South African Farmers' Perceptions of the Benefits and Costs of Complying with EUREPGAP to Export Fresh Citrus to the European Union (EU)

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Abstract

A representative stratified random sample of 100 South African farmers from across all production regions that export fresh citrus to the EU were surveyed during 2007-2008 to document their perceptions of the benefits and costs of complying with EUREPGAP standards on citrus exports. Principal Component Analysis identified six broad dimensions of internal benefits as improved operating/technical performance; regulations compliance and intra-business benefits; gains in competitiveness; regulations compliance and new market access; benefits from existing markets; and to overcome non-tariff barriers to entry. Two further dimensions of supply chain benefits identified by PCA were improved business working relationship and product quality benefits, and improved cooperation and contractual benefits. The sampled growers thus perceive operational, technical, safety, management, monetary, marketing and supply chain benefits from 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 R70510 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. The intra- and inter-firm benefits and costs of compliance identified by these results indicate factors that policymakers, and the Citrus Growers' Association of Southern Africa, can focus on to improve the competitiveness of SA fresh citrus exports to the EU.

Keywords: South African fresh citrus exports, European Union, perceived benefits and costs, EUREPGAP compliance

1. Introduction

The South African (SA) citrus industry is heavily export-oriented, with over 70% of annual output being exported to the European Union (EU), Japan and the United States. The exports of citrus are regulated by mandatory product standards set by the SA government regarding the quality of citrus and requirements for packing, marketing, and labeling. These regulations were recently amended after consultation with the industry to state the production unit code on each carton to enhance traceability at farm level, thus increasing the probability of satisfying local and international food quality and phytosanitary requirements (Jooste *et al*., 2003). Most voluntary product standards in place for SA citrus exports exceed the mandatory standards set by the SA government, and include compliance with private sector standards such as "Natures Choice" from the United Kingdom retail group TESCO, and the European Retailers Produce on Good Agricultural Practices (EUREPGAP) protocol (now known as GLOBALGAP) (EUREPGAP, 2005; GLOBALGAP, 2009). Staff members at the Citrus Growers' Association of Southern Africa (CGA) indicate that more information on the direct and indirect costs that growers incur relative to the benefits when implementing these standards is urgently needed to help the CGA to provide appropriate advice to growers on how to improve their competitiveness in global citrus markets (Hardman, 2007).

This paper, therefore, reports the results of a representative sample survey of SA citrus farmers during March 2007-May 2008 to document their perceptions about the most important motivating factors for gaining EUREPGAP certification; the major benefits derived from certification; how their business working relationships with other players in the SA fresh citrus export supply chain changed after certification; and the main set-up and recurrent annual costs of compliance. *To the best of the authors' knowledge, this is the first farm-level study in South Africa of the motivators for, and the benefits and working relationship effects of, EUREPGAP certification.* The next section outlines some of the potential benefits and costs of compliance with food standards and quality assurance (QA) schemes identified in past research. Section 3 describes the study data, questionnaire, sampling method and statistical technique used to analyze the respondents' perceptions. The study results are presented in section 5, and a

concluding section discusses some management and policy implications of the results.

2. Potential benefits and costs of EUREPGAP certification

2.1 Potential benefits of certification

Past research shows that, apart from the primary role of meeting the minimum foreign market access criterion, firms are motivated by internal benefits (e.g. better record keeping) and external benefits (e.g. better access to new markets or to keep existing customers) to gain certification (Buttle, 1997; Holleran *et al*., 1999; Poksinska *et al*., 2003; Maldonado *et al*., 2005). 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 controls and operating performance. Other motivators include less quality and product price variability; improved food safety; less product rework; better management control; attraction of new customers; improved competitiveness; and increasing work environmental safety (Zaibet & Bredahl, 1997; Turner *et al*., 2000; Henson & Holt, 2000; Yiridoe *et al*., 2003).

Besides consumer and social benefits, past studies report that benefits for farmers of complying with food safety standards include better process design; improved operational performance; longer product shelf-life; access to new markets; retention of consumers; better business image; fewer product recalls; and fewer outbreaks of food-borne illnesses (Valeeva *et al*., 2004; Henson *et al*., 2005). Most of these benefits are obvious to farmers although it is difficult to assign a monetary value to them. Internal benefits relate to improvements in internal operations of the firm such as better record keeping improved management decision-making that leads to better allocation of inputs, or improved staff well-being that raises employee motivation. External motivators include access to new markets or to premium prices for the quality product.

Private certification schemes can serve as a competitive instrument through *branding*, especially in cases where public standards are less enforced. Consistent implementation of these standards, together with labelling and branding systems, could create reputation and competitive advantage (Reardon & Farina, 2002; Henson & Reardon, 2005). Global supermarkets/retailers are increasingly demanding Good Agricultural Practices (GAP) based production with preferred suppliers in order to *differentiate* their fresh produce based on safety, cleanliness, and quality. These retailers have realised that relatively higher-income consumers are willing to pay for improved food safety/quality (Fearne *at al*., 2001).

Past studies also identify higher 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 (Kuperis e*t al*., 1999; Huffman *et al*., 2003; 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 certification could be to try and *stabilise product yield*. The EUREPGAP control chapters that focus on improving farm management and production decisions could lead to higher and/or more stable yields and revenues. Production techniques such as soil mapping that enhance or protect soil fertility increase production per hectare. Improvements in post-harvest storage and handling techniques can reduce crop losses and damage, and hence increase produce availability (Hobbs, 2003).

Improved agricultural practices that improve technical efficiency in the allocation of farm inputs can reduce average costs of production. Moll & Igual (2005) used a full-costing methodology to

compare costs of citrus cultivated in Spain under EUREPGAP versus citrus cultivated under conventional methods. Conventional citrus had 34% higher costs than citrus produced according to EUREPGAP control chapters, as under EUREPGAP the use of chemicals is reduced due to integrated pest management 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 food safety standards in the EU led to significant improvements in the cost competitiveness of the Kenyan fresh vegetable sector. Another advantage of adopting private sector food standards is compliance can build consumer confidence in the brand, and thereby *reduce market risk* in product supply chains (Henson *et al*., 1999; Henson & Reardon, 2005; Krieger & Schiefer, 2005).

The adoption of QA standards 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. These standards enable suppliers to reduce the costs of raw materials inspection, specification, inventory, and other costs associated with inputs. By signalling enhanced product quality, they help to mitigate 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 (Hardman *et al*., 2002; Fouayzi *et al*., 2006).

Management of liability exposure is another important motivation for adopting QA schemes (Hobbs, 2004). Evidence suggests that firms will adopt QA schemes to avoid being held liable for defective products or for not exercising due diligence (in this case exercising adequate food safety control plans). 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).

Implementing required GAPs can help *to expand upon core competencies* within the farm enterprise because GAPs offer farmers the opportunity to increase 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 chain partners, and thus provide timely information to respond to market demands (Hobbs, 2003). 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).

2.2 Costs of certification

Adopting QA schemes incurs (sunk) costs, even though these schemes can lower operating costs and risk. 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 firm may be so weak that substantial investments are required to attain compliance. To estimate compliance costs and their impact on markets, economists use different modelling tools, such as direct cost accounting, variable cost functions, risk analysis models, and linear programming (Valeeva *et al*., 2004). The costs associated with compliance can broadly be classified as initial investment costs and recurrent (future) annual operating costs. Initial investment costs to implement EUREPGAP include farm upgrade costs (e.g. new buildings and storerooms), investment in on-field and administrative infrastructure, and costs of staff training. Future recurrent costs include fertiliser, pesticide storage costs, annual auditing costs, management costs in supervising and monitoring compliance, etc. (Moll & Igual, 2005). Aloui & Kenny (2005) estimated annual expenses of US$2594/ha (US$760 in fixed costs and US$1833 in recurrent

costs) to implement the EUREPGAP standards on citrus farms in the Comunidad Valenciana region of Spain.

Vermeulen *et al*. (2006) estimated that a typical litchi and mango export farm in South Africa without a pack-house, invested R130000 (about US$16250 at the time of the study (Universal Currency Converter, 2008)) on capital, extra management and training per farm to comply with EUREPGAP, while the annual audit and accreditation fees were close to R6000 (about US$750), and could rise to about R35000 (or US$4375) on a farm that has a pack-house. At one SA grape pack-house, Wilson & Abiola (2004) estimated that the costs of complying with EUREPGAP were R1 million (or US$125000) for the new bar coding machine, R170000 (US$21250) to upgrade a pack-house and R120000 (or US$ 15000) for the workshop. Jooste *et al*. (2003) estimated the direct costs of complying with EUREPGAP on three different citrus farms in the Western Cape province of South Africa at a mean of R31/ton (about US$4/ton).

Further research on the SA citrus sector reported an initial audit fee of R3000 (about US$375), with the cost of compliance varying per individual farm (Mabiletsa, 2003). Burger (2002) reports that a SA grape grower spent R1200/ha (or US$150/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 annual turnover) on annual food safety management costs, and around US$150000 to upgrade pack-house faculties to comply.

3. Study data and methodology

3.1 Data source

Staff at the CGA provided the addresses for all 1042 commercial SA citrus growers, and assisted with the posting of questionnaires to certified growers during March 2007-May 2008. These growers were based in the main citrus production regions: Western Cape, Eastern Cape, Limpopo, Mpumalanga, KwaZulu-Natal, Northern Cape, North West and Gauteng.

3.2 Survey questionnaire design and sampling method

A structured questionnaire with five sections was developed adapting material from the literature review - in particular Buttle (1997); Henson *et al*. (1999); Henson *et al*. (2005); Maldonado *et al*. (2005); and Fouayzi *et al*. (2006) - and discussions with Hardman (2007) and Chadwick (2007) on key QA issues facing SA citrus farmers. The questionnaire was further tested using a pilot survey with five citrus growers from the Ixopo region in KwaZulu-Natal. The questionnaire was also translated into Afrikaans by the researcher on the advice of the CGA that many of their growers would prefer 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 Hardman (2007) explaining the aims of the research. The questionnaire captured the sampled growers' motivators for certification, and the potential firm and supply chain benefits of certification. Respondents were asked to rate 22 potential motivators influencing the decision to become EUREPGAP certified on a 10-point Likert scale from 1 (= not important) to 10 (= very important). A 10-point scale is wide enough to reduce distortions in the intercorrelations between variables that arise when ordinal data are analyzed (Kim & Mueller, 1978). Sampled growers were then asked to also rate a list of 23 potential benefits that could be derived from certification on a 10-point Likert scale from 1 (= minor benefit) to 10 (= major benefit). The respondents' perceptions of improvements in their business working relationship with other players in the SA fresh citrus export value chain after certification (if any) were assessed by the extent to which they agree or disagree with 11 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".

Finally, sampled growers were requested to state their compliance costs as a percentage of annual farm turnover for both set-up costs (additional infrastructure, equipment and buildings, staff training, and the first audit) and recurrent annual costs (annual certification audit fee, record keeping, managerial time, and soil and water analysis costs, etc.) in Rand figures. Copies of the questionnaires are not attached to this article due to space constraints, and are available on request from the author. The pilot survey showed that local citrus growers had on average two years of experience with certification, and were thus able to recall set-up and recurrent costs.

Due to budget constraints, the target population of 1042 commercial SA citrus growers could not be surveyed. To obtain a representative sample, a stratified random sample of 25% of the 1042 growers across the eight citrus production regions was drawn. This fraction is considered representative for multivariate analysis and accounts for the relatively high search costs of collecting data, and of possible non-response, from spatially dispersed sampling units (Barnett, 1991; Clover & Darroch, 2005). A sample of 260 commercial SA citrus growers was, therefore, drawn from the eight mutually exclusive strata (production regions) by taking a random sub-sample of 25% of the growers from each stratum. For example, the Western Cape with 376 commercial citrus growers had 94 growers (25% of 376) in the sample, while KZN with 53 commercial citrus growers had 13 growers. The strata data can hence be aggregated without weighting as their sampling fractions are the same (Barnett, 1991).

3.3 Statistical Technique

The sampled farmers' ratings of the motivators for becoming EUREPGAP certified, and of the perceived benefits derived from certification, were analyzed using Principal Component Analysis (PCA) in the Statistical Package for the Social Sciences (SPSS) (Norušis, 1994). The method of PCA transforms the set of observed correlated ratings into another set of uncorrelated indices (principal components or PCs) (Kim & Mueller, 1978) that measure different *dimensions* in the data. The new PCs are mathematical functions of all the original observed ratings - the first PC

explains the largest amount of the variance in these ratings, followed by the second PC, etc. (Manly, 2005).

The reported PCs were extracted using the covariance matrix as the motivator and benefit ratings are measured in similar units on Likert scales. In addition, Varimax rotation was used to try and improve the interpretability of, and hence attach economic meaning to, the PCs (Morrison, 2005). The PCs were estimated as linear functions of the original ratings as shown by equation (1):

$$PC_i = a_{i1}X_1 + a_{i2}X_2 + \ldots.. + a_{in}X_n \quad (1)$$

where $a_{i1} \ldots. a_{in}$ = component loadings, and $X_1 \ldots X_n$ = the n motivating factors or benefits.

4. Empirical results

4.1 Factors motivating respondents to gain EUREPGAP certification

A total of 108 useable questionnaires out of 260 were returned, which represents a relatively favorable response rate of 42% of the stratified random sample that falls 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. 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 differs slightly by province as there are relatively more growers from Limpopo and KZN, and relatively less from the Eastern Cape compared to the target population. Table 1 shows that access to existing markets and new market segments, improving consumer confidence, meeting food safety requirements and retailer needs, and improving business image and competitiveness seem to be the sample respondents' key motivators for becoming certified, compared to improving operations (e.g. to lower spoilage or improve product quality) and social responsibility, and

reducing costs, that had lower ratings.

Insert Table 1 here

Table 2 presents the PCs that were estimated to try and *better identify* the underlying dimensions in the 22 motivator factors. Six PCs that could be meaningfully interpreted using the sizes and signs of their estimated component loadings were retained. The loadings for PC1 show that respondents who rate reduced fruit wastage/spoilage highly as a motivator for certification also rated developing staff skills, improved environmental and social responsibility, improved product quality, reduced input costs and the costs of doing business, and improved farm management systems and record keeping highly as motivators. All of these factors relate to improvements in intra-business or operational/technical performance of the farm. This component explains 32.65% of the total variation in the ratings and identifies an "improved operating/technical performance" dimension. Poksinska *et al*. (2003) report a similar PC for their study on the benefits gained by Swedish firms from implementing the ISO 14000 standard.

Insert Table 2 here

Component PC2 has relatively high loadings on the factors to improve business image, reduce legal liability, meet food safety requirements, improve customer confidence in the product, and to improve farm management systems. It thus captures a "regulations compliance and intra-business benefits" dimension that accounts for 11.32% of the total variation in the ratings. Component PC3 links wanting to improve competitiveness with wanting to avoid rivals gaining a competitive edge, and improving communication in the value chain and customer confidence in the product. This component thus identifies a "gains in competitiveness" dimension that explains 7.48% of the variance. It provides some support for Henson & Jaffee's (2006) strategy concept of 'standards as catalysts', whereby enhancing players' capacity to comply with private sector food quality assurance standards can create new forms of competitive advantage.

The fourth component, PC4, is a "regulations compliance and new market access" dimension that links the need to meet pack-house, retailer and food safety requirements with improved communication with other players in the value chain and access to new market segments. This component accounts for 6.60% of the variation and supports findings by Buttle (1997) and Henson *et al*.(2005) that access to new markets is a major driver of certification. Sample respondents rated expected higher product prices and keeping existing markets highly in PC5 which explains 5.5% of the variation in the ratings and is termed "benefits from existing markets". Finally, PC6 shows the respondents' perceptions that retailer certification needs are a non-tariff barrier to entry and is labeled "to overcome non-tariff barriers to entry". In summary, the 22 motivators for EUREPGAP certification analyzed for the sample SA citrus growers have six dimensions: (1) improved operating/technical performance; (2) regulations compliance and intra-business benefits; (3) gains in competitiveness; (4) regulations compliance and new market access; (5) benefits from existing markets; and (6) to overcome non-tariff barriers to entry.

4.2 Respondents' perceived benefits gained from EUREPGAP certification

Table 3 shows how the sample respondents rated the 23 potential benefits that they could have derived from EUREPGAP certification. The top 10 highest rated benefits were the ability to retain existing customers, improved workers' health and safety, better access to foreign markets, better farm organization, improved food safety, orchard management, business reputation and competitiveness in foreign markets, better quality of data for decision making, and now easier to negotiate and secure product contracts. The literature reviewed to structure the study questionnaire suggests that firms can gain a competitive edge and hence improve product image and prices due to certification.

Insert Table 3 here

Principal component analysis was used again to try and better understand the underlying dimensions in the respondents' ratings of the 23 potential benefits that could be derived from

certification. Table 4 presents the six PCs that could be meaningfully interpreted. Component PC7 has relatively large loadings for less duplication of farm operation processes, reduced fruit wastage, reduced management monitoring, contract negotiating, input and fruit inspection costs, higher product prices, less fruit quality claims, more consistent fruit quality, improved staff motivation and higher product sales. These results imply that PC7, which explains 36.24% of the variance in the ratings, captures "operational, technical and price benefits" from EUREPGAP certification. Buttle (1997), Poksinska *et al*. (2003) and Calisir *et al*. (2005) report similar benefits in their studies of ISO9000 and ISO14000 standard adoption.

Insert Table 4 here

Component PC8 shows "safety, management and cost-savings benefits" as respondents with high ratings for improved fruit safety also had high ratings for improved workers' health and safety, better farm organization, improved orchard management and quality of data for decision making, savings in fertilizer and pesticide costs, and more consistent fruit quality. This component explains 11.28% of the variation in the 23 potential benefits assessed by the sample growers. Component PC9 accounts for 7.68% of the variation and captures "improved foreign market competitiveness benefits" by linking improved competitiveness in foreign markets with better access to foreign markets, higher product sales and product prices, improved staff motivation and improved farm business reputation.

Component PC10 explains 6.61% of the variation and identifies "environmental and insurance benefits" with relatively high positive intercorrelations between better on-farm environmental practices and insurance against production-related accidents on the farm. This PC to a lesser extent also reflects the improved staff motivation, business reputation and orchard management benefits highlighted in PC8 and PC9. The fifth component PC11 explains 4.79% of the variation in the benefit ratings and shows "market access and operational benefits" via positive links between the ability to retain existing markets and better access to foreign markets with better farm organization, orchard management and quality of data for decision making. Finally, PC12

accounts for 4.58% of the variation and indicates “contractual benefits” with higher loadings for the benefits of easier to organize product contracts and improved farm business reputation.

In summary, the 23 potential benefits derived from EUREPGAP certification analyzed for the sample SA citrus growers have six dimensions: (1) improved operating/technical performance; (2) regulations compliance and intra-business benefits; (3) gains in competitiveness; (4) regulations compliance and new market access; (5) benefits from existing markets; and (6) to overcome non-tariff barriers to entry.

Table 5 presents the estimated PC loadings for two dimensions of the sampled farmers’ perceived supply chain benefits from compliance 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. PC13 captured links between aspects of 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”.

Insert Table 5

PC14 captured benefits relating to improved coordination, more joint decision making on fruit quality and safety, more information sharing and contractual benefits. Given the focus of PC14 on working together and less time required to negotiate contracts, PC14 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.

4.3 Respondents' costs of EUREPGAP compliance

Table 6 reports 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. Jaffee & Masakure (2005) report that one large Kenyan vegetable exporter estimated having to spend about 3% of annual turnover on annual food safety management costs.

Of the 58 respondents who reported that annual running costs for EUREPGAP certification were less than 0.5% of turnover, 33 were relatively large farmers (defined by Hardman (2009) as having average annual turnover above R5 million (or about US$625000)). The results are in line with findings by Deodhar (2003) in a study of HACCP implementation in India 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.

Insert Table 6 here

The respondents were presented with a list of initial and annual recurrent costs of compliance identified by previous studies to be incurred when implementing EUREPGAP, and asked to state their costs in Rand figures. Table 7 shows that, on average, they invested R70510 (or about US$8815) on initial costs in order to gain certification. The main costs were for the construction

of infrastructure (43.5%), additional buildings (26%), and employees training (13.5%). Growers 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.

Insert Table 7 here

Table 8 lists the estimated recurrent 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. On average, sampled growers spent approximately R30000 per year (or about US$3750) to maintain EUREPGAP compliance. Hardman (2009) notes that discussions with SA citrus growers confirm that annual certification costs are expected to range from R20000 to R30000 per annum, *which is consistent with the survey findings in this study*. For an average citrus grower with annual turnover greater than R2 million, this recurrent cost would 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.

Insert Table 8 here

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5. Conclusion

The empirical results indicate that the intra-firm factors that motivated the representative sample of 100 SA citrus growers to gain EUREPGAP certification were: (1) improved

operating/technical performance; (2) regulations compliance and intra-business benefits; (3) gains in competitiveness; (4) regulations compliance and new market access; (5) benefits from existing markets; and (6) to overcome non-tariff barriers to entry. These drivers are in part realized in the perceived benefits that the sample growers derived from certification, namely: (1) operational, technical and price benefits; (2) safety, management and cost-savings benefits; (3) improved foreign market competitiveness benefits; (4) environmental and insurance benefits; (5) market access and operational benefits; and (6) contractual benefits.

Inter-firm benefits derived from EUREPGAP certification are reflected in the sample growers' ratings of how their working relationships with other players in the SA fresh citrus export supply chain have changed after certification. The two main dimensions of these benefits were improved business working relationship and product quality benefits, and improved cooperation and contractual benefits. The managerial implication of these dimensions is that certification may bolster working relationships between supply chain players, which can improve the competitiveness of the South African fresh citrus export supply chain.

Set-up (R70510 on average) and annual recurrent (R30156 per annum on average) costs of certification are considerable for relatively smaller farms. Rational producers will only continue to pursue certification as long as the expected benefits outweigh the expected costs. Monitoring and record-keeping requirements associated with certification are largely fixed costs, implying that the average cost per unit of production is higher for smaller than for larger farmers (economies of size). EUREPGAP certification, therefore, is probably more readily afforded by relatively larger commercial farmers, while acting as a potential disincentive for smaller farms. Implementing QA schemes and entering markets that require certification, therefore, 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.

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Table 1: Respondents' ratings of motivating factors influencing the decision to become EUREPGAP certified (1 = not important to 10 = very important), South Africa, 2008 (n=100)

Motivating factor	Rating (mean)	Standard deviation	CV[a]
To keep access to existing markets	8.82	2.10	0.24
To improve customer confidence in our product	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 move first and gain competitive edge	6.97	3.05	0.44
Wanted to improve competitiveness	6.58	3.41	0.52
Expected to get higher 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	60.9	3.02	0.05

Non-compliance acted as 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 communication with other value chain players	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

[a]CV = coefficient of variation = mean rating/standard deviation.

Table 2: Principal component loadings for factors motivating EUREPGAP certification

Principal component (PC)	PC1	PC2	PC3	PC4	PC5	PC6
Eigenvalue	61.66	21.38	14.14	12.46	10.48	8.81
% variance explained	32.65	11.32	7.48	6.60	5.55	4.66
Cumulative % variance explained	32.65	43.97	51.45	58.05	63.60	68.26
To meet retailer needs	-0.387	0.373	0.090	**0.547**	-0.076	**0.360**
To meet food safety requirements	0.061	**0.545**	0.238	**0.348**	-0.058	-0.081
To improve farm management systems	**0.589**	**0.464**	0.002	0.021	0.054	-0.272
To reduce fruit wastage/spoilage	**0.805**	0.035	0.155	0.132	-0.264	-0.019
To improve record keeping	**0.537**	0.317	0.375	-0.136	-0.264	-0.164
To improve customer confidence in our product	0.147	**0.487**	**0.392**	0.212	0.170	0.171
To improve product quality	**0.760**	0.143	0.147	0.181	-0.345	0.096
To meet pack-house requirements	0.344	-0.017	-0.037	**0.835**	0.080	0.101
To access new market segments	-0.007	0.075	0.204	**0.409**	0.289	-0.054
To keep access to existing markets	-0.162	-0.024	0.168	0.070	**0.536**	-0.085
To reduce costs of doing business	**0.667**	0.060	-0.028	0.195	0.302	0.195
To reduce input costs	**0.717**	0.029	0.140	0.103	0.177	-0.009
To reduce legal liability	0.431	**0.688**	-0.207	0.088	-0.146	0.022
To improve business image	0.231	**0.766**	0.185	-0.079	0.197	0.001

Competitors were likely to move first and gain competitive edge	0.228	0.129	**0.728**	0.077	0.193	0.272
Expected to get higher prices	0.290	0.123	0.084	0.188	**0.768**	0.202
To develop staff skills	**0.765**	0.158	0.222	0.015	0.162	-0.053
To improve environmental responsibility	**0.765**	0.381	0.048	-0.065	0.059	-0.027
To improve social responsibility	**0.686**	0.400	0.252	0.011	-0.085	-0.120
To improve communication with other value chain players	0.397	0.171	**0.396**	**0.412**	0.170	-0.158
Non-compliance acted as a barrier to market entry	-0.038	-0.037	0.066	0.041	0.033	**0.862**
Wanted to improve competitiveness	0.190	0.079	**0.875**	0.092	0.118	-0.065

Table 3: Respondents' ratings of perceived benefits derived from EUREPGAP certification (1 = minor benefit to 10 = major benefit), South Africa, 2008 (n=100)

Perceived benefit	Rating (mean)	Standard deviation	CV[b]
Ability to retain existing markets	7.17	2.74	0.38
Improved workers' health and safety	6.69	2.44	0.36
Better access to foreign markets	6.48	3.00	0.46
Better farm organization	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 product 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 the case of farm accidents	3.57	3.06	0.86
Reduced fruit wastage	3.69	2.98	0.81
Savings in fertilizer and pesticide costs	3.31	2.65	0.80
Less 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 organizing product contracts	2.73	2.00	0.73
Lower costs of inspecting fruit quality	2.02	1.86	0.92

[b]CV = coefficient of variation = mean rating/standard deviation.

Table 4: Principal component loadings for perceived benefits derived from EUREPGAP certification

Principal component (PC)	PC7	PC8	PC9	PC10	PC11	PC12
Eigenvalue	68.36	21.28	14.49	12.48	9.03	8.63
% variance explained	36.24	11.28	7.68	6.61	4.79	4.58
Cumulative % variance explained	36.24	47.52	55.20	61.81	66.60	71.18
Higher product sales	**0.409**	0.093	**0.807**	0.036	0.042	-0.038
Improved competitiveness in foreign markets	0.133	0.260	**0.832**	-0.018	-0.055	0.211
Better access to foreign markets	-0.084	0.023	**0.667**	0.208	**0.404**	0.177
Better farm organization	0.244	**0.624**	0.178	0.264	**0.366**	-0.112
More consistent fruit quality	**0.501**	**0.447**	0.253	0.054	0.076	0.033
Improved food safety	0.148	**0.795**	0.101	0.048	-0.081	0.184
Improved workers' health and safety	0.162	**0.724**	0.222	0.254	0.055	-0.128
Ability to retain existing markets	0.050	0.066	0.156	-0.004	**0.702**	0.146
Improved staff motivation	**0.426**	0.159	**0.498**	**0.342**	0.259	-0.074
Improved reputation of the farm business	0.142	0.342	**0.408**	**0.408**	0.255	**0.432**
Improved orchard management	0.258	**0.574**	-0.082	**0.443**	**0.374**	-0.027
Better quality of data for decision making	0.305	**0.539**	-0.018	0.164	**0.446**	-0.402

Less fruit quality claims	**0.585**	0.250	0.271	-0.316	0.253	-0.268
Higher product prices	**0.617**	-0.003	**0.525**	-0.016	0.057	-0.027
Certification serves as insurance in the case of farm accidents	0.269	0.211	0.205	**0.768**	-0.171	0.004
Better on-farm environmental practices	0.225	0.257	0.008	**0.784**	0.173	-0.004
Less duplication of farm operation processes	**0.771**	0.033	0.099	0.262	0.251	-0.041
Reduced fruit wastage	**0.771**	0.278	0.038	0.311	0.043	0.052
Reduced management costs of monitoring farm operations	**0.720**	0.175	0.042	0.216	0.009	0.128
Savings in fertilizer and pesticide costs	**0.513**	**0.465**	0.059	0.189	-0.316	0.139
Decreased costs of organizing product contracts	**0.715**	0.115	0.169	0.036	-0.047	0.078
Lower costs of inspecting fruit quality	**0.544**	0.211	0.104	0.133	0.030	0.111
Now easier to negotiate and secure product contracts	0.207	-0.016	0.156	-0.018	0.135	**0.874**

Table 5: PC loadings for the respondents' perceived supply chain benefits derived from EUREPGAP certification

Principal component (PC)	PC13	PC14
Eigenvalue	6.20	1.18
% variance explained	53.46	10.18
Cumulative % variance explained	53.46	63.64
We now have a better business relationship	**0.868**	0.050
We now have stronger personal confidence in each other	**0.871**	0.235
Trust has improved in our business relationship	**0.689**	0.337
We now share goals and values about our product	**0.627**	0.494
We now share more vital information than before	0.440	**0.644**
Less time required to negotiate contracts	0.230	**0.664**
There is now more joint decision-making on fruit quality	**0.546**	**0.605**
There is now more joint decision-	-0.012	**0.721**

making on fruit safety		
Coordination with each other has improved	0.335	**0.760**
Sharing of information has improved	0.440	**0.639**
We now work together more on quality assurance	**0.613**	0.474

Table 6: Respondents' estimated costs of EUREPGAP compliance as a percentage of annual total farm turnover, South Africa, 2008 (n=100)

% of turnover	Number of respondents with initial investment costs in this range	Number of respondents with annual recurrent certification costs in this range
0 – 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 7: Respondents' estimated initial costs of EUREPGAP certification, South Africa, 2008 (n=100)

Cost item	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.

Table 8: Respondents' estimated annual recurrent 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.