may have about their agent, and indicate their level of their agent.

Section C: Motivators for, and benefits and costs of, adopting QA schemes

The literature reviewed in Chapter 1 of this dissertation shows that, apart from the primary role of meeting the minimum foreign market access criterion, firms are motivated by internal incentives (e.g. better record keeping) and external incentives (e.g. better access to new markets or to keep existing customers) to adopt QA schemes. In section C1, respondents were asked to rank 22 potential motivators for adopting QA adapted from past research on a 10-point Likert-type scale from 1 (Not important) to 10 (Very important). Relatively larger farms may have stronger internal incentives to adopt QA (cost reduction-related incentives) than external incentives associated with market access since relatively larger farmers are likely to already have well-established markets. A 10-point scale was chosen as it is a wide enough scale to reduce distortions in data scaling caused by such ordinal data which can distort empirical results (Kim & Mueller, 1978). Respondents could also specify and rank any other motivators that they considered relevant.

Global retailers have increasingly mandated that growers implement EUREPGAP/GLOBAGAP as part of their due diligence defence against food safety issues. EUREPGAP/GLOBAGAP also provides a basis for better supply chain control, thus giving added confidence about product quality and safety (EUREPGAP, 2005; GLOBAGAP, 2009). Sample growers were thus asked in section C2 to rate a list of 23 potential internal benefits identified in the literature review that can be gained from certification on the same 10-point Likert-type scale as in C1. Grower perceptions of trust and supply chain coordination improvements in their working relationship with other supply chain players after adopting QA are then assessed in section C3 by the extent to which they agree or disagree with statements such as “We now have stronger personal confidence in each other”, “Trust has improved in our business relationship”, and “There is now more joint decision making on fruit quality”. These statements aim to capture perceived supply chain benefits of adopting QA certification. The manner in which growers perceive both internal and external benefits is expected to influence their overall level of satisfaction with QA certification

Given the lack of empirical research in South Africa on quantifying the perceived benefits and costs of QA schemes at farm-level identified in the literature review, growers were requested to state their QA compliance costs as a percentage of average annual total farm income for both set-up costs

and buildings, staff training, and first audit) and recurrent record keeping, management costs, information costs, and soil as far as possible, in Rand figures. Evidence from the pilot survey showed that local citrus growers have on average two years of experience with certification, and are thus able to recall how much they spent on initial investment and recurrent costs.

Section D: Constraints on maintaining QA certification

This section presented sample growers with a list of factors adapted from past studies and interviews with Hardman (2006) and Chadwick (2007) that may constrain their ability to implement certification. They are asked to rate the constraints on a Likert-type scale from 1 (Minor constraint) to 10 (Major constraint). This information may identify key issues that need to be addressed by standard setters, and highlight areas where CGA staff and policymakers can better assist SA citrus growers to implement and maintain certification.

Section E: General farm and farmer information

The decision-maker completing this section was first asked to indicate his/her position (e.g. owner) in the farm, and the province in which the farm is located to enable analysis of the representativeness of the sample. Level of education is noted in order to investigate its link (if any) with growers' overall level of satisfaction with QA certification. Growers are also asked to indicate their business form and whether they operate a pack-house on their farm (affects estimated costs of certification). Years of farming experience and information on export markets is also captured to provide a report on general characteristics of survey respondents. Finally, data on the level of farm income in a typical year could help to identify the link (if any) between farm size and grower satisfaction with QA certification. Relatively larger farms may have stronger incentives to adopt certification as the sunk costs can be spread over a larger volume of output (Fouayzi *et al.*, 2006).

Section F: Non-QA certified citrus growers in South Africa

The last section captured information on non-certified respondents' knowledge of QA schemes, and their ratings of potential reasons why they have not adopted QA schemes on a Likert-type scale from 1 (Not important) to 10 (Very important). This information can help to identify potential barriers to certification and also indicate the distribution of QA compliance by region and/or market supplied.

combination of an e-mail and postal survey. Due to survey budget constraints, the whole population of SA citrus growers could not be surveyed. To obtain a representative sample of growers, a stratified random sample was taken from the CGA database target population of about 1404 citrus farms represented by 1001 growers across nine citrus production regions. The distribution of the growers differed by region, with the Western Cape having the largest proportion of farmers. The survey was conducted during July 2007 to May 2008, including a follow-up telephone survey. For this sampling method, 25% of the target population was drawn following Barnett (1991) and Lyne (2003) and Ramroop (2003) (the latter two both quoted by Clover & Darroch (2005)). According to the researchers, a sampling fraction of 25% is considered representative for multivariate analysis and takes into account the relatively high search costs of, and possible non-responses from, collecting data across spatially dispersed sampling units. A sample of 260 citrus growers was, therefore, drawn from the nine mutually exclusive strata (production regions) by taking a random sub-sample of 25% of the growers from each stratum. Table 2.1 shows the distribution of these growers by production region. As the sampling fractions are similar across strata, the strata data can be aggregated without weighting (Barnett, 1991).

Table 2.1 Method of drawing the study stratified random sample from the target population of 1001 SA citrus farmers, 2007

Province	Cases per province (N)	Cases in sample (n)	Sample cases as % of province (n/N)
Western Cape	366	38	25
Eastern Cape	284	23	25
Limpopo	150	14	25
Mpumalanga	103	13	25
KZN	47	11	25
Northern Cape	36	1	25
North West	10	0	25
Swaziland	4	0	25
Gauteng	1	0	25
TOTAL	1001	100	-

Research using postal surveys

of compliance with food regulation in the UK using a postal survey of 239 food manufacturers and received 67 usable questionnaires, a response rate of 30%. Henson *et al.* (1999) analysed the costs and benefits of implementing HACCP in the UK dairy processing sector by mailing 1200 questionnaires of which 192 were returned (192 = 16% of 1200). Deodhar (2003) reported empirical findings on the motivation for adopting HACCP in the Indian Food Processing industry using a mail survey to over 500 food companies with a nearly 10% response rate. Henson & Holt (2000) exploring incentives for the adoption of food safety controls in the UK dairy sector had a 16% response rate. Vanballe *et al.* (2003) in a national survey of dairy producer practices and attitudes pertaining to dairy market beef food safety in the US, earned a 9% response rate. They motivated the slightly lower response rate by asserting that the dairy farms surveyed were representative of farms nationally. Poksinska *et al.* (2003) studied the implementation of ISO 14000 in Sweden using 268 mailed questionnaires and had a good response rate of 50%. More recently, Banerjee *et al.* (2008) conducted an empirical study to estimate factors affecting adoption of GPS guidance systems by cotton growers in the US by mailing to 12245 cotton producers with a response rate of about 10%. In the SA context, Turner *et al.* (2000) conducted a postal survey among SA agribusiness firms to determine the adoption of ISO 9000 QA standards. The questionnaire sent to the whole population of 280 firms produced 92 usable questionnaires (32.9% response rate). Richardson (2005) reports that postal survey response rates can vary widely between 10% and 90%, depending on the study design.

2.5 Statistical analysis for the study

Statistical analysis of the study data was conducted using the Statistical Package for the Social Sciences (SPSS) software program (Norusis, 1994). The statistical techniques used were Principal Component Analysis (PCA) and Regression Analysis.

2.5.1 Principal Component Analysis

Farmers' ratings of the potential 22 motivators and 23 benefits of adoption of QA certification were separately analysed using PCA to explore the underlying *dimensions* (if any) in these variables. Past studies by Buttle (1997), Fouayzi *et al.* (2006) and Henson *et al.* (2005) classify these factors as internal, external, or regulatory motivators. The method of PCA transforms a set of observed correlated variables into another set of uncorrelated variables or indices (called principal

(Kim & Mueller, 1978) to improve reporting. Lack of correlation is a useful indicator that variables are measuring different dimensions in the data. The new variables are measured in the same units as the original observed variables, the first PC explains the largest amount of the variance in the data followed by the second PC, etc. The aim of using PCA is to economise on the number of variables and to summarise the information contained in a number of correlated variables into a smaller set of uncorrelated dimensions with minimum loss of information (Manly, 2005). In extracting PCs, the researcher must clearly identify whether the correlation or covariance matrix is used (Kim & Mueller, 1978). When the original variables are measured in reasonably similar units, unstandardised variables and the covariance matrix are used. If the variables have different units, standardised variables and the correlation matrix are preferred (Morrison, 1975). This avoids one or more variables with relatively larger variances having an undue influence on the estimated PCs (Manly, 2005). Exploratory PCA is carried out in this study in order to identify any support for the theoretical constructs of the existence of internal/external/regulatory-related factors as separate underlying dimensions of motivator or benefit factors. The PCs will be estimated as linear functions of the original 22 motivator or 23 benefit variables specified in sections C1 and C2 of the questionnaire as shown by equation (2.1).

$$PC_i = a_{i1}X_1 + a_{i2}X_2 + \dots + a_{in}X_n \quad (2.1)$$

Where $a_{i1} \dots a_{in}$ = component loadings; and $X_1 \dots X_n$ = motivator or internal benefit variables.

After extracting the PCs, the decision about which PCs to retain will depend on (1) the percentage of the variance accounted for by each PC; and (2) whether the PC can be *meaningfully interpreted* (Koutsoyiannis, 1987). In this study, PCA will be performed using the covariance matrix as the motivator and benefit variables are measured in the same units, namely values on a Likert-type scale ranging from 1 to 10. The next section outlines a linear regression model used to estimate the determinants of sample respondents' overall levels of satisfaction with QA certification.

2.5.2 Conceptual framework for regression model of factors affecting SA citrus farmers' overall satisfaction with their certification scheme

Past research shows causality between satisfaction with the technology adopted and the perceived benefits and/or cost savings from implementing the technology (Seddon, 1997; Seddon & Cullen, 2002; Calisir *et al.*, 2005). These authors found that producers' benefits perceived from outsourcing led to higher levels of satisfaction with outsourcing. Buttle (1997) and Poksinska *et al.*

ad to more stakeholder (customers, employees, owners)

ing adoption of QA schemes. Fouayzi *et al.* (2006) used

s between firm changes experienced after adopting QA

schemes. They identified three dimensions of underlying benefits from QA certification: *Internal benefits* (e.g. increased profitability, process improvement, and marketing benefits); *cost reductions* (e.g. lower transaction costs); and *external benefits* relating to better working relationships with other players in the supply chain. The regression analysis in this study investigates the relationship between overall satisfaction with QA certification and changes perceived by sampled SA citrus growers after certification (internal and external benefits), farm size, and farmers' satisfaction with their certifying agents in the conceptual model in Figure 2.1.

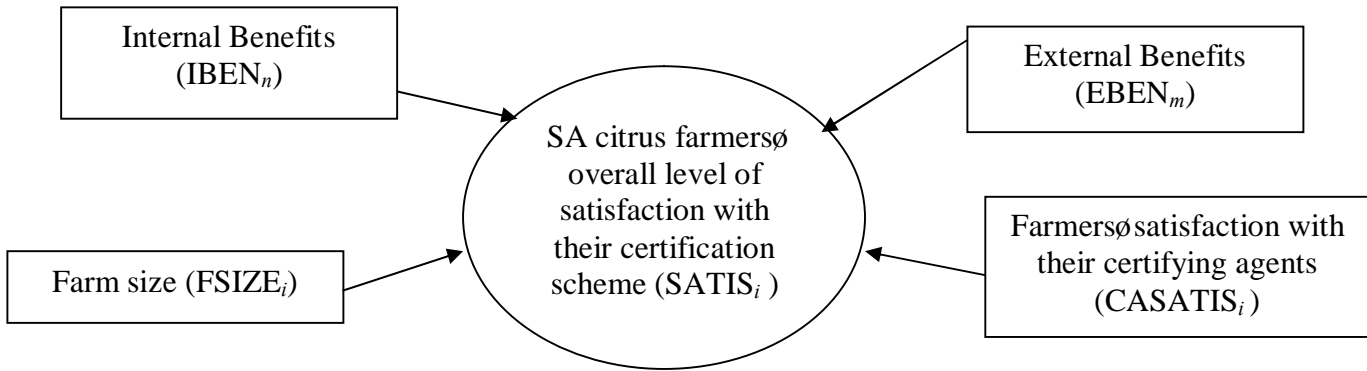


Figure 2.1 Conceptual model of factors affecting SA citrus farmers' overall level of satisfaction with their certification scheme

Based on Figure 2.1, the following study research hypotheses are derived:

- H₁:** *The higher the farmers' perceived internal benefits from certification, the higher is the farmers' overall satisfaction with QA certification.*
- H₂:** *The higher the farmers' perceived external benefits from certification, the higher is the farmers' overall satisfaction with QA certification.*
- H₃:** *The higher is the farmers' satisfaction with their certifying agents, the higher is the farmers' overall satisfaction with QA certification.*
- H₄:** *Farmers with larger farms have higher levels of overall satisfaction with QA certification.*

Following Gujarati (2003) and Darroch (2008), Ordinary Least Squares Regression (OLS) was used to estimate the *i*th sample citrus grower's overall satisfaction with his/her certification scheme (SATIS_{*i*}) as a function of key explanatory variables as per equation (2.2):

$$+ d_2 + \hat{\epsilon}_i + b_n \text{IBEN}_{in} + c_m \text{EBEN}_{im}$$

$$+ d_1 \text{FSIZE}_i + e_1 \text{CASATIS}_i + u_i \tag{2.2}$$

where u_i represents the error term

The variables in equation (2.2) and their expected relationships with SATIS_i are described below:

The dependent variable:

SATIS_i : Farmer’s overall level of satisfaction with his/her certification scheme

The i^{th} sample farmer’s SATIS_i level is captured by his/her score on a 5-point Likert-type scale of 1 (Very dissatisfied) to 5 (Very satisfied) as shown in section A1 of the study questionnaire.

Independent variables:

IBEN_{in} : Perceived internal benefits from adopting certification

Perceived internal benefits relate to improvements in farm operations such as better book-keeping and staff motivation; market-related benefits such as better access to foreign markets, and improved business reputation; and cost-reduction benefits such as less product wastage. The internal benefits are rated by farmers in section C2 of the questionnaire on a 10-point Likert-type scale ranging from 1 (Not important) to 10 (Very important). The n benefit scores for the i^{th} farmer will be used as independent variables in equation (2.2). A positive relationship between all of these benefit scores and SATIS_i is expected.

EBEN_{im} : Perceived external benefits from adopting certification

These variables capture benefits in the business relationship with other players in the citrus export supply chain after QA certification, such as improved trust and information sharing between the growers and their pack-house agents and/or customers. These benefits reflect farmers’ ratings on a Likert-type scale from 1 (Strongly disagree) to 5 (Strongly agree) whether they agree or disagree with statements such as “We now have a better business relationship” with other players in the SA citrus export supply chain in section C3 of the questionnaire. The m benefit scores for the i^{th} farmer will be used as independent variables in equation (2.2), and a positive relationship between all of the EBEN_{im} and SATIS_i is expected.

influence the sample farmers' overall satisfaction with QA certification adoption. Farmers with relatively larger annual turnover are more likely to experience a higher level of benefits, and therefore more overall satisfaction with QA schemes, than relatively smaller farmers due to the ability to spread the fixed costs of certification over larger outputs (economies of size). The next chapter reports the empirical results of the study in terms of the characteristics of the sample growers and the PCA and regression analysis.

CASATIS_i: Farmer's satisfaction with the certifying agent

A farmer's satisfaction with his/her certifying agent is expected to have a positive impact on that farmer's overall level satisfaction with QA schemes. This variable is captured in Question B4 of the questionnaire by asking farmers to show their level of satisfaction with their certifying agent on a 5-point Likert-type scale of 1 (Very dissatisfied) to 5 (Very satisfied). This variable, CASATIS_i for the *i*th farmer, should again be positively related to SATICB_i.

This chapter first describes the representativeness of the sample respondents. It then discusses the respondents' characteristics, and their rankings of problem EUREPGAP control chapters. As only three respondents ranked both EUREPGAP and Nature's Choice control chapters, only the EUREPGAP rankings are presented. The Chapter then reports PCAs of the motivating factors for, and perceived internal and external benefits of QA adoption. Next, it details costs of compliance and growers' perceived constraints in implementing QA schemes. The Chapter concludes with the regression analysis of the determinants of the growers' levels of overall satisfaction with their certification schemes.

3.1 Representativeness of the sample respondents

Of the 260 questionnaires mailed to SA citrus growers, a total of 108 usable questionnaires were returned. This was about 42% of the stratified random sample, which represents a response rate of about 11% from the target population of 1001 farmers. Although these response rates are relatively low, they fall within the range found in past postal surveys cited by Richardson (2005). Of the 108 respondents, 100 were EUREPGAP certified and eight were non-QA certified. Despite the relatively lower response rate, the sample is fairly representative of the distribution of SA citrus farmers nationally, as it has a similar income distribution and composition by production regions. The largest share (35%) of the respondents came from the Western Cape, followed by Limpopo with 21%. The distribution of respondents is similar to that of growers in the SA citrus industry, but differs slightly by province as there are relatively more growers from Limpopo and KZN, and relatively less from the Eastern Cape. Tables 3.1 and 3.2 show some similarities in the distribution for the respondents and the industry, implying the respondents are fairly representative of the target population.

respondents in Southern Africa, 2008 (n=108)

		Percentage
Western Cape	38	35
Limpopo	23	21.3
Eastern Cape	14	13
KZN	13	12
Mpumalanga	11	10.2
Northern Cape	1	0.9
North West	0	0
Swaziland	0	0
Gauteng	0	0
Total	108	100

Tables 3.1 and 3.2 show that Western Cape and Mpumalanga numbers in the sample are similar to the national distribution, while for Limpopo they are 40% higher and for Eastern Cape 50% lower.

Table 3.2 Distribution of commercial citrus producers in Southern Africa, 2008

Province	Industry	Percentage
Western Cape	366	36.6
Eastern Cape	284	28.4
Limpopo	150	15
Mpumalanga	103	10.3
KZN	47	4.7
Northern Cape	36	3.6
North West	10	1
Swaziland	4	0.4
Gauteng	1	0.1
Total	1001	100

Source: Hardman (2009).

of the study sample, the researcher analysed whether the respondents follows that of the industry. The respondents 3.3.

Table 3.3 Distribution of the QA-certified respondents by annual turnover, South Africa, 2008 (n=100)

Annual turnover (Rm)	Respondents (%)
Under 500000	1
500000 ó under 1	3
1 ó under 1.5	6
1.5 ó under 2	7
2 ó under 5	33
5 or over	50

Half of the QA-certified respondents had annual turnover in excess of R5 million, with another 33% between R2 million and R5 million. Hardman (2009) confirms that this distribution is *similar to the income distribution of commercial farmers in the SA citrus industry*, again suggesting that the respondents are fairly representative of the target population.

3.2 Other characteristics of the sample respondents

Of the 108 respondents, 100 were EUREPGAP-certified and only 8 were non-QA certified. The cleaned and coded socioeconomic data were analysed using the SPSS 15.0 software package (Norusis, 1994). The respondents were typically farm owners (50%) and farm managers (32%) or directors responsible for farm product quality management systems. About 36% and 33% of the respondents were university and college graduates, respectively, as reported in Table 3.4, which indicates a relatively educated profile of growers. Most of the sample farmers operated as Close corporations or Companies (54%), followed by Trusts (28%), which are often used as a asset-holding legal entity. Only about 17% of the sample farms were organised as sole proprietorships. The survey respondents' years of farming experience ranged from 5 years to 50 years, with an average of 22 years of experience, which is relatively high. Some 56% of the respondents did not own a pack-house, 41% had their own pack-house, while only 3% said they share a pack-house. EUREPGAP is reported in Table 3.4 as the main QA scheme that sample growers have complied with, while 23% were both EUREPGAP and Tesco's Nature's Choice certified.

characteristics of the sample respondents, South Africa,

Below Matric	1 (1%)
Matric	21 (21%)
College diploma	33 (33%)
University degree	36 (36%)
Postgraduate degree	9 (9%)
Business form	
Sole proprietorships	17 (17%)
Close corporations and/ or companies	54 (54%)
Trusts	28 (28%)
Other	1 (1%)
Years of farming experience	
Minimum: 5 years	Maximum: 50 years
Average: 22 years	
Pack-house ownership	
Yes: 41 (41%)	No: 56 (56%)
Share: 3 (3%)	
QA scheme used	
EUREPGAP	68 (68%)
EUREPGAP and Nature's Choice	23 (23%)
EUREPGAP and other	9 (9%)
Source of information	
Certifying bodies	52 (52%)
Citrus Research Institute	17 (17%)
Retailers	0 (0%)
Private consultants	16 (16%)
Citrus Growers' Association of Southern Africa	2 (2%)
Directly from the standard owners	0 (0%)
Other	13 (13%)

Most sample farmers (52%) find information about QA schemes from their certifying agents, 17 % from the Citrus Research Institute and 16% from private consultants. Surprisingly, only 2 % obtain information from the CGA, implying that the CGA could perhaps become more involved in disseminating information on citrus standard developments. Valencias make up the largest percentage of the respondents' citrus exports by volume, as reported in Table 3.5 and Figure 3.1, followed by Navels. The industry has the same trend, again reflecting the representativeness of the sample growers. The respondents export, on average, mainly Valencias (50%), followed by Navels (24%), Grapefruit (11%), soft citrus (8%), and lemons (5%), in terms of volume (cartons).

Volume of citrus exports, South Africa, 2008 (n=100)

	Volume (cartons)	Standard deviation
Navels (N = 97)	56612	150251
Valencias (N = 99)	118316	246030
Grapefruit (N = 100)	27466	67198
Lemons (N = 94)	13384	49907
Mandarins (N = 96)	20851	45654
TOTAL	236629	

This distribution of export volumes is consistent with the citrus exports reported by CGA in the literature reviewed.

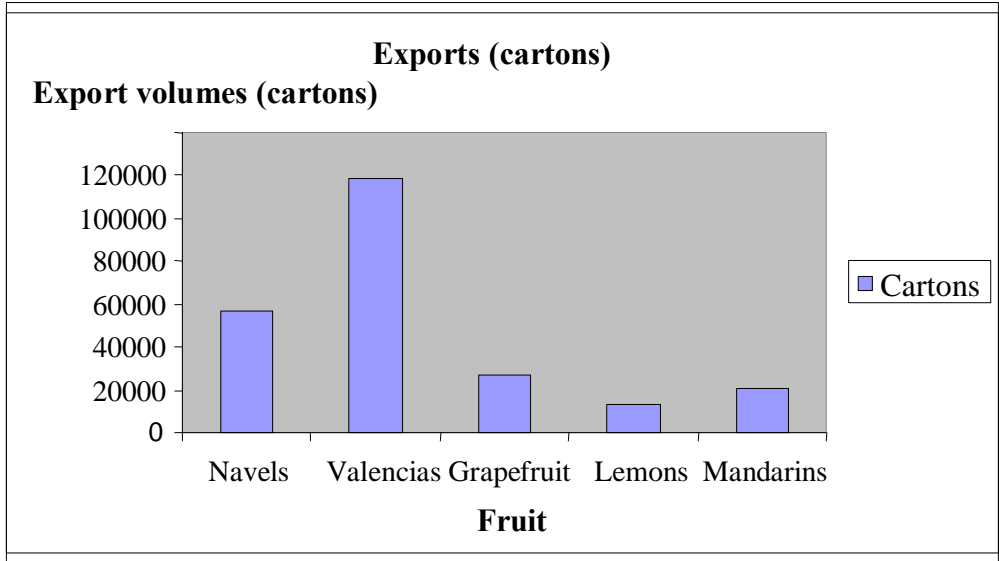


Figure 3.1 Distribution of respondents’ mean annual volume of citrus exports, South Africa, 2008 (n=100)

Markets supplied by the sample respondents were the EU, UK, US, Middle East (ME), South East Asia (SEA), Japan (J), and Russia (R). The top three main citrus export markets are the EU, UK and the Middle East.

Market distribution, South Africa, 2008 (n=100)

	Europe	USA	United Kingdom	Middle East	South East Asia	Japan	Russia
Navels (n=60)	41	20	41	29	11	10	7
Valencias (n=70)	54	5	45	40	13	12	13
Grapefruit (n=31)	27	0	15	4	2	12	4
Lemons (n=22)	16	2	17	16	9	11	3
Mandarins (n=41)	33	13	27	13	7	5	3

3.3 Respondents’ rankings of the EUREPGAP control chapters

As only three respondents ranked the Natureø Choice control chapters, only the respondentsø ranking of the five most difficult EUREPGAP control chapters to implement are presented in Table 3.7. Record-keeping was ranked first as many of the sample farmers found it time consuming to comply with. From the comments they annotated, they have to record details of nearly every farm activity in the orchard. They report also that almost all the other control chapters have to be documented. Some of their comments include òemployees too illiterate to record activities on the fieldö; òone cannot have a manager on the farm 100% taking notesö, for instance, on every application of fertiliser. The sample farmers thus view part of the time spent on book keeping as an opportunity cost that could be spent on other income generating activities. Respondents ranked crop protection the second most difficult chapter to implement as it probably has the most protocols and involves aspects such as IPM rather than use of chemicals. Respondents again commented that another difficult aspect of this chapter is the detailed record keeping required for each aspect.

the five most difficult EUREPGAP control chapters to

EUREPGAP control chapter	Frequency	Percentage (%)
Record keeping	24	24
Crop protection	19	19
Workers' health and welfare	18	18
Waste and pollution management	18	18
Produce handling	15	15
All others	6	6
TOTAL	100	100

Workers' health was ranked the third most difficult chapter together with waste and pollution management, and was related to perceived 'unreasonable' control points such as a washing basin for workers every 600m in the orchard, and the use of various types of protective clothing. Ensuring compliance by employees was found difficult to monitor. Regulations related to the disposal of chemicals and other inputs used on the farm required apparently costly and stringent procedures. The results presented in Table 3.8 show that respondents, on average, were moderately satisfied with the service that they get from their certifying agents as shown by mean scores averaging about 4. Overall, they are satisfied with the service they receive from their agents, with ratings from 1 to 4.

Table 3.8 Respondents' ratings of the service offered by their certifying agents (1 = strongly disagree to 5 = strongly agree), South Africa, 2008 (n = 100)

Aspect	Mean score	Standard deviation
Service before audit	3.94	0.810
Service during	3.82	0.753
Service after session	4.40	0.865
Satisfaction with CAs	4.06	0.703

When asked if the CGA should play a bigger role in resolving problems relating to compliance, about 57% of respondents agreed, 38% said 'No' and 5% had no opinion (see Figure 3.4).

le in resolving the compliance?

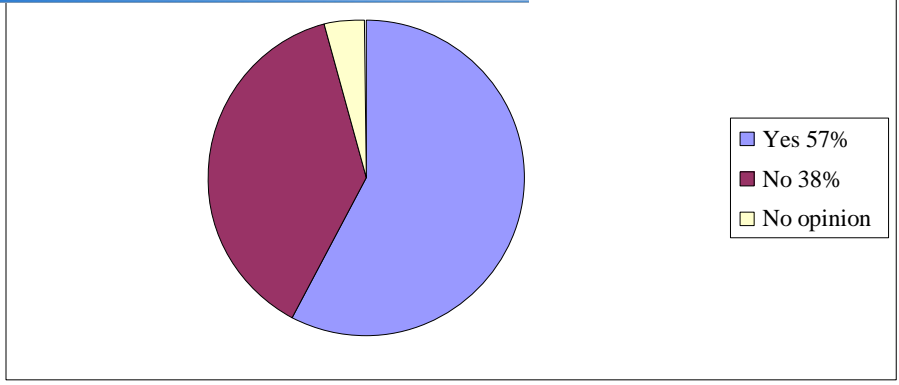


Figure 3.2 Respondents’ views on whether the CGA should be involved in resolving problems related to QA compliance

3.4 Factors motivating respondents to adopt QA schemes

What motivates the survey respondents to adopt quality assurance schemes? The respondents’ ratings of the 22 potential motivators on a scale of 1 (not important) to 10 (very important) are presented in Table 3.9 overleaf. The top rated motivators were to keep access to existing markets, improve customer confidence, access new market segments, meet food safety requirements and retailer needs, improve business image, improve competitiveness and gain higher product prices. In all, these relate to the drive to adopt QA schemes in order to retain existing markets and access new markets. The implication is that the drive towards adoption was a reaction to the retailers’ bargaining power, rather than an initiative by growers. Management of liability exposure was another important motivation for implementation of QA schemes. Previous research notes that firms will adopt quality management schemes to avoid being held liable for defective products and/or not exercising adequate safety and control plans (Fouayzi *et al.*, 2006). This factor also has a relatively high score (6.24) and interviews with selected growers picked that as one of the major drivers towards compliance. Cost cutting and the drive for improved social responsibility were less highly rated motivating factors for sample respondents. Maldonado *et al.* (2005) in a study of the benefits and costs of implementing HACCP reached the same conclusion. The implication is that many of the sampled SA citrus growers already have quality systems in place and EUREPGAP was viewed as certification to fulfil market requirements rather than a food safety and quality objective. Further analysis by each citrus producing region yielded the same top five motivators as the aggregate scores, and also similar scores for the lower rated motivators.



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Factors motivating their adoption of QA schemes (1 =not at all, 5 =very much) in South Africa, 2008 (n=100)

	Rating (mean)	Standard deviation	CV
To keep access to existing markets	8.82	2.10	0.24
To improve customer confidence in our product (n = 98)	8.46	2.46	0.29
To access new market segments	8.43	2.39	0.28
To meet food safety requirements	7.97	2.66	0.33
To meet retailer needs	7.73	3.18	0.41
To improve business image	7.04	2.75	0.39
Competitors were likely to get certification and have edge over us	6.97	3.05	0.44
Wanted to improve competitiveness	6.58	3.41	0.52
Expected to get higher product prices	6.41	3.38	0.53
To improve farm management systems	6.40	3.00	0.47
To reduce legal liability	6.24	3.01	0.48
To meet pack-house requirements	6.14	3.38	0.55
To improve record keeping	6.09	3.02	0.50
Schemes are a barrier to market entry	5.80	3.13	0.54
To improve social responsibility	5.46	2.87	0.53
To improve environmental responsibility	5.44	2.95	0.54
To develop staff skills	5.28	2.99	0.57
To improve coordination with other players in the supply chain	5.20	3.16	0.61
To improve product quality	4.81	3.07	0.64
To reduce fruit wastage/spoilage	3.71	2.90	0.78
To reduce costs of doing business	3.35	2.67	0.80
To reduce input costs	2.90	2.47	0.85

Previous research has identified few underlying dimensions or categories of factors motivating QA adoption (Henson *et al.*, 2005; Buttle, 1997; Poksinska *et al.*, 2003). The objectives of using PCA in this study are to economise in the number of variables and to summarise the information contained in the 22 motivators into a smaller set of uncorrelated dimensions with minimal loss of information (Manly, 2005). The PCA will be performed using the covariance matrix as the motivating factors are measured in the same units, namely values on a Likert-type scale ranging

were highly intercorrelated as shown in Appendix C1 on covariance matrix using the SPSS software package are how many PCs should be retained for analysis depends upon whether the estimated PCs can be *meaningfully* interpreted using the sizes and signs of their estimated factor loadings (Darroch, 2008). Another formal selection criterion is a *rule-of-thumb* to use factor loadings that are greater than ± 0.300 , provided the sample has at least 50 observations, to try and attach an economic meaning to a PC (Koutsoyiannis, 1987). For this study, an attempt is made to meaningfully interpret the PCs, therefore, factor loadings with values less than 0.4 have been ignored. Varimax rotation is used to improve the identification of the underlying dimensions.

Table 3.10 Principal component loadings for the factors motivating respondents' adoption of QA schemes

Principal component	PC1	PC2	PC3	PC4	PC5	PC6
Eigenvalue	7.12	2.47	1.54	1.42	1.21	1.05
% variance explained	24.19	10.32	9.79	7.77	7.64	7.63
Cumulative % variance explained	24.19	34.51	44.30	52.06	59.70	67.33
To meet retailer needs (MOT1)	-.210	.194	.095	.781	-.110	-.012
To meet food safety requirements (MOT2)	.296	.419	.167	.367	-.377	.247
To improve farm management systems (MOT3)	.647	.423	-.070	-.172	-.017	.231
To reduce fruit wastage/spoilage (MOT4)	.830	-.004	.114	.027	.144	-.149
To improve record keeping (MOT5)	.664	.232	.306	-.177	-.277	-.030
To improve customer confidence in our product (MOT6)	.123	.520	.478	.254	.068	.198
To improve product quality (MOT7)	.800	.088	.126	.145	.051	-.171
To meet pack-house requirements (MOT8)	.416	-.064	-.058	.604	.158	.331
To access new market segments (MOT9)	.095	-.018	.055	.244	.044	.740
To keep access to existing markets (MOT10)	-.286	.093	.184	-.183	.135	.736
To reduce costs of doing business (MOT11)	.481	.129	.019	.132	.707	.091
To reduce input costs (MOT12)	.616	.052	.135	-.027	.564	.008
To reduce legal liability (MOT13)	.434	.678	-.195	.150	.123	-.201
To improve business image (MOT14)	.182	.812	.218	-.027	.144	.066
Competitors were likely to get certification and have edge over us (MOT15)	.173	.106	.801	.151	.222	.040
Expected to get higher prices (MOT16)	.056	.218	.272	.086	.542	.239
To develop staff skills (MOT17)	.726	.141	.202	-.127	.220	.218
To improve environmental responsibility (MOT18)	.695	.398	.062	-.140	.209	.039
To improve social responsibility (MOT19)	.717	.374	.237	-.090	.043	-.043
To improve coordination with other players in the supply chain (MOT20)	.484	.113	.324	.179	.141	.306
Schemes are a barrier to market entry (MOT21)	-.176	-.067	.146	.459	.258	-.006
Wanted to improve competitiveness (MOT22)	.262	.028	.820	.008	-.007	.132

The first principal component, PC1, had relatively large factor loadings for MOT3 (to improve farm management systems), MOT4 (to reduce fruit wastage/spoilage), MOT5 (to improve record

quality), MOT12 (to reduce input costs) and MOT17 (to improve intra-farm operations and product quality, and environmental and social responsibility, respectively). This PC identifies a drive to improve operational/technical aspects of the farm, and to meet environmental and social responsibility objectives. PC1 was thus labelled **“Farm operational/technical improvement and meeting environmental and social responsibility”**. Poksinska *et al.* (2003) also identified a similar dimension in their study of the motivators for the implementation of ISO 14000 in Sweden. This PC explained about 24% of the variation in the original variables. PC2 linked MOT14 (to improve business image), MOT13 (to reduce legal liability) and MOT6 (to improve customer confidence in our product). This PC was labelled **“To improve business image and meet regulatory requirements”**. Previous research by Henson *et al.* (2005) and Poksinska *et al.* (2003) has also identified the drive towards certification as a regulatory requirement and a way of enhancing farm reputation.

The third component, PC3, had large positive factor loadings for MOT22 (wanted to improve competitiveness), MOT15 (competitors likely to get certification and have edge over us), and MOT6 (improve customer confidence). This PC was identified as **“To improve market competitiveness”**, and explained about 10% of the total variation in the potential 22 motivators. The fourth PC, PC4, was named **“To meet market access requirements”** as MOT1 (to meet retailer needs), MOT8 (to meet pack-house requirements) and MOT21 (schemes are a barrier to market entry) all had large factor loadings. These three variables show the move towards compliance by respondents in order to meet existing or new market requirements. The results support previous research by Buttle (1997) and Henson *et al.* (2005) which identified market access as one of the major drivers towards QA certification. PC4 explained some 8% of the variation in the original variables. In PC5, MOT11 (to reduce transaction costs), MOT12 (to reduce input costs) and MOT16 (expected to get higher prices) all show the respondents’ drive to gain certification to increase their sales/revenue and reduce costs. This PC was labelled **“To improve farm profitability”** and it explained almost 8% of the variance in the original variables. Finally, PC6 linked MOT9 (to access new market segments) and MOT10 (to keep access to existing markets), which both relate to market access. This PC is similar to PC3 and PC4, although it stresses maintaining and growing market share; it was labelled **“To enhance market access”** and it also explained close to 8% of the variance. The original 22 motivating variables identified in this study can, therefore, be summarised in six dimensions:



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improvement and meeting environmental and social

- 1) To meet regulatory requirements;
- 2) To improve market competitiveness;
- 3) To improve market competitiveness;
- 4) To meet market access requirements;
- 5) To improve farm profitability; and
- 6) To enhance market access.

Analysis of these dimensions indicates drivers towards meeting market requirements, and realising intra-farm operational improvements. The next section analyses the respondents' perceived internal benefits from QA certification.

3.5 Respondents' perceptions of the internal benefits from QA certification

What are the effects of becoming QA certified on the farm? The respondents' ratings of the perceived internal benefits from QA certification are given in Table 3.11. The most important benefits perceived, on average, by respondents were the improved ability to retain existing customers, improved worker health and safety, better access to foreign markets, better farm organisation and improved food safety and orchard management. The six lowest rated benefits achieved with mean scores below four all related to cost-savings. Empirical evidence suggests that firms can gain competitive edge and improve product image from adopting QA schemes (Buttle, 1997). Analysis by each citrus producing region yielded the same top five perceived benefit scores as the aggregate scores, and also similar scores for the lowest-rated perceived benefits relating to cost-savings. PCA was again used to ascertain if there were any underlying benefit dimensions as suggested by previous studies (Buttle, 1997; Henson *et al.*, 2005). The correlation matrix presented in Appendix C2 on page 89 confirms the intercorrelations between the internal benefit (IBEN1 to IBEN23) variables. The covariance matrix was again used to extract the PCs since all 23 IBEN variables are measured in the same units on a Likert-type scale. Varimax rotation greatly improved the interpretation of the seven underlying dimensions of these variables as shown in Table 3.12.

perceived internal benefits from QA certification (1 = South Africa, 2008 (n=100))

	Rating (mean)	Standard deviation	CV
Ability to retain existing markets	7.17	2.74	0.38
Improved worker health and safety	6.69	2.44	0.36
Better access to foreign markets	6.48	3.00	0.46
Better farm organisation	6.40	3.17	0.50
Improved fruit safety	6.14	2.68	0.44
Improved orchard management	5.89	3.05	0.52
Improved reputation of the farm business	5.74	3.24	0.56
Improved competitiveness in foreign markets	5.73	3.22	0.56
Better quality of data for decision making	5.55	2.95	0.53
Now easier to negotiate and secure contracts	4.57	3.34	0.73
Better on-farm environmental practices	4.55	3.08	0.68
Improved staff motivation	4.36	2.77	0.64
Higher product sales	4.24	3.46	0.82
More consistent fruit quality	4.03	2.62	0.65
Less fruit quality claims	3.71	2.67	0.72
Certification serves as insurance in case of farm accidents	3.57	3.06	0.86
Reduced fruit wastage	3.69	2.98	0.81
Savings in fertiliser and pesticide costs	3.31	2.65	0.80
Reduced duplication of farm operation processes	3.28	2.89	0.88
Higher product prices	3.18	2.95	0.93
Reduced management costs of monitoring farm operations	3.04	2.44	0.80
Decreased costs of organising contracts	2.73	2.00	0.73
Lower costs of inspecting fruit quality	2.02	1.86	0.92

The first PC, PC1, had relatively large factor loadings for IBEN19 (reduced management costs of monitoring), IBEN 18 (reduced fruit wastage), IBEN17 (less duplication of farm operation processes), IBEN21 (decreased costs of negotiating contracts) and IBEN22 (lower costs of inspecting fruit quality). All of these benefits are intra-farm and relate to perceived time and input cost savings due to QA certification. Based on the above interpretation and from literature reviewed, this component is named **Cost reduction benefits** and explains some 36% of the

ernal benefit ratings. PC2 captured benefits that relate to high loadings for IBEN4 (better farm organisation), IBEN11 (improved orchard management), IBEN12 (better quality of data for decision making), and IBEN16 (better on-farm environmental practices). PC2 was thus labelled **Improved farm organisation and management benefits**. Buttle (1997), Poksinska *et al.* (2003) and Calisir *et al.* (2005) identified a similar dimension among the underlying benefits of QA adoption identified in their studies.

Table 3.12 PC loadings for the respondents' perceived internal benefits from QA certification

Principal component	PC1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7
Eigenvalue	68.36	21.28	14.49	12.48	9.03	8.63	7.63
% variance explained	36.24	11.28	7.68	6.61	4.79	4.58	4.04
Cumulative % variance explained	36.24	47.52	55.20	61.81	66.60	71.17	75.22
Higher product sales (IBEN1)	.330	.186	.825	.216	.040	-.084	-.003
Improved competitiveness in foreign markets (IBEN2)	.085	.069	.841	.091	.036	.258	.068
Better access to foreign markets (IBEN3)	-.025	.091	.520	.009	.103	.015	.179
Better farm organisation (IBEN4)	.210	.856	.188	.071	.091	.050	.092
More consistent fruit quality (IBEN5)	.197	.219	.150	.511	.160	.272	.032
Improved fruit safety (IBEN6)	.130	.314	.096	.141	.086	.791	.003
Improved worker health and safety (IBEN7)	.114	.724	.274	.104	.244	.320	-.036
Ability to retain existing markets (IBEN8)	.028	.102	.092	.104	-.005	-.004	.930
Improved staff motivation (IBEN9)	.248	.262	.376	.327	.328	-.090	.100
Improved reputation of the farm business (IBEN10)	.158	.111	.283	-.033	.331	.357	.318
Improved orchard management (IBEN11)	.340	.572	-.109	.045	.326	.331	.302
Better quality of data for decision making (IBEN12)	.156	.638	-.137	.493	.138	.158	.056
Less fruit quality claims (IBEN13)	.202	.175	.169	.825	-.127	.056	.095
Higher product prices (IBEN14)	.317	-.109	.483	.627	.254	.028	.214
Certification serves as insurance in case of farm accidents (IBEN15)	.205	.103	.145	.084	.858	.208	-.053
Better on-farm environmental practices (IBEN16)	.190	.460	-.039	-.015	.730	-.040	.088
Reduced duplication of farm operation processes (IBEN17)	.741	.184	.028	.285	.127	-.130	-.026
Reduced fruit wastage (IBEN18)	.779	.313	.111	.180	.273	.114	.053
Reduced management costs of monitoring farm processes (IBEN19)	.846	.132	.117	.032	.101	.155	.056
Savings on fertiliser and pesticide costs (IBEN20)	.492	.062	.117	.077	.221	.505	-.026
Decreased costs of organising contracts (IBEN21)	.691	.041	.229	.227	.042	.098	.027
Lower costs of inspecting fruit quality (IBEN22)	.369	.097	.035	.445	.236	.195	-.135
Now easier to negotiate contracts (IBEN23)	.124	-.038	.156	.009	.025	.049	.053

s, namely IBEN2 (improved competitiveness in foreign
foreign markets) with IBEN1 (higher product sales) and
was labelled **Foreign market and profit improvement**

benefits. The implication is that the sample SA citrus farmers identify monetary benefits from complying with food safety regulations. This factor explained about 8% of the variation in the original 23 potential internal benefit ratings. PC4 linked IBEN13 (less fruit quality claims), IBEN14 (higher product prices), IBEN5 (more consistent fruit quality), IBEN12 (better quality of data for decision making), and IBEN22 (lower inspection costs). A grouping of these benefits indicates that respondents perceive improved product quality and information benefits, so this PC was named **Quality improvement benefits**. PC5 showed high loadings for both IBEN15 (certification serves as insurance in case of farm accidents) and IBEN16 (better on-farm environmental practices), and was therefore labelled **Insurance and environmental benefits**, which accounted for some 5% of the variance in the 23 potential internal benefit ratings. PC6 was labelled **Fruit safety improvement, input cost savings and reputation benefits** due to the high loadings for IBEN6 (improved fruit safety), IBEN20 (savings on fertiliser and pesticide costs), and IBEN10 (improved reputation of farm business). The 23 potential internal benefits analysed in this study were thus explained in six dimensions:

- 1) Cost reduction benefits;
- 2) Improved farm organisation and management benefits;
- 3) Foreign market and profit improvement benefits;
- 4) Quality improvement benefits;
- 5) Insurance and environmental benefits; and
- 6) Fruit safety improvement, input cost savings and reputation benefits.

Sample respondents had expected cost reduction benefits from QA certification that were partly realised as shown by PC1. Similarly, improved farm management practices and the ability to retain existing markets and improve market access have also come up as expected in PC2, PC3 and PC4. The motivations to gain QA certification to improve business image/profitability, and to meet regulatory requirements, seem to have been captured in PC3, PC5 and PC6.

supply chain) benefits from QA certification

er 1 indicates some potential supply chain-related benefits

arising from QA certification. Information provided by traceability systems, for example, can improve coordination of the supply chain (Henson *et al.*, 2005) by reducing the information asymmetries associated with credence characteristics and the costs of supplier identification, and contract negotiation/enforcement. The respondents' ratings of the 11 potential supply chain benefits from QA certification presented in the survey questionnaire are given in Table 3.13

Table 3.13 Respondents' ratings of external (supply chain) benefits from QA certification, South Africa, 2008 (n=100) (1 = Strongly disagree to 5 = Strongly agree)

Perceived supply chain benefit	Rating (mean)	Standard deviation	CV
We now share goals and values about our product (EBEN4)	3.27	1.072	0.33
There is now more joint decision making on fruit safety (EBEN8)	3.21	0.967	0.30
We now work together more on quality assurance (EBEN11)	3.20	1.028	0.32
We now have a better business relationship (EBEN1)	3.12	1.122	0.36
Coordination with each other has improved (EBEN9)	3.05	0.947	0.31
Trust has improved in our business relationship (EBEN3)	3.03	0.969	0.31
We now share more vital information than before (EBEN5)	3.03	1.123	0.37
Sharing of information has improved (EBEN10)	2.96	1.118	0.38
We now have stronger personal confidence in each other (EBEN2)	2.95	1.029	0.35
There is now more joint decision making on fruit quality(EBEN7)	2.89	0.898	0.31
Less time required to negotiate contracts (EBEN6)	2.82	0.989	0.35

The sampled growers rated shared goals and values about the product, more joint decision making on fruit safety, more working together on quality assurance, a better business relationship, improved coordination and improved trust, as the six major supply chain benefits from QA certification. The relatively low mean scores imply somewhat neutral overall responses, although scores ranged from 1 (strongly disagree) to 5 (strongly agree). Analysis of these supply chain perceived benefits by region revealed slightly varied responses in the top six, however EBEN4, EBEN8 and EBEN11 were common top six benefits and EBEN6 was common to all regions as the lowest rated benefit. Based on Table 3.14, these perceived supply chain benefits were highly intercorrelated and PCA was, therefore, used to reduce these 11 benefits into fewer dimensions which can be more easily interpreted.

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EBEN2	.800**	1.00									
EBEN3	.620**	.744**	1.00								
EBEN4	.497**	.654**	.660**	1.00							
EBEN5	.410**	.456**	.536**	.614**	1.00						
EBEN6	.384*	.359**	.297**	.390**	.551**	1.00					
EBEN7	.589**	.643**	.517**	.608**	.500**	.616**	1.00				
EBEN8	.193	.286	.342**	.362*	.341**	.334**	.504**	1.00			
EBEN9	.435**	.457**	.528**	.559**	.559**	.545**	.628**	.526*	1.00		
EBEN10	.489**	.568**	.576**	.530**	.574**	.435**	.627**	.463**	.625**	1.00	
EBEN11	.532**	.587**	.506**	.571**	.555**	.370**	.613**	.332**	.585**	.660**	1.00
	EBEN1	EBEN2	EBEN3	EBEN4	EBEN5	EBEN6	EBEN7	EBEN8	EBEN9	EBEN10	EBEN11

Note: *, **and *** denote statistical significance at the 10%, 5% and 1% level, respectively.

Varimax rotation was used to maximise the variance of the new PCs and to try and improve interpretability of these PCs. Table 3.15 has the estimated PC loadings for two dimensions of the perceived supply chain benefits that can be meaningfully interpreted. The two distinct PCs extracted from the original 11 supply chain benefits accounted for 63.64% of the variance in the original variables. PC1 captured EBEN1, EBEN2, EBEN3, EBEN4 and EBEN11 which relate to an improved business working relationship via improved trust, shared goals and values about the product and working together on quality assurance. This PC was thus entitled **Improved working relationship and product quality benefits**.

Table 3.15 PC loadings for the respondents' perceived external (supply chain) benefits from QA certification

Principal component	PC1	PC2
Eigenvalue	6.195	1.179
% variance explained	53.46	10.176
Cumulative % variance explained	53.46	63.64
We now have a better business relationship (EBEN1)	.868	.050
We now have stronger personal confidence in each other (EBEN2)	.871	.235
Trust has improved in our business relationship (EBEN3)	.689	.337
We now share goals and values about our product (EBEN4)	.627	.494
We now share more vital information than before (EBEN)	.440	.644
Less time required to negotiate contracts (EBEN6)	.230	.664
There is now more joint decision making on fruit quality (EBEN7)	.546	.605
There is now more joint decision making on fruit safety (EBEN8)	-.012	.721
Coordination with each other has improved (EBEN9)	.335	.760
Sharing of information has improved (EBEN10)	.440	.639
We now work together more on quality assurance (EBEN11)	.613	.474

Improved coordination, more joint decision making on fruit
 and contractual benefits. Given the focus of PC2 on
 to negotiate contracts, PC2 was labelled **Improved**

cooperation and contractual benefits. Fostering closer relationships among supply chain partners can lower transactions costs and improve the quantity and quality of throughput. The managerial implication is that certification may improve working relationships between supply chain players, which can improve the competitiveness of the South African citrus export supply chain. Certification can also reduce information asymmetry between the players by promoting information sharing and improving coordination. The next section reports the respondents' estimated costs of certification and compliance with EUREPGAP, including set-up costs and annual running costs to maintain certification.

3.7 Respondents' estimated costs of EUREPGAP certification and compliance

While the respondents perceive internal and supply chain benefits from the adoption of QA schemes, the implementation of these schemes incur costs. These costs include personnel training and acquisition of new equipment for control and testing (Fouayzi *et al*, 2006) and may be quite substantial. Tables 3.16 to 3.18 report the respondents' initial investment and annual recurrent certification costs as a percentage of average annual farm turnover, and in Rand terms. About 60% of the respondents invested less than 1% of their average annual farm income to gain certification with EUREPGAP. In addition, 84% of the respondents spent less than 1% of turnover on annual recurrent certification costs. Moll & Igual (2005) in their EUREPGAP implementation study in Spain estimated recurrent costs up to 11% of annual turnover.

Table 3.16 Respondents' estimated costs of EUREPGAP compliance as a percentage of annual total farm turnover, South Africa, 2008 (n=100)

Percentage of turnover	Number of respondents with initial investment costs in this range	Number of respondents with annual recurrent certification costs in this range
0 to under 0,5%	39 (39%)	58 (58%)
0,5% - under 1%	21 (21%)	26 (26%)
1% - under 1,5%	18 (18%)	8 (8%)
1,5% - under 2%	13 (13%)	4 (4%)
2% or over	9 (9%)	4 (4%)

Table 3.17 shows the distribution of annual recurrent costs of EUREPGAP certification as a percentage of annual farm turnover and by size of farm in the study sample. Of the 58 respondents

Costs for EUREPGAP certification were less than 0.5% of turnover (defined by Hardman (2009) as having average annual turnover of less than R5 million). These findings are in line with findings by Deodhar (2003) in the Indian study of HACCP implementation and by Zaibet & Bredahl (1997) who reported certification costs with quality standards on average 1.5% of total annual expenditure. The implication is that the average cost per unit of production is higher for smaller than for larger farmers (economies of size). Thus while adopting QA schemes might result in cost-saving gains, QA certification costs may act as a disincentive for smaller farms.

Table 3.17 Respondents’ estimated costs of EUREPGAP compliance by farm size, South Africa, 2008 (n=100)

Item	Farm size (turnover)						Total
	<R500000	R500000< R1M	R1M <R1.5M	R1.5M <R2M	R2M <R5M	R5M & over	
0 ó <0,5%	0	0	3	3	19	33	58
0,5% - <1%	1	0	2	2	9	12	26
1% - <1,5%	0	1	0	0	5	2	8
1,5% - <2%	0	1	1	2	0	0	4
2% or over	0	1	1	2	0	0	4
Total respondents	1	3	7	9	33	47	100
Chi-Square 44.597*** 20 (Degrees of freedom)							

Note: *** denotes statistical significance at the 1% level; M = Million

The respondents were presented with a list of initial and recurrent costs of compliance identified by previous studies to be incurred when implementing EUREPGAP, and asked to state their costs in Rand figures. Table 3.18 shows that, on average, respondents invested R70510 in order to gain certification. The main establishment costs were for the construction of infrastructure (43.5%), additional buildings (26%), and employees training (13.5%). Sample respondents with a pack-house spent statistically significantly more funds on additional infrastructure, equipment and employees training costs than those without a pack-house, to obtain certification.

Initial costs of EUREPGAP certification, South Africa,

	With pack-house	No pack-house	t-value	Mean cost
Infrastructure	39634	21893	2.066***	30763
Additional equipment	8988	6446	1.087**	7717
Additional buildings	20566	16188	0.457	18377
Employees training	14078	5107	3.052***	9593
Cost of initial audit	4278	3841	0.844**	4060
Total mean cost	87544	53475		70510

Note: ** and *** denote statistical significance at the 5% and 1% level, respectively.

The breakdown of establishment costs by region showed no significant differences; therefore, these costs were not reported. Table 3.19 has the estimated annual costs of maintaining compliance with EUREPGAP reported by the sampled respondents. These growers spend on average R4554 for the annual audit to renew EUREPGAP certification, about R3500 for recordkeeping, over R5000 both additional labour and management costs, and R4883 for soil analysis.

Table 3.19 Respondents’ estimated annual costs of maintaining EUREPGAP compliance, South Africa, 2008 (n=100)

Cost item	With pack-house	No pack-house	t-value	Mean cost
Audit	4824	4284	0.982*	4554
Storage	1800	986	1.196**	1393
Record keeping	3863	3179	0.586	3521
Additional labour	6244	4054	1256**	5149
Management costs	6580	4829	0.957	5704
Cost of sourcing information	3223	2185	0.547	2704
Soil analysis	6878	2888	2.702***	4883
Water analysis	2644	1852	1.573**	2248
Total mean cost	36056	24257		30156

Note: *, ** and *** denotes statistical significance at the 10%, 5% and 1% level, respectively.

On average, sampled growers spent approximately R30000 per year to maintain EUREPGAP compliance. Hardman (2009) asserts that informal discussions with SA citrus growers confirm that

to range from R20000 to R30000 per annum, which is study. For an average citrus grower with turnover above constitute 1.5% of annual income. Respondents raised the issue of difficulty in establishing clear baseline and cut-off points against which costs of EUREPGAP compliance can be identified relative to costs of other day-to-day business activities. Heasman & Henson (1997) also found this problem. Sample respondents with a pack-house spent relatively more on annual certification costs as shown by statistically significantly higher mean audit, storage, additional labour, soil analysis and water analysis costs in Table 3.19. The next section discusses the problems encountered by respondents in implementing QA schemes.

3.8 Respondents’ perceptions of the constraints on complying with QA certification

The respondents’ ratings of the 11 potential constraints in implementing QA certification are given in Table 3.20. The main constraints, on average, were the time spent monitoring compliance activities, high annual costs of maintaining certification, lack of sufficiently trained personnel, the need for more detailed record-keeping, and standard protocol is too broad and complex as it covers fruits and vegetables. These constraint rankings are consistent with the respondents’ rankings of the top five EUREPGAP control chapters that are the most difficult to implement.

Table 3.20 Respondents’ perceptions of the constraints on complying with QA certification (1 = minor constraint to 10 = major constraint), South Africa, 2008 (n=100)

Perceived constraints	Rating (mean)	Standard deviation	CV
Time spent monitoring compliance activities	7.53	2.65	0.35
High annual costs of maintaining certification	6.99	2.87	0.41
Lack of sufficiently trained personnel	6.96	3.54	0.51
Need for more detailed record keeping	6.38	2.68	0.42
Standard protocol is too broad and complex as it covers all fruits and vegetables	6.07	3.25	0.54
Maintaining own knowledge about certification standards	5.96	2.87	0.48
Difficult to motivate staff to implement the scheme protocols	5.58	3.29	0.59
High costs of maintaining new buildings and farm infrastructure	5.50	2.89	0.53
Certification agents apply standards differently	4.10	3.60	0.88

farmers that were presented with 11 potential constraints identified in the literature review that may hinder QA adoption. They were asked to rate these constraints on a Likert-type scale from 10 (very important) to 1 (not important) as shown in Table 3.21. The non-certified respondents rated uncertainty about costs and benefits from certification, investments costs are too high, no price premium, current farm systems are adequate, and costs of compliance are too high, as the top five reasons why they have not adopted QA schemes. Uncertainty about costs and benefits is rated as the major reason which supports the need for this study of perceived certification benefits and costs. The CGA can use this information in extension services to workshop the importance of compliance with these schemes, especially by highlighting the potential benefits of certification.

Table 3.21 Respondents’ ratings of reasons for not adopting QA schemes (1 = not important to 10 = very important), South Africa, 2008 (n=8)

Reasons for non-adoption	Rating (mean)	Standard deviation	CV
Uncertainty about costs and benefits from certification	8.33	2.57	0.30
Investments costs are too high	8.33	2.31	0.28
No price premium	7.00	4.26	0.61
Current farm systems are adequate	7.00	4.26	0.61
Costs of compliance are too high	6.75	3.39	0.50
The schemes are not mandatory	6.75	3.28	0.49
Lack of knowledge about QA schemes	6.00	3.98	0.66
Standards are not important to our business	5.67	4.05	0.71
Not required by our customers	4.83	2.38	0.49
QA schemes are too stringent	4.75	3.82	0.80
We have not been advised to adopt	4.50	3.73	0.82

The next section reports the respondents’ levels of overall satisfaction with QA certification and the empirical OLS regression model of the determinants of overall satisfaction outlined in section 2.5.2 and by equation (2.2) in Chapter 2.

The second objective of this study was to analyse the determinants of SA citrus farmers' overall level of satisfaction with their QA schemes. Table 3.22 has the number of sample respondents at each level of overall satisfaction with QA certification by region. In all, 63% of the respondents reported being either somewhat or very satisfied with certification. Figure 3.3 is a histogram of the distribution of these responses, and has a mean score of 3.58 (standard deviation 1.027), which indicates that the respondents' overall levels of satisfaction with QA certification are relatively high. An analysis by region indicates that, on average, sample respondents from KZN were relatively more satisfied (77%), followed by Eastern Cape (64%) and Mpumalanga (63%). Further analysis also shows relatively higher overall satisfaction mean score for respondents from KZN (mean 4.15) compared to other regions, however the t-test reveals no statistically significant regional differences.

Table 3.22 Respondents' levels of overall satisfaction with QA certification by region, South Africa, 2008 (n = 100)

Level of satisfaction	Number of respondents by region						Total
	KZN	Western Cape	Mpumalanga	Eastern Cape	Northern Cape	Limpopo	
Very satisfied	6	3	2	1	0	4	16
Somewhat satisfied	4	19	5	8	1	10	47
Neutral	2	6	2	2	0	7	19
Somewhat dissatisfied	1	7	2	3	0	2	15
Very dissatisfied	0	3	0	0	0	0	3
Total	13	38	11	14	1	23	100

Histogram

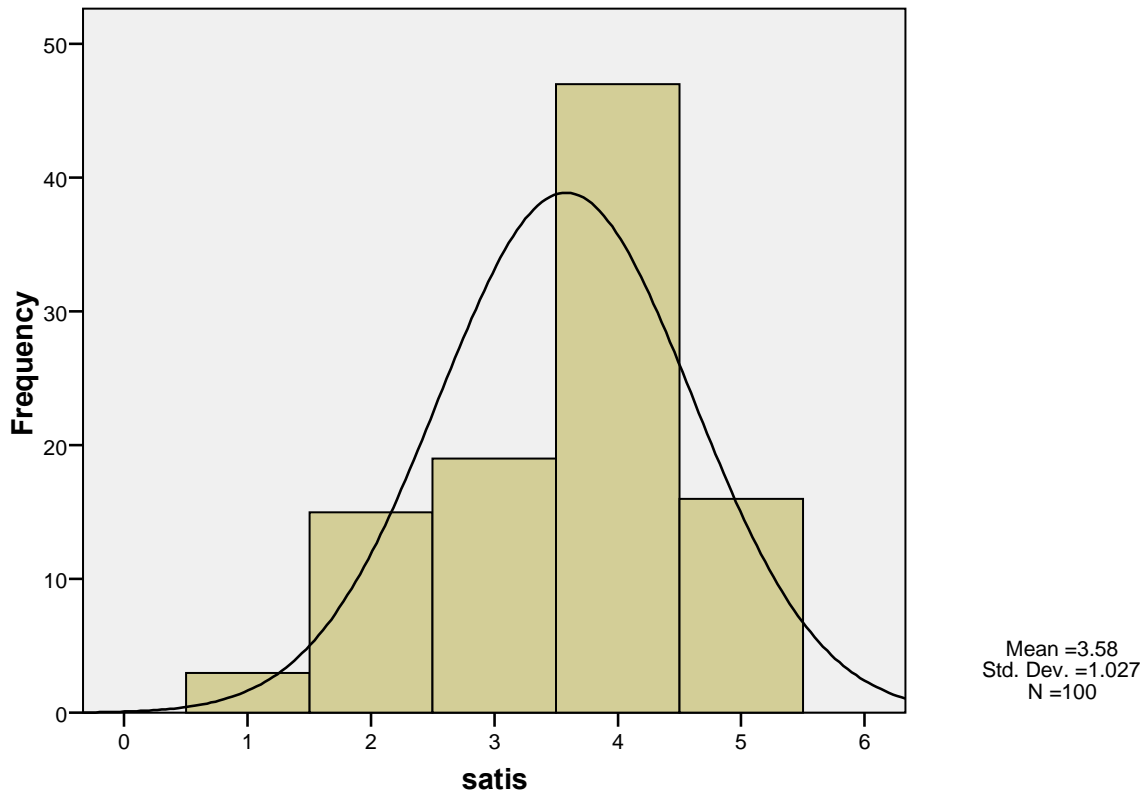


Figure 3.3 Distribution of respondents' levels of overall satisfaction with QA certification (1 = very dissatisfied to 5 = very satisfied), South Africa, 2008 (n=100)

Literature reviewed in Chapter 1 (Buttle, 1997; Pan, 2003; Santos & Escanciano, 2006; Fouayzi *et al.*, 2006) reported empirical evidence supporting the positive relationship between the degree of participants' overall satisfaction with certification and the benefits they attributed to it. The regression model of the determinants of the respondents' overall satisfaction in equation (3.1) was specified in the conceptual framework in equation (2.2) in Chapter 2 and was estimated using OLS regression:

$$\begin{aligned}
 \text{SATIS}_i = & b_0 + b_1\text{IBEN}_{i1} + b_2\text{IBEN}_{i2} + \acute{1} + b_n\text{IBEN}_{in} \\
 & + c_1\text{EBEN}_{i1} + c_2\text{EBEN}_{i2} + \acute{1} + c_m\text{EBEN}_{im} \\
 & + d_1\text{FSIZE}_i + e_1\text{CASATIS}_i + u_i
 \end{aligned} \tag{3.1}$$

intercorrelations between the dependent ($SATIS_i$) and Appendix C3 on page 89. The estimated correlation strong positive correlations between $SATIS_i$ and most of

the internal benefits ($IBEN_{in}$), with the correlations being statistically significant at the 10% and 5% levels of significance. Notable exceptions were IBEN13 (less fruit quality claims), IBEN17 (reduced duplication of farm operation processes), IBEN19 (lower management costs of monitoring farm operations), IBEN20 (savings in fertiliser and pesticide costs) and IBEN23 (now easier to negotiate and secure product contracts). There were also relatively strong positive correlations between $SATIS_i$ and the supply chain benefits EBEN2 (stronger personal confidence in each other) and EBEN6 (less time required to negotiate contracts) at the 10% level of significance, and with EBEN3 (trust has improved) and EBEN9 (improved coordination) at the 5% level of significance.

OLS regression was applied to estimate the relationship (if any) between $SATIS_i$ and the potential internal benefits and supply chain benefits experienced after certification. In a regression analysis, the higher the multiple R, the higher is the correlation between the dependent variable (in this case $SATIS_i$), and the weighted sum of the predictor variables (in this case $IBEN_{in}$, $EBEN_{im}$, $FSIZE_i$, and $CASATIS_i$ (Gujarati, 2003). The adjusted R^2 indicates how much variance in $SATIS_i$ is accounted for by all of the explanatory variables combined. Table 3.23 presents the parameter estimates and other regression statistics. The explanatory power of the OLS regression model estimated above is relatively low (Adjusted $R^2 = 38.8\%$) and very few parameter estimates have statistically significant t-values. All of the $IBEN_{in}$, $EBEN_{im}$, $FSIZE_i$, and $CASATIS_i$ variables above should theoretically have a positive relationship with $SATIS_i$, and yet there are several negative parameter estimates ó for example those for IBEN3 (better access to foreign markets), IBEN7 (improved workers health and safety), IBEN9 (improved staff motivation), IBEN10 (improved reputation of the farm business), IBEN12 (better quality data for decision making), IBEN13 (less fruit quality claims), EBEN2 (we now have stronger personal confidence in each other) and EBEN7 (there is now more joint decision making on fruit quality). This is a classical symptom of multicollinearity (Gujarati, 2003), which is supported by relatively high bivariate correlations among many variables used in the regression. Finally, the Variance Inflation Factor (VIF) for all the predictors, although below 10, is still high enough to raise concerns about multicollinearity and biased regression estimates.

ates for determinants of respondents' overall level of h Africa, 2008 (n = 100)

	Coefficient estimates	t-values	VIF
Constant	-.200	-.257	
CASATIS _i	.423	2.468**	2.224
FSIZE _i	3.97E-008	.801	1.316
Higher product sales (IBEN1)	.028	.596	4.205
Improved competitiveness in foreign markets (IBEN2)	.049	1.061	3.441
Better access to foreign markets (IBEN3)	-.001	-.014	2.679
Better farm organisation (IBEN4)	.036	.622	5.069
More consistent fruit quality (IBEN5)	.057	.993	3.445
Improved fruit safety (IBEN6)	.161	3.477***	2.369
Improved worker health and safety (IBEN7)	-.002	-.031	3.461
Ability to retain existing markets (IBEN8)	.128	3.102***	1.973
Improved staff motivation (IBEN9)	-.062	-1.179	3.260
Improved reputation of the farm business (IBEN10)	-.049	-.991	3.882
Improved orchard management (IBEN11)	.082	1.559	3.961
Better quality of data for decision making (IBEN12)	-.098	-1.871*	3.703
Less fruit quality claims (IBEN13)	-.063	-1.006	4.234
Higher product prices (IBEN14)	.047	.933	3.429
Certification serves as insurance in case of farm accidents (IBEN15)	.064	1.393	3.046
Better on-farm environmental practices (IBEN16)	.092	1.892*	3.424
Reduced duplication of farm operation processes (IBEN17)	.072	1.269	4.189
Reduced fruit wastage (IBEN18)	-.084	-1.307	5.606
Lower management costs of monitoring farm operations (IBEN19)	-.053	-.805	4.000
Savings on fertiliser and pesticide costs (IBEN20)	-.061	-1.149	3.042
Decreased costs of organising contracts (IBEN21)	.006	.082	3.074
Lower costs of inspecting fruit quality (IBEN22)	.112	1.533	2.850
Now easier to negotiate and secure contracts (IBEN23)	-.100	-2.948***	1.953
We now have a better business relationship (EBEN1)	.151	1.102	3.604
We now have stronger personal confidence in each other (EBEN2)	-.181	-.898	6.631
Trust has improved in our business relationship (EBEN3)	.336	2.140**	3.558
We now share goals and values about our product (EBEN4)	.057	.377	3.969
We now share more vital information than before (EBEN5)	-.277	-1.901*	4.117
Less time required to negotiate contracts (EBEN6)	.054	.350	3.638
There is now more joint decision making on fruit quality (EBEN7)	-.126	-.602	5.446
There is now more joint decision making on fruit safety (EBEN8)	.203	1.471	2.739
Coordination with each other has improved (EBEN9)	.082	.500	3.665
Sharing of information has improved (EBEN10)	-.113	-.838	3.490
We now work together more on quality assurance (EBEN11)	.013	.096	3.155
Adjusted R²= 38.8%		F =2.743***	

Note: *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively.
VIF = Variance inflation factor (Gujarati, 2003).

To try and remedy multicollinearity, PCA was used to convert the 36 explanatory variables into uncorrelated PCs that replace them in the OLS regression as per equation (3.2) below:

$$SATIS_i = b_0 + b_1PC_{i1} + b_2PC_{i2} + \dots + b_nPC_{in} + u_i \quad (3.2)$$

positive factor loadings on the basis that as each perceived
es, $SATIS_i$ levels should increase. The correlation matrix
or variables are not measured in the same units - $IBEN_{in}$,

$EBEN_{im}$, and $CASATIS_i$ are in ordinal form, while $FSIZE_i$ is measured in Rands. Varimax rotation was again applied to try and improve the interpretation of the new PCs to be used in the OLS regression. Table 3.24 has the eight new PCs that could be meaningfully interpreted and hence substituted into equation (3.2).

PC1 which drew all of the supply chain benefits ($EBEN_{im}$) with high factor loadings was labelled **“Supply chain benefits”** and it explained about 32% of the variance in the 36 explanatory variables. PC8 captured only $FSIZE_i$ with a large factor loading, and is thus labelled **“Farm size”**. PC2 showed high loadings for more consistent fruit quality, less fruit quality claims, less duplication of farm operation processes, reduced product waste, and reduced costs, all relating to improved internal operational performance. This PC was thus labelled **“Improved internal farm operational performance”**, and it explained about 9% of the total variance in the original variables. PC3 linked $IBEN_2$ (improved competitiveness in foreign markets), $IBEN_3$ (better access to foreign markets), $IBEN_1$ (higher product sales), $EBEN_6$ (less time to negotiate contracts), $IBEN_{10}$ (improved farm reputation) and $IBEN_{23}$ (easier to negotiate and secure product contracts). This PC is labelled **“Foreign market access benefits”**, and is consistent with previous research that has identified market benefits as key in QA schemes (see Buttle (1997); Henson *et al.* (1999); Turner *et al.*(2000); Reardon & Farina (2002); Henson & Reardon (2005) and Maldonado *et al.* (2005)). These authors argue that consistently implementing private standards, certifications, labelling and branding systems can create reputation and competitive advantage for suppliers, and meet retailer demands for GAP-based production to *differentiate* their fresh produce based on product safety and quality.

PC4 captured intercorrelations between $IBEN_{15}$ (certification serves as insurance in case of farm accidents) and $IBEN_{16}$ (better on-farm environmental practices) with $IBEN_{11}$ (improved orchard management), $IBEN_{10}$ (improved reputation of the farm), and $IBEN_4$ ((better farm organisation). This PC is thus called **“Intra-farm benefits”** and it explained some 6% of the variance in the explanatory variables.

	PC3	PC4	PC5	PC6	PC7	PC8		
Eigenvalue	11.59	3.19	2.46	2.07	1.63	1.39	1.25	1.11
% variance explained	32.18	8.86	6.83	5.73	4.5	3.86	3.47	3.095
Cumulative % variance explained	32.18	41.05	47.88	53.62	58.16	62.02	65.49	68.59
CASATIS _i	-.141	-.011	.075	-.160	-.687	-.011	-.068	-.116
FSIZE _i	-.165	.198	.208	-.037	.046	.057	-.025	.571
IBEN1	.225	.380	.659	.038	-.067	.201	.020	.165
IBEN2	.113	.220	.801	-.055	.108	.030	.024	-.005
IBEN3	.163	-.106	.706	.196	.076	-.033	.134	.270
IBEN4	.082	.231	.258	.412	.350	.497	.029	.165
IBEN5	-.004	.508	.366	.219	.102	.347	.098	-.232
IBEN6	-.015	.266	.270	.061	.687	.138	-.054	-.277
IBEN7	.087	.195	.290	.266	.498	.477	-.164	-.042
IBEN8	.122	-.037	.274	.026	.222	.027	.719	.109
IBEN9	.344	.308	.430	.421	-.067	.296	.172	-.013
IBEN10	.201	.158	.560	.456	.260	-.139	.188	-.143
IBEN11	.157	.231	-.011	.461	.595	.229	.228	.087
IBEN12	.180	.159	-.022	.311	.350	.686	.076	.134
IBEN13	.212	.441	.218	-.169	-.062	.593	.238	-.020
IBEN14	.293	.526	.372	.013	-.140	.170	.298	-.088
IBEN15	.149	.309	.148	.657	.165	-.001	-.048	-.262
IBEN16	.172	.157	.038	.776	.271	.104	-.006	.052
IBEN17	.184	.670	.077	.362	-.042	.186	.094	.258
IBEN18	.297	.693	.034	.340	.219	.096	-.004	.093
IBEN19	.264	.731	.025	.140	.249	-.066	-.072	.229
IBEN20	.001	.667	.143	.114	.326	.020	-.118	-.342
IBEN21	.176	.786	.136	-.006	.036	.031	.016	.067
IBEN22	.320	.513	.153	.165	.067	.086	-.068	-.055
IBEN23	.028	.239	.430	.128	.024	-.519	.059	.146
EBEN1	.685	.271	-.011	-.136	.039	.131	.250	-.021
EBEN2	.768	.322	-.003	.062	.263	.030	.236	-.001
EBEN3	.722	.201	-.108	.251	.077	.214	.062	-.030
EBEN4	.698	.258	.077	.073	.168	.149	-.125	-.243
EBEN5	.589	.197	.262	.150	.023	.220	-.170	-.422
EBEN6	.443	.090	.610	.028	.000	.049	-.065	-.147
EBEN7	.780	.144	.324	-.070	.099	-.121	-.095	.030
EBEN8	.471	-.014	.154	-.088	.330	-.127	-.600	.196
EBEN9	.678	.023	.344	.202	.028	.183	-.285	.106
EBEN10	.723	.012	.271	.308	-.101	-.110	-.047	.025
EBEN11	.700	.124	.275	.199	.029	.016	.123	-.046

PC5 had high positive factor loadings for improved fruit safety (0.687) and improved orchard management. However, it also shows respondents' satisfaction with their certifying agents with a high but negative loading. This implies that those respondents who gave low ratings about the performance of agents, rated internal benefits of certification highly. Although difficult to interpret, PC5 was labelled "Improved fruit safety and orchard management". PC6 had high factor

decision making, less fruit quality claims, better farm worker health and safety, and was labelled "Quality and welfare benefits". PC7 had a negative sign on the contract negotiation loading. PC7 had

only two original variables with high factor loadings - IBEN7 (ability to retain existing markets) and EBEN8 (more joint decision making on fruit safety). This PC illustrates that those respondents who rated ability to retain existing markets disagreed that there was more joint decision making on fruit safety, and was labelled "Ability to retain existing markets". The eight PCs were used as explanatory variables to re-estimate the OLS regression for the determinants of $SATIS_i$ as shown in Table 3.25.

Table 3.25 Regression coefficient estimates for the new PCs as determinants of respondents' overall level of satisfaction with QA certification, South Africa, 2008

Explanatory variables	Coefficient estimates	t-values
Constant	3.580	38.747
PC1	.065	.701
PC2	.120	1.290
PC3	.201	2.168**
PC4	.240	2.580**
PC5	.267	2.874**
PC6	.241	2.598**
PC7	.152	1.638*
PC8	.020	.217
Adjusted R² = 19.0%		F = 3.906***

Note: * and **denote statistical significance at the 10% and 5% level, respectively.

PC1 = Supply chain benefits; PC2 = Improved internal farm operational performance; PC3 = Foreign market access benefits; PC4 = Intra-farm benefits; PC5 = Improved fruit safety and orchard management; PC6 = Quality and worker welfare benefits; PC7 = Ability to retain existing markets; and PC8 = Farm size.

The coefficient estimates for all PCs presented in Table 3.25 had the correct positive signs as expected, with those for PCs 3, 4, 5 and 6 all statistically significant at the 5% level of significance, and for PC7 at the 10% level of significance. The implication is that respondents perceived internal benefits in the form of foreign market access benefits, intra-farm benefits, improved fruit safety and orchard management, quality and worker welfare benefits, and ability to retain existing markets all had a positive effect on the sample growers' overall level of satisfaction with QA certification. Larger farm size also led to increases in respondents' overall level of satisfaction with QA certification, although the parameter estimate was not statistically significant. Similarly, no

the sample respondents' levels of satisfaction with their satisfaction with QA certification.

3.11 Key issues that sample respondents face in dealing with their QA certifying agents

The last objective of this study was to report on the key issues that sample respondents faced in dealing with their certifying agents. Respondents were asked to comment on issues regarding their CAs. Only 12 respondents completed this section. Firstly, they stated that audits carried out on the farm are not flexible enough to suit the records that they keep. They assert that auditors work by using data systems that do not readily accept information from any other record keeping format, despite providing the same information. Secondly, some respondents indicate that they have to wait for a long time to get the audit certificate after the audit has been completed. This sometimes can negatively impact their ability to export to the retailer during that period as they wait for the certificate. The third main concern was the issue of cost, where respondents felt that the audit fee was too high. Coupled with the high annual audit fee was their opinion that the annual audits are too frequent and they should at most be done every two years. Other comments were 'employees carrying out the audits are unqualified', 'sometimes difficult to get an audit done when the grower requires it', and 'audit changes every year'. These concerns, though perceptions from survey respondents, could be addressed by the CGA in future negotiations with GLOBALGAP representatives.

The study also investigated growers' views on whether certifying agents within the industry apply the same standards when carrying out audits. The results showed that 87 out of 100 respondents agreed that certifying agents (CAs) apply the same standards, while the other 13 disagree. Other than the issues raised above, most respondents' level of satisfaction with their CAs is relatively high. In all, 63% of the respondents reported being either satisfied or very satisfied with their CAs. Also, as shown in Table 3.8 on page 37, sampled respondents were, on average, moderately satisfied with the service that they get from their CAs. Others commented that they have a good working relationship with their CAs, and find them quite helpful. It is, therefore, critical that the issues raised by the respondents be addressed by relevant bodies so as to facilitate the successful implementation of QA schemes in the South African citrus industry.

ION AND CONCLUSION

questions specified in the Introduction, the sample growers perceived that record-keeping; crop protection; workers' health and safety; waste and pollution management; and produce handling were the top five most difficult EUREPGAP chapters to implement. Respondents indicated that they have to record every activity performed in the orchard e.g. chemicals applied, dates and in what proportion. Farmers view part of this time spent on compliance for extra supervision of employees as increasing management costs. Crop protection relates to perceived complex requirements and procedures that the sample farmers find very time consuming to implement. Many respondents reported that they already have adequate quality control systems in place. The policy implication is that policymakers need to be aware of the extra burdens that protocols create for management. Workers' health and safety was ranked third most difficult with respondents identifying complex issues relating to employee training and first aid procedures. The CGA could perhaps consult with focus groups of key SA citrus farmers to identify how to better implement best practices relating to these five control chapters. Note, however, that although EUREPGAP control points are difficult to implement, they do identify opportunities for cost reduction (e.g. input cost reduction through less use of fertiliser) and reduced transaction costs (e.g. less time to verify suppliers by retailers).

Regarding the second research question, the main factors that motivated the sample respondents to gain QA certification were: to keep access to existing markets; to improve customer confidence in their products; to access new markets; and to meet food safety and retailer requirements. The main drivers towards certification, therefore, were to retain existing markets and thus stay competitive. Reducing fruit wastage and lower input costs were rated relatively lower as motivators. The implication is that the sampled SA citrus farmers who exported citrus to the EU were mainly driven by market need factors in order to gain certification. The PCA further identified six underlying dimensions of these motivators: (1) Farm technical/operational improvement and meeting environmental and social responsibility; (2) Improvement of business image and meeting fruit safety requirements; (3) Improvement of market competitiveness; (4) Meeting market access requirements; (5) Improvement of farm profitability; and (6) Enhancement of market access. These dimensions suggest a drive by sample respondents to gain certification to meet market requirements, achieve intra-farm benefits such as cost-reductions, and to remain competitive in foreign markets. Analysis



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ed the same top five motivators as the aggregate scores, and motivators.

The sampled respondents identified the main internal benefits of QA certification as the ability to retain existing markets, improved worker health and safety, better access to foreign markets, better farm organisation and improved fruit safety and orchard management. The PCA identified six broad dimensions of internal benefits: (1) Cost reduction benefits; (2) Improved farm organisation and management benefits; (3) Foreign market and profit improvement benefits; (4) Quality improvement benefits; (5) Insurance and environmental benefits; and (6) Fruit safety improvement, input cost savings and reputation benefits. Comparing the motivator and perceived benefit dimensions, most of the motivators seem to have been in part realised by the respondents. Seeking farm operational/technical improvement and meeting environmental responsibility was met via improved farm organisation and management, quality/fruit safety improvements, and insurance/environmental benefits. The drivers to improve business image/market competitiveness/market access requirements/farm profitability were realised via reputation/cost reduction/input cost savings/foreign market and profit improvement benefits from QA certification.

Respondents rated shared goals and values about the product, more joint decision making on fruit safety, more working together on quality assurance, a better business working relationship, improved coordination and improved trust as the six major supply chain benefits from QA certification. These external benefits were reduced by PCA into two broad dimensions: (1) Improved working relationship and product quality benefits; and (2) Improved cooperation and contractual benefits. The managerial implication of these PCs is that certification may bolster working relationships between supply chain players, which can improve the competitiveness of the South African citrus export supply chain.

The major costs of implementing EUREPGAP certification related to initial investment costs and the recurrent annual costs of compliance. The respondents, on average, spent an estimated R70655 on initial compliance costs, mainly for infrastructure, additional buildings and employees training. About 60% of respondents spent less than 1% of annual farm turnover on initial compliance costs, while most of the respondents (84%) spent less than 1% of total annual farm turnover on recurrent costs of compliance. The sampled respondents with pack-houses had relatively higher costs to obtain certification as they had to upgrade farm infrastructure and their pack-house buildings to meet the standard protocol requirements. As Antle (1999) has postulated, monitoring and record-

certification are largely fixed costs. This implies that the costs are higher for smaller than for larger farmers (economies of scale) and are more readily afforded by relatively larger commercial farmers, while acting as a potential disincentive for smaller farms. The main challenges faced by the sample growers in implementing certification were considerable time spent on monitoring compliance, relatively high annual costs to maintain certification, lack of sufficiently trained personnel, and the need for more detailed record-keeping. These perceived challenges tally with the respondents' rankings of the record-keeping (for crop protection and other management activities) and employee training and first aid procedures as difficult aspects of the EUREPGAP control chapters to implement.

About 63% of the sampled respondents were either satisfied or very satisfied with QA certification. The economic implication is that implementing quality standards has helped to improve farm operational/technical processes that translate into higher product sales and prices, less fruit waste and reduced fertiliser and pesticide costs. Given the perceived market benefits, certification is also a necessary strategy for maintaining competitiveness in EU citrus markets. Five dimensions of the respondents' perceived internal benefits from certification, namely foreign market access benefits; intra-farm benefits; improved fruit safety and orchard management; quality and worker welfare benefits; and ability to retain existing markets all had a statistically significant positive influence on the sample growers' overall level of satisfaction with certification. Supply chain benefits also had a positive effect on overall level of satisfaction, although the effects were not statistically significant. Similarly, no significant relationship could be established between farm size or respondents' level of satisfaction with their certifying agents and their overall level of satisfaction with QA certification. The study results are consistent with those of Buttle (1997), Santos & Escanciano (2006) and Fouayzi *et al.* (2006), that identified positive links between satisfaction and the perceived benefits of adopting QA schemes. The key issues raised by some sample respondents in dealing with their certifying agents were lack of flexible annual audit systems to suit these growers' different record-keeping formats, time taken to receive the audit certificate after the audit has been completed, and the perceived high annual audit fee. These concerns, although from 12 respondents, could be addressed by the CGA in future negotiations with GLOBALGAP representatives. Overall, the sample respondents believe that their certifying agents apply the same standards during farm audits.



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represent a value-adding diversification opportunity, especially larger citrus farmers, who may more easily adopt the certification. However, relatively smaller farmers or new entrants into the SA citrus industry need to be aware of the perceived benefits relative to the potential costs of QA certification. This has policy implications for factors to consider that will promote the creation of small and medium-sized enterprises (SMEs).

A limitation of this study is that it did not value the respondents' perceived benefits such as improved market access, enhanced business image (being trusted supplier), and better on-farm environmental practices. With regard to the costs of certification, the challenge lies in isolating the impact of the individual standard on reducing internal costs and transaction costs. The findings of this study are broadly in line with past research on the type of benefits and costs associated with QA certification, and hence add to previous work. Research on the factors that motivate the adoption of QA certification by SA citrus growers provides insights to help improve the competitiveness of the SA citrus export supply chain. Implementing QA schemes and entering certified markets have complex impacts on the economic performance of adopters as shown by the perceived benefits and costs reported in this study. An assessment of the benefits and costs helps to show the trade-offs at farm-level and, hence, can help the CGA to better represent producers in future negotiations on reviewing GLOBALGAP and other QA standards. The challenges reported by the respondents in implementing certification can assist the standard setters in future revisions of some control chapters such as record-keeping and worker health and safety. Given that QA systems are increasingly becoming the basis of competitiveness in international markets, policy makers need to recognise their potential role in facilitating compliance, especially in the SA case where new farm entrants are being promoted. The CGA could also consider providing more extension advice to farmers on technical requirements (particularly best practices for implementing control chapters).

SUMMARY

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Increasingly being implemented by food enterprises in South Africa in response to some consumers' demand for greater food safety. Examples of QA schemes include ISO 9000, EUREPGAP, the British Retail Consortium, and Hazard Analysis Critical Control Points (HACCP). These QA schemes are intended to manage food safety risk and liability and to promote enhanced quality along food supply chains. A review of literature identifies the key factors driving the adoption of QA as free trade; changing consumer tastes and preferences for better quality and safer food; changes in the structure of the food industry (retailers gaining more bargaining power in the supply chains); and increasing public focus on food safety. Despite tangible benefits to the environment and safer food for the consumer, policymakers and economists are concerned about the benefit-cost implications of QA schemes. The first objective of this study was to analyse the benefits and costs of QA certification for SA citrus farmers. More precisely to report on: control chapters that SA citrus growers find most difficult to implement; factors that motivated them to adopt QA schemes; their perceived benefits and costs of compliance; their key challenges in implementing QA certification; their overall levels of satisfaction with QA schemes (mainly EUREPGAP); and the key issues they face in dealing with their certifying agents (CAs). The study used an e-mail and postal survey questionnaire sent to 260 SA citrus growers selected via stratified random sampling in July 2007. A total of 108 questionnaires were returned - a response rate of 41.5% for the sample and 10.8% for the target population of 1001 citrus growers. These results, together with the income distribution of the respondents that is similar to that of the SA citrus industry, provide a fairly representative sample for analysis.

The respondents ranked the top five most difficult EUREPGAP chapters to implement as: (1) record keeping; (2) crop protection; (3) worker health and safety; (4) waste and pollution management; and (5) produce handling. The difficulty with record keeping is that every control point in the protocol has to be recorded and auditors are stringent in their documentation requirements. Crop protection is considered to have complex control points and requirements to implement. The main factors motivating the sample respondents to gain QA certification were to keep access to existing markets; to improve customer confidence in their products; to access new markets; and to meet food safety and retailer requirements. Improving fruit wastage and lower input costs were rated relatively lower as motivators. Principal Component Analysis (PCA) identified six underlying dimensions of motivators as: (1) Farm technical/operational improvement and meeting environmental and social responsibility; (2) To improve business image and meet fruit safety requirements; (3) To improve



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market access requirements; (5) To improve farm profitability. These dimensions show a drive by sample respondents to gain, achieve intra-farm benefits such as cost-reductions, and to remain competitive in foreign markets. Analysis across each SA citrus producing region yielded the same top five motivators as the aggregate scores, and similar scores for the lowest rated motivators.

The sampled respondents identified the main internal benefits of QA certification as the ability to retain existing markets, improved worker health and safety, better access to foreign markets, better farm organisation and improved fruit safety and orchard management. The PCA identified six broad dimensions of internal benefits, namely: (1) Cost reduction benefits, (2) Improved farm organisation and management benefits; (3) Foreign market and profit improvement benefits; (4) Quality improvement benefits; (5) Insurance and environmental benefits; and (6) Fruit safety improvement, input cost savings and reputation benefits. Comparing the motivator and perceived benefit dimensions, most of the motivators seem to have been in part realised by the respondents. Seeking farm operational/technical improvement and meeting environmental responsibility was met via improved farm organisation and management, quality/fruit safety improvements, and insurance/environmental benefits. The drivers to improve business image/market competitiveness/market access requirements/farm profitability were evidenced by perceived reputation/cost reduction/input cost savings/foreign market and profit improvement benefits from QA certification.

The major costs of implementing EUREPGAP certification related to initial investment costs and the recurrent annual costs of compliance. The respondents, on average, spent an estimated R70655 on initial compliance costs, mainly for infrastructure, additional buildings and employees training. About 60% of respondents spent less than 1% of annual farm turnover on initial compliance costs, while most of the respondents (84%) spent less than 1% of total annual farm turnover on recurrent costs of compliance. The sample respondents with pack-houses had relatively higher costs to obtain certification as they had to upgrade farm infrastructure and their pack-house buildings to meet the standard protocol requirements. Monitoring and record-keeping requirements associated with certification are largely fixed costs, which implies that the average cost per unit of production is higher for smaller than for larger farmers (economies of size). The main conclusion is that certification is probably more readily afforded by relatively larger commercial farmers, while acting as a potential disincentive for smaller farms. The main challenges faced by the sample growers in implementing certification were considerable time spent on monitoring compliance,



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certification, lack of sufficiently trained personnel, and the
 These perceived challenges tally with the respondents' (protection and other management activities) and employee

training and first aid procedures as difficult aspects of the EUREPGAP control chapters to implement.

Most of the sample respondents (63%) were either satisfied or very satisfied with QA certification. The economic implication is that implementing quality standards has helped to improve farm operational/technical processes that translate into higher business sales and prices, less fruit waste and reduced fertiliser and pesticide costs. Given the perceived market benefits, certification is also a necessary strategy for maintaining competitiveness in EU. Ordinary Least Squares (OLS) regression estimated that five dimensions of the respondents' perceived internal benefits from certification, namely foreign market access benefits, intra-farm benefits, improved fruit safety and orchard management, quality and worker welfare benefits, and ability to retain existing markets had a statistically significant positive influence on the sample growers' overall level of satisfaction with certification. Supply chain benefits also had a positive effect on overall level of satisfaction, although the effects were not statistically significant. Similarly, no significant relationship could be established between farm size or respondents' level of satisfaction with their certifying agents and their overall level of satisfaction with QA certification. The study results are consistent with previous research which has identified positive links between satisfaction with, and the perceived benefits of, adopting QA schemes.

The key issues raised by some sample respondents in dealing with their certifying agents were lack of flexible audit systems to suit growers' different record-keeping formats, growers having to wait a long time to get the audit certificate after the audit has been completed, and the perceived high annual audit fee. These issues could be addressed by the CGA in future negotiations with GLOBALGAP representatives. Overall, the sample respondents believe that their certifying agents apply the same standards during farm audits. As QA systems are increasingly becoming the basis of competitiveness in international citrus markets, policy makers need to recognise their potential role in facilitating compliance, especially in the SA case where new farm entrants are being promoted. One main recommendation from the study is that the CGA could consider providing more extension advice to SA citrus farmers on technical requirements (particularly best practices to implement control chapters).

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APPENDICES

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Infrastructure	Costs of investment in on-field and administrative infrastructure
Additional equipment	Equipment for specific technical requirements (e.g. to apply fertiliser)
Additional buildings	Buildings that must be constructed to store chemicals, pesticides, etc.
Staff training	Initial training of managers, technicians and workers
Initial auditing	Initial auditing, associated paperwork, etc
Operating costs	
Annual certification fee	Annual certification fee paid to Food PLUS
Current input use	e.g. gloves, masks, shoes, glasses
Annual auditing cost	Certification is renewed annually
Storage costs	Fertiliser and pesticides storage
Record keeping	All documentation and staff time
Additional labour costs	Labour cost addition since certification
Managerial costs	Costs of management time spent on monitoring compliance
Information costs	Costs to keep updated on safety standards
Analysis costs	Soil, plant leaf and water analysis

Source: Moll & Igual (2005); Kleinwechter & Grethe (2006); and Vermeulen *et al.* (2006)

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and the questionnaire for SA citrus growers



CITRUS GROWERS ASSOCIATION of SOUTHERN AFRICA

P O Box 461, Hillcrest 3650
Tel: (031) 7652514/ Fax: (031) 7658029
Reg. No. 2000/010147/08¹

15 May 2008

Dear Citrus Growers

Cost and Benefits of Quality Assurance Schemes (EUREPGAP, Natures' Choice, etc.)

Many citrus growers in South Africa are certified by one or more quality assurance scheme, such as Naturesø Choice or EUREPGAP. In order to address growersø needs and to better represent growers at the forums where decisions are made about these schemes, *CGA has sanctioned* a study to determine growersø views about the actual costs and benefits of participating in such a scheme. **The results of the first round could not identify clear trends, so we are very keen to please have your input in this second round.**

Researchers in the Discipline of Agricultural Economics at the University of KwaZulu-Natal are conducting this study among SA citrus growers. Your input is required to make this exercise meaningful so that CGA can improve their service to you.

Herewith you will find an 8-page questionnaire (that should take about 15-20 minutes to complete) that the manager of the farm should fill in to provide the necessary data. **The Afrikaans version is available as a separate questionnaire.**

Completed forms should be returned to **Mr P Hardman** by **30 June 2008** by e-mail to ph@cga.co.za or by fax ((031) 765 2514) or by **post to CGA, 23 Plantation Road, Hillcrest Park, Hillcrest, KwaZulu-Natal.**

Please note that your participation is voluntary, **all responses will be treated in a confidential manner and**, no individual farm, or farmer will be identified in the study results. The researchers will **send you a summary report** of the survey if requested. Your participation in this exercise is most appreciated. **Thank you.**

Yours sincerely

Paul Hardman
Industry Affairs Manager
CGA

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UNIVERSITY OF
KWAZULU-NATAL

**Discipline of Agricultural Economics
School of Agricultural Sciences & Agribusiness
University of KwaZulu-Natal, Pietermaritzburg**

November 2007

**Certified Growers answer section A, B, C, D & E
Non-Certified Growers answer section E & F**

Benefits and Costs of Private Quality Assurance Schemes for South African Citrus Exporters

This study aims to analyse your views about the costs and benefits of private quality assurance (QA) certification schemes for South African citrus exports. The study is undertaken by the Discipline of Agricultural Economics at the University of KwaZulu-Natal, South Africa, and is sanctioned by the Citrus Growers Association of Southern Africa (CGA). It is necessary that we obtain some personal and business data from you to enable the analysis of the economic implications of implementing these schemes. Your input is highly valued and will help the CGA to better represent you in industry discussions about certification schemes.

We would appreciate it if the main decision-maker in your business answers the questionnaire.

Please answer the questionnaire for one certified unit

Your participation in the survey is voluntary. All the information in this questionnaire will be treated as strictly confidential, and no individual farmer or farms will be identified in the study results. A copy of the summary report of the survey results will be sent to you if you indicate that you wish to receive it.

Please return the questionnaire in the stamped addressed envelope provided as soon as possible, but not later than **15 December 2007**.

Would you like a copy of the summary report of the survey results?

Yes	No
-----	----

If you have any questions, please contact Mr Philani Ndlovu (Postgraduate student, Discipline of Agricultural Economics, University of KwaZulu-Natal, Pietermaritzburg) Telephone: (058) 307 0718; Cell: 084 509 4649; Email: 200501147@ukzn.ac.za. FAX TO: 058 303 8534 (Att: Philani)

CERTIFICATION SCHEME INFORMATION

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your overall level of satisfaction with the certification

Very dissatisfied		Somewhat dissatisfied		Neutral		Somewhat satisfied		Very satisfied	
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A2: Scheme Details

Name of Certification Scheme	EurepGAP		Nature's Choice		Other (specify)		
Year of First Certification							
Type of Certification	Individual			Group			
If no longer certified, please give reasons for discontinuing:							

A3: Where do you get information about quality assurance schemes from?

Certifying Agent		CRI		Retailer		Private Consultant		CGA Publication		Scheme secretariat	
Other											

A4.1 The table below lists EurepGAP control chapters. Please RANK from 1 (most difficult), 2 (second most difficult), etc. the FIVE chapters that you find most difficult to comply with.

EurepGAP Control Chapter	Rank	Why this Chapter Is Difficult to Comply with
Traceability		
Recordkeeping & Internal Inspection		
Varieties and Rootstocks		
Site History and Site Management		
Soil and Substrate Management		
Fertiliser Use		
Irrigation/Fertigation		
Crop Protection		
Harvesting		
Produce Handling		
Waste & Pollution Management		
Worker Health, Safety & Welfare		
Environmental Issues		
Complaint Form		

choice control chapters. Please RANK from 1 (most difficult) to 5 (easiest) the FIVE chapters that you find most difficult to

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Nature's Choice Control Chapter	Rank	Why this Chapter Is Difficult to Comply with
Rational Use of Plant Protection Products		
Rational Use of Fertiliser & Manures		
Pollution Prevention		
Protection of Human Health		
Efficient Use of Natural Resources		
Recycling and Re-Use of Materials		
Wildlife and Landscape Conservation		

A4.3: If you use another scheme, please RANK from 1 (most difficult), 2 (second most difficult), etc. the FIVE chapters that you find most difficult to comply with.

Scheme name		
Scheme Control Chapter	Rank	Why this Chapter Is Difficult to Comply with

PERFORMANCE OF CERTIFICATION AGENTS

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		Number of Hours per Audit Session			
CMI					
PPECB					
SGS ICS					
Other (Specify)					
Does your agent apply the standards at the same level as other certifying agents in South Africa?				Yes	No
Are you aware of the channels that can be used in case you have problems with the scheme?				Yes	No
If you have used these channels, did you satisfactory resolve the problem?				Yes	No
Should CGA play a bigger role in trying to resolve problems you face in the use of these channels?				Yes	No
If yes, how?					

B2: To what extent do you agree with the following statements about the service provided by your certifying agent?

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Agent is readily accessible prior to audit sessions.					
Audit competency is satisfactory.					
Post-audit communication is satisfactory.					
Overall service is satisfactory.					

B3: Please state the main concerns (if any) that you have about your certifying agent:

B4: How satisfied are you with the performance of your certifying agent?

Very Dissatisfied		Somewhat Dissatisfied		Neutral		Somewhat Satisfied		Very Satisfied	
-------------------	--	-----------------------	--	---------	--	--------------------	--	----------------	--

FACTORS AND COSTS OF CERTIFICATION

Rank the following factors a score out of 10 as reasons why you decided to get certified. 1 = Not important and 10 = Very important

Reason for Gainin g Certification	Score Out of 10
To meet retailer needs	
To meet food safety requirements	
To improve farm management systems	
To reduce fruit wastage/spoilage	
To improve recordkeeping	
To improve customer confidence in our product	
To improve product quality	
To meet packhouse needs	
To access new market segments	
To keep access to existing markets	
To reduce costs of doing business e.g. costs of dealing with buyers	
To reduce input costs	
To reduce legal liability	
To improve business image	
Competitors were likely to get certification and have edge over us	
Expected to get higher product prices	
To develop staff skills	
To improve environmental responsibility	
To improve social responsibility	
To improve coordination with other players in the supply chain	
Schemes are a barrier to market entry	
Wanted to improve competitiveness	
Other (Specify)	
Other (Specify)	

Factors as benefits that you have gained from certification and 10 = Very important

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Factor	Score out of 10
Higher product sales	
Improved competitiveness in foreign markets	
Better access to foreign markets	
Better farm organisation (e.g. managing inventory)	
More consistent fruit quality	
Improved fruit safety	
Improved worker health and safety	
Ability to retain existing markets	
Improved staff motivation	
Improved reputation of the farm business	
Improved orchard management	
Better quality of data for decision making	
Less fruit quality claims	
Higher product prices	
Certification save as insurance in case of farm accidents	
Better on-farm environmental practices	
Reduced duplication of farm operation processes	
Reduced product waste	
Lower management costs of monitoring farm operations	
Savings in fertiliser and pesticide costs	
Decreased costs of organising contracts	
Lower costs of inspecting fruit quality	
Now easier to negotiate and secure contracts	
Other (Specify)	
Other (Specify)	

See with the following statements about your business or that you have experienced AFTER adopting QA schemes?

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
We now have a better business relationship					
We now have stronger personal confidence in each other					
Trust has improved in our business relationship					
We now share goals and values about our product					
We now share more vital information than before					
Less time required to negotiate contracts					
There is now more joint decision making on fruit quality					
There is now more joint decision making on food safety					
Coordination with each other has improved					
Sharing of information has improved					
We now work together more on quality assurance					

C4: Please indicate what percentage the following compliance costs make up of the average annual total farm income.

Set-up cost of certification				
0 . 0.5%	0.6 . 1%	1.1 . 1.5%	1.6 . 2%	Greater than 2%
Recurrent annual costs of compliance				
0 . 0.5%	0.6 . 1%	1.1 . 1.5%	1.6 . 2%	Greater than 2%

C4.1: Please estimate the following costs of obtaining certification.

Investment Costs	Rand
Infrastructure	
Additional equipment	
Additional buildings	
Staff training	
Cost for your first audit	
Operating Costs	Rand
Audit fee per year	
Storage costs	
Record keeping	
Additional labour costs	
Managerial costs	
Costs to collect information about quality assurance schemes	
Soil analysis costs	
Water analysis costs	

CHALLENGES IN MAINTAINING CERTIFICATION

Factors (and any others that you want to specify) a score out of 10 for each factor, as challenges that you face in maintaining certification:

Constraint	Score Out of 10
Lack of sufficiently trained personnel	
Difficult to motivate staff to implement the scheme protocols	
Need for more detailed record keeping	
High costs of maintaining new buildings and farm infrastructure	
Certification agents apply standards differently	
Maintaining own knowledge about certification standards	
High annual costs of maintaining certification	
Time spent monitoring compliance activities	
Standard protocol is too broad and complex as it covers all fruits and vegetables	
Other (Specify)	
Other (Specify)	
Other (Specify)	

SECTION E: (For certified and non-certified)

GENERAL FARM AND FARMER INFORMATION

E1: Grower and farm details

Position of Person Completing the Questionnaire	Owner	Farm / marketing manager	Other (specify)		
Province e.g. W. Cape					
Education Level of person completing the questionnaire	Below Matric	Matric	University Degree	College Diploma	Postgraduate Degree
Business Form	Sole Proprietor	CC or Company	Trust	Other (Specify)	
Do you operate a pack house on your farm	Yes	No	We share		
Years of Farming Experience of the owner of the farm or general manager					
Market Breakdown	Export Market ____%	Local Market ____%	Processing ____%		

on

Product	Exports / Cartons	Major Export Market (Please Tick)							
		EU	US	UK	ME	SEA	JP	RS	
Valencias		EU	US	UK	ME	SEA	JP	RS	
Grapefruit		EU	US	UK	ME	SEA	JP	RS	
Lemons		EU	US	UK	ME	SEA	JP	RS	
Mandarins		EU	US	UK	ME	SEA	JP	RS	

EU = Mainland Europe; **US** = United States; **UK** = United Kingdom; **ME** = Middle East; **SEA** = South East Asia; **JP** = Japan; **RA** = Russia

E3: What is the annual income in a typical year (all farming activities)?

Less than R500, 000	R500, 000 . R1 million	R1 million . R1.5 million	R1.5 million . R2 million	R2 million . R5 million	Over R5 million
---------------------	------------------------	---------------------------	---------------------------	-------------------------	-----------------

E3.1: Please indicate the percentage contribution of each activity to the above average annual income.

All Citrus	%
Other Farming Activity 1:	%
Other Farming Activity 2:	%
Other Farming Activity 3:	%
Other Income:	%

FOR NON-CERTIFIED GROWERS

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Do you use any private quality assurance schemes?	Yes	No	
Is the pack-house that you use HACCP certified?	Yes	No	
What is your status regarding quality assurance schemes?	Planning to adopt	No plans to adopt	

F2: Please give EACH of the following factors a score out of 10, as reasons why you have not adopted private quality assurance schemes: where 1 = Not important and 10 = Very important

Factor	Score (Out of 10)
Lack of knowledge about private quality assurance schemes	
Set-up costs of adopting private quality assurance schemes are prohibitive	
Costs of operating under private quality assurance schemes are too high	
Have not been advised to adopt private quality assurance schemes	
Private quality assurance schemes are not mandatory	
Uncertainty about the costs and benefits of private quality assurance schemes	
Not required by customers	
Private quality assurance schemes are too stringent	
Standards not important in our business	
Current quality control system is adequate enough to meet customer needs	
Do not receive higher product prices if certified	
Other (please specify)	
Other (please specify)	
Other (please specify)	

Thank you very much for your valuable participation.

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ix C Correlation matrices

g respondents' adoption of QA schemes

C2: Intercorrelations for respondents' perceived internal benefits from QA certification

C3: Intercorrelations for OLS regression variables

Appendix C1: Intercorrelations for factors motivating respondents' adoption of QA schemes

MOT1	1														
MOT2	0.249*	1													
MOT3	-0.119	.307**	1												
MOT4	-0.147	0.153	.467**	1											
MOT5	-0.17	.341**	.550**	.512**	1										
MOT6	.213*	.388**	0.195	.201*	.298**	1									
MOT7	-0.041	.210*	.426**	.723**	.522**	.274**	1								
MOT8	.200*	.280**	0.193	.294**	0.095	.257*	.384**	1							
MOT9	0.162	.213*	0.149	0.021	0.07	0.166	-0.056	.288**	1						
MOT10	-0.06	0.042	0.02	-.201*	-0.158	.281**	-.198*	0.069	.353**	1					
MOT11	-0.032	0.124	.306**	.481**	.201*	.257*	.420**	.349**	.210*	0.024	1				
MOT12	-0.14	0.096	.429**	.563**	.310**	0.182	.410**	.230*	0.166	-0.116	.734**	1			
MOT13	0.062	.251*	.442**	.388**	.261**	.291**	.412**	.218*	0.049	-.215*	.317**	.344**	1		
MOT14	0.083	.312**	.463**	.232*	.395**	.478**	.199*	0.059	0.182	0.087	.318**	.330**	.564**	1	
MOT15	0.142	0.182	0.137	.227*	.283**	.461**	.267**	0.195	.218*	0.143	.263*	.355**	0.114	.327**	1
MOT16	0.106	0.108	0.172	0.12	0.049	.281**	0.128	.283**	0.088	.203*	.356**	.237*	0.053	.223*	.322**
MOT17	-.211*	.281**	.577**	.537**	.549**	.284**	.488**	.240*	.213*	0.008	.477**	.585**	.322**	.315**	.356**
MOT18	-0.145	.246*	.579**	.553**	.505**	.288**	.638**	0.174	0.056	-0.002	.475**	.471**	.548**	.400**	.262**
MOT19	-0.116	.307**	.582**	.627**	.551**	.350**	.528**	0.191	0.008	-0.063	.355**	.480**	.553**	.437**	.334**
MOT20	0.094	.265**	.396**	.379**	.247*	.394**	.240*	.319**	.253*	0.08	.351**	.497**	.243*	.321**	.343**
MOT21	.217*	0.02	-0.109	-0.072	-0.104	0.137	-0.074	0.11	0.148	0.087	0.074	-0.033	-0.057	0.01	0.164
MOT22	0.056	.250*	0.161	.296*	.353**	.351**	.252*	0.117	.251*	0.16	0.0176	.307**	0.066	.311**	.629**
	MOT1	MOT2	MOT3	MOT4	MOT5	MOT6	MOT7	MOT8	MOT9	MOT10	MOT11	MOT12	MOT13	MOT14	MOT15

Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively.

Appendix C2: Intercorrelations for respondents' perceived internal benefits from QA certification

IBEN1	1													
IBEN2	.688**	1												
IBEN3	.483**	.498**	1											
IBEN4	.412**	.265**	.264**	1										
IBEN5	.378**	.294**	.216**	.495**	1									
IBEN6	.205*	.291**	0.138	.374*	.406**	1								
IBEN7	.340**	.377**	.204*	.690**	.375**	.508**	1							
IBEN8	0.138	0.182	.312**	.221*	0.146	0.105	0.115	1						
IBEN9	.567**	.443**	.377**	.492**	.480**	.272**	.374**	.237*	1					
IBEN10	.393**	.509**	.434**	.389**	.430**	.418**	.310**	.337**	.522**	1				
IBEN11	0.16	0.118	0.189	.606**	.348**	.450**	.514**	.274**	.344*	0.451	1			
IBEN12	0.184	0.071	0.147	.582**	.364**	.383**	.531**	0.185	.381**	0.227	.589**	1		
IBEN13	.415**	.310**	0.089	.278**	.543**	.219*	.278**	.203*	.418**	0.161	.198*	.488**	1	
IBEN14	.601**	.459**	.280**	0.185	.478**	0.179	.200*	.232*	.496**	.302**	0.189	.235*	.541**	1
IBEN15	.255*	.232*	.204*	.326**	.391**	.308**	.416**	0.049	.416**	.440**	.436**	.278**	0.05	.337**
IBEN16	0.175	0.104	0.17	.437**	.298**	.259**	.460**	0.129	.451**	.436**	.544**	.421**	0.101	0.153
IBEN17	.417**	.205*	.199*	.422**	.445**	0.163	.277**	0.136	.539**	.350**	.372**	.425**	.421**	.381**
IBEN18	.424**	.258**	0.067	.468**	.414**	.380**	.463**	0.109	.468**	.343**	.541**	.399**	.364**	.467**
IBEN19	.396**	.229*	0.128	.358**	.330**	.282**	.288**	0.091	.356**	.332**	.427**	.286**	.281**	.373**
IBEN20	.244*	.266**	0.014	.313**	.513**	.440**	.388**	0.03	.314**	.341**	.337**	.203*	.238*	.319**
IBEN21	.446**	.302**	0.123	.303**	.432**	.244**	.255*	0.135	.311**	0.194	.247*	0.191	.338**	.466**
IBEN22	.278**	.237*	0.125	.265**	.326**	.290**	.314**	0.043	.400**	.270**	.315**	.354**	.415**	.361**
IBEN23	.215*	.311**	.280**	0.091	0.169	0.128	0.029	0.121	0.146	.373**	0.016	-0.164	-0.005	.201*
	IBEN1	IBEN2	IBEN3	IBEN4	IBEN5	IBEN6	IBEN7	IBEN8	IBEN9	IBEN10	IBEN11	IBEN12	IBEN13	IBEN14

Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively.



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	155	.252*	.325**	280**	.353**	0.061	.426**	.352**	.228*	.312**	.282**	.413**	.356**	261**						
EBEN6	0.203*	-0.021	0.051	.470**	.448**	.404**	.242*	.341**	0.17	.244*	.250(*)	.453**	.442**	0.107	0.058	.263**	.278**	.271**	0.136	
EBEN7	0.114	-0.059	0.019	.366**	350**	.387**	0.129	0.13	0.162	0.196	0.135	.386**	.334**	0.154	0.095	0.163	.301**	0.188	0.146	
EBEN8	0.039	-0.247*	0.023	0.151	0.155	0.153	0.051	0.001	0.183	0.173	-0.17	0.032	0.159	0.083	0.094	0.004	-0.017	0.078	0.103	
EBEN9	0.261**	-0.109	0.032	.372**	333**	.344**	.306**	.215*	0.117	.360**	0.117	.433**	.323**	.202*	.286**	.233*	.300**	.300**	.368**	
EBEN10	0.012	-0.063	-0.113	.355**	.266**	.361**	0.164	0.135	0.096	0.11	0.058	.433**	.454**	0.18	0.166	0.158	.308**	.236*	.265**	
EBEN11	0.163	-0.159	-0.021	409**	.352**	.286**	.264**	.265**	0.14	.244*	.212*	.468**	.397**	.256*	.218*	.292**	.449**	.315**	.366**	
	SATIS	CASATIS	F5SIZE	IBEN1	IBEN2	IBEN3	IBEN4	IBEN5	IBEN6	IBEN7	IBEN8	IBEN9	IBEN10	IBEN11	IBEN12	IBEN13	IBEN14	IBEN15	IBEN16	
Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively.																				



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							.29**	.359**	.280**	.390**	.614**	1						
.251*	.236*	0.17	.230*	.215*	.336**	.545**	.639**	.468**	.598**	.390**	.551**	1						
.210*	.351**	.348**	.214*	.303**	.400**	0.126	.265**	.274**	.335**	.598**	.484**	.603**	1					
0.022	0.16	.326**	0.097	0.061	0.183	.384**	.438**	.494**	.574**	.335**	.301**	.283**	.446**	1				
.257**	.318**	.257**	0.123	.273**	.349**	.374**	.525**	.523**	.464**	.566**	.540**	.528**	.624**	.518**	1			
.285**	.355**	.234*	0.021	0.13	.330**	.504**	.579**	.473**	.566**	.464**	.524**	.405**	.584**	.372**	.611**	1		
.223*	.380**	.288**	0.138	.276**	.352**	.212*	0.504	0.579	0.473	.574**	.548**	.359**	.599**	.279**	0.554	.611**	1	
IBEN17	IBEN18	IBEN19	IBEN20	IBEN21	IBEN22	IBEN23	EBEN1	EBEN2	EBEN3	EBEN4	EBEN5	EBEN6	EBEN7	EBEN8	EBEN9	EBEN10	EBEN11	
Note: *, **, *** denote statistical significance at the 10%, 5% and 1% level, respectively.																		