

**IMPROVING THE ECONOMIC
COMPETITIVENESS OF SOUTH AFRICAN
AGRIBUSINESS FIRMS :
THE ROLE OF ISO 9000 QUALITY
ASSURANCE STANDARDS**

By

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I hereby certify that, unless specifically indicated to the contrary, this thesis is the result of my own original work.

A handwritten signature in blue ink, appearing to read "Christopher Turner", positioned above a dashed horizontal line.

CHRISTOPHER TURNER

ABSTRACT

Global free trade presents both challenges and opportunities for South African agribusiness firms. To improve their competitiveness, firms need to become more customer orientated and cost effective. Product differentiation (adding value to products) and niche marketing are just two approaches firms can use to satisfy consumer wants. Cost leadership can be achieved through economies of size, reducing transaction costs and adopting cost-saving technology.

This study presents recognised strategies that firms can adopt to meet the challenges of competition. Total Quality Management (continuous process improvement) can be used in conjunction with process reengineering (radical process redesign), whilst both concepts are integrated into process management. The main focus of this study is on quality issues, especially the experiences with the ISO 9000 quality assurance standards amongst South African agribusiness firms. Worldwide, the ISO 9000 standards have received considerable support from firms seeking to improve their economic competitiveness.

A postal survey was conducted in 1998 amongst 92 South African agribusiness firms to establish the extent of adoption of the ISO 9000 quality assurance standards, reasons for certification and the costs and benefits of adopting these standards. Almost 36 percent of respondent firms were ISO 9000 certified. The desire to improve customer service, a basis for quality improvement and the need to improve operational efficiency (reduce wastage) were the most important factors influencing certification. Certification had a positive impact on most performance indicators, in particular on

documented processes (e.g. record-keeping), overall firm performance and quality of output. Total costs of achieving ISO 9000 certification did not exceed 1,02 percent of turnover. Cost economies were evident for large firms.

Two-group and three-group Discriminant analyses were conducted to identify and rank factors that distinguish between firms which had adopted the ISO 9000 standards, those which had adopted alternative quality assurance systems, and those operating without any formal quality assurance standards. Results revealed that ISO 9000 certified firms tended to be larger, established firms with parent company affiliation, manufacturing products derived from agricultural output and exporting to developed countries. Most non-ISO 9000 certified firms had adopted an alternative quality assurance system. Firms with no recognised form of quality assurance tended to be cooperatives involved in service provision. The most important variable distinguishing ISO 9000 adopters from adopters of alternative quality assurance systems was turnover (firm size). The presence of size economies could prevent small firms from adopting ISO 9000. Due to the fact that the ISO 9000 quality assurance standards are internationally recognised and have received considerable international support, government might consider subsidising the costs of ISO 9000 certification amongst small and medium-sized enterprises wanting to export to developed countries. In addition, government and business associations could increase awareness of ISO 9000 and its associated costs and benefits amongst South African firms by disseminating relevant information.

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INTRODUCTION

Over the past decade, changes in both the local and international policy environments have influenced the South African agricultural and agribusiness sectors. Locally, deregulation of marketing institutions, elimination of production controls and a new political dispensation have liberated South African agricultural trade. The Uruguay Round of the General Agreement on Tariffs and Trade (GATT), now administered by the World Trade Organisation (WTO), initiated the process of freeing-up international trade in agricultural and food products. As South Africa is a signatory to GATT and now forms part of the global market place, agribusiness firms are faced with increasing competition in both domestic and international markets. To be competitive, firms need to respond to customer demands and at the same time become more cost effective relative to competitors. Thus, to succeed in a highly competitive environment firms have to improve product and service quality, whilst at the same time reduce production and transaction costs. To meet these challenges, managers of South African agribusiness firms will have to adopt innovative business strategies to enhance firm competitiveness.

One objective of this study is to present recognised strategies which agribusiness firms can employ to enhance their economic competitiveness in domestic and world markets. These strategies include Total Quality Management (TQM), business process reengineering and process management. Complementary to these strategies are the ISO 9000 quality assurance standards, and the main focus of the study considers the costs and benefits of adopting the ISO 9000 standards and identifying factors that distinguish between adopters and non-adopters of ISO 9000. Firms adopting these

standards can enhance their competitiveness in world markets.

Worldwide, over 226000 companies in 129 countries have sought ISO 9000 certification in an attempt to improve their competitiveness. ISO 9000 certification has been shown to produce both marketing and cost saving advantages, and improve worker morale and production efficiency (Zaibet and Bredahl, 1997). Numerous international studies, including Market and Opinion Research International (1996), Manchester Business School (1996), Scicchitano (1996), Zaibet and Bredahl (1997), and a South African study (SABS, 1995), have focused on firms' experiences with the ISO 9000 quality assurance standards.

This study reports on a postal survey which was conducted amongst 92 South African agribusiness firms in 1998 to study South African experiences with ISO 9000, including the extent of ISO 9000 adoption, reasons for certification and the costs and benefits involved. The study also investigates the orientation of agribusiness firms to other quality systems, namely Hazard Analysis Critical Control Point (HACCP) and Total Quality Management (TQM). In addition, Discriminant analyses are conducted to identify and rank factors that distinguish between firms which have adopted the ISO 9000 standards, those which have adopted alternative quality assurance systems, and those operating without any formal quality assurance standards. Local agribusiness firms may benefit from the respondents' experiences with ISO 9000 reported in this study.

The thesis is presented as follows: Chapter 1 considers economic competitiveness, it's measurement and recognised strategies that firms can adopt to enhance their competitiveness. A literature review

of firms' experiences with the ISO 9000 quality assurance standards is presented in Chapter 2. These standards have received considerable support from firms striving to improve their competitiveness. Chapter 3 describes the postal survey conducted amongst South African agribusiness firms, while general survey results (Chapter 4) and certified firms' experiences with ISO 9000 certification (Chapter 5), including the extent of ISO 9000 adoption, reasons for certification and the costs and benefits involved, are presented in the following two chapters. Results of Discriminant analyses aimed at identifying and ranking factors that distinguish between adopters and non-adopters of ISO 9000 are discussed in Chapter 6. The study ends with conclusions, and management and policy implications.

CHAPTER 1

ECONOMIC COMPETITIVENESS

The aim of this chapter is to define the term ‘competitiveness’, how it is measured and to examine what factors enhance or impede the competitiveness of firms. In addition, recognised strategies that firms can adopt to enhance their competitiveness are presented.

1.1 Defining and measuring competitiveness

In a changing economic environment, the economic competitiveness of countries and firms has been the focus of much research and discussion (Ortmann, 1997). Despite this fact, the definition of the term ‘competitiveness’ and how it is measured is not clear (Kennedy et al., 1997; Sonka and Hudson, 1990; van Duren et al., 1991). The meaning of ‘competitiveness’ is related to the level at which it is considered, either at a national, industrial sector or firm level (Coffin et al., 1993; Traill and Da Silva, 1995).

Historically, international trade related to the concept of comparative advantage, which predicts that trade flows occur as a result of relative cost differentials between countries. Comparative advantage theory is based on the assumptions that there are no economies of scale, that technologies everywhere are identical, products are undifferentiated and that a country’s factor endowments (land, labor and capital) are fixed (Porter, 1990:12). Many of these assumptions do not hold in today’s dynamic trade environment (Ahearn et al., 1990; Petit and Gnaegy, 1995; Porter, 1990). Whereas comparative

advantage explains trade and optimal welfare in undistorted markets, competitiveness incorporates the effects of market disorders and is thus a more practical concept (Sharples, 1990; Tefertiller and Ward, 1995). According to Petit and Gnaegy (1995:47), “national competitiveness is the ability to produce and provide products and services for international markets while ensuring rising levels of real income, at least some portion of which is used to further the development of the economy.” National competitiveness is a function of the competitiveness of a country’s sectors and firms (Coffin et al., 1993). Governments have a critical role to play in enhancing competitiveness through supporting the private sector, developing infrastructure (information, transport and energy) and investing in education, training and research and development (Petit and Gnaegy, 1995). Sectoral level competitiveness is the ability of one sector (industry) to compete with another industry in the same country or a similar industry in another country (Coffin et al., 1993).

Porter (1990:33) argues that individual companies, not nations, compete with one another in the global market place. Thus, firm competitiveness, not national competitiveness, should be the focus of attention. According to Kennedy et al. (1997), definitions of firm competitiveness follow two main themes: The first focuses on the underlying sources of competitiveness, which include the ability of firms to profitably create and deliver value via cost leadership and/or product differentiation. The second theme concentrates on the indicators of competitiveness which relate to profitability and market share.

The strategic management school defines competitiveness as the ability to profitably create and deliver value through cost leadership and/or product differentiation (Kennedy et al., 1997:386).

According to Tefertiller and Ward (1995: 105), competitiveness involves quality differences, relative prices, production and distribution costs, the ability to market, and the efficiency of the marketing and distribution systems. Therefore, competitiveness is related to factors that influence a firm's cost and demand structure. Table 1.1 presents the factors influencing firm competitiveness.

Table 1.1 Factors influencing firm competitiveness



Source: van Duren et al. (1991)

1.2 Ways to improve firm competitiveness

Following the strategic management school, a firm can increase its competitiveness by (1) improving customer benefits and/or (2) reducing costs.

1.2.1 Competitiveness through customer benefits

Central to this approach is the concept of customer value perception, defined as a customer's

perceived benefits derived from a product relative to the price (cost) of the product (Kennedy et al., 1997:387). For a firm to be competitive, customer value perceptions of its product(s) must exceed those of competitors or substitute products.

Increasing a product's perceived benefits is achieved through product differentiation or adding value to the product (Kennedy et al., 1997). The aim of transforming a product's attributes (adding value) is to increase customer value by deliberately altering perceived benefits. Value-added competitiveness necessitates an understanding of, and responding to, customer demands (Kennedy et al., 1997). Income levels, family and work arrangements, cultural diversity and lifestyle all impact on the dynamic consumer demand environment. Compared to targeting a broad consumer group, niche marketing seeks to fulfill particular consumer needs.

Kennedy et al. (1997) list the following driving forces of value-added competitiveness:

- a) more selective consumer demands,
- b) technological developments (e.g biotechnology and information technology), and
- c) vertical coordination (strategic alliances and contracted production) within the agribusiness sector.

Biotechnology has influenced product attributes such as meat leanness, and pest resistance, protein quality and starch content of crops, whilst information technology allows firms to understand and respond to diverse consumer wants. According to Streeter et al. (1991), information technology has a major role to play in enhancing firm competitiveness. At retail level, information technology ensures product attributes (quality, nutrition, safety and environmental aspects) are conveyed to consumers.

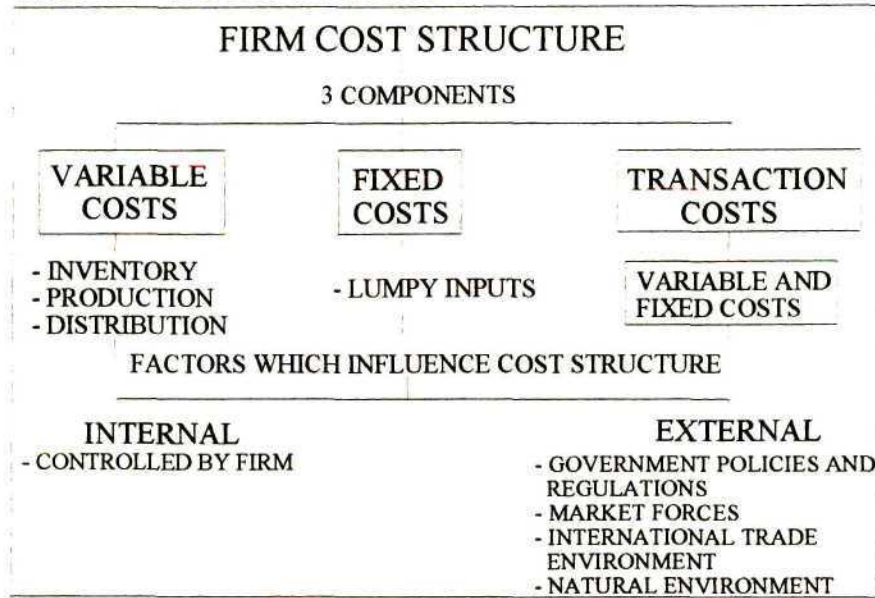
In addition, information technology provides an effective means to coordinate activities in the supply chain (Ziggers, 1997).

Despite the power of technology, a firm's ability to respond to consumer demands would not be possible without coordination throughout the supply chain (den Ouden et al., 1996; Kennedy et al., 1997). Vertical cooperation refers to the vertical relationship (strategic alliances, subcontracting) between two or more supply chain stages without full ownership or control, whilst vertical integration involves single ownership and total management control of adjacent supply chain stages. Vertical cooperation yields many of the advantages of vertical integration without incurring all of its costs and risk (den Ouden et al., 1996). Reduction of transaction costs, guaranteed input source and product market, and customer demand feedback represent the major advantages of vertical cooperation. Reducing transaction costs through the adoption of voluntary standards (such as the ISO 9000 quality assurance standards) enhances vertical cooperation. The nature of transaction costs and the ISO 9000 quality assurance standards will be discussed in more detail later.

1.2.2 Competitiveness through cost leadership

According to Kennedy et al. (1997), firms operating in markets of undifferentiated products (raw materials), or differentiated products with many close substitutes, must focus on those factors which influence the cost structure of a firm (presented in Table 1.2). In striving to reduce costs, a firm should not decrease perceived product benefits.

Table 1.2 A firm's cost structure



Source: Adapted from Kennedy et al. (1997)

As shown in Table 1.2, a firm's cost competitiveness is influenced by the factors which affect variable, fixed and transaction costs. Variable costs vary as the level of output changes, whilst fixed costs are independent of the level of output. Although small firms often have behavioural advantages (market flexibility, entrepreneurial drive, niche marketing), they are at a disadvantage with respect to costs (Nooteboom, 1993:283). In general, small firms lack economies of size (small production), scope (few products), experience and learning. Outsourcing, or purchasing inputs from a specialised producer (achieving economies of scale), is limited by the presence of transaction costs (Nooteboom, 1993). Transaction costs are the costs of undertaking an exchange between a customer/buyer and a supplier/seller. These include information costs and the costs (risk and moral hazard, legal costs, opportunity cost of time, etc.) associated with negotiating, monitoring and enforcing exchange (Bredahl and Holleran, 1997; Nooteboom, 1993). Lowering transaction costs represents an important component of enhancing firm competitiveness (Kennedy et al., 1997:389). Voluntary institutions,

such as the ISO 9000 quality assurance standards, can be adopted to reduce transaction costs (Bredahl and Holleran, 1997). The costs and benefits of adopting ISO 9000 quality assurance standards will be discussed in Chapter 2.

The cost structure of a firm is influenced by both internal and external forces (Table 1.2). Strategies that a firm can employ to become more cost effective include:

- a) adopting cost-saving innovations such as voluntary institutions, e.g. ISO 9000 quality assurance standards, process automation and modern information systems,
- b) investing in research and development to advance technical innovation, and
- c) achieving economies of size.

Following the discussion on competitiveness and the ways to enhance it, the next section describes strategies firms can adopt to increase their competitiveness. The concepts of Total Quality Management (continuous quality improvement), business process reengineering (radical approach to improve quality and/or reduce costs) and process management are examined.

1.3 Strategies for improving firm competitiveness

Ortmann (1997) described three recognised strategies which, if adopted, could improve the economic competitiveness of agribusiness firms, namely Total Quality Management, business process reengineering and process management. Each of these strategies will be discussed.

1.3.1 Total Quality Management (TQM)

Traditionally, quality control initiatives involved product conformity within stipulated requirements. Faced with highly competitive markets and the need to relate quality to customer demands, a new comprehensive management approach, known as Total Quality Management (TQM), integrates all quality related activities from different disciplines (Schiefer, 1997). According to Develin and Hand (1993), TQM is a system of behaviour which encompasses everyone within an organisation and which determines their relationships with the outside world. Tingey (1997) reports that TQM is a comprehensive set of management tools, management philosophies and improvement methods which include customer orientation, the empowerment of employees, management participation and continual process improvement. According to Cartin, as cited by Schiefer (1997), the objective of TQM is to achieve 'high quality processes' that satisfy customer requirements, use resources efficiently, minimise product variability, use key point quality measures to assess performance, and add value to an organisation's objectives.

Schiefer (1997) maintains that TQM centres on the following primary principles:

- a) satisfying the needs and expectations of customers (ie. maintain high quality in products and services), and
- b) to continuously improve quality in all organizational activities and processes.

According to Schiefer (1997), each process in an organisation requires inputs and produces outputs, thus each step has its own customers. Customers may be internal or external to the organisation but

all form part of the interlinked supplier-customer quality chain. The focal point of TQM is the customer, and every aspect of an organisation centres on satisfying the needs of the customer (Schuler et al., 1996).

Schiefer (1997) maintains that to implement and maintain continual process improvement, the principles of TQM require (Figure 1.1):

- a) a management style which provides leadership and generates vision that people are willing to embrace,
- b) the empowerment of workers to implement process improvements,
- c) team-orientated organisational structures which support process analysis and design (quality teams or quality circles), and
- d) the use of tools and techniques (for example: brainstorming, benchmarking, etc.) in the design, analysis, control and improvement of individual processes.

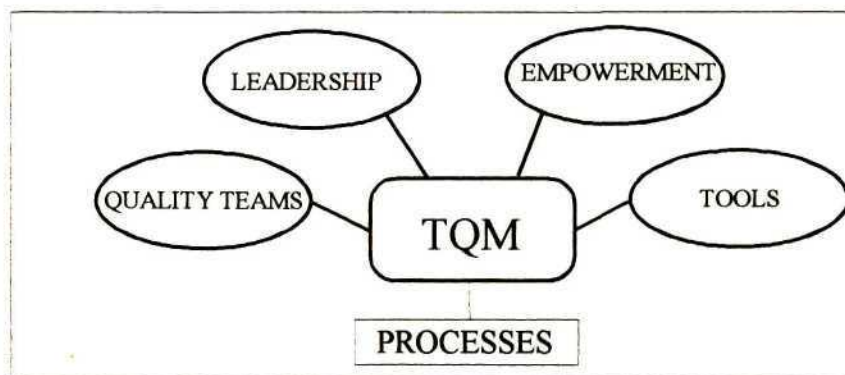


Figure 1.1 Requirements of a TQM programme
Source: Schiefer (1997)

The study by Mizzi (1997) listed the following perceived benefits and costs of TQM: Main benefits include improving competitiveness and customer satisfaction as well as strengthening the firms

learning and innovative potential. Pressures on human resources and compliance costs represent major costs.

1.3.2 Business process reengineering (BPR)

According to Davenport (1993), implementing quality control initiatives and continuous process improvement is not sufficient in the face of fierce competition. Unlike TQM, which is driven by continuous quality improvement, business process reengineering follows a radical approach to improve a firm's competitiveness. Hammer and Champy (1994:32) define business process reengineering as "the fundamental rethinking and redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed". According to Davenport (1993:5), a process is a structured, measured set of activities designed to produce a defined output for a particular market (customer). It deals with how work is done in an organisation. Davenport (1993) prefers to use the term process innovation which, he argues, encompasses more than just 'redesigning' processes. Process innovation considers how new work strategies, process design activities and their implementation are incorporated into the technological, human and organizational dimensions of the firm. Ortmann (1997) used the terms 'process reengineering' and 'process innovation' synonymously.

Davenport (1993) lists the following driving forces of process innovation (reengineering): a) cost effective processes, b) process time reduction, c) customer pressure, d) improving profitability, and e) improving firm coordination and management.

Although there are many reasons why firms implement process innovation, the primary concern is improving financial performance through process cost reduction (Davenport, 1993). Other motivators include time reduction and improvements in quality and customer service.

Although continuous improvement (TQM) and process reengineering stress the importance of quality improvement, top management involvement, business processes, customer needs and organisational culture, the two approaches differ fundamentally (Hammer and Champy, 1994; Lee and Asllani, 1997). Davenport (1993) provides a summary (Table 1.3) of the important differences between continuous improvement and process innovation (reengineering). Although process innovation involves greater risk, potential returns are higher.

Table 1.3 Main differences between continuous improvement and process innovation

	Continuous improvement	Process innovation
Level of change	Incremental	Radical
Starting point	Existing process	Clean slate
Frequency of change	One-time/continuous	One-time (discrete)
Time required	Short	Long
Participation	Bottom-up	Top-down
Typical scope	Narrow, within functions	Broad, cross-functional
Risk	Moderate	High
Primary facilitator	Statistical control	Information technology
Type of change	Cultural	Cultural/structural

Source: Davenport (1993)

Davenport (1993) maintains that a combination of continuous process improvement and process innovation is necessary in a quality control programme. A firm practicing continuous process improvement could implement process innovation (reengineering) and then continue with process improvement to avert process degradation.

The framework for implementing process innovation, according to Davenport (1993), is illustrated in Figure 1.2.

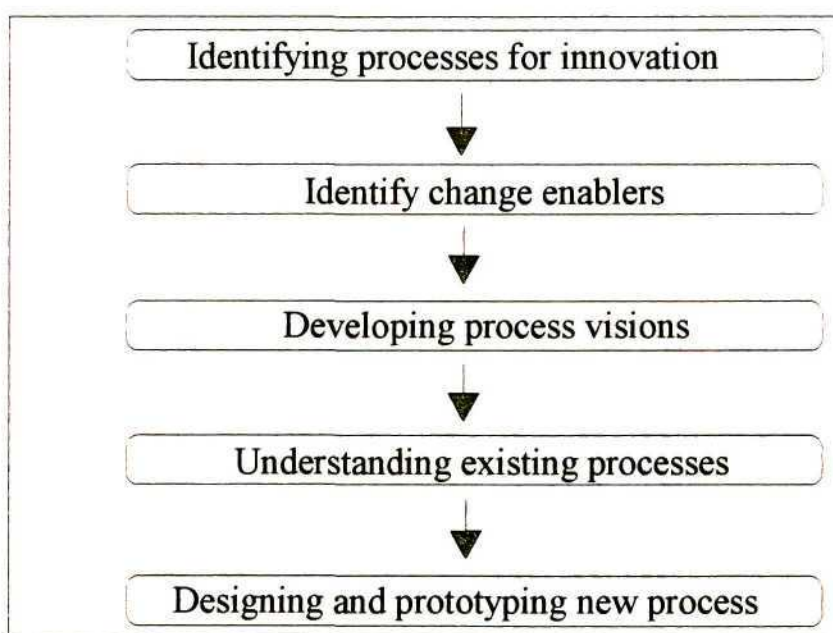


Figure 1.2 Framework for process innovation
Source: Davenport (1993)

1.3.3 Process management

Process management, as presented by Helbig (1997), is a third strategy to increase firm competitiveness. Process management embodies both TQM and process reengineering principles

(importance of processes, their organisation and development) and includes a process controlling aspect. "Process management assures the adaptation of the organisation and processes towards the changing demands of the business environment (customers)" (Helbig, 1997:190). Process improvement can either be continuous or radical, depending on the result required. According to Helbig (1997), process management consists of three modules, namely:

- a) Module one involves the planning and preparation of radical process redesigns (process reengineering). This stage should consider the outcomes of different process scenarios to aid decision making.
- b) Module two focuses on controlling and continually adapting processes to business environmental needs (process improvement).
- c) Module three monitors changes in environmental demands, such as customer requirements.

In this chapter, customer orientation and cost leadership were identified as factors that could enhance firm competitiveness. Three strategies (TQM, BPR and Process management) that firms can adopt to achieve these goals were also discussed. The next chapter introduces the ISO 9000 quality assurance standards, which have been adopted by businesses throughout the world to enhance quality management. A general overview of the ISO 9000 quality assurance standards will be provided, followed by a review of the costs and benefits of ISO 9000 certification.

CHAPTER 2

ISO 9000 QUALITY ASSURANCE STANDARDS

This chapter provides an overview of the ISO 9000 quality assurance standards. In addition, the relationship between ISO 9000, TQM and Hazard Analysis Critical Control Point (HACCP) will be discussed.

2.1 The ISO 9000 quality assurance standards

In 1987, the Geneva-based International Organisation for Standardisation published a series of quality assurance standards which were collectively known as ISO 9000. ISO is not an acronym, instead, it is a word derived from the Greek word *isos*, meaning “equal”. The ISO 9000 standards are voluntary principles of good practice and have been adopted by the European Union and much of the industrialised world (Schiefer, 1994; Schuler et al., 1996). At the end of 1997, over 226000 certifications had been awarded in 129 countries worldwide, of these South Africa holds 1915 certificates (International Organisation for Standardisation, 1998). Europe (excluding United Kingdom), the United Kingdom, Far East Countries and North America held 39, 25, 14 and 11 percent of these certifications respectively.

The ISO 9000 series represents generic standards which detail internationally accepted procedures and management guidelines to maintain quality in product design, production, installation and servicing which can be adapted to any type of business (Guerin and Rice, 1996; Schuler et al., 1996;

Zaibet and Bredahl, 1997). The standards represent a quality assurance system not a product certification scheme (Schuler et al., 1996). According to Hendry (1991), the system aims primarily at preventing nonconformity at all production stages from design through to servicing. The objective of the ISO 9000 series is to promote worldwide standards which will improve quality, operating productivity and efficiency, and to reduce costs (Schuler et al., 1996). To achieve these goals, processes must be in place, meticulously documented, standardised across the company and followed precisely (Bounds, 1996).

To achieve ISO registration, a company must obtain the guidelines (normally from a certifying body), adapt them to its own particular needs, prepare documentation, train employees, follow the documentation procedures and submit to an audit by an external certifying organisation. If the company is successful, it receives registration. A registered firm can use its registration, including the symbols of the registrar and the accrediting body, in its publicity, in its advertising and on its letterheads. However, it cannot use registration statements or symbols on its products or in any way that could imply product quality. This is because registration applies to the supplier's quality management system and not to any individual product or service (Schuler et al., 1996).

The ISO 9000 series consists of five standards, ISO 9000-9004, of which ISO 9001-9003 list the certification requirements for quality systems of different comprehensiveness, decreasing from ISO 9001 to 9003 (Schiefer, 1994). ISO 9000 is the guideline for selecting which standard is appropriate to a particular organisation whilst ISO 9004 provides a guideline for the implementation of ISO 9001, ISO 9002 and ISO 9003 (Taormina, 1996).

Schuler et al. (1996) described the five standards as follows:

ISO 9000 - guidelines for selection and use. This standard explains fundamental quality concepts, defines key terms and provides guidance on selecting and using ISO 9001, 9002 and 9003. It is the road map for using other parts of the ISO series.

ISO 9001 - model for quality assurance in design/development, production, installation and servicing. This is the most comprehensive standard (20 elements) in the series and covers all elements listed in ISO 9002 and 9003. In addition, it addresses design and development considerations.

ISO 9002 - model for quality assurance in production, installation and servicing. This section contains 18 elements that address the prevention, detection and correction of problems that occur during production, installation and servicing.

ISO 9003 - model for quality assurance in final inspection and testing. This is the least comprehensive of the standards (12 elements) and is devoted to the detection and correction of problems that occur during the final inspection and testing.

ISO 9004 - guidelines for quality management and quality system elements. It is used to develop and implement a quality system and to determine the extent to which an element is applicable. It is cross-referenced to other ISO 9000 standards and can be used to guide both internal and external audits.

The relationship between each model is shown in Figure 2.1, as adapted from Tingey (1997).

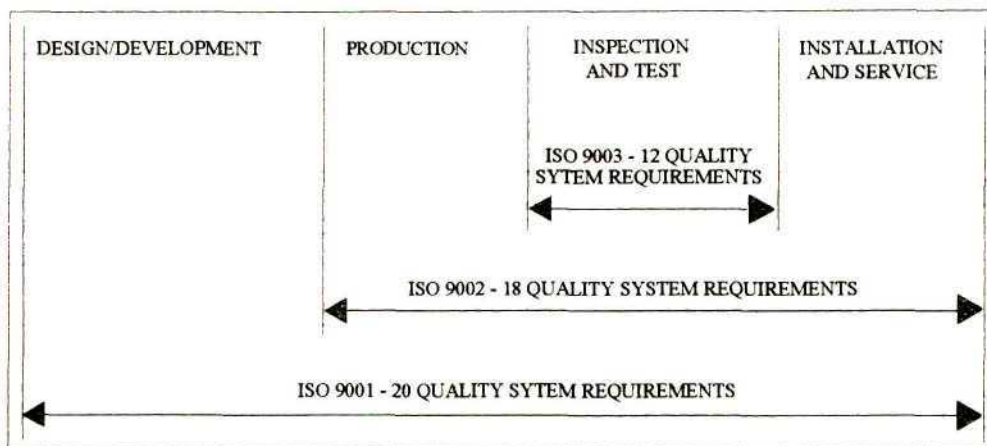


Figure 2.1 ISO 9000 quality assurance series

Source: Tingey (1997)

Taormina (1996) raised the following relevant point: A company can move from ISO 9003 to ISO 9002 to ISO 9001 as the scope of its business changes. However, there is no need to achieve ISO 9001 certification unless design is critical to the product or service. ISO 9001 is not necessarily better than ISO 9002, it depends on the nature of the company concerned.

Attaining certification is probably the most difficult management task a company ever has to face and can necessitate a total change in corporate philosophy (Hendry, 1991). Everything in the organisation will be challenged, probed, analysed and ultimately put into a work instruction. Registering to ISO 9000 demands management commitment, total employee participation, documentation and very hard work (Hendry, 1991). When implementing a quality assurance system, a organisation may utilize internal resources, outside consultants, or a combination of both (Guerin and Rice, 1996). If internal resources are employed, a quality assurance supervisor or administrator has to be appointed, working

full-time for up to two years. According to Hendry (1991), departmental managers can expect to spend about 20 percent of their time for two years on ISO 9000 implementation. In addition, at least 24 hours training per employee is required. If time is an important factor, then a consultant could be commissioned to assist in implementing ISO 9000 and keep teething problems to a minimum. Consultants can assist with the process of organisation, documentation and meeting the ISO quality standards. It is important to see consultants' client lists to determine how much experience they have had with ISO 9000 and with similar companies. Self-declaration is another option (Schuler et al., 1996; von Solms, 1998). Here, a company adopts a quality system and declares itself to be in conformance with the ISO standards but does not submit to an external audit by a third-party registrar.

According to Tingey (1997), the ISO 9000 registration process consists of the following four major steps: a) Pre-audit (optional), b) Audit (pass/fail), c) Registration, and d) Surveillance audit (bi-annual/on-going).

The registration process begins with an optional pre-audit which evaluates the quality system currently in place and prepares the company for the actual audit. The next step involves the comprehensive audit of the organisation's quality management system by a third-party auditor. Third-party audits are carried out by independent agencies which are accredited by the ISO standards organisation to conduct such audits. These audits verify compliance with the standard and, depending on the size of the organisation, can last several days. If no major non-conformities are found during the audit, the company is recommended for registration. If non-conformities are found, the company

must provide a corrective action plan to the registrar. Continuous monitoring and verification of the quality management system ensures that the system does not deteriorate. Surveillance audits are conducted by third-party auditors usually every six months with a full reassessment every three years. Employing an internationally recognised registrar (certifying body) should enable a company to do business anywhere in the world.

According to Schuler et al. (1996), a general time frame for implementing ISO 9000 is 12 to 18 months. Bounds (1996) states that the worldwide standard for obtaining ISO 9000 certification is about 18 months. Schuler et al. (1996) report that a firm can work on a planning horizon of two years and subtract time if any of the following systems are in place:

- a) a comprehensive quality manual,
- b) an internal audit system and approved supplier system,
- c) a corrective action procedure (respond to internal, supplier or customer problems),
- d) a regularly scheduled management review,
- e) a comprehensive document control system, and
- f) an aggressive training programme for employees.

Zaibet and Bredahl (1997) believe that the main motivating factors for firms to become ISO 9000 certified include: a) coordinating operations in different plants, b) improving internal communication, c) enhancing the firm's competitive position (maintain or increase market share), and d) increasing firm efficiency by improving food safety whilst reducing total costs. According to Guerin and Rice (1996:27), companies seek ISO 9000 registration for a number of reasons, which include customer

pressure, quality benefits, market advantage and EU regulatory requirements. Van der Wiele and Brown (1997:300) cite the following driving forces of ISO certification: market related factors, customer service, quality and efficiency improvement, and as a 'kick start' for quality improvement. Bredahl and Holleran (1997) report that firms become ISO 9000 certified for both internal (firm-driven) and external (customer-driven) reasons - internal reasons accounted for 52 percent of ISO 9000 certifications, 36 percent related to external reasons and the remaining 12 percent were influenced by both factors. Internal factors included procedural efficiency, staff motivation, and reductions in error rates, wastage and costs, whilst external reasons included customer requirements and the desire to gain market access and market share.

A South African study (SABS, 1995) ranked the reasons for becoming certified as follows: a) the desire to improve existing management systems, b) to gain competitive/market advantage, and c) realising the value of becoming certified (improve management and production efficiency, and financial returns).

ISO 9000 certification incurs costs before any benefits can be realised. Costs can be divided into three categories, namely implementation costs, registration costs and on-going auditing costs. Major implementation costs are documenting procedures, staff training, performing pre-audits and the acquisition of equipment for calibration. These costs represent the major portion of becoming ISO 9000 certified (Zaibet and Bredahl, 1997; Taormina, 1996). The significance of consulting fees will depend directly on the use of such services. According to Taormina (1996), ISO 9000 implementation costs depend upon the following considerations: a) amount of internal expertise available, b)

effectiveness of the existing quality management system, c) existing level of documentation control, d) management and employee resistance to change, e) degree of desire to turn the effort into an investment, f) outside resources and expertise needed, g) complexity of the processes and procedures, and h) costs of the certification and re-certification process.

Zaibet and Bredahl (1997) reported that the one-time certification cost did not exceed 0,5 percent of turnover of firms in the United Kingdom meat sector. They concluded that these costs should not represent a constraint toward achieving certification. Certification costs depend upon: firm size, complexity (nature of processes) and the ISO 9000 series chosen. The third category of costs include periodic audits (every six months) and the re-certification audit (every third year).

The following disadvantages of ISO 9000 certification have been reported (Sadgrove, 1995; van der Wiele and Brown, 1997): a) it is bureaucratic, b) excessive on-going paperwork, c) it is internally focussed (internal processes), d) staff feel that standards are imposed on them, and e) ISO 9000 does not encourage continuous process improvement.

Incorporating ISO 9000 into a TQM system and ensuring that staff understand the importance of, and participate in, ISO 9000 implementation would help alleviate these drawbacks. The importance of involving employees during ISO 9000 implementation (identifying and documenting firms' procedures) could not be over-emphasised in the literature. Concise documented procedures will limit unnecessary paperwork, while still satisfying necessary record-keeping and process control requirements.

ISO 9000 certification produces both tangible and intangible benefits. Although intangible benefits cannot be expressed in monetary values, they should not be ignored when determining if the benefits of ISO 9000 certification outweigh the costs incurred. Zaibet and Bredahl (1997) identified various tangible cost reductions from ISO 9000 registration, which could be broadly classified into the following categories:

a) Management and production costs. Training programmes have contributed to reduced human errors, rejection rates and non-conformities. The implementation of ISO has also increased staff motivation and given them the incentive to run their own departments, thereby reducing the number of managers. Better management meant internal auditing became less frequent. In addition, the need for a specific process control department was removed. These changes had significant effects on management costs, estimated at 20 percent reduction in control costs and 7 percent reduction in total costs. The main elements of cost savings comprised reductions in human errors, non-conformities and rejection rates, ranging from 10 percent without certification to 3 percent with certification.

b) Reduction in transaction costs. As a quality assurance system, ISO 9000 provides some assurance that a reasonable quality of product is delivered so that processors do not have to spend as much money and time searching and contracting suppliers, evaluating product quality and enforcing contracts. With certified suppliers, the decrease in the number of suppliers results in considerable time and money savings (reduction in supplier audits), leading to a reduction in auditing staff and analytical laboratories.

Zaibet and Bredahl (1997) used an interlinked market model to test the effects of lower transaction and production costs due to the adoption of ISO 9000 standards. Their results showed that lower costs at the input supply level generated gains for both producers and consumers, with producers capturing most of the gains. Table 2.1 summarises the benefits of ISO 9000 certification.

Table 2.1 Benefits of ISO 9000 certification

BENEFITS OF ISO 9000 CERTIFICATION
REDUCTION IN HUMAN ERRORS, REJECTION RATE AND NON-CONFORMITIES
DECREASE IN NUMBER OF AUDITS DONE ON SUPPLIERS
INCREASE IN PRODUCTIVITY
DECREASE IN LABOUR FORCE
REDUCTION IN TRANSACTION COSTS
IMPROVEMENT IN PRODUCT QUALITY
THE DEVELOPMENT OF A QUALITY BASED CULTURE
IMPROVEMENT OF CUSTOMER SERVICE
IMPROVEMENT IN EMPLOYEE MORALE AND INTERNAL COMMUNICATION
IMPROVEMENT IN RECORD KEEPING
IMPROVEMENT IN FINANCIAL AND STOCK CONTROL
IMPROVEMENT IN OVERALL MANAGEMENT

Source: Hendry (1991); SABS (1995); Zaibet and Bredahl (1997).

Having discussed the ISO 9000 quality assurance standards, two additional points need to be considered. Firstly, barriers to trade, which have steadily declined following international trade agreements (GATT/WTO), could be replaced by non-tariff barriers (Caswell and Hooker, 1996). Although at present ISO 9000 certification remains a voluntary standard, it could become a compulsory requirement (standard business practice) for future international trade. The marketing

advantages of ISO 9000 certification (securing new customers and gaining market share) would then disappear; being certified would only ensure that a firm can trade internationally. Secondly, as more firms in an industry become ISO 9000 certified, the competitive (marketing) advantages to a single firm will decrease (van der Wiele and Brown, 1997). Although the marketing advantages of ISO 9000 certification would decrease, potential cost savings (management, production and transaction costs) could still be exploited.

2.2 ISO 9000 and TQM

ISO 9000 and TQM are not equivalent terms, but ISO 9000 forms part of the quality management process. ISO 9000 and TQM approaches have both similarities and differences. Management responsibility, corrective/preventive action and training are both common objectives. However, ISO 9000 does not totally encompass the TQM principles of continuous quality improvement, customer focus and the training and empowerment (human management) of workers (Fowler and Lord, 1995; Yung, 1997). Unlike ISO 9000, TQM does not place sufficient emphasis on documentation (Yung, 1997). According to Schiefer (1997), to meet continuous quality improvement, a TQM programme has to be integrated into an organisational structure which allows for its documentation, enforcement and control. The ISO 9000 quality assurance standards can provide this necessary structure (Schiefer, 1997; Schuler et al., 1996). Sadgrove (1995:107) added “without ISO 9000, a TQM company often lacks a systematic approach to quality”. Whilst TQM focuses on corporate culture, ISO 9000 looks at corporate systems (Sadgrove, 1995). The marketing advantages of ISO 9000 certification and its documentation procedures could enhance a TQM system. According to Yung (1997), the ISO

technical committee are trying to revise the ISO 9000 series (Vision 2000) by incorporating some of the principles (quality improvement, management commitment, customer satisfaction) of TQM.

2.3 ISO 9000 and Hazard Analysis Critical Control Point (HACCP)

The key objective of HACCP principles is to ensure food safety, particularly the control of chemical, microbiological and physical hazards (Caswell and Hooker, 1996). Bredahl and Holleran (1997) report that greater food safety legislation is forcing food companies to adopt risk management tools, such as HACCP principles. An effective HACCP system will identify key (critical) points along the processing chain where potential hazards are likely to occur, implement preventive measures (control) to contain hazards and establish monitoring procedures (Caswell and Hooker, 1996; Unnevehr and Jensen, 1996). According to Early and Shepherd (1997:395), HACCP and ISO 9000 are compatible. As ISO 9000 is not a product quality system, incorporating HACCP principles into a ISO 9000 system would satisfy food safety requirements. Faced with sanitary and phytosanitary regulations (non-tariff barriers), food companies applying HACCP principles will be at a competitive advantage (Caswell and Hooker, 1996).

Following the issues discussed in this chapter, the ISO 9000 quality standards partially satisfy the two competitiveness indicators, namely customer orientation and cost leadership. As already discussed in Chapter 1, a TQM program (continuous process improvement) can be used in conjunction with process reengineering (radical process redesign), whilst both concepts are integrated into process management. Thus, the ISO 9000 quality assurance standard on its own, or in conjunction with a

TQM programme, can be incorporated into a number of strategies to enhance firm competitiveness. The next chapter deals with the research methodology to be followed in this study.

CHAPTER 3

POSTAL SURVEY

Following the literature review, this chapter describes the survey to be conducted amongst South African agribusiness firms. The objectives of the study are to determine the extent of adoption of the ISO 9000 quality assurance standards, and to identify the costs and benefits of adopting these standards. From the data collected, discriminant analyses will be conducted to identify and rank factors that differentiate between firms which have adopted the ISO 9000 standards (ISO 9000 adopters) and those which have not adopted the standards (non-ISO 9000 adopters).

Agribusiness firms in the context of this study include agricultural input manufacturers (seed, feed, fertiliser, agrochemical, equipment and machinery manufacturers), agricultural output processors (wineries, tanneries, canneries, dairies, textiles, sugar and grain millers, sawmills, abattoirs and other farm product processors), as well as agricultural service providers (fruit exporters, pack-houses, agricultural retail suppliers). Various sources (e.g. telephone directories, mailing lists from relevant associations, magazines, South African Bureau of Standards (SABS) register (1998)) were consulted to compile a mailing list of 280 South African agribusiness firms.

3.1 Survey questionnaire

A questionnaire was compiled, based on the work by Bredahl and Holleran (1997) and SABS (1995), and piloted during March 1998 amongst four agribusiness firms, two of which were ISO 9000

certified. The final questionnaire, which consists of six sections (see Appendix 1), will be briefly discussed.

Section A: The aim of this section is to establish relevant details of the company. These include, amongst others, the nature of the company (manufacturer, processor, retailer etc.), the proportion of product sales in domestic and international markets, the number of firm employees and approximate annual product turnover (which relate to firm size). From the turnover data, ISO 9000 certification costs as a percentage of annual turnover can be calculated.

Section B examines general quality control considerations (what quality control measures are in place and why?) and agri-food firms are questioned about the HACCP concept.

Section C explores the relationship between the company and its suppliers. The objective of this series of questions is to investigate the transaction costs of doing business. Searching, negotiating and enforcing activities are questioned.

Section D deals with the ISO 9000 quality assurance system. Questions cover both general and specific aspects, the more important being:

- a) the single most important reason for ISO 9000 certification (firm or customer driven, or a combination of both factors),
- b) the importance of factors that motivated ISO 9000 certification,
- c) the costs of achieving ISO 9000 certification,

- d) the benefits of ISO 9000 certification relative to the costs involved, and
- e) the concept of Total Quality Management.

Section E focuses on the impact of ISO 9000 on firm performance with regard to customer service, error rates and wastage, profits, market share, competitiveness, operating and transaction costs.

Section F is relevant to firms that are not ISO 9000 certified. A brief explanation of ISO 9000 is provided, and potential costs and benefits are presented. A company's interest in the ISO 9000 quality assurance standards is questioned.

3.2 Data collection

A postal survey was conducted during July and August 1998. Owing to generally poor response rates to postal surveys, the entire population of agribusiness firms (280) was surveyed in an attempt to ensure sufficient cases for statistically valid results. Since one of the disadvantages of a postal survey is the possibility of the questionnaire ending up in the wastepaper basket, much was done to improve the response rate. This was achieved as follows:

- a) A covering letter outlined the objectives of the study and requested that the questionnaire be completed and returned as soon as possible but not later than the 31 July 1998.
- b) All questionnaires were accompanied by self-addressed postage-paid envelopes.
- c) The South African Chamber of Business (SACOB) was invited to promote participation amongst

firms, but they were unwilling to cooperate.

d) It was stated that results would be made available to those firms who participated, if requested by them.

e) Follow-up letters were posted on 27 July 1998 to all those firms that had not yet responded to the survey, encouraging them to participate.

f) A low response rate following the deadline date necessitated a more direct approach. Managing directors or quality control managers were contacted telephonically to follow up on the progress on the questionnaire. Numerous respondents never recalled seeing the questionnaire and they requested that the questionnaire be resent, either by post or facsimile. A total of 68 questionnaires were resent. Reasons given for the non-arrival of the initial questionnaire included a) the questionnaire being lost within a company's internal mail system, b) a change in management over that time, and c) the reliability of the postal service was questioned since questionnaires were sent to the correct address, but they never arrived.

The response to the postal survey may be summarised as follows:

•	Number of questionnaires sent out	-	280	
•	Number of usable questionnaires received	-	92	(32,9 percent)
•	Number of non-usable questionnaires received	-	32	(11,4 percent)
•	Total number of questionnaires received	-	124	(44,3 percent)

The usable response rate of 32,9 percent for a postal survey can be regarded as satisfactory. Van der

Wiele and Brown (1997), Manchester Business School (1996), Scicchitano (1996) and a South African study (SABS, 1995) reported response rates of 32, 28, 26 and 36 percent for their respective postal surveys. The 32 non-usable responses were returned by companies that were unwilling to participate in the study. Reasons given for not participating in the study are presented in Appendix 2.

The 92 respondents were divided into the following three strata:

- | | | |
|--------------------------------|---|-------------------|
| • ISO 9000 certified firms | - | 33 (35,9 percent) |
| • Intermediate firms | - | 9 (9,8 percent) |
| • Non-ISO 9000 certified firms | - | 50 (54,3 percent) |

Only firms actively pursuing certification were classified as being ‘intermediate’. These firms had initiated ISO 9000 implementation but were not certified at the time of the survey.

Having described the postal survey to be conducted amongst South African agribusiness firms, the next chapter explores the results obtained. Differences between ISO 9000 certified firms and non-ISO 9000 certified firms are presented and discussed.

CHAPTER 4

GENERAL SURVEY RESULTS

This chapter reports on data collected from the postal survey conducted amongst 92 South African agribusiness firms. Respondents were classified as being either ISO 9000 certified, intermediate or non-ISO 9000 certified firms. Intermediate firms had initiated ISO 9000 implementation but were not ISO 9000 certified at the time of the survey.

4.1 General characteristics of respondents

This section deals with the characteristics of the sample of South African agribusiness firms that responded to the questionnaire. The characteristics include types of business arrangement, nature of business, firm size, financial aspects and export orientation.

4.1.1 Business arrangements

The most common business arrangement among respondent agribusiness firms ($n = 92$) was the private company (67 percent), followed by the public company (25 percent) and cooperative (4 percent), with the remaining three firms comprising individual owner, partnership and close corporation. Of the sample ISO 9000 certified firms (33), 70 percent operated as private companies, 27 percent as public companies, with a partnership making up the remaining three percent. Intermediate firms (9) comprised private companies (78 percent) and public companies (22 percent).

The majority of non-ISO 9000 certified firms comprised private companies (64 percent), 24 percent public companies and 8 percent cooperatives. A close corporation (1) and individual owner (1) were also represented.

Of the total respondents, 75 percent had parent company affiliation, of which 73,5 percent were South African parent companies. A greater proportion of ISO 9000 certified firms had parent company affiliation (91 percent) compared to intermediate (67 percent) and non-ISO 9000 certified firms (66 percent), with 72 percent of ISO 9000 certified firms, 67 percent of intermediate and 76 percent of non-ISO 9000 certified firms having South African parent companies.

4.1.2 Nature of business

The majority of respondents were involved in manufacturing (84 percent), with 16 percent being involved in the service sector. Manufacturing includes processing firms. Service firms include retailers, importers/distributors, brokers, consultants, exporters, and research, development and marketing firms. Manufacturing comprised 94 percent of ISO 9000 certified firms compared with 78 percent in each of the intermediate and non-ISO 9000 certified firms respectively.

When asked about the type of products or services their firm produced/provided, a wide spectrum of products/services were listed (21 categories in all). To facilitate data analysis it was necessary to reclassify the products/services into three broad classes. Table 4.1 describes the three classes and which products/services make up each.

Table 4.1 **Classification of products and services among sample South African (SA) agribusiness firms, 1998 (n = 92)**

Class description	Products/Services	n	Percentage certified firms	Percentage intermediate firms	Percentage non-certified firms
Products derived from agricultural output	dairy, maize, sugar, poultry and fruit products etc., textiles, canned fruit, tea/coffee, food stuffs, timber, wine and spirits, hides and skins	46	45,7	8,6	45,7
Products used as agricultural inputs	fertiliser, agricultural machinery and equipment, feed manufacturers, agrochemicals, seed producers and feed premixes	40	30	7,5	62,5
Agricultural service providers	buying and selling of agricultural products, property marketing, consultants, exporters, agricultural retail suppliers	6	0	66,7	33,3

Forty-six percent of products derived from agricultural output and 30 percent of products used as agricultural inputs originated from ISO 9000 certified firms. Although the ISO 9000 quality assurance standards had not yet been adopted by any of the service agribusiness firms in this study, they can be adapted to any type of business (Schuler et al., 1996). Of the six firms in this class, four (67 percent) were in the process of implementing ISO 9000.

The average age of agribusiness firms in the sample was 38 years 5 months (median = 30 years). The lower median age suggests that a few older firms skew the distribution. The mean ages of ISO 9000

certified, intermediate and non-ISO 9000 certified firms were 55 years 3 months (median = 50 years), 17 years 8 months (median = 12 years) and 30 years 4 month (median = 24 years) respectively. The difference in mean age between ISO 9000 certified and non-ISO 9000 certified firms (24 years 11 months) is statistically significant at the one percent level of probability.

4.1.3 Firm size and financial position

Firm size was measured according to two factors, namely firm turnover (gross sales) and number of employees. Table 4.2 summarises the annual turnover and number of employees of respondent agribusiness firms. The total number of people employed by these firms was 77963 people. The total turnover of respondent agribusiness firms (n = 72) was R26,4 billion.

Table 4.2 Annual turnover and number of employees, sample SA agribusiness firms, 1998

	All firms	Certified firms	Intermediate firms	Non-certified firms
Annual turnover (R million)				
Mean	366,503 (n=72)	541,885 (n=24)	665,721 (n=7)	212,754 (n=41)
Median	199,0	477,5	336,4	110,0
Range	2,5 - 2429,0	10 - 2337,4	4,5 - 2429,0	2,5 - 1093,6
Number of employees				
Mean	847 (n=92)	1155 (n=33)	339 (n=9)	736 (n=50)
Median	223	420	200	190
Range	9 - 10000	9 - 8000	10 - 1100	12 - 10000

Comparing mean and median values, both turnover and employee numbers were higher for ISO 9000

certified than non-ISO 9000 certified firms. The mean difference in annual turnover between ISO 9000 certified and non-ISO 9000 certified companies (R 329,131 million) is statistically significant at the five percent level of probability.

To determine the financial position of the sample agribusiness firms, they were asked to supply their current and net capital ratios (Table 4.3). The current ratio (current assets/current liabilities) indicates business liquidity whilst the net capital ratio (total assets/total liabilities) measures firm solvency.

Table 4.3 Current and net capital ratios, sample SA agribusiness firms, 1998

	All firms	Certified firms	Intermediate firms	Non-certified firms
Current ratio				
Mean	1,93 (n = 44)	1,67 (n = 15)	1,38 (n = 4)	2,17 (n = 25)
Median	1,57	1,44	1,16	2,05
Range	0,43 - 6,50	0,90 - 3,61	1 - 2,20	0,43 - 6,50
Net capital ratio				
Mean	2,79 (n = 42)	2,95 (n = 15)	1,49 (n = 3)	2,86 (n = 24)
Median	1,72	1,80	1,38	1,63
Range	0,19 - 10,00	1,32 - 8,82	1,22 - 1,87	0,19 - 10,00

Given the favourable liquidity situation of non-ISO 9000 certified companies, then if the decision was made to adopt the ISO 9000 standards, these firms should be in a position to meet the associated costs involved. The presence of a substitute quality assurance system could explain why these firms are not ISO 9000 certified at present. This aspect will be discussed in the section 4.2.

4.1.4 Export orientation of respondent firms

Of all the respondents, 79 percent were involved in the export market. About 82 percent of ISO 9000 certified and 89 percent of intermediate companies exported their products compared to 76 percent of non-ISO 9000 certified firms. Table 4.4 summarises the proportion of physical production sold on the export market and turnover derived from exports.

Table 4.4 Proportion of production sold as, and turnover derived from, exports of sample SA agribusiness firms, 1998

	All firms	Certified firms	Intermediate firms	Non-certified firms
Proportion of physical products sold on export market (percent)				
Mean	26,6 (n = 65)	25,1 (n = 23)	54,8 (n = 8)	20,9 (n = 34)
Median	10	10	60	15
Range	0,5 - 100	1 - 100	1 - 100	0,5 - 90
Proportion of turnover from exports (percent)				
Mean	23,2 (n = 62)	21,7 (n = 21)	40,7 (n = 8)	19,9 (n = 33)
Median	10	6	25	12
Range	0,55 - 100	1 - 100	5 - 100	0,55 - 96

The mean proportion of physical products sold on the export market and turnover derived from exports was higher for ISO 9000 certified firms than non-ISO 9000 certified firms. The mean turnover from exports (n = 53) amounted to R126,7 million whilst the median value was considerably less (R16,5 million). Mean turnover from exports for ISO 9000 certified firms (n = 19) equaled R100,9 million (median = R35 million) which was lower than the R528,5 million (median = R106,3

million) of intermediate firms (n = 6) but higher than that of non-ISO 9000 certified firms (n = 28) which amounted to R58,2 million (median = R7,6 million). When considering the destination of exports, the majority of exports (54 percent) were destined for the African continent, with Europe (25 percent) and Asia (10 percent) being other significant markets. Table 4.5 summarises the export destinations of respondent firms in the study.

Table 4.5 Percentage of total exports to various continents, sample SA agribusiness firms, 1998

Continent	Africa	Europe	Asia	Australasia	North America	South America
All companies (n = 67)						
Mean	54,2	25,1	10,4	5,2	3,1	2,0
Median	70	2	0	0	0	0
Range	0 - 100	0 - 100	0 - 90	0 - 100	0 - 32	0 - 27
Certified firms (n = 23)						
Mean	50,6	16,0	17,0	10,4	3,5	2,5
Median	60	0	8	0	0	0
Range	0 - 100	0 - 100	0 - 90	0 - 100	0 - 32	0 - 27
Intermediate firms (n = 8)						
Mean	50,3	33,4	9,2	0	7,0	0,1
Median	49,8	14,5	0,5	0	2,5	0
Range	0 - 100	0 - 88	0 - 30	0	0 - 30	0 - 0,68
Non-certified firms (n = 36)						
Mean	57,4	29,1	6,4	3,0	2,1	2,0
Median	88,5	7,8	0	0	0	0
Range	0 - 100	0 - 100	0 - 60	0 - 90	0 - 27	0 - 26

An interesting result is that only 16 percent of certified firms exported to Europe as compared to 29 percent of non-ISO 9000 certified firms. As the ISO 9000 standards originated in Europe and have received considerable support there, this result seems to contrast with expectations. The result could be explained by the fact that alternative (substitute) quality assurance systems are in place in non-ISO 9000 certified firms and at present these appear to satisfy European customer requirements. However, there may be increasing pressure on non-ISO 9000 certified firms to adopt the ISO 9000 standards as the future demand for such standards increases among importing countries.

4.2 Quality control and supplier relationship

When asked if their firm had adopted a system to address deviations from quality specifications, 92 percent of all respondents indicated they had a system in place. In all, ISO 9000 was mentioned in 46 percent of cases, which is higher than the reported ISO 9000 certified companies (36 percent) as some companies are in the process of implementing ISO 9000. Clearly, all ISO 9000 certified companies had a system in place (sometimes in combination with HACCP or in-house quality assurance systems) but interestingly 86 percent of non-ISO 9000 certified companies ($n = 50$) reported using some form of quality assurance system(s). These include: in-house quality assurance systems (71,5 percent), conformance with external standards (19 percent) and HACCP (9,5 percent). Half of the intermediate firms mentioned ISO 9000, while in-house quality assurance systems were reported by the remaining firms. In this category no mention was made of HACCP. In-house quality assurance systems are those systems which are developed and monitored internally whilst external standards are stipulated by external bodies (e.g. government specifications, veterinary and medical

regulations).

The mean age of respondent firms' quality control system(s) was 103 months (8 years 7 months), but more important is the difference in age between ISO 9000 certified, intermediate and non-ISO 9000 certified firms' current quality control system(s). For ISO 9000 certified firms the mean age of quality control system(s) was 53 months (4 years 5 months) compared to 13 years 6 months and 10 years 11 months for intermediate and non-ISO 9000 certified firms respectively.

Of the respondent firms, 84 percent indicated that their employees receive quality control training, whilst 89 percent said that training was continuous. All employees of ISO 9000 certified companies received quality control training (intermediate firms = 87,5 percent) compared with 73,5 percent of non-ISO 9000 certified firms, with 94 percent of employees of the former receiving continuous training (intermediate firms = 100 percent) compared to 82 percent of the latter. About 88 percent of certified and 80 percent of non-certified firms indicated that their customers required some quality assurance system.

Of 89 respondent firms, only 45 percent required their suppliers to have a quality assurance system in place at present, whilst the majority (77 percent) said it would be a future requirement. Presently, only 42 percent of ISO 9000 certified and 44 percent of intermediate firms required suppliers to have a quality assurance system compared to 47 percent of non-ISO 9000 certified firms, but in the future 75 percent of certified, 89 percent of intermediate and 76 percent of non-certified companies would make it a requirement. When asked which quality assurance system would be a future requirement,

ISO 9000 was mentioned by 70 percent of ISO 9000 certified respondents. With intermediate companies ($n = 7$), ISO 9000 was mentioned in 71 percent of responses. The main quality assurance systems mentioned by non-ISO 9000 certified companies included ISO 9000 (29 percent) and customised systems (26 percent), with 13 percent of respondents being unsure. A greater proportion of ISO 9000 certified (73 percent) and intermediate companies (78 percent) work with suppliers on quality assurance compared to 64 percent of non-certified firms.

When asked about the single most important reason for adopting a quality assurance system, 41 percent of respondents ($n = 91$) cited firm-driven or internal reasons (improve operational efficiency, cost reduction, etc.) whilst 54 percent indicated customer-driven or external reasons (gain market share, customer requirement, etc.). Five percent cited a combination of both firm/customer-driven reasons. Most ISO 9000 certified companies (51,5 percent) cited firm-driven reasons compared to 56 and 61 percent of intermediate and non-ISO 9000 certified firms which reported customer-driven reasons.

When questioned if the adoption of a quality assurance system was a standard business practice for a firm in their line of business, 63 percent ($n = 92$) indicated that locally it was a standard business practice whilst 88,5 percent ($n = 87$) felt that it was a standard business practice in the international arena. In the questionnaire, standard business practice was defined as “widely accepted by sectoral participants (i.e. producers, buyers, sellers and regulators)”. Interestingly, only 58 percent of ISO 9000 certified companies (intermediate firms = 56 percent, non-ISO 9000 certified firms = 68 percent) felt that the adoption of a quality assurance system was a standard business practice locally

whilst 81 percent (intermediate firms = 100 percent, non-ISO 9000 certified firms = 91,5 percent) thought it was an international standard business practice.

Of the total respondents, 55 percent were classified as agri-food firms. When asked about their familiarity with HACCP, 72 percent of the agri-food respondents were familiar with this concept. Of the ISO 9000 certified (n = 19) and intermediate (n = 7) agri-food companies, 84 and 71 percent respectively were familiar with HACCP compared to 62,5 percent of non-ISO 9000 certified agri-food firms (n = 24). Of the agri-food respondents, 52 percent had adopted HACCP principles whilst 44 percent thought that HACCP is commonly adopted in their respective lines of business. About 63 percent of the ISO 9000 certified agri-food companies had implemented HACCP compared to 46 percent of non-ISO 9000 certified agri-food firms. Of the certified agri-food firms, 68 percent felt that HACCP is applicable to a firm in their line of business whilst only 25 percent of non-ISO 9000 certified agri-food firms held the same view. These results suggest that ISO 9000 certified agri-food companies are more aware of and concerned with quality issues and more likely to adopt systems to address these issues, for example HACCP. In addition, the results support the findings of Early and Shepherd (1997:395) that HACCP and ISO 9000 are compatible. As ISO 9000 is not a product quality system, incorporating HACCP principles into a ISO 9000 system would satisfy food safety requirements.

Of all the respondents, 75 percent indicated it was not difficult to identify input suppliers whilst 25 percent sometimes had difficulty in identifying suppliers. When asked if it was relatively time consuming to draft supply specifications, 52 percent of respondents answered no, whilst 35 percent

indicated it was sometimes time consuming and 13 percent said that it was time consuming. A greater proportion of ISO 9000 certified companies (21 percent) fell into the 'time consuming' bracket as compared to non-certified companies (6 percent). Only 12 percent of ISO 9000 certified companies indicated that searching for a supplier is a frequent monthly activity as compared to 16 percent of non-certified companies (intermediate firms = 25 percent). A greater proportion of ISO 9000 certified (45,5 percent) and intermediate (62,5 percent) firms had over 50 suppliers to choose from compared to non-certified firms (30 percent).

The percentage of ISO 9000 certified companies that inspect a supplier's product before signing a contract (91 percent) was greater than the 70 percent of non-ISO 9000 certified companies (intermediate firms = 89 percent). Most certified companies (67 percent) negotiated long-term contracts with suppliers compared to 54 percent of non-ISO 9000 certified firms (intermediate firms = 89 percent). The fact that ISO 9000 certified companies found it time consuming to draft supply specifications, inspect products before signing contracts and work with suppliers on quality assurance is consistent with the finding that ISO 9000 certified companies are more likely to negotiate long-term contracts and therefore reduce the frequency of searching for input suppliers.

Of all respondents, 63 percent had farmers as suppliers. Fewer ISO 9000 certified firms (58 percent) had farmers as suppliers as opposed to non-certified companies (62 percent). The inputs (products) supplied by farmers are presented in Table 4.6.

Table 4.6 Input (product) supplied by farmers to sample SA agribusiness firms, 1998

Input (product)	All firms		Certified firms		Intermediate firms		Non-certified firms	
	n	%	n	%	n	%	n	%
Milk	7	12,3	6	86	1	14	0	0
Grains and other crops	19	33,3	4	21	3	16	12	63
Sugar-cane	7	12,3	5	71	0	0	2	29
Fruit and vegetables	6	10,4	1	17	1	17	4	66
Chickens	2	3,5	0	0	0	0	2	100
Animal products and grains	3	5,3	0	0	1	33	2	67
Timber	3	5,3	0	0	0	0	3	100
Seed	3	5,3	0	0	1	33	2	67
Wine/grapes	2	3,5	1	50	0	0	1	50
Animal products	3	5,3	1	33	0	0	2	67
Fruit and wine	2	3,5	1	50	1	50	0	0
TOTAL	57	100	19		8		30	

From Table 4.6 it is clear that given the same input (product), some companies had adopted ISO 9000 while others had not. This may indicate that scope exists for the non-ISO 9000 certified companies to go the ISO 9000 route. The incidence of certification is much higher amongst firms processing milk and sugar cane. As yet, no companies sourcing chickens, combined animal products and grain, timber and seed inputs had sought certification.

Of the firms having farmers as suppliers, 93 percent indicated that they required minimum quality standards from farmers. More ISO 9000 certified companies (95 percent) required minimum

standards from farmers than non-ISO 9000 certified companies (90 percent). All intermediate firms required minimum quality assurance standards from their farmers. Considering the vertical supply chain concept (i.e. raw material supplier (farmer) → processor → retailer), respondent firms were asked if they thought the incorporation of quality control measures at farm level could make the supply chain more productive and cost efficient. Almost all ISO 9000 certified companies (95 percent) answered yes whilst 87,5 percent of intermediate and 79 percent of non-ISO 9000 certified companies agreed. Firms were asked if they thought the ISO 9000 quality assurance standards could facilitate such control measures. The majority (67 percent) of ISO 9000 certified companies said yes, with equal proportions of the remaining respondents (33 percent) answering no and uncertain. Of the non-certified firms, 28 percent, 31 percent and 41 percent responded with yes, no and uncertain respectively.

After a brief introduction to the ISO 9000 quality assurance standards, non-certified firms were asked if they would consider adopting the ISO 9000 quality assurance standards. Most (66 percent) non-certified firms said they would consider adopting ISO 9000.

This chapter presented characteristics of the sample of South African firms that responded to the questionnaire. Differences between ISO 9000 certified, intermediate and non-ISO 9000 certified firms were described. The next chapter examines ISO 9000 certification, including the reasons for certification and the costs and benefits involved.

CHAPTER 5

ISO 9000 CERTIFICATION

This chapter reports on the experiences of the 33 respondent ISO 9000 certified firms with regards to the factors motivating certification, costs and impacts of certification. Where possible, international experiences are presented to allow for comparisons. The concepts of TQM and ISO 14000 are also covered.

5.1 General characteristics of ISO 9000 certified firms

In this study 36 percent of the sample firms ($n = 92$) indicated they were ISO 9000 certified. Of these 33 firms, 94 percent (31) were certified in the ISO 9002 model with the remaining two firms being ISO 9001 certified. The ISO 9001 model is the most comprehensive in the series (covers 20 elements: quality assurance in design/development, production, installation and servicing) whilst ISO 9002 contains 18 elements (excludes design/development considerations) (Schuler et al., 1996).

Although one firm gained ISO 9000 certification in 1988, 76 percent of all certifications occurred in the last five years. Of the certified respondents, 76 percent hold their certification with the SABS, 12 percent with SGS whilst the remaining four firms (12 percent) hold their certification with other certification bodies (Dekra, EQnet and DQS, DAR and Lloyds). The majority of certified firms were introduced to the ISO 9000 quality assurance standards by their company headquarters (55 percent), with clients and the SABS accounting for 13 percent each. The remaining 19 percent comprise media

(6 percent), competitors (3 percent) and other (10 percent).

Just over a quarter of respondents (26 percent) indicated it was necessary to hire a consultant to assist in documentation writing, while the majority (74 percent) said it was not necessary to hire a consultant. The mean number of pre-certification audits among respondents was 1,621 (median = 1). One firm achieved certification with no pre-certification audits whilst one firm needed six. Certified firms were also asked whether they considered ISO 9000 certification to be a standard business practice for a firm in their line of business in terms of time (presently and in the future) and scope (locally and internationally). About 64 percent felt ISO 9000 certification to be a standard business practice locally at present, while 90 percent felt it would be a standard business practice locally in the future. On the other hand, 78 percent of respondents felt certification was a standard business practice internationally at present, but all respondents indicated it would be a standard business practice internationally in the future.

5.2 Factors which motivated ISO 9000 certification

When asked to give the single most important reason for adopting the ISO 9000 quality assurance standards, 42 percent of certified firms cited internal firm-driven reasons, 42 percent reported external customer-driven reasons whilst 16 percent indicated a combination of the two. Internal factors include procedural efficiency, staff motivation, and reductions in error rates, wastage and costs, whilst external reasons include customer requirements and the desire to gain market access and market share. Of the certified respondents in this study, 61 percent indicated that their principal customers

did not require certification at present, but 78 percent thought that certification would be a future customer requirement. This reinforces the point that the external or customer-driven reason for certification is not the main driving force at present, but it may become the dominant reason in the future.

To investigate the motivating factors in more detail, ISO 9000 certified respondents were asked to indicate the importance of these factors on a three-category scale ranging from 'not important' to 'important' and 'very important'. The proportion of firms which indicated 'important' or 'very important' for each influencing factor is presented in Table 5.1 The factors were ranked according to these proportions. The desire to improve customer service was the most influential factor, followed by a basis for quality improvement and a desire to improve operational efficiency (reduce wastage). Although the importance of certification in reducing transaction costs was only ranked twelfth, it is evident from other factors (e.g. improve customer service, improve operational efficiency, access to foreign markets, unite various quality systems, certification will be a future requirement) that it is an important motivating factor.

Table 5.1 Factors which motivated ISO 9000 certification among a sample of SA agribusiness firms, 1998 (n = 32)

Factor	Mode*	Percentage of firms indicating 'important' or 'very important'	Rank
Improve customer service	3	100	1
A basis for quality improvement	3	96,9	2
Improve operational efficiency (reduce wastage)	3	90,7	3
Access to foreign markets	3	87,5	4
Reduction in operating costs	2	87,5	4
Gain market share	3	84,4	6
Customer requirement	2	84,4	6
Unite various quality systems	2	81,3	8
Certification will be a future requirement	3	80,7	9
Industry requirement (stay in business)	2	75,0	10
Corporate mandate	2	67,7	11
Reduction in transaction costs	2	56,3	12
Other (n = 2)			

* where 1 = not important, 2 = important and 3 = very important

The following additional factors that motivated certification were raised by two firms: a) ensure uniformity between plants, b) retain existing customers, c) improve utilisation of facilities, d) improve skills, knowledge, attitude and ability, and e) clear transmission of information. The two respondents rated each of these five factors as being very important. The factors which motivated ISO 9000 certification among respondents in this study coincide with those reported by SABS (1995), Van der

Wiele and Brown (1997), Zaibet and Bredahl (1997), and Guerin and Rice (1996).

5.3 Costs of ISO 9000 certification

ISO 9000 certified firms were asked to estimate the costs of ISO 9000 implementation, pre-certification auditing fees and ISO certification (Table 5.2). All costs shown in Table 5.2 are expressed on a 1997/98 basis and have been grouped according to firm turnover to account for firm size. ISO 9000 implementation costs include items such as staff training, documenting procedures, hiring of consultants, redeployment of internal resources and the acquisition of equipment for calibration. Certification costs depend upon firm size, complexity (nature of processes) and the ISO 9000 series chosen.

To account for firm size, total costs of certification are expressed as a percentage of annual turnover and total certification costs per employee. Zaibet and Bredahl (1997) reported that the total cost of achieving ISO 9000 certification did not exceed 1,5 percent (range = 0,07 - 1,5 percent) of turnover of firms in their United Kingdom meat sector study. Their study was conducted amongst four small and medium sized firms. They concluded that these costs should not represent a constraint toward achieving certification.

Table 5.2 Costs of ISO 9000 certification among a sample of SA agribusiness firms, 1997/98 = 100

Costs of ISO 9000	Group *	n	Mean (R)	Median (R)	Range (R)
Implementation	A	7	56256	50943	11880 - 154957
	B	6	144228	100101	14200 - 300000
	C	6	302949	146711	50943 - 1045440
Pre-certification auditing fees	A	5	8046	7642	5043 - 11880
	B	3	8070	4632	1500 - 18078
	C	7	24901	10189	6113 - 70296
Certification	A	4	8235	7301	6457 - 11880
	B	3	27704	21300	15496 - 46316
	C	6	39883	24453	7030 - 99792
Total cost	A	6	67541	50934	12000 - 167871
	B	6	162115	136975	14200 - 322826
	C	7	318758	163019	19911 - 1188000
Total cost per employee	A	6	664,04	522,00	198,00 - 1554,36
	B	6	453,77	137,30	14,35 - 2137,92
	C	6	583,27	399,24	20,17 - 1321,35
			percent	percent	percent
Total cost as a percentage of turnover	A	6	0,301	0,157	0,027 - 1,024
	B	6	0,041	0,048	0,003 - 0,065
	C	6	0,045	0,019	0,011 - 0,140

* Group A = company turnover < R100 million

Group B = company turnover ≥ R100 million but < R650 million

Group C = company turnover ≥ R650 million

The results of this study (Table 5.2) suggest that the costs of certification may be prohibitive for very small firms as smaller firms show the highest cost per Rand of turnover and per employee. There is also some evidence of diseconomies for very large firms. However, the means computed for the

largest firms were skewed by one firm that reported certification costs in excess of R1 million (this firm achieved ISO 9001 certification). The median values presented in Table 5.2 indicate size economies across the full range of turnover, but higher certification costs per employee for very small and very large firms.

5.4 Disadvantages of ISO 9000 certification

When asked to list any disadvantages of ISO 9000 certification, some 85 percent of certified firms expressed their experiences. These are summarised in Appendix 3. Nearly 40 percent of respondents (n = 28) indicated there were no disadvantages/drawbacks of certification, while cost considerations were mentioned by 11 percent of respondents. Excessive documentation load/paperwork was mentioned in 25 percent of cases. Other drawbacks mentioned also reflect the following disadvantages of ISO 9000 reported by researchers elsewhere (Sadgrove, 1995; van der Wiele and Brown, 1997): a) it is bureaucratic, b) excessive on-going paperwork, c) it is internally focused (internal processes), d) staff feel that standards are imposed on them, and e) ISO 9000 does not encourage continuous process improvement.

5.5 Impact of ISO 9000 certification

Respondents were asked to score on a five-point scale, ranging from 1 (highly negative) to 5 (highly positive), the impact of certification on each performance indicator. The ranking of performance indicators was based on the proportion of respondents indicating a 'positive' or 'highly positive'

impact (Table 5.3).

Table 5.3 Ratings of performance indicators, sample of SA agribusiness firms, 1998

PERFORMANCE INDICATOR	Mode*	Percentage of firms indicating 'positive' or 'highly positive'	Rank
Documented process (e.g. record-keeping) (n = 32)	5	96,9	1
Overall firm performance (n = 32)	4	93,8	2
Quality of output (n = 32)	4	93,7	3
Error rates (decrease) (n = 32)	4	90,6	4
Customer service (n = 31)	4	90,4	5
Quality of purchased inputs (n = 32)	4	81,3	6
Competitiveness (n = 32)	4	75,0	7
Sales (n = 31)	4	74,2	8
Inter-firm communication (n = 32)	4	71,9	9
Productivity (n = 32)	4	71,9	9
Worker satisfaction / employee morale (n = 32)	4	68,8	11
Market access (n = 32)	4	68,8	11
Wastage (i.e. scrap costs) (decrease) (n = 32)	4	68,8	11
Profits (n = 32)	4	68,7	14
Overall operating costs (decrease) (n = 32)	4	65,6	15
Market share (n = 32)	4	56,3	16

* where 1 = highly negative impact, 3 = no impact and 5 = highly positive impact

Certification had a positive impact on most performance indicators, in particular on documented

processes (e.g. record-keeping), overall firm performance and quality of output. In addition, certification has had a positive impact on decreasing error rates, customer service and quality of purchased inputs. Factors ranked 1, 5, 6, 9 and 11 show the positive impact of certification on reducing transaction costs. Similar findings have been reported by Market and Opinion Research International (1996), Manchester Business School (1996), Hendry (1991), SABS (1995) and Zaibet and Bredahl (1997).

Certified firms were asked to provide information (before and after certification) of any improvements in performance measures resulting from certification. A summary of the certified companies' experiences is presented in Table 5.4

Clearly, benefits have been achieved from certification. Substantial cost savings can be achieved through improvements in conformance to specifications, less reject products/returns and scrap material, and less customer complaints will ensure continued customer satisfaction and support.

Table 5.4 Actual improvements in performance measures as reported by ISO 9000 certified firms, sample of SA agribusiness firms, 1998 (n = 19)

Improvement	n	Before certification	After certification
Conformance to specifications*	10	Mean improvement = 15,9 percent (n = 8), range = 5 - 25 percent	
Problem solving	1	Problems were not followed up	Problems solved much faster
Management	1	Management was not so quality conscious	Management totally involved
Less customer complaints*	4	Mean improvement = 394 percent (n = 2), range = 188 - 600 percent	
Reduced product returns/rejects*	4	Mean improvement = 314 percent, range = 91 - 666 percent	
Suppliers' input conformance*	2	85 percent (n = 1)	95 percent (n = 1)
Documentation efficiency*	1	Overall improvement	
Calibration*	2	Mean improvement = 48 percent range = 47 - 49 percent	
Employee discipline	1	Overall improvement	
Scrap material*	1	2,0 percent of final product	1,3 percent of final product
Product losses	1	±R700000 per annum	±R400000 per annum 1,5 years later
Corrective action	1	Haphazard corrective action	Standardised corrective action system
Penalties due to non-conformance*	1	R45514	0

* improvements which reduce transaction costs

Of the ISO 9000 certified firms (n = 33), 88 percent indicated that the benefits of ISO 9000 certification outweigh the costs incurred; 79 percent said benefits significantly outweighed the costs

whilst 21 percent reported small net benefits. Of the certified firms, 97 percent believed that adopting the ISO 9000 quality assurance standards could benefit South African agribusiness firms. Being an importer and distributor of agricultural equipment, the remaining firm felt that as long as overseas suppliers were certified, local certification was not necessary.

5.6 ISO 9000 and TQM

After a brief introduction of the Total Quality Management (TQM) concept, 58 percent of the certified firms indicated they had adopted the principles of TQM. Of the certified firms that had not adopted TQM ($n = 14$), 43 percent had considered and rejected TQM, and an equal percentage was currently considering implementing TQM, while 14 percent had never come across the concept. The adoption of TQM by the majority of ISO 9000 certified firms supports the findings of Schiefer (1997), Schuler et al., (1996), Sadgrove (1995) and Yung (1997) that ISO 9000 and TQM are compatible.

5.7 ISO 14000

In 1996, the International Organisation for Standardisation published the ISO 14000 voluntary environmental management standards. The need to reduce energy and other resource consumption, liability and risk, and improve compliance with legislative and regulatory requirements is driving firms to adopt an environmental management system such as ISO 14000 (Hemenway, 1996). At the end of 1997, over 5000 environmental certificates were held in 55 countries; of these certificates 21 were

held by South African firms (International Organisation for Standardisation, 1998). The ISO 9000 certified firms were asked if they had adopted the ISO 14000 environmental system. Only three firms (9 percent) indicated they had adopted ISO 14000. Of the remaining firms, 77 percent said they were considering adopting ISO 14000.

This chapter has described South African agribusiness firms' experiences with ISO 9000. The next chapter uses discriminant analysis to determine the factors that distinguish between the adopters (certified) and non-adopters (non-certified) of ISO 9000.

CHAPTER 6

DISCRIMINANT ANALYSIS

The aim of discriminant analysis is to predict group membership (Norusis, 1994). Linear combinations of independent (predictor) variables are constructed and provide a basis for grouping cases. Whereas descriptive statistics and univariate tests help to identify some differences among groups, discriminant analysis and other multivariate techniques analyse variables together.

This section considers explanatory variables that are expected to discriminate between adopters (certified firms) and non-adopters (non-certified firms) of ISO 9000. The nine intermediate firms (partial adopters) were excluded from the analysis.

6.1 Independent variables

The variables (and their expected signs) which are expected to distinguish ISO 9000 adopters from non-adopters include:

a) Firm size(+). This variable was measured in terms of firm turnover (**TURNOVER**) and/or number of employees (**EMPLOYEE**). Larger firms stand to benefit more from certification and are better able to spread the fixed costs of adoption. However, since most (86 percent) of the non-ISO 9000 certified firms already had an alternative quality assurance system in place, the discriminating power of variables measuring firm size was not expected to be strongly positive.

b) Alternative quality assurance system (-). The presence of an alternative quality assurance system that meets customer and firm requirements reduces the need to adopt ISO 9000 quality assurance standards. A dummy variable (**ALTQAS**) scoring one for firms with an alternative quality assurance system, and zero otherwise, was included to capture the effects of substitutes for ISO 9000 quality assurance standards. These substitutes include: in-house quality assurance systems (71,5percent), conformance to external standards (19 percent) and Hazard Analysis Critical Control Point (HACCP) (9,5 percent). In-house quality assurance systems are those systems which are developed and monitored internally whilst external standards are stipulated by external agents (e.g. government, veterinary and medical professions, etc.).

c) Selling to international customers (+). Firms with greater export orientation, particularly those exporting to developed countries where ISO 9000 standards are popular, are more likely to be ISO 9000 certified. Firm export orientation was measured as the percentage of turnover derived from exports (**TURNEXP**). In addition, a dummy variable (**EXPDEVD**) was constructed scoring one if a firm exported more than 50 percent of total exports to developed continents (Australasia, Europe and North America), and zero otherwise.

d) Parent company (+). A dummy variable (**PARENTCO**) scored one if the firm was affiliated to a parent company, and zero otherwise. A positive relationship between affiliation and adoption was expected as firms with parent companies, especially international parent companies, need uniformity between plants and are more likely to be exposed to the benefits of ISO 9000.

e) Years in business (**AGE**) (+). Older firms would have had more time to achieve certification and are therefore more likely to have adopted ISO 9000.

f) Involvement in manufacturing (+). The incidence of certification was expected to be highest

amongst processors and manufacturers because ISO 9000 quality assurance standards were originally designed for the manufacturing sector. According to Manchester Business School (1996:10), manufacturing companies still accounted for the majority of ISO 9000 certifications, but their dominance was declining. A dummy variable (**MANUFACT**) was created, scoring one for manufacturing and processing firms, and zero otherwise.

g) Products derived from agricultural output (+). Firms intending to export agricultural products are more likely to adopt an internationally recognised quality assurance system to compete in world markets. The dummy variable (**AGRICOUT**) scored one for products processed from agricultural output, and zero otherwise.

h) Business entity (-). The dummy variable (**COOP**) scored one for firms operating as cooperatives, and zero otherwise. Cooperatives serve local customers and thus the presence of an internationally recognised quality assurance system is not imperative. Sole proprietorships are also less likely to adopt ISO 9000 standards, due to management constraints. The dummy variable (**INDOWNER**) scored one for owner operators, and zero otherwise.

6.2 Discriminant analysis between adopters and non-adopters of ISO 9000

The dependent variable in the analysis, **ADOPTER**, scored one for ISO 9000 adopters and zero for non-adopters of ISO 9000. Table 6.1 shows significance tests (F-values and their significance), standardised coefficients and classification results for the discriminant model.

Table 6.1 Estimated discriminant function between adopters and non-adopters of ISO 9000, sample of SA agribusiness firms, 1998

Explanatory variable			Discriminant model (n = 65)	
			Standardised coefficient	
ALTQAS			-1,193****	
COOP			-0,561****	
PARENTCO			0,314***	
AGRICOUT			0,262**	
TURNOVER			0,200*	
Discriminant function statistics				
Chi-square			92,48****	
Wilks' Lambda			0,22	
Canonical correlation			0,89	
Eigenvalue			3,61	
Overall classification				
Actual group		Number of cases	Predicted group membership (Percentage in parenthesis)	
			0	1
Non-adopters of ISO 9000	0	41	37 (90,2)	4 (9,8)
Adopters of ISO 9000	1	24	0 (0)	24 (100)
Overall percentage classified			93,85 percent	

*, **, ***, **** denote statistical significance at the 20, 10, 5 and 1 percent levels of probability

Of a possible 83 cases, only 65 cases contained all relevant information. The overall Chi-square value of 92,48 (significant at the 1 percent level of probability) indicates that, collectively, the five

explanatory variables distinguish significantly between adopters and non-adopters of ISO 9000. Wilks' Lambda (λ) examines the ratio of within-group sum of squares to total sum of squares (Norusis, 1994). Here $\lambda = 0,22$, indicating a high level of discriminating power. In addition, the Eigenvalue (ratio of between-groups to within-groups sum of squares) of 3,61 and canonical correlation (degree of association between discriminant scores and group membership) of 0,89 indicate a good predictive model. Close to 94 percent of the known cases were correctly classified.

The relationships (coefficient signs) between dependent and independent variables are as expected. The discriminant analysis revealed that the most important variable discriminating between adopters and non-adopters was the presence of an alternative quality assurance system (**ALTQAS**). Firms with alternative quality assurance systems are unlikely to adopt ISO 9000 standards. Of course, the extent to which alternatives substitute for ISO 9000 could diminish if customer preferences shift in favour of ISO 9000 certification.

The next most important discriminating variable was whether or not the firm operated as a cooperative (**COOP**). **COOP** and **MANUFACT** were negatively correlated ($r = -0,37$). Thus, firms operating as cooperatives and service providers tend to be non-adopters of ISO 9000. Ranked third was parent company affiliation (**PARENTCO**). International parent company affiliation was not found to be significantly different between adopters and non-adopters, suggesting that the ISO 9000 certification decision rested with local management. Products derived from agricultural output (**AGRICOUT**) were ranked fourth. Since **AGRICOUT** is positively correlated with **MANUFACT** ($r = 0,44$) and **EXPDEVD** ($r = 0,47$), ISO 9000 adopters tend to be processors and manufacturers

that export more than 50 percent of their products to developed regions. **TURNOVER** is positively correlated with **AGE** ($r = 0,60$) and **EMPLOYEE** ($r = 0,70$). Although firm turnover (**TURNOVER**) was only significant at the 20 percent level of probability, its importance is watered down because many large non-ISO 9000 adopters employed alternative quality assurance systems. The **AGRICOUT** and **TURNOVER** variables suggest that ISO 9000 certification amongst South African agribusiness firms is associated with larger, established manufacturing concerns. Other international studies, such as Manchester Business School (1996) and Scicchitano (1996), have shown that certification occurs irrespective of firm size or nature of business.

The two-group discriminant analysis revealed that the presence of an alternative quality assurance system was the main variable distinguishing between adopters and non-adopters of ISO 9000. Clearly, the non-adopter group could be separated into two distinct groups, those firms that have adopted alternative quality assurance systems and firms with no quality assurance system in place. Section 6.3 employs discriminant analysis to identify variables that distinguish between these three groups.

6.3 Three-group discriminant analysis between adopters of ISO 9000 quality assurance system (QAS), adopters of alternative QAS and firms with no QAS

With three groups, two discriminant functions can be estimated. In this case, group 3 contains ISO 9000 adopters, group 2 the alternative quality assurance system adopters, and group 1 the non-adopters. Table 6.2 presents results for the three-group model.

Table 6.2 Three-group discriminant function between adopters of ISO 9000 quality assurance system (QAS), adopters of alternative QAS and firms with no QAS, sample of SA agribusiness firms, 1998 (n = 65)

Explanatory variable	Standardised coefficient		Significance level		
	Discriminantfunction1	Discriminant function 2			
COOP	-0,694	0,306	****		
PARENTCO	0,418	0,061	*		
AGRICOUT	0,362	-0,301	*		
TURNOVER	0,244	0,940	***		
Discriminant function statistics					
Chi-square	35,90****	5,35*			
Wilks' Lambda	0,55	0,92			
Canonical correlation	0,63	0,29			
Eigenvalue	0,66	0,09			
Overall classification					
Actual group		Number of cases	Predicted group membership (Percentage in parenthesis)		
			1	2	3
Firms with no QAS	1	7	3 (42,9)	4 (57,1)	0 (0)
Adopters of alternative QAS	2	34	1 (2,9)	29 (85,3)	4 (11,8)
Adopters of ISO 9000 QAS	3	24	0 (0)	16 (66,7)	8 (33,3)
Overall percentage classified			61,5 percent		

*, ***, **** denote statistical significance at the 20, 5 and 1 percent levels of probability

To fully appreciate the results of this discriminant analysis, group centroids for each discriminant function (Figure 6.1) need to be considered. The first discriminant function (D_1) effectively

distinguishes between group 1 (non-adopters) and groups 2 and 3. The difference in group centroids amounts to 2,72 standard deviations. The most important variable in discriminant function 1 is **COOP**. Its negative sign suggests that groups 2 and 3 do not operate as cooperatives. **PARENTCO** ranked second, and **AGRICOUT** ranked third, suggest that non-adopters do not have parent company affiliation, do not process or manufacture products derived from agricultural output, and do not export to developed regions. **AGRICOUT** is positively correlated with **MANUFACT** ($r = 0,44$) and **EXPDEVD** ($r = 0,47$). The remaining variable entering the model, **TURNOVER**, suggests that adopters of quality assurance systems tend to be larger firms (greater turnover and number of employees).

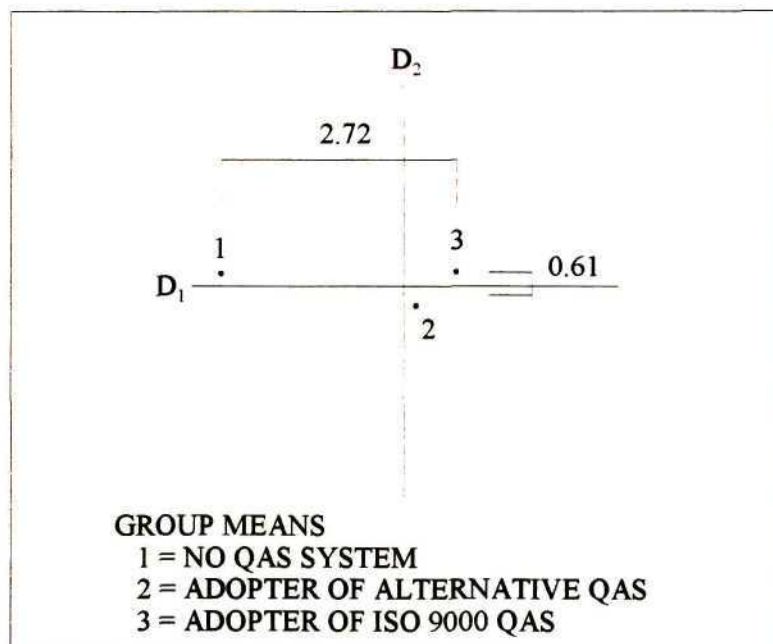


Figure 6.1 Group centroids plotted on orthogonal discriminant functions

The second discriminant function (D_2) distinguishes between group 2 and groups 1 and 3. However, the function is barely significant and the difference in group centroids amounts to just 0,61 standard deviations. For this reason, only **TURNOVER** with a weighting of 0,94 warrants mention. The positive sign suggests that ISO 9000 certification involves greater fixed costs (and hence size economies) than do alternative quality assurance standards, and that some large firms do not perceive net benefits in adopting any quality assurance system. These large firms tend to be cooperatives that specialize in providing agricultural services.

Discriminant analysis was used to determine the factors that distinguish between adopters and non-adopters of ISO 9000. Most non-adopter firms had adopted an alternative quality assurance system whilst some firms had no recognised quality assurance system. Conclusions, management and policy implications are presented next.

CONCLUSIONS

The liberalisation of world markets presents both challenges and opportunities for South African agribusiness firms. Global free trade forces firms to become more competitive, allowing firms to expand existing markets or enter new ones. To improve competitiveness, firms need to become more customer orientated and cost effective. Product differentiation (adding value to products) and niche marketing are just two approaches firms can use to satisfy consumer wants. Cost leadership can be achieved through economies of size, reducing transaction costs and adopting cost-saving technology.

This study identified strategies that firms can adopt to meet the challenges of competition, including Total Quality Management (TQM), business process reengineering and process management. Before discussing the ISO 9000 quality assurance system, the following points need to be made. Firstly, becoming customer orientated (understanding and responding to the needs of consumers) is critical for company survival. Secondly, adopting modern information technologies encourages customer orientation and enhances both inter- and intra-firm communications. Lastly, industry-wide adoption of ISO 9000 quality assurance standards would reduce transaction costs.

The ISO 9000 quality assurance standards are increasingly being adopted by firms throughout the world. A postal survey conducted amongst 92 South African agribusiness firms revealed that 33 respondents (36 percent) were ISO 9000 certified. The desire to improve customer service, a basis for quality improvement and the need to improve operational efficiency (reduce wastage) were the most important factors influencing certification. Certification had a positive impact on most

performance indicators, in particular on documented processes (e.g. record-keeping), overall firm performance and quality of output. In addition, certification has had a positive impact on decreasing error rates, and improving customer service and quality of purchased inputs. Results also suggest that certification had a positive impact on reducing transaction costs.

Discriminant analysis was used to identify and rank variables that differentiate between adopters and non-adopters of ISO 9000. The presence of an alternative quality assurance system, and operating as a cooperative, were inversely related to ISO 9000 adoption. Results revealed that adopters of ISO 9000 tended to be larger, established firms with parent company affiliation, manufacturing products derived from agricultural output and exporting to developed countries. A three-group discriminant analysis was also performed separating the non-adopter group into those firms with an alternative quality assurance system and those without any recognised quality assurance system. This analysis showed that firms with no quality assurance tended to be large cooperatives involved in the service sector. The most important variable distinguishing between firms that had adopted ISO 9000 and those that had adopted an alternative quality assurance system was firm turnover. This finding suggests that the fixed costs of implementing ISO 9000 limit its adoption amongst very small firms in South Africa. Apparently this is not the case in United Kingdom and the United States of America where ISO 9000 has been readily adopted by small and medium sized firms as well as firms in the service industry.

At present firms with alternative quality assurance systems do not perceive any additional net benefits arising from ISO 9000 certification. However, client preferences, especially in North America, Europe

and Australasia, could well shift in favour of an internationally recognised and accredited quality assurance system such as ISO 9000. Barriers to trade, which have steadily declined following international trade agreements (GATT/WTO), could be replaced by non-tariff barriers such as ISO 9000 certification and HACCP (Caswell and Hooker, 1996). To secure export markets in the future, managers of firms with alternative quality assurance systems will need to monitor client and country quality assurance requirements.

Results suggest that the presence of size economies could exclude small firms from ISO 9000 certification. This has policy implications in South Africa where government is actively promoting small and medium-sized enterprises (SME's). Government might consider subsidising the costs of ISO 9000 certification amongst SME's wanting to export to developed countries. At present, African, South American and Asian clients generally do not require ISO 9000 certification. In addition, government and business associations could increase awareness of ISO 9000 and its associated costs and benefits amongst South African firms by disseminating relevant information.

Being a relatively new concept, further research on ISO 9000 certification needs to be conducted. Through identifying and quantifying the costs and benefits of certification, proper feasibility studies can be done. In addition, monitoring the progress of certification amongst South African agribusiness firms would determine the extent of adoption amongst various firm types and sizes. Comparisons could then be made between different industry sectors and international experiences.

SUMMARY

The South African and world agricultural markets have experienced considerable change in recent years. Economic and political considerations have been the main driving forces in the deregulation of the South African agricultural sector. The elimination of marketing boards, single-channel marketing and import restrictions has liberated local agricultural trade. On a global scale, the Uruguay round of the General Agreement on Tariffs and Trade (GATT), now administered by the World Trade Organisation (WTO), has enhanced the global liberalisation of agricultural trade. The dynamic trade environment has important consequences for local agribusiness firms. Competition for market share in both local and international markets will become more fierce and firms that cannot adapt to the new challenges of the market will ultimately go out of business.

Managers of agribusiness firms need to identify, and respond to, the factors which influence firm competitiveness. Competitiveness is the ability to profitably create and deliver value through cost leadership and/or product differentiation. Firms need to examine their cost structure and identify where costs can be reduced. Achieving economies of size, reducing transaction costs and adopting cost-saving technologies all encourage cost leadership. Identifying and responding to customer demands through product differentiation, quality control or niche marketing enhances firm competitiveness. Recognised management strategies such as Total Quality Management (TQM), business process reengineering and process management have been employed by firms throughout the world to improve their competitiveness. Central to TQM is continuous process improvement, whilst process reengineering takes a more radical approach to process improvement. Process

management encompasses both the continuous improvement and reengineering approaches.

Businesses throughout the world are increasingly adopting the ISO 9000 quality assurance standards. ISO 9000 certified firms become more competitive through becoming more cost effective and customer orientated. These standards were developed by the International Organisation for Standardisation which is based in Geneva, Switzerland. ISO 9000 represents voluntary principles of good practice. The ISO 9000 series (ISO 9000 - ISO 9004) describes internationally accepted procedures and guidelines to maintain quality in product design, production, installation and service. To become ISO certified, a firm must obtain the guidelines, adapt them to their own particular needs, follow the documented procedures and then submit to an audit by an external registration organisation.

A postal survey was conducted amongst 92 South African agribusiness firms to study South African experiences with ISO 9000, including the extent of ISO 9000 adoption, reasons for certification and the costs and benefits involved. Respondents were classified as being either certified (33), intermediate (partially certified) (9) or non-certified firms (50). The questionnaire also investigated the orientation of agribusiness firms to other quality systems, namely Hazard Analysis Critical Control Point (HACCP) and Total Quality Management (TQM). The three most important factors influencing ISO 9000 certification were, the desire to improve customer service, a basis for quality improvement and the need to improve operational efficiency (decrease wastage). In particular, certification impacted positively on documented processes (e.g. record-keeping), overall firm performance and quality of output. Certification also resulted in lower error rates, improved customer service, better

quality of purchased inputs and reduced transaction costs. Total costs of achieving ISO 9000 certification did not exceed 1,02 percent of turnover. The results of this study suggest that the costs of certification may be prohibitive for very small firms as smaller firms show the highest cost per Rand of turnover and per employee. There is also some evidence of diseconomies for very large firms. The ISO 9000 system, with its effective documentation, enforcement and control procedures, provides structure to a TQM system. The HACCP system can also be readily incorporated into a ISO 9000 system.

Discriminant analysis was used to determine which firm characteristics influence certification. The independent variables (and their expected signs) which were expected to distinguish ISO 9000 adopters from non-adopters include: a) firm size (+), b) alternative quality assurance system (-), c) selling to international customers (+), d) parent company (+), e) years in business (+), f) involvement in manufacturing (+), g) products derived from agricultural output (+) and h) business entity (-). Firms with an alternative quality assurance system, or operating as a cooperative, were unlikely to adopt the ISO 9000 quality assurance standards. Adopters of ISO 9000 tended to be larger, established firms with parent company affiliation, manufacturing products derived from agricultural output and exporting to developed countries. Three-group discriminant analysis separated the non-adopter group into those firms with an alternative quality assurance system and those without any recognised quality assurance system. Results of this analysis showed that firms with no quality assurance tended to be large cooperatives involved in the service sector. Firm turnover was the most important variable distinguishing between firms that had adopted ISO 9000 and those that had adopted an alternative quality assurance system.

To secure future trade, managers of firms with alternative quality assurance systems will need to observe customer and country quality assurance requirements. A change in customer preferences, especially in developed countries, could necessitate an internationally recognised and accredited quality assurance system such as ISO 9000. In addition, barriers to trade, which have steadily decreased following international trade agreements (GATT/W TO), could be replaced by non-tariff barriers such as ISO 9000 certification and HACCP.

Results of the exploratory and discriminant analysis suggest that size economies could prevent very small firms from becoming ISO 9000 certified. This places smaller firms at a distinct disadvantage compared to larger firms. The South Africa government, who are actively promoting small and medium-sized enterprises (SME's), might consider subsidising the costs of ISO 9000 certification amongst SME's wanting to enter the export market. Comments expressed by some of the respondents highlighted the need for disseminating information relevant to the ISO 9000 standards. Government and business associations could assist in this regard, thereby encouraging South African firms to become more competitive in order to meet the challenges of the global market place.

REFERENCES

- AHEARN, M., CULVER, D. AND SCHONEY, R. (1990). Usefulness and limitations of COP estimates for evaluating international competitiveness: A comparison of Canadian and U.S. wheat. *American Journal of Agricultural Economics*, Vol 72, No. 5: 1283-1291.
- BOUNDS, G.M. (1996). Siemens seeks ISO 9000 certification: A foundation for vision 2000. In: Bounds, G.M. (ed), *Cases in Quality*, Irwin, Chicago, USA.
- BREDAHL, M.E. AND HOLLERAN, E. (1997). Food safety, transaction costs and institutional innovation. In: Schiefer, G. and Helbig, R. (eds), *Quality Management and Process Improvement for Competitive Advantage in Agricultural and Food*. Proceedings of the 49th seminar of the European Association of Agricultural Economists, University of Bonn (ILB), Germany: 51-67.
- CASWELL, J.A., AND HOOKER, N.H. (1996). HACCP as an international trade standard. *American Journal of Agricultural Economics*, Vol 78, No. 3: 775-779.
- COFFIN, G., LARUE, B., BANIK, M., AND WESTGREN, R. (1993). Competitiveness in the Canadian Food Industry. *Canadian Journal of Agricultural Economics*, Vol 41, No. 4: 459-473.
- DAVENPORT, T.H. (1993). *Process Innovation: Reengineering Work Through Information Technology*. Harvard Business School Press, Boston, USA.
- DEN OUDEN, M., DIJKUIZEN, A.A., HUIRNE, R.B.M. AND ZUURBIER, P.J.P. (1996). Vertical cooperation in agricultural production - marketing chains, with special reference to product differentiation in pork. *Agribusiness: An International Journal*, Vol 12, No. 3: 277-290.
- DEVELIN, N. AND HAND, M. (1993). *Total Quality Management: Breaking Down the Barriers*. Institute of Chartered Accountants in England and Wales, London, UK.

EARLY, R. AND SHEPARD, D. (1997). A holistic approach to quality with safety in the food chain. In: Schiefer, G. and Helbig, R. (eds), *Quality Management and Process Improvement for Competitive Advantage in Agricultural and Food*. Proceedings of the 49th seminar of the European Association of Agricultural Economists, University of Bonn (ILB), Germany: 391-400.

FOWLER, C. AND LORD, B. (1995). ISO and TQM. *Chartered Accountants Journal of New Zealand*, Vol 74, No. 10: 33-38.

GUERIN, J.M. AND RICE, R.W. (1996). Perceptions of importers in the United Kingdom, Germany, and the Netherlands regarding the competitive advantages of ISO 9000. *Forest Products Journal*, Vol 46, No. 4: 27-31.

HAMMER, M. AND CHAMPY, J. (1994). *Reengineering the Corporation: A Manifesto for Business Revolution*. HarperCollins Publishers, New York, USA.

HELBIG, R. (1997). Process management - supporting tools and consequences for the agricultural sector. In: Schiefer, G. and Helbig, R. (eds), *Quality Management and Process Improvement for Competitive Advantage in Agricultural and Food*. Proceedings of the 49th seminar of the European Association of Agricultural Economists, University of Bonn (ILB), Germany: 189-202.

HEMENWAY, C.G. (1996). Ten things you should know about ISO 14000. *SABS-Bulletin*, Vol 15, No. 8:12-14.

HENDRY, I. (1991). Quality assured: A stamp for survival. *Pulp and Paper International*, Vol. 33, No. 8:16-23.

INTERNATIONAL ORGANISATION FOR STANDARDISATION (1998). *The ISO survey of ISO 9000 and ISO 14000 certificates - The seventh cycle: up to and including 1997*. Online information <<http://www.iso.ch>>.

KENNEDY, P.L., HARRISON, R.W., KALAITZANDONAKES, N.G., PETERSON, H.C. AND RINDFUSS, R.P. (1997). Perspectives on evaluating competitiveness in agribusiness industries. *Agribusiness: An International Journal*, Vol 13, No. 4: 385-392.

LEE, S.M. AND ASLLANI, A. (1997). TQM and BPR: symbiosis and new approach for integration. *Management Decision*, Vol 35, No 6: 409-416.

MANCHESTER BUSINESS SCHOOL (1996). ISO 9000 - Does it work?, Survey commissioned by SGS Yarsley International Certification Services. *ISO 9000 News*, Vol 5, No. 6: 4-11.

MARKET AND OPINION RESEARCH INTERNATIONAL (1996). Attitudes of 'Captains of Industry' towards ISO 9000, Survey commissioned by SGS Yarsley International Certification Services, *ISO 9000 News*, Vol 5, No. 6: 12-14.

MIZZI, L. (1997). Total quality management in agro-industrial small and medium-sized enterprises (SMEs) in Malta. In: Schiefer, G. and Helbig, R. (eds), *Quality Management and Process Improvement for Competitive Advantage in Agricultural and Food*. Proceedings of the 49th seminar of the European Association of Agricultural Economists, University of Bonn (ILB), Germany: 157-167.

NOOTEBOOM, B. (1993). Firm size effects on transaction costs. *Small Business Economics*, Vol 5: 283-295.

NORUŠIS, M.J. (1994). *SPSS Professional Statistics 6.1 Manual*. Marketing Department, SPSS Inc., Chicago, USA.

ORTMANN, G.F. (1997). *Improving the economic competitiveness of agricultural and agribusiness firms in a changing economic environment: Quality, process management and information technology*. Report B-97/2, University of Bonn (ILB), Germany.

PETIT, M., AND GNAEGY, S. (1995). Agricultural competitiveness and global trade: Looking at the future of agriculture through a crystal ball. In: Peters, G.H. and Hedley, D.D. (eds), *Agricultural Competitiveness: Market Forces and Policy Choice*. Proceedings of the 22nd International Conference of Agricultural Economists, Harare, Zimbabwe. Dartmouth Publishing Company, UK: 45-60.

PORTER, M. (1990). *The Competitive Advantage of Nations*. The Free Press, New York, USA.

SABS (1995). *Marketing research study amongst SABS ISO 9000 certified companies*. South African Bureau of Standards, Pretoria, South Africa.

SABS (1998). *SABS Register*. Malnor Ltd, Auckland Park, South Africa.

SADGROVE, K. (1995). *Making TQM work*. Kogan Page Ltd, London, UK.

SCHIEFER, G. (1994). *Quality management in agriculture and food: Management principles, system requirements and development directions*. Report B-94/2, University of Bonn (ILB), Germany.

SCHIEFER, G. (1997). Total quality management and quality assurance in agriculture and food. In: Schiefer, G. and Helbig, R. (eds), *Quality Management and Process Improvement for Competitive Advantage in Agricultural and Food*. Proceedings of the 49th seminar of the European Association of Agricultural Economists, University of Bonn (ILB), Germany: 139-156.

SCHULER, C., DUNLAP, J. AND SCHULER, K. (1996). *ISO 9000: Manufacturing, Software, and Service*. Delmar Publishers, New York, USA.

SCICCHITANO, P. (1996). Survey takes snapshot of ISO 9000 in the USA. *ISO 9000 News*, Vol 5, No. 4: 6-9.

SHARPLES, J.A. (1990). Cost of production and productivity in analysing trade and competitiveness. *American Journal of Agricultural Economics*, Vol 72, No. 5: 1278-1282.

SONKA, S.T. AND HUDSON, M.A. (1990). Research issues and opportunities affecting the competitiveness of agribusiness firms. *Agribusiness: An International Journal*, Vol 6, No. 2: 87-96.

STREETER, D.H., SONKA, S.T. AND HUDSON, M.A. (1991). Information technology, coordination, and competitiveness in the food and agribusiness sector. *American Journal of Agricultural Economics*, Vol 73, No. 5: 1465-1471.

TAORMINA, T. (1996). *Virtual Leadership and the ISO 9000 Imperative*. Prentice Hall PTR, Upper Saddle River, New Jersey, USA.

TEFERTILLER, K.R. AND WARD, R.W. (1995). Revealed comparative production advantage: Implications for competitiveness in Florida's vegetable industry. *Agribusiness: An International Journal*, Vol 11, No. 2: 105-115.

TINGEY, M.O. (1997). *ISO 9000, Malcolm Baldrige and the SEI CMM for Software*. Prentice Hall PTR, Upper Saddle River, USA.

TRAILL, B. AND DA SILVA, J.G. (1995). Trade, foreign direct investment and competitiveness in the European food industries. In: Peters, G.H. and Hedley, D.D. (eds), *Agricultural Competitiveness: Market Forces and Policy Choice*. Proceedings of the 22nd International Conference of Agricultural Economists, Harare, Zimbabwe. Dartmouth Publishing Company, UK: 79-97.

UNNEVEHR, L.J. AND JENSEN, H.H. (1996). HACCP as a regulatory innovation to improve food safety in the meat industry. *American Journal of Agricultural Economics*, Vol 78, No. 3: 764-769.

VAN DUREN, E., MARTIN, L. AND WESTGREN, R. (1991). Assessing the competitiveness of Canada's agrifood industry. *Canadian Journal of Agricultural Economics*, Vol 39, No. 4: 727-738.

VAN DER WIELE, T. AND BROWN, A. (1997). ISO 9000 series experiences in small and medium-sized enterprises. *Total Quality Management*, Vol 8, No. 2/3: 300-304.

VON SOLMS, S. (1998). *Personal communication*. Quality Assurance Manager, Mondi Kraft, Richards Bay, South Africa.

YUNG, W.K.C. (1997). The values of TQM in the revised ISO 9000 quality system. *International Journal of Operations and Production Management*, Vol17, No. 2: 221-230.

ZAIBET, L. AND BREDAHL, M. (1997). Gains from ISO certification in the UK meat sector. *Agribusiness: An International Journal*, Vol 13, No. 4: 375-384.

ZIGGERS, G.W. (1997). Integrated quality assurance in the pork supply chain: the challenge of vertical cooperation. In: Schiefer, G. and Helbig, R. (eds), *Quality Management and Process Improvement for Competitive Advantage in Agricultural and Food*. Proceedings of the 49th seminar of the European Association of Agricultural Economists, University of Bonn (ILB), Germany: 365-378.

SECTION E. IMPACT OF ISO 9000 CERTIFICATION

What **impact** has ISO 9000 certification had on each of the following **performance indicators**? (Please tick the appropriate block for each performance indicator)

PERFORMANCE INDICATOR	LEVEL OF IMPACT				
	Highly Negative	Negative	None	Positive	Highly Positive
Competitiveness					
Customer service					
Documented process (eg. record-keeping)					
Error rates (decrease)					
Inter-firm communication					
Market access					
Market share					
Number of supplier audits (decrease)					
Number of suppliers (decrease)					
Number of customer audits (decrease)					
Overall firm performance					
Overall firm satisfaction level with ISO 9000					
Overall operating costs (decrease)					
Transaction costs (decrease)					
Wastage (ie. scrap costs) (decrease)					
Productivity					
Profits					
Quality of output					
Quality of purchased inputs					
Sales					
Worker satisfaction / employee morale					

Please go to SECTION G.

**UNIVERSITY OF NATAL, PIETERMARITZBURG
DEPARTMENT OF AGRICULTURAL ECONOMICS**

AGRIBUSINESS QUESTIONNAIRE: 1998

To be completed by a member of senior management and/or a person responsible for the firm's quality control initiatives.

The main objective of this questionnaire is to investigate the benefits and costs of applying quality standards within South African agribusiness firms, with particular emphasis on the ISO 9000 quality assurance standards. **Please follow the instructions given with each question and answer each question fully.**

YOUR SURVEY ANSWERS WILL BE KEPT STRICTLY CONFIDENTIAL.

SECTION A: FIRM/COMPANY DETAILS

1. Which best describes the **nature** of your business? (Please tick the appropriate block(s))

Manufacturer	<input type="checkbox"/>	Retailer	<input type="checkbox"/>
Processor	<input type="checkbox"/>	Other	<input type="checkbox"/>

If **Other**, please describe: _____

2. Is your company affiliated to a **parent company**? (Yes/No) _____
If **Yes**, is the parent company a **South African** company? (Yes/No) _____

3. The **institution** where this questionnaire is being completed can be viewed as (please tick the appropriate block):

(a) the headquarters of the company	<input type="checkbox"/>
(b) a plant or branch of the company	<input type="checkbox"/>
(c) other	<input type="checkbox"/>

If **Other**, please describe: _____

4. For how many **years** has your company been in business? _____ **years**

5. What **products/services** does your company produce/provide? _____

6. Number of employees currently **employed**? _____

7. In what **form of business** does your firm operate? (Please tick the appropriate block)

(a) Private Company (Pty) Ltd	
(b) Public Company	
(c) Close Corporation (CC)	
(d) Partnership	
(e) Individual owner	
(f) Other	

If **Other**, please describe: _____

8. Is your product(s) destined exclusively for the **domestic market**? (Yes/No) _____
 If **No**, proportion of physical production sold on export market _____ %.
 Proportion of **turnover** from exports _____ %

9. What **percentage of total exports** is sold in the following continents?

Continent	Percentage
Africa	
Australasia	
Asia	
Europe	
North America - USA and Canada	
South America	
	100

10. What was the **turnover (sales)** of your company during the last financial year?

R _____ million (financial year: _____)

11. From the company's last **balance sheet** (date: _____), please indicate the following ratios.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} = \underline{\hspace{2cm}}$$

$$\text{Net capital ratio} = \frac{\text{Total assets}}{\text{Total liabilities}} = \underline{\hspace{2cm}}$$

The next section deals with quality control in your firm.

SECTION B: QUALITY CONTROL

1. Does your firm have a **system** to address deviations from quality specifications?
(Yes/No) _____
If **Yes**, **what** system(s) do you have? _____
2. How **long** have you had your current quality control system? _____ months
3. Do employees in your firm receive **quality control training**? (Yes/No) _____
If **Yes**, is there **continuous training**? (Yes/No) _____
4. Does your firm **require** suppliers to have a quality assurance system?
At **present**? (Yes/No) _____ In the **future**? (Yes/No) _____
If **Yes**, **which** system? _____
5. To your knowledge, do your **competitors** require suppliers to have a quality assurance system? (Yes/No) _____
6. If you had to give the **single most important** reason your firm adopted a quality assurance system, would you say that it was (please tick the appropriate block):

FIRM-DRIVEN (ie. improve operational efficiency, cost reduction, etc.)	CUSTOMER-DRIVEN (ie. gain market share, customer requirement, etc.)
---	---

7. Do your **customers** require quality assurance systems? (Please tick the appropriate block)

NO		SOME		ALL	
----	--	------	--	-----	--

8. Do **government** regulations require your firm to have a quality assurance system in place?
(Yes/No) _____
9. In your opinion, is the **adoption** of a quality assurance system standard business practice* for a firm in your line of business?
Locally (Yes/No) _____ Internationally (Yes/No) _____
* standard business practice = widely accepted by sectoral participants (ie. producers, buyers, sellers and regulation).

The following question is only relevant to agri-food firms.

10. Are you **familiar** with the Hazard Analysis Critical Control Point (HACCP) regulations?
(Yes/No) _____
Has your firm **adopted** HACCP? (Yes/No) _____
In your opinion, is application of HACCP **common** in your line of business?
(Yes/No) _____

The next section deals with your suppliers.

SECTION C: SUPPLIERS

1. Is it difficult to **identify suppliers** of inputs/products that your firm requires? (Please tick the appropriate block)

No		Sometimes		Yes	
----	--	-----------	--	-----	--

2. Is it relatively **time consuming** to draft supply (product) specifications? (Please tick the appropriate block)

No		Sometimes		Yes	
----	--	-----------	--	-----	--

3. Is **searching** for a supplier a frequent monthly activity? (Yes/No) _____

4. How **many** suppliers are there to choose from? (Please tick the appropriate block)

0 - 5	6 - 10	11 - 20	21 - 50	51 - 100	> 100
-------	--------	---------	---------	----------	-------

5. Does your firm **work with suppliers** on quality assurance? (Yes/No) _____

6. Choose **one** of your principal suppliers. In one year, **how** many quality control audits does your firm conduct on this supplier? _____

7. Is the process of **negotiating** terms of contract with suppliers a relatively time consuming operation?

No		Sometimes		Yes	
----	--	-----------	--	-----	--

8. Do you frequently **hire a specialist (consultant)** to assist in supplier contract negotiations? (Yes/No) _____

9. Do you **inspect** a supplier's product before signing a contract? (Yes/No) _____

10. Do you have a tendency to negotiate **long-term contracts** with suppliers? (Yes/No) _____

11. Do you have **farmers** as suppliers? (Yes/No) _____ (If No, please go to SECTION D).

If Yes, please list the inputs (products) supplied by farmers: _____

12. Do you **require** minimum quality standards from farmers? (Yes/No) _____

13. Considering the vertical supply chain concept (ie. raw material supplier (farmer) → processor → retailer), do you think the **incorporation** of quality control measures at farm level could make the supply chain more productive and cost-efficient? (Yes/No) _____
 Do you think the **ISO 9000** quality standards could facilitate such quality control measures? (Yes/No/Uncertain) _____

The next section deals with ISO 9000 certification.

SECTION D: ISO 9000 CERTIFICATION/QUALITY ASSURANCE SYSTEM

1. Is your firm **currently** ISO 9000 certified? (Yes/No) _____
 If **Yes**, which **ISO 9000 model** is your firm certified in? (Please tick the appropriate block)

ISO 9001		ISO 9002		ISO 9003	
----------	--	----------	--	----------	--

2. If you answered **No** to Question 1, has your firm (please tick the appropriate block):

(a) considered and rejected ISO 9000 certification	
(b) currently considering ISO 9000 certification	
(c) never come across the concept of ISO 9000	
(d) been certified and then abandoned ISO 9000	

If your firm has not adopted the ISO 9000 quality assurance standards then please go to SECTION F.

3. How were you **first** introduced to the ISO 9000 quality assurance standards? (Please tick only one of the options provided)

ISO 9000 first introduced by	
(a) Competitors	
(b) Media	
(c) Clients	
(d) Company headquarters	
(e) Suppliers	
(f) Other	

If **Other**, please describe: _____

4. What is the **date** of your original ISO 9000 certification? _____
With whom are you registered? (eg SABS) _____

5. What was the **number** of pre-certification audits for your firm? _____
6. Was it necessary for your firm to **hire a consultant** to assist in documentation writing? (Yes/No) _____
7. If you had to give the **single most important** reason for your firm adopting ISO 9000, would you say that it was (please tick the appropriate block):

FIRM-DRIVEN → internal reasons (ie. improve operational efficiency, cost reduction, etc.)		CUSTOMER-DRIVEN → external reasons (ie. gain market share, customer requirement, etc.)	
---	--	--	--

8. Do your principal customers **require** ISO 9000 certification? (Yes/No) _____
If **No**, do you think the situation might **change** in the future? (Yes/No) _____
9. Please indicate the **importance** of factors which influenced/motivated ISO 9000 certification. (Please tick the appropriate block for each factor)

FACTOR	LEVEL OF IMPORTANCE		
	Not Important	Important	Very Important
A basis for quality improvement			
Access to foreign markets			
Certification will be a future requirement			
Corporate mandate			
Reduction in operating costs			
Reduction in transaction costs*			
Customer requirement			
Industry requirement (stay in business)			
Improve operational efficiency/ reduce wastage			
Improve customer service			
Gain market share			
Unite various quality systems			
Other			

* transaction costs = the costs of undertaking exchange between a customer (buyer) and a supplier (seller). They include information costs and the costs associated with negotiating, monitoring and enforcing exchange.

If **Other**, please explain: _____

10. Has your firm **eliminated** any quality control staff positions after ISO 9000 certification?
 (Yes/No) _____
 If **Yes**, how **many** positions have been eliminated? _____
 How many quality control staff do you employ **now**? _____

11. What were the **costs** of

	Costs (Rand)
(a) ISO 9000 implementation*	
(b) Pre-certification auditing fees	
(c) ISO 9000 certification	
(d) Other associated expenses	

* implementation costs include items such as staff training, documenting procedures, hiring of consultants, redeployment of internal resources and the acquisition of equipment for calibration.

Please **describe** the ‘associated expenses’ in (d) above: _____

12. Were the implementation, auditing and certification costs (see Question 11) an initial constraint to the adoption of the ISO 9000 quality assurance standards ?
 (Yes/No) _____

13. Do you **consider** ISO 9000 certification to be a standard business practice for a firm in your line of business?
Locally: At present? (Yes/No) _____ In the future? (Yes/No) _____
Internationally: At present? (Yes/No) _____ In the future? (Yes/No) _____

14. Please **list** any drawbacks/disadvantages of ISO 9000 certification which your company experienced.

15. Please **provide factual information** (before and after certification) of any improvements in performance measures resulting from ISO 9000 certification.

	Before Certification	After Certification
Example: Conformance to specifications	75% of final products conformed	within two years 90% of products conformed

16. In your opinion, do the **benefits** of ISO 9000 certification **outweigh** the **costs** incurred? (Yes/No) _____
If **Yes**, the **extent** being (please tick the appropriate block)

Significant	<input type="checkbox"/>	Minimal	<input type="checkbox"/>	Uncertain	<input type="checkbox"/>
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17. Do you believe the adoption of ISO 9000 quality assurance standards could **benefit** South African agribusiness firms? (Yes/No) _____

ISO 9000 certification may be **part** of a more comprehensive quality management approach as exemplified in the Total Quality Management (TQM) concept. TQM is centred on the principles of satisfying customer needs and expectations, and the continuous improvement of quality in all business activities and processes.

18. Has your firm **adopted** the principles of TQM? (Yes/No) _____
If **No**, has your firm (please tick the appropriate block)

(a) considered and rejected the principles of TQM	<input type="checkbox"/>
(b) currently considering TQM implementation	<input type="checkbox"/>
(c) never come across the concept of TQM	<input type="checkbox"/>

19. Has your firm **adopted** the ISO 14000 environmental quality standards? (Yes/No) _____
If **No**, is your firm considering adopting ISO 14000? (Yes/No) _____

The next section deals in more detail with the impacts of adopting the ISO 9000 quality standards.

The following section deals with firms which have not adopted the ISO 9000 quality assurance standards.

SECTION F. ISO 9000 QUALITY ASSURANCE STANDARDS

Introduction:

ISO 9000 quality assurance standards represent voluntary principles of good practice. ISO 9000 standards were developed by the International Organisation for Standardisation (ISO) which is based in Geneva, Switzerland. The series describes internationally accepted procedures and guidelines to maintain quality in product design, production, installation and servicing. It is not a product certification scheme.

Studies done locally and abroad have identified the following costs and benefits of ISO 9000 certification.

Costs:

- ▶ registration fees
- ▶ implementation costs, which include staff training, documenting procedures, consultants' fees, redeployment of internal resources and the acquisition of equipment for calibration
- ▶ auditing fees

Benefits:

- ▶ reduction in human errors, product non-conformities and product rejection rates
- ▶ internal auditing became more cost efficient
- ▶ transaction costs are lower when dealing with certified suppliers
- ▶ need for analytical laboratories is reduced
- ▶ maintain market share
- ▶ provides some guarantee of access into export markets
- ▶ improvement in product/service quality
- ▶ staff motivation increased
- ▶ improvement in record-keeping
- ▶ improvement in internal communication
- ▶ advocates and instills a market orientation and customer focus in employees

Outline of the basic procedure to obtain ISO 9000 certification:

- A firm develops and implements a quality management system and detailed procedures, based on the dictates of the ISO 9000 standards.
- The system is then audited by a qualified external assessing agent.
- If the system is judged to be in compliance with the ISO standard, the firm can be "registered".
- Once in place the system is audited periodically at intervals ranging from 6 months to once every 3 years.

1. After reading this brief outline of the ISO 9000 standards, **would you consider** adopting the ISO 9000 quality standards? (Yes/No) _____

APPENDIX 2. REASONS GIVEN FOR NON-PARTICIPATION IN STUDY

Table 1. Reasons given for not participating in study, sample of SA agribusiness firms, 1998 (n = 32)

Reason given	n
Company policy not to participate in any kind of questionnaire or survey	1
No reason given	8
Unable to complete questionnaire due to strike action	1
Some questions are confidential and we therefore exercise our right not to submit this document	1
To busy - no time available to complete questionnaire	3
Company takeover	1
Company/plant no longer exists/closed down	3
Foreign company - management not speak English	1
Major restructuring in progress	2
Felt questionnaire not applicable/relevant to business	8
Posted to wrong address	3
TOTAL	32

APPENDIX 3. DISADVANTAGES EXPERIENCED WITH ISO 9000 CERTIFICATION

Table 2. Disadvantages associated with ISO 9000 certification, 1998 (N = 28)

Description of drawbacks/disadvantages	n	Percent
No drawbacks/disadvantages	11	39,30
Cost	3	10,72
Constraint on production	1	3,57
Heavy documentation load and poor auditing results in loss of credibility	1	3,57
Ensure not go overboard	1	3,57
Paperwork time consuming	1	3,57
High expectations from senior management	1	3,57
Sustaining discipline to procedural requirements	1	3,57
Time consuming to develop and implement (but outweighed by ensuing benefits)	1	3,57
Certification is a time consuming paper exercise but computer software can ease problem but certification bodies require a manual system to start off with	1	3,57
Lose staff with ISO experience (brain drain)	1	3,57
Motivational problems due to increased workload	1	3,57
Increase in paper work	1	3,57
Initially paperwork and system took up time and effort involving a change in attitude	1	3,57
Can easily focus on process rather than goal (ISO vs quality improvement) and too much paper work - use electronic document management system	1	3,57
Initial work load in documenting and implementation, difficulty experienced in getting people to write what they do - fears only after certification did staff accept /buy into ISO 9002 system	1	3,57
TOTAL	28	100